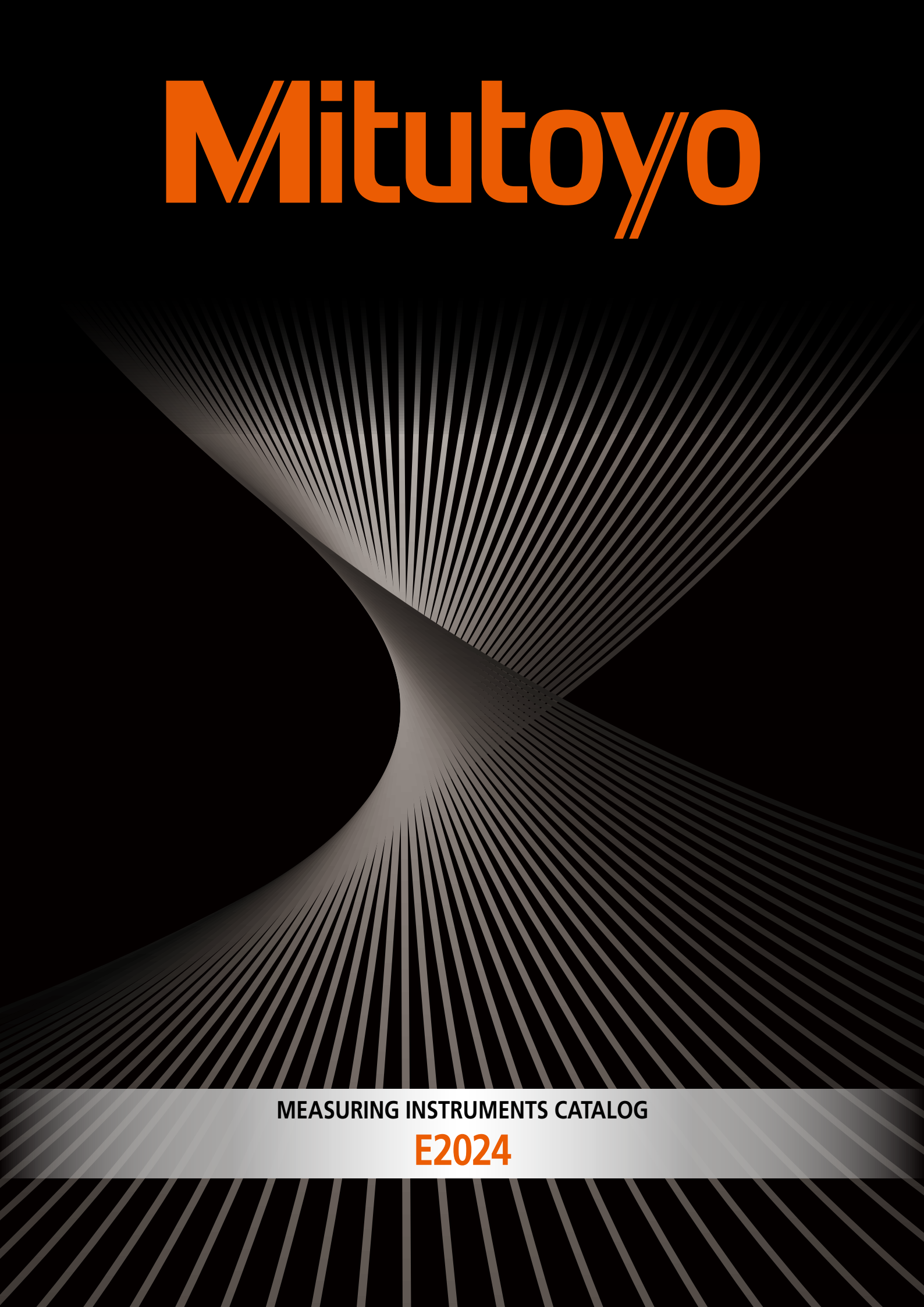
Mitutoyo



MEASURING INSTRUMENTS CATALOG

E2024

Notes on Use

Export Control

Do not commit an act, which could directly or indirectly, violate any law or regulation of Japan, your country or any other international treaty, relating to the export or re-export of any commodities.
Please consult our sales office near you before you export our products or you offer technical information to a nonresident.

Safety Caution

Mitutoyo products are designed, manufactured and sold as industrial products that are intended for use at manufacturing sites.
Carefully read the specifications and functions in this catalog before selecting products.
Safety may be compromised if you use products for purposes other than those stated here.
Feel free to contact your nearest Mitutoyo sales center if you wish to use a product for other purposes or in a special environment.

Sale of inch-model products

Sale of inch-model products in Japan is regulated by the Japanese laws and ordinances.
If you request to purchase inch-model products, contact your nearest Mitutoyo sales office.

Appearance and Specifications

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.
The product names in this catalog are registered trademarks or trademarks of Mitutoyo or their respective companies.

Mitutoyo

Measuring Instruments Catalog

E2024

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Mitutoyo

Meaning of Symbols

ABSOLUTE Linear Encoder

ABSOLUTE™

ABSOLUTE is a trademark of Mitutoyo Corporation.

This is an electronic measuring scale that provides a direct readout of ABSOLUTE linear position when switched on, without needing to be zeroed or reset. Mitutoyo measuring instruments incorporating these scales provide the significant benefit of being always ready for measurement without the need of preliminary setting after switching on. There are three types of ABSOLUTE linear encoders depending on whether the method used is electrostatic, electromagnetic, or optical. They are widely used in various measuring instruments as measuring systems endowed with enhanced reliability of measured values.

Advantages:

1. No count error occurs even if you move the slider or spindle extremely rapidly.
2. You do not have to reset the system to zero when turning on the system after turning it off*1.
3. As this type of encoder can drive with less power than the incremental encoder, the battery life is prolonged to about 5 years (continuous operation of 18,000 hours)*2 under normal use.

*1 Unless the battery is removed.
*2 In the case of ABSOLUTE Digimatic calipers and ABSOLUTE coolant proof calipers.

IP Codes

IP65

IP66

IP67

IP67 G

IP is a trademark of Mitutoyo Corporation. The numerals and letters indicate protection levels.

These are codes that indicate the degree of protection provided (by an enclosure) for the electrical function of a product against the ingress of foreign bodies, dust and water as defined in IEC standards (IEC 60529: 2013) and JIS C 0920: 2003. [IEC: International Electrotechnical Commission]

(IP: International Protection) **IP** □ □ □ (Supplementary letter)

First characteristic numeral	Degrees of protection against solid foreign objects	
	Brief description	Definition
0	Unprotected	—
1	Protected against solid foreign objects of Sø50 mm and greater	A Sø50 mm object probe shall not fully penetrate enclosure*
2	Protected against solid foreign objects of Sø12.5 mm and greater	A Sø12.5 mm object probe shall not fully penetrate enclosure*
3	Protected against solid foreign objects of Sø2.5 mm and greater	A Sø2.5 mm object probe shall not fully penetrate enclosure*
4	Protected against solid foreign objects of Sø1.0 mm and greater	A Sø1.0 mm object probe shall not fully penetrate enclosure*
5	Protected against dust	Ingress of dust is not totally prevented, but dust that does penetrate must not interfere with satisfactory operation of the apparatus or impair safety.
6	Dust-proof	No ingress of dust allowed.

* The full diameter of the object probe shall not pass through an opening of the enclosure.

For details of the test conditions used in evaluating each degree of protection, please refer to IEC 60529 (JIS C 0920).

Second characteristic numeral	Degrees of protection against water	
	Brief description	Definition
0	Unprotected	—
1	Protected against vertical water drops	Vertically falling water drops shall have no harmful effects.
2	Protected against vertical water drops within a tilt angle of 15°	Vertically falling water drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical.
3	Protected against spraying water	Water sprayed at an angle up to 60° either side of the vertical shall have no harmful effects.
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects.
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects.
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.
7	Protection against water penetration	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time.
8	Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for IPX7.

Supplementary letter	Degrees of protection against oil	
	Abstract	
F	Oil-resistant	Drops or splashes of oil from any direction cause no harmful effects.
G	Oil-proof	Protection against entry of oil droplets or splashes from all directions.

The protection levels against oil are specified only in the appendix of JIS C 0920.

Digimatic S1

DIGIMATIC S1

Mitutoyo's proprietary bidirectional serial communication protocol enables a connected PC to execute measurement data output, setting and control of a measuring instrument, and capture of information of a specific measuring instrument.

TÜV Rheinland certification marks

All products with the marks shown on the left have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence. Mitutoyo also calibrates the purchased measuring instruments and issues a calibration certificate, for a fee, that proves traceability to the relevant standard.
Note: For the meaning of the inspection marks shown at left, refer to the detailed description of each product.

MeasurLink® ENABLED marks

Products equipped with the measurement data output function can be connected to the measurement data network system MeasurLink®.
MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

Installation of Main Unit Startup System

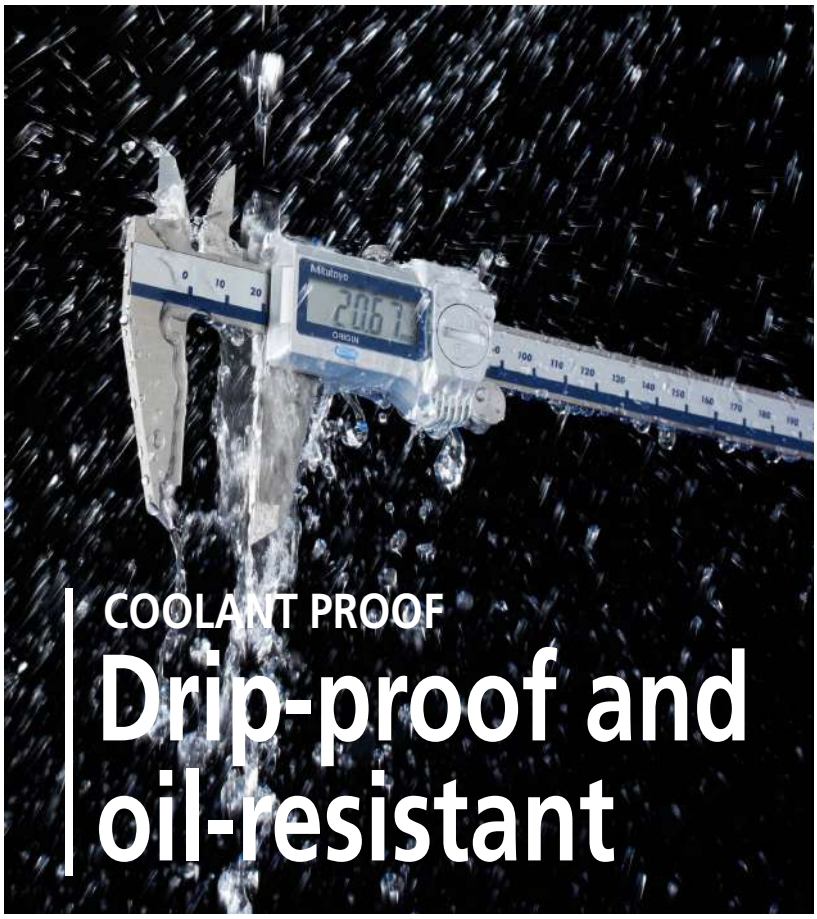
As a part of the enhancement of our export control system, the large CNC measuring machines (all the CNC Coordinate Measuring Machines, Vision Measuring Systems, and Form Measuring Machines) are now equipped with a Main Unit Startup System (relocation detecting system) before export.
This system is designed to take a machine out of operation upon detecting the mechanical shock that accompanies relocation. If you intend to relocate a measuring machine fitted with this system, please contact us beforehand so that our service engineers can assist you.
However, the system may be triggered in the event of a natural event such as a powerful earthquake. In this case, our service engineers will deal with the situation at the earliest opportunity.

Features of Mitutoyo Small Tool Instruments

Resolution: 0.0001 mm

High Accuracy Digimatic Micrometer SERIES 293 with resolution of 0.0001 mm

The High-Accuracy Digimatic Micrometer utilizes Mitutoyo's innovative 0.1 µm resolution ABS (ABSOLUTE) rotary sensor and high-accuracy screw machining technology to achieve the MPE of ±0.5 µm, delivering 0.1 µm resolution measurements without sacrificing operability.



COOLANT PROOF

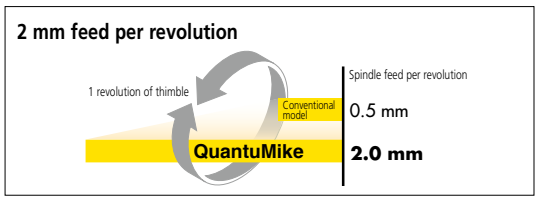
COOLANT PROOF is the universal term for Mitutoyo Digimatic Small Tool Instruments that are not only resistant to dust and water ingress (rated to IP65 or better) but also to deterioration of materials due to contact with the cutting oil or coolant fluids in normal use.

Note: Some types of aggressive cutting oil or coolant may degrade the sealing materials over time.

COOLANT PROOF™

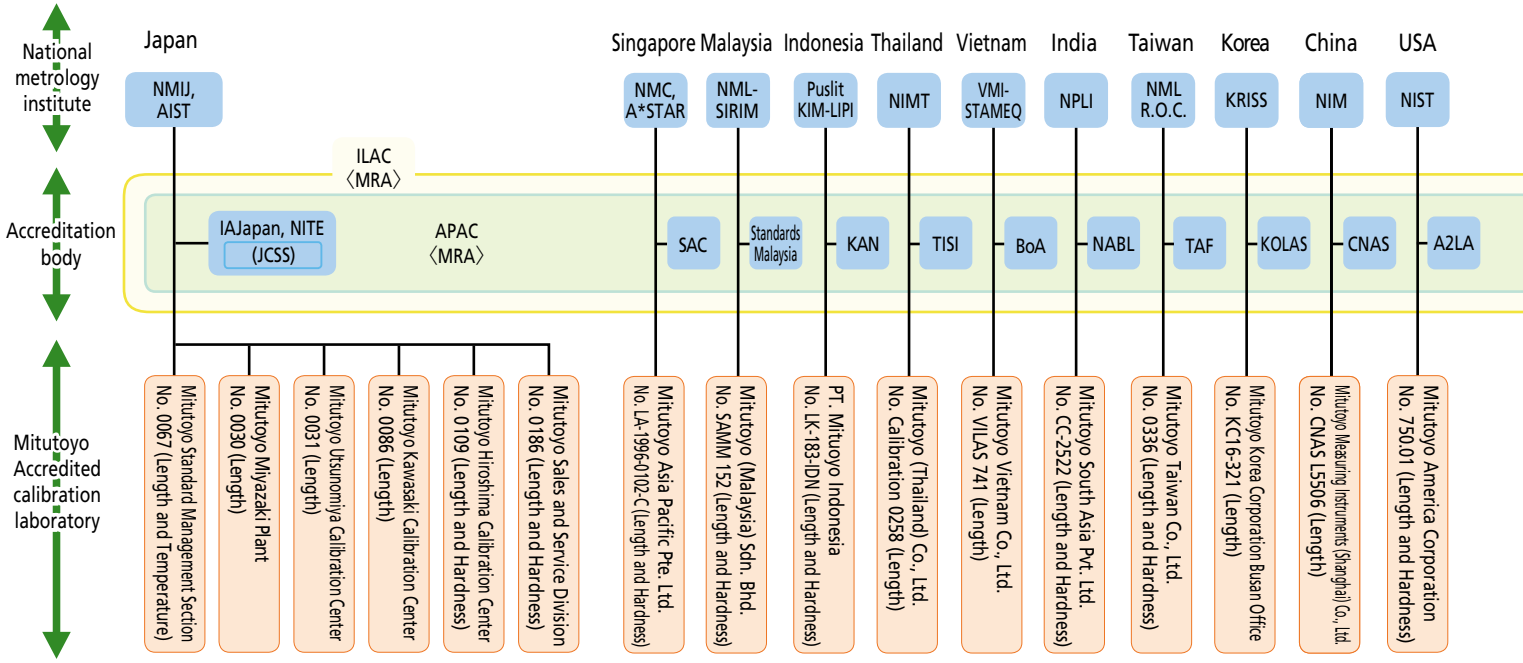
QuantuMike with 2 mm/rev Spindle Feed

Faster measurement is achieved by using a finer thread which feeds the spindle by 2 mm per revolution of the thimble instead of the standard 0.5 mm. This increase of spindle feed has been made possible thanks to new high precision thread-cutting and testing techniques.
In addition, the ratchet thimble mechanism helps ensure repeatable results and enables easy operation- even when making measurement one-handed.



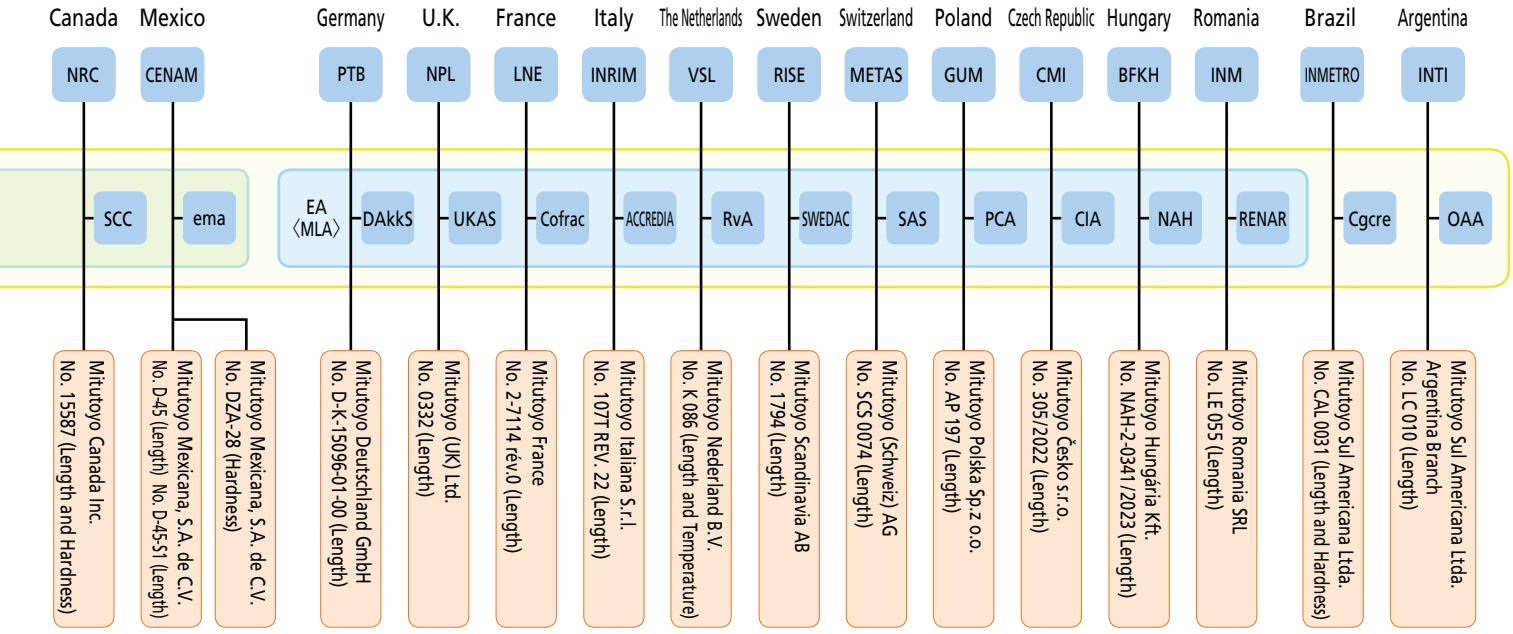
Calibration Laboratories Worldwide

Mitutoyo has built a network for comprehensive calibration support of precision measuring products in the global market. To provide calibration services on a global scale, Mitutoyo has gained ISO/IEC 17025 certification from the accreditation body in each country, and has issued calibration certificates carrying the mark of each accreditation body. In addition, the calibration certificates issued by each calibration laboratory are mutually recognized in the countries and commercial areas signed in the MRA (Mutual Recognition Arrangement) of ILAC (International Laboratory Accreditation Cooperation) and APAC (Asia Pacific Accreditation Cooperation), or the MLA (Multilateral Agreement) of EA (European co-operation for Accreditation).



- Japan
  - AIST : National Institute of Advanced Industrial Science and Technology
  - NMIJ : National Metrology Institute of Japan
  - IAJapan : International Accreditation Japan
  - NITE : National Institute of Technology and Evaluation
  - JCSS : Japan Calibration Service System
- Singapore
  - NMC, A*STAR : National Metrology Centre/Agency for Science, Technology and Research
  - SAC : Singapore Accreditation Council
- Malaysia
  - NML-SIRIM : National Metrology Laboratory-Standards and Industrial Research Institute of Malaysia
  - Standards Malaysia : Standards Malaysia
- Indonesia
  - Puslit KIM-LIPI : Research Center for Calibration, Instrumentation and Metrology-Indonesian Institute of Science
  - KAN : Komite Akreditasi Nasional
- Thailand
  - NIMT : National Institute of Metrology (Thailand)
  - TISI : Thai Industrial Standard Institute
- Vietnam
  - VMI-STAMEQ : Vietnam Metrology Institute, Directorate for Standards and Quality
  - BoA : BUREAU OF ACCREDITATION
- India
  - NPLI : National Physical Laboratory of India
  - NABL : National Accreditation Board for Testing and Calibration Laboratories
- Taiwan
  - NML R.O.C. : National Measurement Laboratory R.O.C.
  - TAF : Taiwan Accreditation Foundation
- Korea
  - KRISS : Korea Research Institute of Standards and Science
  - KOLAS : Korea Laboratory Accreditation Scheme
- China
  - NIM : National Institute of Metrology
  - CNAS : China National Accreditation Service for Conformity Assesment
- U.S.A.
  - NIST : National Institute of Standards and Technology
  - A2LA : American Association for Laboratory Accreditation
- Canada
  - NRC : National Research Council Canada/Institute for National Measurement Standards
  - SCC : Calibration Laboratory Assessment Service/Standards Council of Canada
- Mexico
  - CENAM : Centro Nacional de Metrología
  - ema : Entidad Mexicana de Acreditación, a.c.
- Germany
  - PTB : Physikalisch-Technische Bundesanstalt
  - DAkkS : Deutsche Akkreditierungsstelle GmbH
- U.K.
  - NPL : National Physical Laboratory
  - UKAS : United Kingdom Accreditation Service
- France
  - LNE : Laboratorie national de metrologie et d'essaias
  - Cofrac : Comité français d'accréditation

Note: The above are domestic and international locations where Mitutoyo provides ISO/IEC 17025 accredited calibration services.
(As of July, 2024)



- Italy
  - INRIM : Istituto Nazionale di Ricerca Metrologica
  - ACCREDIA : L'ENTE ITALIANO DI ACCREDITAMENTO
- The Netherlands
  - VSL : Van Swinden Laboratorium
  - RvA : Raad voor Accreditatie
- Sweden
  - RISE : RISE Research Institutes of Sweden AB
  - SWEDAC : Swedish Board for Accreditation and Conformity Assessment
- Switzerland
  - METAS : The Federal Institute of Metrology
  - SAS : Swiss Accreditation Service
- Poland
  - GUM : Główny Urząd Miar - the National Metrology Institute in Poland
  - PCA : Polskie Centrum Akredytacji
- Czech Republic
  - CMI : Český Metrologický Institut
  - CIA : Český Institut pro Akreditaci
- Hungary
  - BFKH : Government Office of the Capital City Budapest
  - NAH : Nemzeti Akkreditáló Hatóság
- Romania
  - INM : Institutul National de Metrologie
  - RENAR : Asociaţia de Acreditare din România
- Brazil
  - INMETRO : Instituto Nacional de Metrologia Qualidade e Tecnologia
  - Cgcre : Coordenação Geral de Acreditação do INMETRO
- Argentina
  - INTI : Instituto Nacional de Tecnologia Industrial
  - OAA : Organismo Argentino de Acreditación

ILAC : International Laboratory Accreditation Cooperation
APAC : Asia Pacific Accreditation Cooperation
MRA : Mutual Recognition Arrangement
EA : European co-operation for Accreditation
MLA : Multilateral Agreement

Name of each National metrology institutes and Accreditation bodies are based on our survey.
For the latest information, please refer to our website. **https://www.mitutoyo.co.jp**

Certificate of DAkkS accredited laboratory (Mitutoyo Deutschland in Germany)

Cerificate of SAC accredited laboratory (Mitutoyo Asia Pacific in Singapore)

Certificate of A2LA accredited laboratory (Mitutoyo America in U.S.A.)

Certificate of RvA accredited laboratory (Mitutoyo Nederland in the Netherlands)

Certificate of CNAS accredited laboratory (Mitutoyo Measuring Instruments (Shanghai) in China)

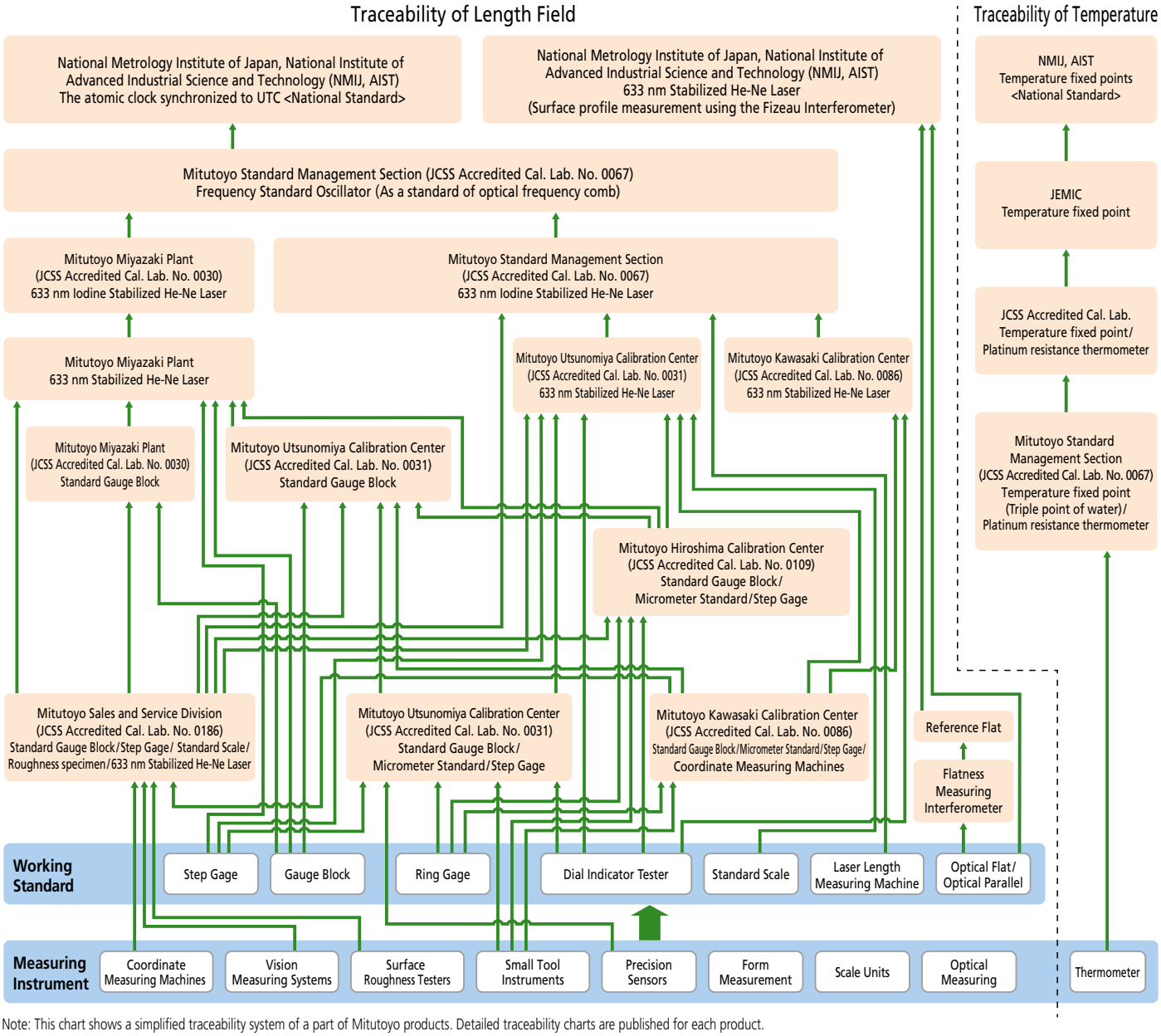
Certificate of Cgcre accredited laboratory (Mitutoyo Sul Americana in Brazil)

Traceability of Mitutoyo Standards

Mitutoyo ensures and maintains traceability of various types of precision measuring instruments by holding standards of length and other physical quantities that are directly traceable to the national standards for use in calibrating the working standards used for the calibration of measuring instrument products supplied to industry. Furthermore, Mitutoyo offers a temperature calibration service which is indispensable for high-accuracy length measurement.

The Mitutoyo traceability system with the optical frequency comb at the top level, ensuring performance equivalent to that of the Japan's national standard, and the calibration technology supporting this system are the basis of highly accurate and reliable products offered to customers.

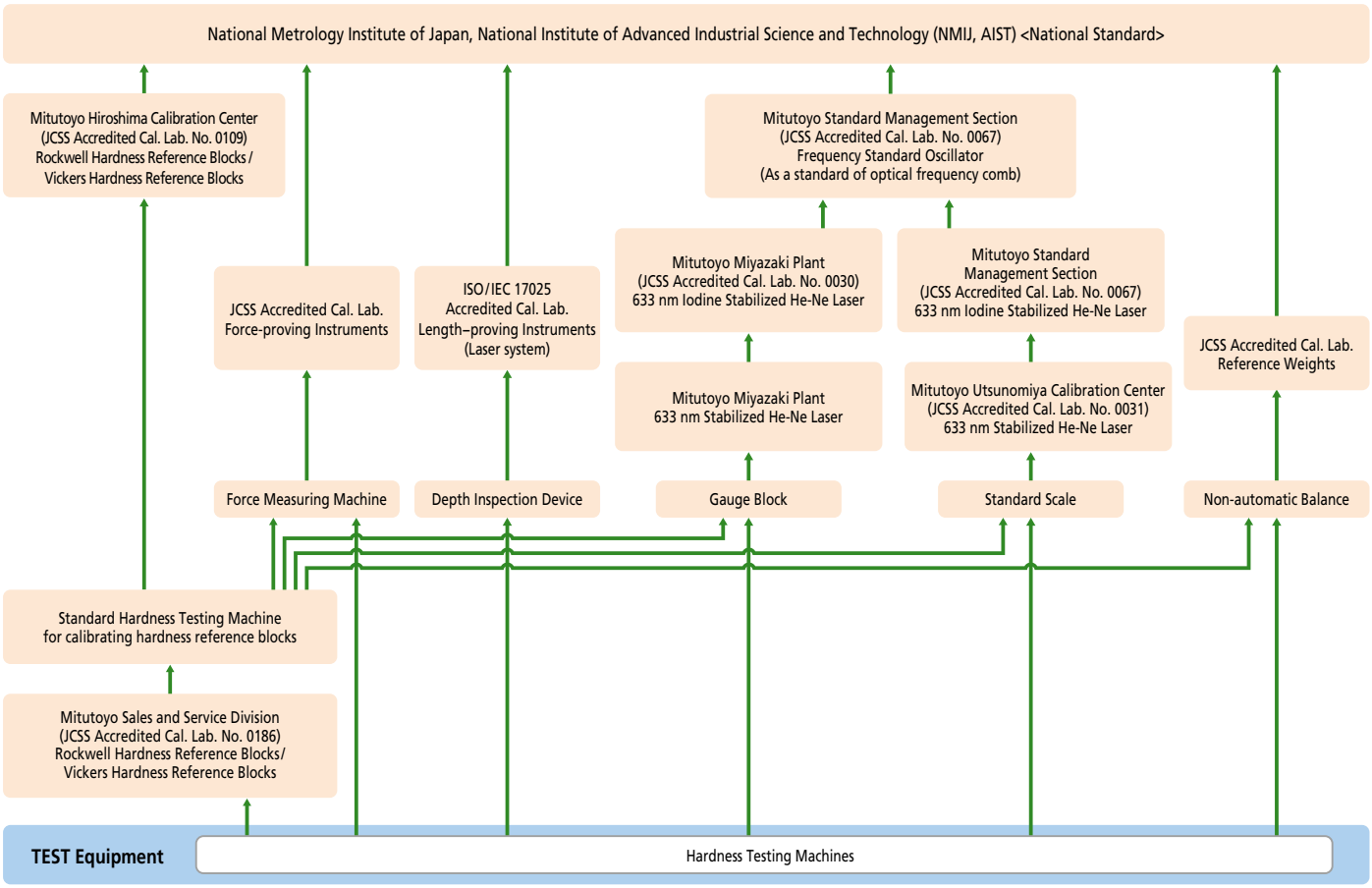
Certificate of JCSS accredited laboratory (Mitutoyo Standard Management Section)



Note: This chart shows a simplified traceability system of a part of Mitutoyo products. Detailed traceability charts are published for each product.
(As of July, 2024)

For the latest information, please refer to our website. **https://www.mitutoyo.co.jp**

Traceability of Hardness Field



Note: This chart shows a simplified traceability system of a part of Mitutoyo products. Detailed traceability charts are published for each product.
(As of July, 2024)

For the latest information, please refer to our website. **https://www.mitutoyo.co.jp**

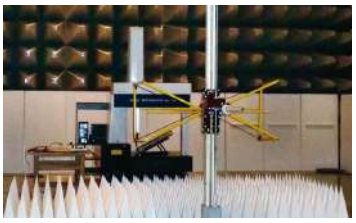
Video

Response to Safety and Environmental Protection Regulations

To deliver safe and reliable products to our customers, Mitutoyo evaluates its products to ensure that they adhere to applicable product safety and environmental standards, including CE marking.

CE Marking

CE marking indicates that a product complies with the essential requirements of the relevant European health, safety and environmental protection legislation.



Conformity evaluation for CE marking (EMC Directives)

Major applicable Directives relating to Mitutoyo products

Applicable Directives	Applicable range
Machinery Directive	At least one part of a machine that may cause injury to the human body if it moves due to movement of an actuator such as a motor.
EMC Directive (Electromagnetic Compatibility Directive)	A product that may produce electromagnetic radiation or which is influenced by electromagnetic radiation from outside.
Low Voltage Directive	Equipment (device) that uses AC voltage of 50 to 1000 V or DC voltage of 75 to 1500 V.
Radio Equipment Directive	All electrical and electronic equipment that intentionally transmits and receives radio waves at frequencies below 3000 GHz.
RoHS Directive	Restriction of the use of certain hazardous substances in electrical and electronic equipment. Restricted substances and maximum concentration values tolerated by weight: · Lead (0.1%) · Cadmium (0.01%) · Mercury (0.1%) · Hexavalent chromium (0.1%) · Polybrominated biphenyls (PBB) (0.1%) · Polybrominated diphenyl ethers (PBDE) (0.1%) · Bis (2-ethylhexyl) phthalate (DEHP) (0.1%) · Butyl benzyl phthalate (BBP) (0.1%) · Dibutyl phthalate (DBP) (0.1%) · Diisobutyl phthalate (DIBP) (0.1%) Note: Our products fall under Cat.9 "Monitoring and control instruments including industrial monitoring and control instruments".

UKCA Marking

UKCA marking indicates that the products conform to the applicable requirements for products sold in Great Britain.

Response to WEEE Directive

The WEEE Directive*1 is a directive that mandates appropriate collection and recycling of electrical and electronic equipment waste. The purpose of this directive is to increase the reuse and recycling of these products. To differentiate between equipment waste and household waste, a crossed-out wheeled-bin symbol is marked on a product.

*1 WEEE Directive: Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment.

Response to REACH Regulation

REACH Regulation*2 is a regulation governing registration, evaluation, authorization and restriction of chemical substances in Europe, and all products such as substances, mixtures and molded products (including accessories and packaging materials) are regulated.
Chemical substances scientifically proven to be substances that are hazardous to human health and the global environment (Candidate List of substances of very high concern for Authorisation (CLS)) are prohibited to be sold or information concerning them disclosed is mandated in Europe.
We will actively disclose information about our products and provide replacement if we find our products contain any of the listed substances.

*2 REACH Regulation: Regulation (EC) No1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals

Response to Management Methods for Restricted Use of Hazardous Substances in Electrical and Electronic Product (China RoHS 2)

We set the environmental protection use period regulated by China RoHS 2 per product and label with the marks shown on the right, together with a list of the contained substances.

"Environmental Protection Use Period" mark*3

*3 The environmental protection use period does not indicate the product warranty period.

Precautions to be taken when handling button cells

⚠ WARNING Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

- KEEP batteries OUT OF REACH OF CHILDREN, ingestion can cause DEATH or serious injury.
  Seek immediate medical attention if you suspect that a battery is swallowed or inserted inside any part of the body.
- Do not dismantle, heat or throw the battery in a fire.
- If alkaline solution leaks from the battery and contacts your skin or clothes, immediately wash the affected area with water. IF IN EYES, immediately rinse eyes cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing and summon immediate assistance from a doctor.
- Do not solder directly to a battery.
- Ensure batteries are inserted without coming into contact with metal parts of equipment.
- In case of disposal, insulate (+) and (-) terminals of a battery by applying an insulating material.

⚠ CAUTION Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

- Do not try to charge the battery as it is not chargeable. Install the battery with correct polarity. Failure to do so can cause battery leakage or burst resulting in damage to the instrument or personal injury.

NOTICE Indicates a potentially hazardous situation which, if not avoided, may result in property damage.

- Do not use new and used batteries together. Do not use different types of batteries together.
- Do not use nor leave batteries in direct sunlight nor in locations subject to high temperature or humidity.
- Avoid letting batteries contact water.
- Remove batteries from equipment that will not be used for a prolonged period.

Follow the regulations of each country when disposing of batteries.

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Mitutoyo

01

Calibration Instruments

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

PROPRIETARY INSPECTION CERTIFICATE

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

Metric/Inch Rectangular Gauge Block Sets

Gauge Block Comparator
GBCD-100A

Black Granite Surface Plates

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Mitutoyo

Features and Accuracies

Features of Mitutoyo gauge blocks

Mitutoyo offers gauge blocks for use as length standards that are fully domestically manufactured at our plant in Japan and highly trusted worldwide for their accuracy, quality, and durability.
They are available in three types: steel rectangular gauge blocks, ceramic rectangular gauge blocks (CERA Blocks), and steel square gauge blocks. In addition, tungsten carbide rectangular gauge blocks and tungsten carbide square gauge blocks are available as protectors. Select the right gauge blocks depending on the conditions, environment, and application of use.

Accuracy

Our calibration technique combined with established traceability to the Japanese national standard ensures that highly reliable products are delivered. We ensure the traceability of all our gauge blocks and guarantee their accuracy based on the national standard, so you can feel confident when using them.

Wringing

Lapping measuring surfaces is one of Mitutoyo's specialties. Our advanced technique, developed over more than half a century, enables us to achieve the optimum flatness and surface finish needed for gauge blocks and thus maximize the wringing force.

Abrasion resistance and dimensional stability

By adopting high-carbon, high-chrome steel that can satisfy various material characteristics necessary for gauge blocks, and thermally processing it carefully and repeatedly with our advanced technology, we produce high levels of hardness for reliable use and minimize aging deterioration as much as possible.

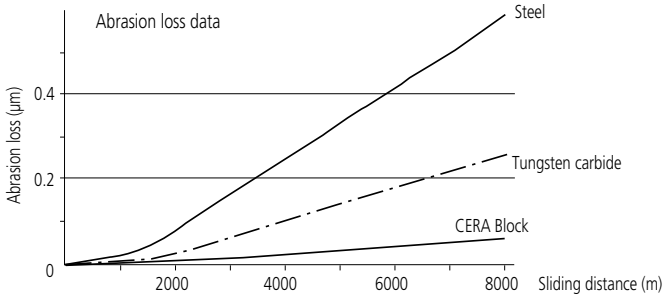
CERA Blocks

Produced by using our ultra-precision processing technology and ceramic materials with excellent surface smoothness, CERA Blocks feature the following advantages not delivered by steel blocks.

(1) Corrosion Resistant
Anti-corrosion treatment is not required when handled normally (i.e. with fingers), resulting in simple maintenance and storage.

(2) No Burrs Caused by Accidental Mishandling
Since the CERA Block is very hard, it will not scratch easily and is highly resistant to burrs. If a burr is formed, it can easily be removed with a ceramic deburring stone (Ceraston).

(3) Excellent abrasion resistance
CERA Blocks are 10 times more resistant to abrasion than steel blocks and therefore have a longer life (based on in-house test results).



(4) Dimensional Stability
CERA Blocks are highly resistant to dimensional changes over time.

(5) Clearly Marked Sizes
Black characters, indicating the nominal length, are inscribed by laser and are clearly visible against the white surface of the block.

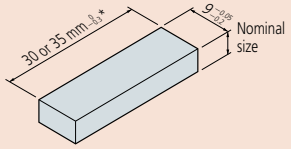
(6) Non-magnetic Nature Prevents Steel Swarf Contamination

(7) High Wringing Force
Superior flatness and surface finish provides maximum wringing force.

Classification of Gauge Blocks by Shape

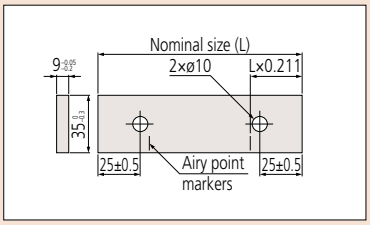
Mitutoyo broadly divides gauge blocks into two categories according to the block shape.

Rectangular gauge blocks



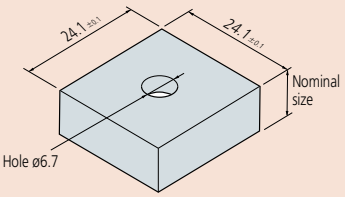
* Depends on the nominal size.
More than 10 mm: 35 mm
10 mm or less: 30 mm

All standard long blocks 125 mm or more have two coupling holes on the body.



Long rectangular gauge blocks

Square gauge blocks



Mitutoyo Gauge Blocks and Inspection Certificates

A Certificate of Inspection is furnished with all Mitutoyo gauge blocks with a serial number on the box (in the case of sets) and an identification number on each block. The deviation of each block from nominal length, at the time of inspection, is stated. For this inspection, each gauge block is measured relative to the upper level master using a gauge block comparator. Grade K gauge blocks are measured by a primary measurement method using an interferometer.

Product catalog
E12001

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Selecting Gauge Blocks

- Select gauge blocks in accordance with the combination range required.
  If a large length is required, use one or more blocks from a long-block set.
- Select gauge blocks in accordance with the minimum length step required. Add a wear block at each end of the stack if the workpiece material is abrasive, or if the stack will be used frequently.
- If a set containing a large number of gauge blocks is selected, the number of gauge blocks required for any particular length is reduced and the number of combinations is increased. Accuracy of the blocks in the set will be retained longer because normal wear will be spread over a larger number of blocks.
- Gauge block sets dedicated to micrometer and caliper inspection are available (refer to page 01-13 for details).
- If using only one length repeatedly, it is a good idea to purchase discrete gauge blocks (refer to pages 01-15, 01-16, 01-17, 01-18, 01-25, and 01-26 for details) .
- Products can be provided in combinations other than those in our standard sets. When placing such orders, please specify whether a storage box is required. Feel free to consult us if you need gauge blocks compliant with British (BS), American, or other standards.
  The U.S. Federal Specification for gauge blocks was replaced by ASME B89.1.9 in 2002. Please contact your local Mitutoyo sales office for further information.
- 2 mm-based gauge blocks, which take the base of the minimum length step as 2 mm, are available and many people find them easier to handle than 1 mm-based gauge blocks.
- All Mitutoyo gauge blocks, whether sold in sets or individually, come with a measurement inspection certificate.

Constructing a Gauge Block Stack

The following points should be noted when constructing a gauge block stack:

(1) Use as few gauge blocks as possible to obtain the required length by selecting thick blocks wherever possible.

(2) Select the block for the least significant digit first, then work back through the more significant digits until the required length is attained.

(3) There are multiple combinations for the integer part of a length. To prevent wear as much as possible, do not always use the same gauge blocks.

Example: Required length=45.6785 mm

• For a 1 mm-based gauge block set

1.0005
1.008
1.17
17.5
+) 25
45.6785 mm

• For a 2 mm-based gauge block set

2.0005
2.008
2.17
14.5
+) 25
45.6785 mm

Note: Regarding the method for wringing, refer to "Quick Guide to Precision Measuring Instruments" on page 13-28.

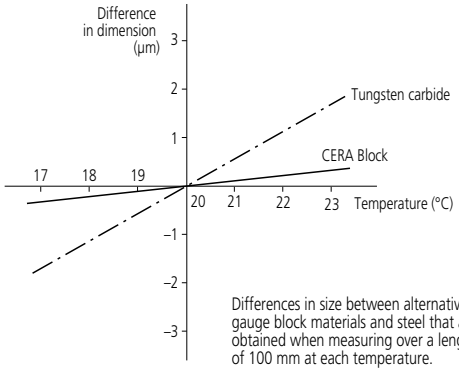
(8) Superior Material Characteristics of CERA Block

Property \ Material	CERA Block (ZrO_2)	Steel (Fe)	Tungsten Carbide (WC-Co)	ZERO CERA Blocks (Low thermal expansion)
Hardness (HV)	1350	800	1650	826
Coefficient of thermal expansion (10^{-6}/K)	9.3±0.5	10.8±0.5	5.5±1.0	0±0.02
Flexural strength by 3-point bending (MPa)	1270	1960	1960	210
Fracture toughness K_{1C} (MPa·$m^{1/2}$)	7	120	12	1.2
Young's modulus ×10^4 (MPa)	20.6	20.6	61.8	130
Poisson's ratio	0.3	0.3	0.2	0.3
Specific gravity	6.0	7.8	14.8	2.5
Thermal conductivity (W/m·k)	2.9	54.4	79.5	3.7

Note: Ceramics have the advantage of a slow response to temperature changes due to the low thermal conductivity. However, caution is required when using CERA blocks under conditions of rapid temperature change.

(9) Difference in expansion coefficient between steel and CERA blocks is just 1.5×10^{-6}/K

The thermal expansion coefficient of a CERA Block is quite similar to that of a steel gauge block.



Differences in size between alternative gauge block materials and steel that are obtained when measuring over a length of 100 mm at each temperature.

(10) Highly Resistant to Dropping and Impact Damage

The CERA Block material is one of the toughest ceramics. It is extremely difficult to crack a CERA Block in normal use.

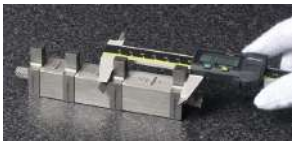
Features of Square Gauge Blocks

(1) Gauge blocks in a stack can be clamped together

After wringing square gauge blocks, a tie rod can be inserted through the center hole to clamp the blocks together for extra security.

(2) A height reference standard can easily be made

A precision height reference standard can be made easily and inexpensively using accessories such as the plain jaw and block base.



(3) A dedicated inspection jig can easily be made

A dedicated inspection jig for periodic inspection of instruments can be made easily and inexpensively.

(4) A wide measuring surface with cross-sectional dimensions of 24.1×24.1 mm is available.

A square gauge block retains stable orientation both longitudinally and laterally. A wide range of applications is covered, including cutting tool positioning, angle measurement with a sine bar, taper measurement with a roller, and inspection of depth micrometers.

Long and Ultra-Thin Gauge Blocks

Mitutoyo offers extra-thin gauge blocks from 0.10 mm to 0.99 mm (increments of 0.01 mm) as well as long gauge blocks up to 1,000 mm as standard products.

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Features and Accuracies

Grade and Application

The following table can be used to select the gauge block grade according to usage (specified by ISO3650, BS4311, and JIS B 7506).

	Applications	Grade
Workshop use	• Mounting tools and cutters	2
	• Manufacturing gages • Calibrating instruments	1 or 2
Inspection use	• Inspecting mechanical parts, tools, etc.	1 or 2
	• Checking the accuracy of gages • Calibrating instruments	0 or 1
Calibration use	• Checking the accuracy of gauge blocks for workshop • Checking the accuracy of gauge blocks for inspection • Checking the accuracy of instruments	K or 0
Reference use	• Checking the accuracy of gauge blocks for calibration • For academic research	K

ACCURACY SPECIFICATIONS: JIS B 7506-2004 (JAPAN) ISO 3650:1998

(at 20 °C)

Nominal length (mm)		Grade K		Grade 0		Grade 1		Grade 2	
		Limit deviation of length at any point (µm)	Tolerance for the variation in length (µm)	Limit deviation of length at any point (µm)	Tolerance for the variation in length (µm)	Limit deviation of length at any point (µm)	Tolerance for the variation in length (µm)	Limit deviation of length at any point (µm)	Tolerance for the variation in length (µm)
from 0.5	up to 10	±0.20	0.05	±0.12	0.10	±0.20	0.16	±0.45	0.30
over 10	up to 25	±0.30	0.05	±0.14	0.10	±0.30	0.16	±0.60	0.30
over 25	up to 50	±0.40	0.06	±0.20	0.10	±0.40	0.18	±0.80	0.30
over 50	up to 75	±0.50	0.06	±0.25	0.12	±0.50	0.18	±1.00	0.35
over 75	up to 100	±0.60	0.07	±0.30	0.12	±0.60	0.20	±1.20	0.35
over 100	up to 150	±0.80	0.08	±0.40	0.14	±0.80	0.20	±1.60	0.40
over 150	up to 200	±1.00	0.09	±0.50	0.16	±1.00	0.25	±2.00	0.40
over 200	up to 250	±1.20	0.10	±0.60	0.16	±1.20	0.25	±2.40	0.45
over 250	up to 300	±1.40	0.10	±0.70	0.18	±1.40	0.25	±2.80	0.50
over 300	up to 400	±1.80	0.12	±0.90	0.20	±1.80	0.30	±3.60	0.50
over 400	up to 500	±2.20	0.14	±1.10	0.25	±2.20	0.35	±4.40	0.60
over 500	up to 600	±2.60	0.16	±1.30	0.25	±2.60	0.40	±5.00	0.70
over 600	up to 700	±3.00	0.18	±1.50	0.30	±3.00	0.45	±6.00	0.70
over 700	up to 800	±3.40	0.20	±1.70	0.30	±3.40	0.50	±6.50	0.80
over 800	up to 900	±3.80	0.20	±1.90	0.35	±3.80	0.50	±7.50	0.90
over 900	up to 1000	±4.20	0.25	±2.00	0.40	±4.20	0.60	±8.00	1.00

ACCURACY SPECIFICATIONS: BS 4311:2007 (UK)

(at 20 °C)

Nominal length (in)		Grade K		Grade 0		Grade 1		Grade 2	
		Limit deviation of length at any point (µin)	Tolerance for the variation in length (µin)	Limit deviation of length at any point (µin)	Tolerance for the variation in length (µin)	Limit deviation of length at any point (µin)	Tolerance for the variation in length (µin)	Limit deviation of length at any point (µin)	Tolerance for the variation in length (µin)
over 0	up to 0.4	±8	2	±5	4	±8	6	±18	12
over 0.4	up to 1	±12	2	±6	4	±12	6	±24	12
over 1	up to 2	±16	3	±8	4	±16	7	±32	12
over 2	up to 3	±20	3	±10	5	±20	7	±40	14
over 3	up to 4	±24	3	±12	5	±24	8	±48	14

Note 1: The accuracy of nominal lengths from 0.1 mm up to less than 0.5 mm follows that of nominal lengths from 0.5 mm up to 10 mm.
Note 2: Grade K gauge blocks are only available as made-to-order rectangular gauge blocks.
Note 3: Grade K gauge blocks are supplied with a JCSS calibration certificate. When ordering, kindly provide your formal name and contact information.

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ACCURACY SPECIFICATIONS: ASME B89.1.9-2002 (USA)

(at 20 °C)

Nominal length (in)		Grade K		Grade 00		Grade 0		Grade 1		Grade 2	
		Limit deviation of length at any point (µin)	Tolerance for the variation in length (µin)	Limit deviation of length at any point (µin)	Tolerance for the variation in length (µin)	Limit deviation of length at any point (µin)	Tolerance for the variation in length (µin)	Limit deviation of length at any point (µin)	Tolerance for the variation in length (µin)	Limit deviation of length at any point (µin)	Tolerance for the variation in length (µin)
	up to 0.05	±12	2	±4	2	±6	4	±12	6	±24	12
over 0.05	up to 0.4	±10	2	±3	2	±5	4	±8	6	±18	12
over 0.45	up to 1	±12	2	±3	2	±6	4	±12	6	±24	12
over 1	up to 2	±16	2	±4	2	±8	4	±16	6	±32	12
over 2	up to 3	±20	2	±5	3	±10	4	±20	6	±40	14
over 3	up to 4	±24	3	±6	3	±12	5	±24	8	±48	14
over 4	up to 5	±32	3	±8	3	±16	5	±32	8	±64	16
over 5	up to 6	±32	3	±8	3	±16	5	±32	8	±64	16
over 6	up to 7	±40	4	±10	4	±20	6	±40	10	±80	16
over 7	up to 8	±40	4	±10	4	±20	6	±40	10	±80	16
over 8	up to 10	±48	4	±12	4	±24	6	±48	10	±104	18
over 10	up to 12	±56	4	±14	4	±28	7	±56	10	±112	20
over 12	up to 16	±72	5	±18	5	±36	8	±72	12	±144	20
over 16	up to 20	±88	6	±20	6	±44	10	±88	14	±176	24
over 20	up to 24	±104	6	±25	6	±52	10	±104	16	±200	28
over 24	up to 28	±120	7	±30	7	±60	12	±120	18	±240	28
over 28	up to 32	±136	8	±34	8	±68	12	±136	20	±260	32
over 32	up to 36	±152	8	±38	8	±76	14	±152	20	±300	36
over 36	up to 40	±160	10	±40	10	±80	16	±168	24	±320	40

Nominal length (mm)		Grade K		Grade 00		Grade 0		Grade 1		Grade 2	
		Limit deviation of length at any point (µm)	Tolerance for the variation in length (µm)	Limit deviation of length at any point (µm)	Tolerance for the variation in length (µm)	Limit deviation of length at any point (µm)	Tolerance for the variation in length (µm)	Limit deviation of length at any point (µm)	Tolerance for the variation in length (µm)	Limit deviation of length at any point (µm)	Tolerance for the variation in length (µm)
	up to 0.5	±0.30	0.05	±0.10	0.05	±0.14	0.10	±0.30	0.16	±0.60	0.30
over 0.5	up to 10	±0.20	0.05	±0.07	0.05	±0.12	0.10	±0.20	0.16	±0.45	0.30
over 10	up to 25	±0.30	0.05	±0.07	0.05	±0.14	0.10	±0.30	0.16	±0.60	0.30
over 25	up to 50	±0.40	0.06	±0.10	0.06	±0.20	0.10	±0.40	0.18	±0.80	0.30
over 50	up to 75	±0.50	0.06	±0.12	0.06	±0.25	0.12	±0.50	0.18	±1.00	0.35
over 75	up to 100	±0.60	0.07	±0.15	0.07	±0.30	0.12	±0.60	0.20	±1.20	0.35
over 100	up to 150	±0.80	0.08	±0.20	0.08	±0.40	0.14	±0.80	0.20	±1.60	0.40
over 150	up to 200	±1.00	0.09	±0.25	0.09	±0.50	0.16	±1.00	0.25	±2.00	0.40
over 200	up to 250	±1.20	0.10	±0.30	0.10	±0.60	0.16	±1.20	0.25	±2.40	0.45
over 250	up to 300	±1.40	0.10	±0.35	0.10	±0.70	0.18	±1.40	0.25	±2.80	0.50
over 300	up to 400	±1.80	0.12	±0.45	0.12	±0.90	0.20	±1.80	0.30	±3.60	0.50
over 400	up to 500	±2.20	0.14	±0.50	0.14	±1.10	0.25	±2.20	0.35	±4.40	0.60
over 500	up to 600	±2.60	0.16	±0.65	0.16	±1.30	0.25	±2.60	0.40	±5.00	0.70
over 600	up to 700	±3.00	0.18	±0.75	0.18	±1.50	0.30	±3.00	0.45	±6.00	0.70
over 700	up to 800	±3.40	0.20	±0.85	0.20	±1.70	0.30	±3.40	0.50	±6.50	0.80
over 800	up to 900	±3.80	0.20	±0.95	0.20	±1.90	0.35	±3.80	0.50	±7.50	0.90
over 900	up to 1000	±4.20	0.25	±1.00	0.25	±2.00	0.40	±4.20	0.60	±8.00	1.00

Note 1: The accuracy of nominal lengths from 0.1 mm up to less than 0.5 mm follows that of nominal lengths from 0.5 mm up to 10 mm.
Note 2: Grade K gauge blocks are only available as made-to-order rectangular gauge blocks.
Note 3: Grade K gauge blocks are supplied with a JCSS calibration certificate. When ordering, kindly provide your formal name and contact information.

Limit deviation of length at any point
This is the permitted deviation from nominal length.
The deviation of length, expressed as "actual length - nominal length", is measured at a total of five points: the "middle point" of the gauge block measuring face and the "four corners, at 1.5 mm on the inside from the side faces".

Tolerance for the variation in length
This is the permitted variation in length.
The variation in length is expressed as "deviation of length for the maximum (greatest length) - deviation of length for the minimum (smallest length)" among those measured at the five points mentioned above.

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Gauge Blocks with a Calibrated Coefficient of Thermal Expansion

- The products are the highest-quality gauge blocks exceeding Grade K and are provided with highly accurate thermal expansion coefficient data. They help minimize thermal correction and therefore are suitable for highly accurate calibration. (Uncertainty of thermal expansion coefficient: 0.035×10^{-6}/K (k=2))
- The thermal expansion coefficient is measured with a highly accurate double-faced interferometer (DFI), and the dimensional accuracy is guaranteed with gauge block interferometer (GBI).
- Useful in highly accurate calibration of CMMs.
- A mark "Coefficient of Thermal Expansion" is engraved on the surface. They are available in the nominal sizes (100 to 500 mm) of steel and ceramic rectangular gauge blocks.

SPECIFICATIONS

Metric Blocks with CTE

Code No. (steel)*1	Code No. (CERA)*1	Length (mm)
611681	613681	100
611802	613802	125
611803	613803	150
611804	613804	175
611682	613682	200
611805	613805	250
611683	613683	300
611684	613684	400
611685	613685	500

Inch Blocks with CTE

Code No. (steel)*1	Code No. (CERA)*1	Length (in)
611204	613204	4
611205	613205	5
611206	613206	6
611207	613207	7
611208	613208	8
611222	613222	10
611223	613223	12
611224	613224	16
611225	613225	20

Grade	K class in JIS/ISO, ASME
Uncertainty of thermal expansion coefficient	0.035×10^{-6}/K (k=2)
Uncertainty of length measurement	30 nm (k=2), for 100 mm block

Note: An inspection certificate and a JCSS calibration certificate are supplied as standard.
A calibration report and a calibration certificate for the thermal expansion coefficient are also supplied as standard.

PROPRIETARY INSPECTION CERTIFICATE

*1: Suffix No. (-■■■) for Selecting Standard Required

ISO / JIS

Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-01B	K	✔	✔

ASME

Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-51B	K	✔	✔

BS

Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-11B	K	✔	✔

Note: Only for 100 mm type

Inspection Certificate

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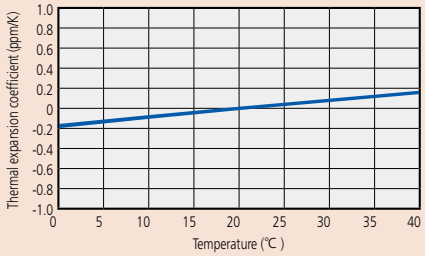
PROPRIETARY INSPECTION CERTIFICATE

ZERO CERA Blocks (Ultra-low Thermal Expansion)

- ZERO CERA Blocks are next-generation gauge blocks made of special ceramic materials that have extremely low thermal expansion. They are lightweight, easy to handle, and slow in aging (thermal expansion coefficient: $0\pm0.02\times10^{-6}$/K (20 °C), specific gravity 2.4 kg/cm^3). Many research institutions and academic institutions rely on ZERO CERA Blocks in various applications, including the study of methods of calibrating CMM.
- Each block is marked with "ZERO CERA BLOCK" logo.
- Available in the nominal sizes (30 to 1,000 mm) of rectangular gauge blocks.

Thermal expansion coefficient–Temperature characteristic



Comparison of maximum errors at 23 °C (500 mm size)

Temperature compensation error of typical ISO/JIS-certified product: ±1.5 µm
Temperature compensation error of Mitutoyo standard gauge blocks: ±0.75 µm
Temperature compensation error of gauge blocks with thermal expansion coefficient: ±0.075 µm
Maximum thermal expansion of ZERO CERA Blocks: +0.03 µm
Thermal expansion of steel gauge blocks: +16.2 µm
Thermal expansion of CERA Blocks: +13.95 µm

SPECIFICATIONS

Metric Blocks

Code No.			Length (mm)
JIS/ISO	BS	ASME	
617673-016	**617673-116**	**617673-516**	30
617675-016	**617675-116**	**617675-516**	50
617681-016	**617681-116**	**617681-516**	100
617682-016	**617682-116**	**617682-516**	200
617683-016	**617683-116**	**617683-516**	300
617684-016	**617684-116**	**617684-516**	400
617685-016	**617685-116**	**617685-516**	500
617840-016	**617840-116**	**617840-516**	600
617841-016	**617841-116**	**617841-516**	700
617843-016	**617843-116**	**617843-516**	800
617844-016	**617844-116**	**617844-516**	900
617845-016	**617845-116**	**617845-516**	1000
516-771-60	**516-771-61**	**516-771-66**	Above set

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Mitutoyo

Metric/Inch Rectangular Gauge Block Sets SERIES 516

- Mitutoyo provides a wide selection of boxed sets of gauge blocks to meet the various needs of industry. Please select the set most suited to your working conditions and applications.

Steel 1 mm Base Block Sets

Steel 112-block set

Steel 103-block set

Steel 76-block set

Steel 56-block set

Steel 47-block set

Steel 46-block set

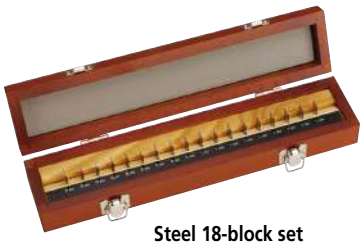
Steel 34-block set

Steel 32-block set

Steel 0.001 mm Step Block Sets

Steel 9-block set
(1.001 to 1.009 mm)

Steel 9-block set
(0.991 to 0.999 mm)



Steel 18-block set

Steel Long Block Sets

Steel 8-block set

Steel Wear Block Sets

Steel (1 mm)

Steel Thin Block Sets

Steel 9-block set

Note: Details of the contents of any particular set are given on pages 01-11 to 01-12.

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CERA 1 mm Base Block Sets

CERA 112-block set

CERA 103-block set

CERA 76-block set

CERA 56-block set

CERA 47-block set

CERA 46-block set

CERA 34-block set

CERA 32-block set

CERA 0.001 mm Step Block Sets

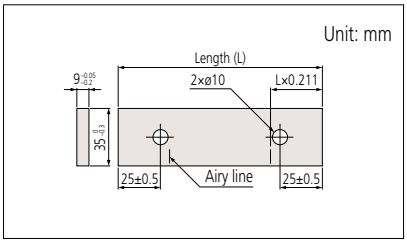
CERA 9-block set
(1.001 to 1.009 mm)

CERA 9-block set
(0.991 to 0.999 mm)

CERA 18-block set

CERA Long Block Sets

CERA 8-block set



CERA Wear Block Sets

CERA (1 mm)

Note: Details of the contents of any particular set are given on pages 01-11 to 01-12.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Gauge Blocks

SPECIFICATIONS

1 mm Base Block Sets

Blocks per set	Code No.		Standard/grade available and **Suffix No.**[*1]			Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	BS	Size (mm)	Step (mm)	Qty.
122	—	—	—	—	—	1.0005		1
	516-596	—	K: **-■0**	—	—	1.001 - 1.009	0.001	9
	516-597	—	0: **-■0**	—	—	1.01 - 1.49	0.01	49
	516-598	—	1: **-■0**	—	—	1.6 - 1.9	0.1	4
	516-599	—	2: **-■0**	—	—	0.5 - 24.5	0.5	49
						30 - 100	10	8
						25, 75		2
112	**516-531**	**516-541**	—	K: **-■6**	—	1.0005		1
	516-937	**516-337**	K: **-■0**	00: **-■6**	K: **-■1**	1.001 - 1.009	0.001	9
	516-938	**516-338**	0: **-■0**	0: **-■6**	0: **-■1**	1.01 - 1.49	0.01	49
	516-939	**516-339**	1: **-■0**	1: **-■6**	1: **-■1**	0.5 - 24.5	0.5	49
	516-940	**516-340**	2: **-■0**	2: **-■6**	2: **-■1**	25 - 100	25	4
103	**516-533**	**516-542**	—	K: **-■6**	—	1.005		1
	516-941	**516-341**	K: **-■0**	00: **-■6**	K: **-■1**	1.01 - 1.49	0.01	49
	516-942	**516-342**	0: **-■0**	0: **-■6**	0: **-■1**	0.5 - 24.5	0.5	49
	516-943	**516-343**	1: **-■0**	1: **-■6**	1: **-■1**	25 - 100	25	4
	516-944	**516-344**	2: **-■0**	2: **-■6**	2: **-■1**			
88	—	—	—	—	—	1.0005		1
	516-969	**516-369**	—	—	K: **-■1**	1.001 - 1.009	0.001	9
	516-970	**516-370**	0: **-■0**	—	0: **-■1**	1.01 - 1.49	0.01	49
	516-971	**516-371**	1: **-■0**	—	1: **-■1**	0.5 - 9.5	0.5	19
	516-972	**516-372**	2: **-■0**	—	2: **-■1**	10 - 100	10	10
87	**516-535**	**515-543**	—	K: **-■6**	—	1.001 - 1.009	0.001	9
	516-945	**516-345**	K: **-■0**	00: **-■6**	K: **-■1**	1.01 - 1.49	0.01	49
	516-946	**516-346**	0: **-■0**	0: **-■6**	0: **-■1**	0.5 - 9.5	0.5	19
	516-947	**516-347**	1: **-■0**	1: **-■6**	1: **-■1**	10 - 100	10	10
	516-948	**516-348**	2: **-■0**	2: **-■6**	2: **-■1**			
76	—	—	—	—	—	1.005		1
	516-949	**516-349**	K: **-■0**	—	—	1.01 - 1.49	0.01	49
	516-950	**516-350**	0: **-■0**	—	—	0.5 - 9.5	0.5	19
	516-951	**516-351**	1: **-■0**	—	—	10 - 40	10	4
	516-952	**516-352**	2: **-■0**	—	—	50 - 100	25	3
56	**516-536**	**516-544**	—	K: **-■6**	—	0.5		1
	516-953	**516-353**	K: **-■0**	00: **-■6**	—	1.001 - 1.009	0.001	9
	516-954	**516-354**	0: **-■0**	0: **-■6**	—	1.01 - 1.09	0.01	9
	516-955	**516-355**	1: **-■0**	1: **-■6**	—	1.1 - 1.9	0.1	9
	516-956	**516-356**	2: **-■0**	2: **-■6**	—	1 - 24	1	24
						25 - 100	25	4
47	**516-537**	**516-545**	—	K: **-■6**	—	1.005		1
	516-957	**516-357**	K: **-■0**	00: **-■6**	—	1.01 - 1.09	0.01	9
	516-958	**516-358**	0: **-■0**	0: **-■6**	—	1.1 - 1.9	0.1	9
	516-959	**516-359**	1: **-■0**	1: **-■6**	—	1 - 24	1	24
	516-960	**516-360**	2: **-■0**	2: **-■6**	—	25 - 100	25	4
47	—	—	—	—	—	1.005		1
	516-961	**516-361**	K: **-■0**	—	K: **-■1**	1.01 - 1.19	0.01	19
	516-962	**516-362**	0: **-■0**	—	0: **-■1**	1.2 - 1.9	0.1	8
	516-963	**516-363**	1: **-■0**	—	1: **-■1**	1 - 9	1	9
	516-964	**516-364**	2: **-■0**	—	2: **-■1**	10 - 100	10	10
46	—	—	—	—	—	1.001 - 1.009	0.001	9
	516-994	**516-394**	K: **-■0**	—	—	1.01 - 1.09	0.01	9
	516-995	**516-395**	0: **-■0**	—	—	1.1 - 1.9	0.1	9
	516-996	**516-396**	1: **-■0**	—	—	1 - 9	1	9
	516-997	**516-397**	2: **-■0**	—	—	10 - 100	10	10
34	—	—	—	—	—	1.0005		1
	516-128	**516-178**	K: **-■0**	—	K: **-■1**	1.001 - 1.009	0.001	9
	516-129	**516-179**	0: **-■0**	—	0: **-■1**	1.01 - 1.09	0.01	9
	516-130	**516-180**	1: **-■0**	—	1: **-■1**	1.1 - 1.9	0.1	9
	516-131	**516-181**	2: **-■0**	—	2: **-■1**	1 - 5	1	5
						10		1
32	—	—	—	—	—	1.005		1
	516-965	**516-365**	K: **-■0**	—	K: **-■1**	1.01 - 1.09	0.01	9
	516-966	**516-366**	0: **-■0**	—	0: **-■1**	1.1 - 1.9	0.1	9
	516-967	**516-367**	1: **-■0**	—	1: **-■1**	1 - 9	1	9
	516-968	**516-368**	2: **-■0**	—	2: **-■1**	10 - 30	10	3
						60		1

Thin Block Sets

Blocks per set	Code No.		Standard/grade available and **Suffix No.**[*1]			Blocks included in set		
	Steel	CERA	ISO/JIS	ASME	BS	Size (mm)	Step (mm)	Qty.
9	**516-990**	—	0: **-■0**	—	—	0.10 - 0.50	0.05	9
	516-991	—	1: **-■0**	—	—			
	516-992	—	2: **-■0**	—	—			

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

PROPRIETARY INSPECTION CERTIFICATE

*1: Suffix No. (■) for Selecting Standard and Certificate Provided

ISO/JIS

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✔	
6	✔	✔

Suffix No. 1: Not available for Grade K sets.

ASME

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✔	
6	✔	✔

Suffix No. 1: Not available for Grade K sets.
Suffix No. 6: Only for Grade K sets.

BS

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✔	
6	✔	✔

Suffix No. 1: Not available for Grade K sets.
Suffix No. 6: Only for Grade K sets.

Inspection Certificate

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

PROPRIETARY INSPECTION CERTIFICATE

SPECIFICATIONS

0.001 mm Step Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and **Suffix No.**[*1] ISO/JIS	ASME	BS	Blocks included in set Size (mm)	Step (mm)	Qty.
18	**516-973** **516-974** **516-975** **516-976**	**516-373** **516-374** **516-375** **516-376**	K: **-■0** 0: **-■0** 1: **-■0** 2: **-■0**	— — — —	— — — —	0.991 - 0.999 1.001 - 1.009	0.001 0.001	9 9
9	**516-981** **516-982** **516-983** **516-984**	**516-381** **516-382** **516-383** **516-384**	K: **-■0** 0: **-■0** 1: **-■0** 2: **-■0**	— — — —	K: **-■1** 0: **-■1** 1: **-■1** 2: **-■1**	1.001 - 1.009	0.001	9
9	**516-985** **516-986** **516-987** **516-988**	**516-385** **516-386** **516-387** **516-388**	K: **-■0** 0: **-■0** 1: **-■0** 2: **-■0**	— — — —	— — — —	0.991 - 0.999	0.001	9

Long Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and **Suffix No.**[*1] ISO/JIS	ASME	BS	Blocks included in set Size (mm)	Step (mm)	Qty.
8	**516-540** **516-701** **516-702** **516-703** **516-704**	**516-546** **516-731** **516-732** **516-733** **516-734**	— K: **-■0** 0: **-■0** 1: **-■0** 2: **-■0**	K: **-■6** 00: **-■6** 0: **-■6** 1: **-■6** 2: **-■6**	— — — — —	125 - 175 200 - 250 300 - 500	25 50 100	3 2 3

Wear Block Sets

Blocks per set	Code No. Carbide	Code No. CERA	Standard/grade available and **Suffix No.**[*1] ISO/JIS	ASME	BS	Blocks included in set Size (mm)	Step (mm)	Qty.
2	**516-807** **516-806**	**516-832** **516-833**	0: **-■0** 1: **-■0**	0: **-■6** 1: **-■6**	— —	1		2
2	**516-803** **516-802**	**516-830** **516-831**	0: **-■0** 1: **-■0**	0: **-■6** 1: **-■6**	— —	2		2

Inch Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and **Suffix No.**[*1] ISO/JIS	ASME	BS	Blocks included in set Size (in)	Step (in)	Qty.
82	**516-548** **516-905** **516-906** **516-907** **516-908**	**516-556** **516-305** **516-306** **516-307** **516-308**	— — — — —	K: **-■6** 00: **-■6** 0: **-■6** 1: **-■6** 2: **-■6**	— — 0: **-■1** 1: **-■1** 2: **-■1**	0.10005 0.1001 - 0.1009 0.101 - 0.149 0.05 - 0.95 1 - 4	 0.0001 0.001 0.05 1	1 9 49 19 4
81	**516-549** **516-901** **516-902** **516-903** **516-904**	**516-557** **516-301** **516-302** **516-303** **516-304**	— — — — —	K: **-■6** 00: **-■6** 0: **-■6** 1: **-■6** 2: **-■6**	— — 0: **-■1** 1: **-■1** 2: **-■1**	0.1001 - 0.1009 0.101 - 0.149 0.05 - 0.95 1 - 4	0.0001 0.001 0.05 1	9 49 19 4
49	— — **516-910** **516-911** **516-912**	— — — — —	— — — — —	— — — — —	— — 0: **-■1** 1: **-■1** 2: **-■1**	0.1001 - 0.1009 0.101 - 0.109 0.01 - 0.19 0.2 - 0.9 1 - 4	0.0001 0.001 0.01 0.1 1	9 9 19 8 4
35	**516-550** **516-913** **516-914** **516-915** **516-916**	**516-558** **516-313** **516-314** **516-315** **516-316**	— — — — —	K: **-■6** 00: **-■6** 0: **-■6** 1: **-■6** 2: **-■6**	— — 0: **-■1** 1: **-■1** 2: **-■1**	0.10005 0.1001 - 0.1009 0.101 - 0.109 0.11 - 0.19 0.1 - 0.3 0.5, 1, 2, 4	 0.0001 0.001 0.01 0.1	1 9 9 9 3 4

Thin Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and **Suffix No.**[*1] ISO/JIS	ASME	BS	Blocks included in set Size (in)	Step (in)	Qty.
28	**516-551** **516-917** **516-918** **516-919** **516-920**	— — — — —	— — — — —	K: **-■6** 00: **-■6** 0: **-■6** 1: **-■6** 2: **-■6**	— — — — —	0.02005 0.0201 - 0.0209 0.021 - 0.029 0.01 - 0.09	 0.0001 0.001 0.01	1 9 9 9
10	**516-926** **516-927** **516-928**	— — —	— — —	0: **-■6** 1: **-■6** —	0: **-■1** 1: **-■1** 2: **-■1**	0.005 - 0.050	0.005	10

Long Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and **Suffix No.**[*1] ISO/JIS	ASME	BS	Blocks included in set Size (in)	Step (in)	Qty.
8	— — **516-712** **516-713**	**516-564** **516-741** **516-742** **516-743**	— — — —	K: **-■6** 00: **-■6** 0: **-■6** 1: **-■6**	— — — —	5 - 7 8, 10, 12 16, 20	1 2 4	3 3 2

Wear Block Sets

Blocks per set	Code No. Carbide	Code No. CERA	Standard/grade available and **Suffix No.**[*1] ISO/JIS	ASME	BS	Blocks included in set Size (in)	Step (in)	Qty.
2	**516-809** **516-808**	**516-836** **516-837**	— —	0: **-■6** 1: **-■6**	— —	0.05		2
2	**516-805** **516-804**	**516-834** **516-835**	— —	0: **-■6** 1: **-■6**	— —	0.1		2

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

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Mitutoyo

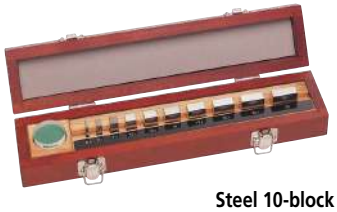
Gauge Blocks

Micrometer Inspection Gauge Block Sets SERIES 516

- Special sets for micrometer inspection. **516-106/107/108** and **516-156/157/158** are useful for checking maximum permissible error. For inspection of large micrometers, we recommend using **516-115/116/117** and **516-165/166/167** together. **516-580/581/582** and **516-390/391/392** are special sets for inspection of QuantuMike, whose spindle moves 2.0 mm per one thimble rotation.

Steel

Steel 10-block set



Steel 10-block set

Steel 8-block set

Steel 10-block set

CERA

CERA 10-block set

CERA 10-block set

CERA 8-block set

CERA 10-block set

Gauge Block Sets for Micrometer Inspection

A set consisting of a Micro Checker and gauge blocks for micrometer inspection.

(516-132/133/134/135/136/137)

516-607

Micro Checker

Can clamp a stack of gauge blocks to be used for micrometer inspection.

SPECIFICATIONS

Metric Micro Checker (holder only)

Code No.	516-607
Applicable gauge block sets	**516-106/107/108**, **516-156/157/158**
Applicable gauge block sizes (mm)	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25

Inch Micro Checker (holder only)

Code No.	516-608
Applicable gauge block sets	**516-921/922/923**, **516-321/322/323**
Applicable gauge block sizes (in)	0.105, 0.210, 0.315, 0.420, 0.5, 0.605, 0.710, 0.815, 0.920, 1

Typical application

(The gauge block and optical parallel shown are optional accessories.)

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PROPRIETARY INSPECTION CERTIFICATE

*1: Suffix No. (■) for Selecting Standard and Certificate Provided

ISO/JIS

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✔	
6	✔	✔

Suffix No. 1: Not available for Grade K sets.

ASME

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✔	
6	✔	✔

Suffix No. 1: Not available for Grade K sets.
Suffix No. 6: Only for Grade K sets.

BS

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✔	

Inspection Certificate

SPECIFICATIONS

Metric Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and Suffix No.*1 ISO/JIS	ASME	BS	Blocks included in set
16	516-111 516-112 516-113	516-161 516-162 516-163	0: -■0 1: -■0 2: -■0	— — —	— — —	1.00, 1.25, 1.5, 2, 3, 5, 10, 15, 20, 25, 25.25, 30, 35, 40, 45, 50 mm, Cerastone, Optical parallels (t=12 mm, 25 mm)
10	516-977 516-978 516-979 516-980	— 516-378 516-379 516-380	K: -■0 0: -■0 1: -■0 2: -■0	— — — —	— — — —	1.00, 1.25, 1.50, 2, 3, 5, 10, 15, 20, 25 mm, Optical parallel (t=12 mm)
10	516-103 516-101 —	516-152 516-153 516-154	0: -■0 1: -■0 2: -■0	0: -■6 1: -■6 —	— — —	1.00, 1.25, 1.50, 2, 3, 5, 10, 15, 20, 25 mm
10	516-580 516-581 516-582	516-390 516-391 516-392	0: -■0 1: -■0 2: -■0	— — —	— — —	2.2, 4.8, 7.8, 10.4, 12, 15.2, 17.4, 19.6, 22.6, 25 mm
10	516-106 516-107 516-108	516-156 516-157 516-158	0: -■0 1: -■0 2: -■0	— — —	— — —	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25 mm, Optical parallel (t=12 mm)
10	516-132 516-133 516-134	516-182 516-183 516-184	0: -■0 1: -■0 2: -■0	— — —	— — —	1.25, 1.50, 1, 2, 3, 5, 10, 15, 20, 25 mm, Micro Checker, Optical parallel (t=12 mm)
10	516-135 516-136 516-137	516-185 516-186 516-187	0: -■0 1: -■0 2: -■0	— — —	— — —	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25 mm, Micro Checker, Optical parallel (t=12 mm)
8	— — 516-115 516-116 516-117	516-547 516-164 516-165 516-166 516-167	— K: -■0 0: -■0 1: -■0 2: -■0	K: -■6 00: -■6 0: -■6 1: -■6 2: -■6	— — — — —	25, 50, 75, 100, 125, 150, 175, 200 mm

Inch Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and Suffix No.*1 ISO/JIS	ASME	BS	Blocks included in set
10	516-528 516-529 516-530	516-318 516-319 516-320	— — —	00: -■6 0: -■6 1: -■6	0: -■1 1: -■1 2: -■1	0.087, 0.189, 0.307, 0.409, 0.472, 0.598, 0.669, 0.772, 0.890, 1 in
10	516-552 516-921 516-922 516-923	516-559 516-321 516-322 516-323	— — — —	K: -■6 00: -■6 0: -■6 1: -■6	— 0: -■1 1: -■1 2: -■1	0.105, 0.210, 0.315, 0.420, 0.500, 0.605, 0.710, 0.815, 0.920, 1 in, Optical parallel (t=0.5 in)
10	516-553 516-138 516-139 516-140	516-560 516-188 516-189 516-190	— — — —	K: -■6 00: -■6 0: -■6 1: -■6	— 0: -■1 1: -■1 2: -■1	0.105, 0.210, 0.315, 0.420, 0.500, 0.605, 0.710, 0.815, 0.920, 1 in, Micro checker, Optical parallel (t=0.5 in)
9	516-554 516-929 516-930 516-931 516-932	516-561 516-333 516-334 516-335 516-336	— — — — —	K: -■6 00: -■6 0: -■6 1: -■6 2: -■6	— — — — —	0.0625, 0.100, 0.125, 0.200, 0.250, 0.300, 0.500, 1, 2 in, Optical parallel (t=0.5 in)
9	516-555 516-141 516-142 516-143 516-144	516-562 516-191 516-192 516-193 516-194	— — — — —	K: -■6 00: -■6 0: -■6 1: -■6 2: -■6	— — — — —	0.0625, 0.100, 0.125, 0.200, 0.250, 0.300, 0.500, 1, 2 in, Micro Checker, Optical parallel (t=0.5 in)
9	— — 516-934 516-935 516-936	516-563 516-329 516-330 516-331 516-332	— — — — —	K: -■6 00: -■6 0: -■6 1: -■6 2: -■6	— — — — —	0.0625, 0.100, 0.125, 0.200, 0.250, 0.300, 0.500, 1, 2 in
8	516-126 516-127	516-176 516-177	— —	0: -■6 1: -■6	— —	1, 2, 3, 4, 5, 6, 7, 8 in

SERIES 516 – Caliper Inspection Gauge Block Sets

SPECIFICATIONS

Metric Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and Suffix No. ISO/JIS	ASME	BS	Blocks included in set
5	— —	— 516-174	— 2: -10	— —	— —	5 pcs.: 10.3, 24.5, 50, 75, 100 mm, Ceramic plain jaws, Holder (250 mm), Glove
4	516-526 516-527	516-566 516-567	1: -10 2: -10	— —	— —	4 pcs.: 10, 30, 50, 125 mm, Setting ring (ø4 mm, ø10 mm), Pin gage (ø10 mm), Glove
3	516-124 516-125	516-150 516-151	1: -10 2: -10	— —	— —	3 pcs.: 30, 41.3, 131.4 mm, Setting ring (ø4 mm, ø25 mm), Glove
2	516-122 516-123	516-172 516-173	1: -10 2: -10	— —	— —	2 pcs.: 41.3, 131.4 mm, Setting ring (ø20 mm), Glove

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Mitutoyo

Gauge Blocks

Individual Metric Rectangular Gauge Blocks

- One or more gauge blocks can be purchased separately. If using only one length repeatedly, it is good practice to purchase discrete gauge blocks.
- Nominal sizes not shown in the list can also be manufactured.
- Each gauge block is supplied with an inspection certificate. When placing an order, please give us the code number with the suffix number corresponding to the applicable standard (see the suffix list).

SPECIFICATIONS

Metric Blocks

Length (mm)	Code No.*1	
	Steel	CERA
0.1	**611821**	—
0.11	**611860**	—
0.12	**611861**	—
0.13	**611862**	—
0.14	**611863**	—
0.15	**611822**	—
0.16	**611864**	—
0.17	**611865**	—
0.18	**611866**	—
0.19	**611867**	—
0.2	**611823**	—
0.21	**611868**	—
0.22	**611869**	—
0.23	**611870**	—
0.24	**611871**	—
0.25	**611824**	—
0.26	**611872**	—
0.27	**611873**	—
0.28	**611874**	—
0.29	**611875**	—
0.3	**611825**	—
0.31	**611876**	—
0.32	**611877**	—
0.33	**611878**	—
0.34	**611879**	—
0.35	**611826**	—
0.36	**611880**	—
0.37	**611881**	—
0.38	**611882**	—
0.39	**611883**	—
0.4	**611827**	—
0.41	**611884**	—
0.42	**611885**	—
0.43	**611886**	—
0.44	**611887**	—
0.45	**611828**	—
0.46	**611888**	—
0.47	**611889**	—
0.48	**611890**	—
0.49	**611891**	—
0.5	**611506**	**613506**
0.51	**611892**	—
0.52	**611893**	—

Length (mm)	Code No.*1	
	Steel	CERA
0.53	**611894**	—
0.54	**611895**	—
0.55	**611896**	—
0.56	**611897**	—
0.57	**611898**	—
0.58	**611899**	—
0.59	**611900**	—
0.6	**611901**	—
0.61	**611902**	—
0.62	**611903**	—
0.63	**611904**	—
0.64	**611905**	—
0.65	**611906**	—
0.66	**611907**	—
0.67	**611908**	—
0.68	**611909**	—
0.69	**611910**	—
0.7	**611911**	—
0.71	**611912**	—
0.72	**611913**	—
0.73	**611914**	—
0.74	**611915**	—
0.75	**611916**	—
0.76	**611917**	—
0.77	**611918**	—
0.78	**611919**	—
0.79	**611920**	—
0.8	**611921**	—
0.81	**611922**	—
0.82	**611923**	—
0.83	**611924**	—
0.84	**611925**	—
0.85	**611926**	—
0.86	**611927**	—
0.87	**611928**	—
0.88	**611929**	—
0.89	**611930**	—
0.9	**611931**	—
0.91	**611932**	—
0.92	**611933**	—
0.93	**611934**	—
0.94	**611935**	—
0.95	**611936**	—

Length (mm)	Code No.*1	
	Steel	CERA
0.96	**611937**	—
0.97	**611938**	—
0.98	**611939**	—
0.99	**611940**	—
0.991	**611551**	**613551**
0.992	**611552**	**613552**
0.993	**611553**	**613553**
0.994	**611554**	**613554**
0.995	**611555**	**613555**
0.996	**611556**	**613556**
0.997	**611557**	**613557**
0.998	**611558**	**613558**
0.999	**611559**	**613559**
1	**611611**	**613611**
1.0005	**611520**	**613520**
1.001	**611521**	**613521**
1.002	**611522**	**613522**
1.003	**611523**	**613523**
1.004	**611524**	**613524**
1.005	**611525**	**613525**
1.006	**611526**	**613526**
1.007	**611527**	**613527**
1.008	**611528**	**613528**
1.009	**611529**	**613529**
1.01	**611561**	**613561**
1.02	**611562**	**613562**
1.03	**611563**	**613563**
1.04	**611564**	**613564**
1.05	**611565**	**613565**
1.06	**611566**	**613566**
1.07	**611567**	**613567**
1.08	**611568**	**613568**
1.09	**611569**	**613569**
1.1	**611570**	**613570**
1.11	**611571**	**613571**
1.12	**611572**	**613572**
1.13	**611573**	**613573**
1.14	**611574**	**613574**
1.15	**611575**	**613575**
1.16	**611576**	**613576**
1.17	**611577**	**613577**
1.18	**611578**	**613578**
1.19	**611579**	**613579**

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

*1: Suffix No. (-■■■) for Selecting Standard and Certificate Provided

ISO / JIS

Suffix No.	Grade	Inspection Certificate	Calibration Certificate	
			JCSS	RvA
-016	K	✔	✔	
-021	0	✔		
-026	0	✔	✔	
-031	1	✔		
-036	1	✔	✔	
-041	2	✔		
-046	2	✔	✔	

ASME

Suffix No.	Grade	Inspection Certificate	Calibration Certificate
			JCSS
-516	K	✔	✔
-521	00	✔	
-531	0	✔	
-541	1	✔	
-551	2	✔	

BS

Suffix No.	Grade	Inspection Certificate	Calibration Certificate
			JCSS
-116	K	✔	✔
-121	0	✔	
-126	0	✔	✔
-131	1	✔	
-136	1	✔	✔
-141	2	✔	
-146	2	✔	✔

Mitutoyo
CERTIFICATE OF INSPECTION
SAMPLE

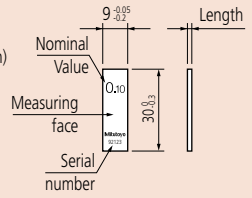
Inspection Certificate

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

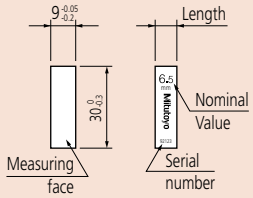
Dimensions

Unit: mm

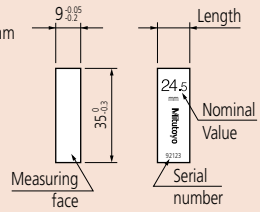
Nominal length:
0.1 mm to 5.5 mm
(0.004 in to 0.25 in)



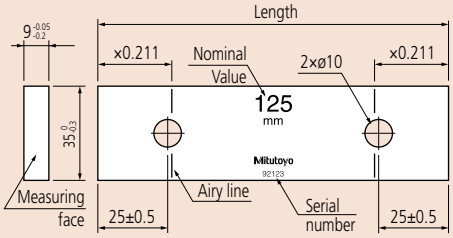
Nominal length:
6 mm to 10 mm
(0.3 in to 0.4 in)



Nominal length:
10.3 mm to 100 mm
(0.45 in to 4 in)



Nominal length 125 mm to 1000 mm (5 in to 20 in)



Length (mm)	Code No.*1 Steel	CERA
1.2	**611580**	**613580**
1.21	**611581**	**613581**
1.22	**611582**	**613582**
1.23	**611583**	**613583**
1.24	**611584**	**613584**
1.25	**611585**	**613585**
1.26	**611586**	**613586**
1.27	**611587**	**613587**
1.28	**611588**	**613588**
1.29	**611589**	**613589**
1.3	**611590**	**613590**
1.31	**611591**	**613591**
1.32	**611592**	**613592**
1.33	**611593**	**613593**
1.34	**611594**	**613594**
1.35	**611595**	**613595**
1.36	**611596**	**613596**
1.37	**611597**	**613597**
1.38	**611598**	**613598**
1.39	**611599**	**613599**
1.4	**611600**	**613600**
1.41	**611601**	**613601**
1.42	**611602**	**613602**
1.43	**611603**	**613603**
1.44	**611604**	**613604**
1.45	**611605**	**613605**
1.46	**611606**	**613606**
1.47	**611607**	**613607**
1.48	**611608**	**613608**
1.49	**611609**	**613609**
1.5	**611641**	**613641**
1.6	**611516**	**613516**
1.7	**611517**	**613517**
1.8	**611518**	**613518**
1.9	**611519**	**613519**
2	**611612**	**613612**
2.0005	**611690**	—
2.001	**611691**	—
2.002	**611692**	—
2.003	**611693**	—
2.004	**611694**	—
2.005	**611695**	—
2.006	**611696**	—
2.007	**611697**	—
2.008	**611698**	—
2.009	**611699**	—
2.01	**611701**	—
2.02	**611702**	—
2.03	**611703**	—
2.04	**611704**	—
2.05	**611705**	—
2.06	**611706**	—
2.07	**611707**	—
2.08	**611708**	—
2.09	**611709**	—
2.1	**611710**	—
2.11	**611711**	—
2.12	**611712**	—
2.13	**611713**	—
2.14	**611714**	—
2.15	**611715**	—
2.16	**611716**	—

Length (mm)	Code No.*1 Steel	CERA
2.17	**611717**	—
2.18	**611718**	—
2.19	**611719**	—
2.2	**611720**	—
2.21	**611721**	—
2.22	**611722**	—
2.23	**611723**	—
2.24	**611724**	—
2.25	**611725**	—
2.26	**611726**	—
2.27	**611727**	—
2.28	**611728**	—
2.29	**611729**	—
2.3	**611730**	—
2.31	**611731**	—
2.32	**611732**	—
2.33	**611733**	—
2.34	**611734**	—
2.35	**611735**	—
2.36	**611736**	—
2.37	**611737**	—
2.38	**611738**	—
2.39	**611739**	—
2.4	**611740**	—
2.41	**611741**	—
2.42	**611742**	—
2.43	**611743**	—
2.44	**611744**	—
2.45	**611745**	—
2.46	**611746**	—
2.47	**611747**	—
2.48	**611748**	—
2.49	**611749**	—
2.5	**611642**	**613642**
2.6	**611750**	—
2.7	**611751**	—
2.8	**611752**	—
2.9	**611753**	—
3	**611613**	**613613**
3.5	**611643**	**613643**
4	**611614**	**613614**
4.5	**611644**	**613644**
5	**611615**	**613615**
5.1	**611850**	**613850**
5.5	**611645**	**613645**
6	**611616**	**613616**
6.5	**611646**	**613646**
7	**611617**	**613617**
7.5	**611647**	**613647**
7.7	**611851**	**613851**
8	**611618**	**613618**
8.5	**611648**	**613648**
9	**611619**	**613619**
9.5	**611649**	**613649**
10	**611671**	**613671**
10.3	**611852**	**613852**
10.5	**611650**	**613650**
11	**611621**	**613621**
11.5	**611651**	**613651**
12	**611622**	**613622**
12.5	**611652**	**613652**
12.9	**611853**	**613853**

Length (mm)	Code No.*1 Steel	CERA
13	**611623**	**613623**
13.5	**611653**	**613653**
14	**611624**	**613624**
14.5	**611654**	**613654**
15	**611625**	**613625**
15.5	**611655**	**613655**
16	**611626**	**613626**
16.5	**611656**	**613656**
17	**611627**	**613627**
17.5	**611657**	**613657**
17.6	**611854**	**613854**
18	**611628**	**613628**
18.5	**611658**	**613658**
19	**611629**	**613629**
19.5	**611659**	**613659**
20	**611672**	**613672**
20.2	**611855**	**613855**
20.5	**611660**	**613660**
21	**611631**	**613631**
21.5	**611661**	**613661**
22	**611632**	**613632**
22.5	**611662**	**613662**
22.8	**611856**	**613856**
23	**611633**	**613633**
23.5	**611663**	**613663**
24	**611634**	**613634**
24.5	**611664**	**613664**
25	**611635**	**613635**
25.25	**611754**	**613754**
30	**611673**	**613673**
35	**611755**	**613755**
40	**611674**	**613674**
41.3	**611857**	**613857**
45	**611756**	**613756**
50	**611675**	**613675**
60	**611676**	**613676**
70	**611677**	**613677**
75	**611801**	**613801**
80	**611678**	**613678**
90	**611679**	**613679**
100	**611681**	**613681**
125	**611802**	**613802**
131.4	**611858**	**613858**
150	**611803**	**613803**
175	**611804**	**613804**
200	**611682**	**613682**
250	**611805**	**613805**
300	**611683**	**613683**
400	**611684**	**613684**
500	**611685**	**613685**
600	**611840**	—
700	**611841**	—
750	**611842**	—
800	**611843**	—
900	**611844**	—
1000	**611845**	—

Metric Wear Blocks

Length (mm)	Code No.*1 Tungsten carbide
1	**612611**
2	**612612**

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Individual Inch Rectangular Gauge Blocks

SPECIFICATIONS

Inch Blocks

Length (in)	Code No.*1	
	Steel	CERA
0.004	**611304**	—
0.005	**611305**	—
0.006	**611306**	—
0.007	**611307**	—
0.008	**611308**	—
0.009	**611309**	—
0.01	**611310**	—
0.011	**611311**	—
0.012	**611312**	—
0.013	**611313**	—
0.014	**611314**	—
0.015	**611315**	—
0.016	**611316**	—
0.017	**611317**	—
0.018	**611318**	—
0.019	**611319**	—
0.02	**611320**	—
0.02005	**611240**	—
0.0201	**611231**	—
0.0202	**611232**	—
0.0203	**611233**	—
0.0204	**611234**	—
0.0205	**611235**	—
0.0206	**611236**	—
0.0207	**611237**	—
0.0208	**611238**	—
0.0209	**611239**	—
0.021	**611321**	—
0.022	**611322**	—
0.023	**611323**	—

Length (in)	Code No.*1	
	Steel	CERA
0.024	**611324**	—
0.025	**611325**	—
0.026	**611326**	—
0.027	**611327**	—
0.028	**611328**	—
0.029	**611329**	—
0.03	**611330**	—
0.031	**611331**	—
0.03125 (1/32)	**611101**	**613103**
0.032	**611332**	—
0.033	**611333**	—
0.034	**611334**	—
0.035	**611335**	—
0.036	**611336**	—
0.037	**611337**	—
0.038	**611338**	—
0.039	**611339**	—
0.04	**611340**	—
0.041	**611341**	—
0.042	**611342**	—
0.043	**611343**	—
0.044	**611344**	—
0.045	**611345**	—
0.046	**611346**	—
0.046875 (3/64)	**611102**	**613104**
0.047	**611347**	—
0.048	**611348**	—
0.049	**611349**	—
0.05	**611105**	**613105**
0.06	**611106**	—

Length (in)	Code No.*1	
	Steel	CERA
0.0625	**611303**	**613303**
0.07	**611107**	—
0.078125 (5/64)	**611103**	**613100**
0.08	**611108**	—
0.09	**611109**	—
0.09375 (3/32)	**611104**	**613101**
0.1	**611191**	**613191**
0.100025	**611111**	**613110**
0.10005	**611135**	**613135**
0.100075	**611112**	**613111**
0.1001	**611121**	**613121**
0.1002	**611122**	**613122**
0.1003	**611123**	**613123**
0.1004	**611124**	**613124**
0.1005	**611125**	**613125**
0.1006	**611126**	**613126**
0.1007	**611127**	**613127**
0.1008	**611128**	**613128**
0.1009	**611129**	**613129**
0.101	**611141**	**613141**
0.102	**611142**	**613142**
0.103	**611143**	**613143**
0.104	**611144**	**613144**
0.105	**611145**	**613145**
0.106	**611146**	**613146**
0.107	**611147**	**613147**
0.108	**611148**	**613148**
0.109	**611149**	**613149**
0.109375 (7/64)	**611110**	**613102**

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

PROPRIETARY INSPECTION CERTIFICATE

*1: Suffix No. (-■■■) for Selecting Standard and Certificate Provided

ASME

Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-516	K	✔	✔
-521	00	✔	
-531	0	✔	
-541	1	✔	
-551	2	✔	

BS

Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-121	0	✔	
-131	1	✔	
-141	2	✔	

Mitutoyo
CERTIFICATE OF INSPECTION
SAMPLE

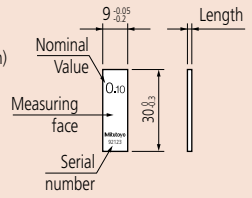
Inspection Certificate

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

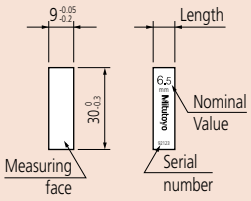
Dimensions

Unit: mm

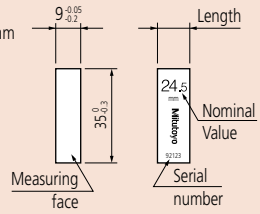
Nominal length:
0.1 mm to 5.5 mm
(0.004 in to 0.25 in)



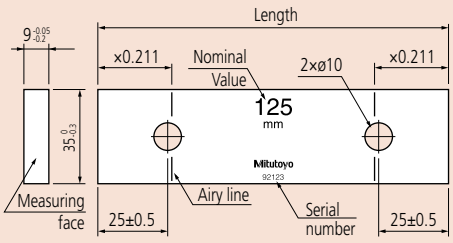
Nominal length:
6 mm to 10 mm
(0.3 in to 0.4 in)



Nominal length:
10.3 mm to 100 mm
(0.45 in to 4 in)



Nominal length 125 mm to 1000 mm (5 in to 20 in)



SPECIFICATIONS

Inch Blocks

Length (in)	Code No.*1	
	Steel	CERA
0.11	**611150**	**613150**
0.111	**611151**	**613151**
0.112	**611152**	**613152**
0.113	**611153**	**613153**
0.114	**611154**	**613154**
0.115	**611155**	**613155**
0.116	**611156**	**613156**
0.117	**611157**	**613157**
0.118	**611158**	**613158**
0.119	**611159**	**613159**
0.12	**611160**	**613160**
0.121	**611161**	**613161**
0.122	**611162**	**613162**
0.123	**611163**	**613163**
0.124	**611164**	**613164**
0.125	**611165**	**613165**
0.126	**611166**	**613166**
0.127	**611167**	**613167**
0.128	**611168**	**613168**
0.129	**611169**	**613169**
0.13	**611170**	**613170**
0.131	**611171**	**613171**
0.132	**611172**	**613172**
0.133	**611173**	**613173**
0.134	**611174**	**613174**
0.135	**611175**	**613175**
0.136	**611176**	**613176**
0.137	**611177**	**613177**
0.138	**611178**	**613178**
0.139	**611179**	**613179**
0.14	**611180**	**613180**
0.141	**611181**	**613181**
0.142	**611182**	**613182**
0.143	**611183**	**613183**
0.144	**611184**	**613184**
0.145	**611185**	**613185**
0.146	**611186**	**613186**
0.147	**611187**	**613187**
0.148	**611188**	**613188**
0.149	**611189**	**613189**
0.15	**611115**	**613115**
0.16	**611116**	**613116**
0.17	**611117**	**613117**
0.18	**611118**	**613118**
0.19	**611119**	**613119**
0.2	**611192**	**613192**
0.21	**611221**	**613221**
0.25	**611212**	**613212**
0.3	**611193**	**613193**
0.315	**611209**	**613209**
0.35	**611213**	**613213**
0.375 (3/8)	**611113**	**613112**
0.4	**611194**	**613194**
0.420	**611210**	**613210**
0.45	**611214**	**613214**
0.5	**611195**	**613195**
0.55	**611215**	**613215**
0.6	**611196**	**613196**
0.605	**611211**	**613211**
0.65	**611216**	**613216**
0.7	**611197**	**613197**
0.710	**611220**	**613220**
0.75	**611217**	**613217**
0.8	**611198**	**613198**
0.815	**611226**	**613226**
0.85	**611218**	**613218**
0.9	**611199**	**613199**
0.920	**611227**	**613227**
0.95	**611219**	**613219**
1	**611201**	**613201**
2	**611202**	**613202**
3	**611203**	**613203**
4	**611204**	**613204**
5	**611205**	**613205**
6	**611206**	**613206**
7	**611207**	**613207**
8	**611208**	**613208**
10	**611222**	**613222**
12	**611223**	**613223**
16	**611224**	**613224**
20	**611225**	**613225**

Inch Wear Blocks

Length (in)	Code No.*1 Tungsten carbide
0.05	**612105**
0.1	**612191**

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.
4 inch or more is not listed in the standard of British Standards Institution.

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Rectangular Gauge Block Accessories SERIES 516

- Accessory sets for extending the range of application for rectangular gauge blocks.
- Available in 22-piece and 14-piece sets. Each accessory is also available separately for applications where a full set is not needed.
- Can be used with both steel and CERA blocks.

516-601
(22 pcs.)

SPECIFICATIONS

Item Description	Code No.	Nominal capacity/ dimension (mm)	Set		Quantity Supplied
			22 pcs. **516-601**	14 pcs. **516-602**	
Holder	**619002**	15 to 60		✔	1 pc.
	619003	5 to 100	✔	✔	
	619004	15 to 160	✔	✔	
	619005	20 to 250	✔	✔	
Base	**619009**	35	✔	✔	
Half-round jaw	**619010***	2	✔	✔	One pair (2 pcs.)
	619011*	5	✔	✔	
	619012*	8	✔	✔	
	619013*	12	✔		
	619014*	20	✔		
Plain jaw	**619018***	160	✔		
Scriber point	**619019**	—	✔	✔	1 pc.
Center point	**619020**	—	✔	✔	
Tram point	**619021***	—	✔		One pair (2 pcs.)
Triangular straightedge	**619022**	100	✔	✔	1 pc.
	619023	160	✔		

* A single piece is supplied for each code number, except for half-round jaws, plain jaws (B type) and tram points, which are supplied as a two-pack.

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Typical application

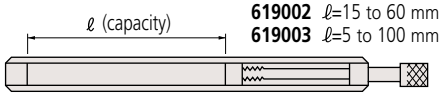
Half-round jaw (**619013**) 2 pcs.
Holder (**619002**) 1 pc.
Gauge block

Base (**619009**) 1 pc.
Holder (**619003**) 1 pc.
Scriber point (**619019**) 1 pc.
Gauge block

Setting a bore gage using a holder with a pair of Type I half-round jaws arranged as flat contact surfaces

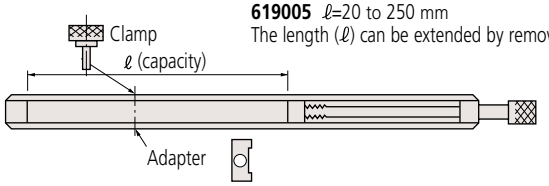
Holder

Thickness=15 mm
Width=29.5 mm

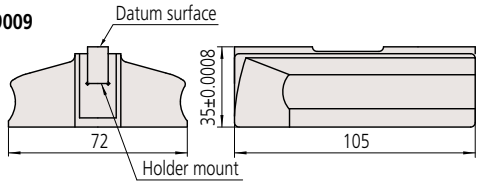


619002 ℓ=15 to 60 mm
619003 ℓ=5 to 100 mm

619004 ℓ=15 to 160 mm
619005 ℓ=20 to 250 mm
The length (ℓ) can be extended by removing the adapter.



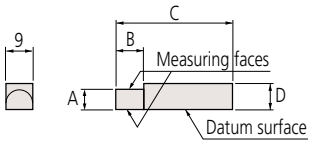
Base **619009**



Flatness of the datum surface 0.5 µm
Parallelism 0.8 µm
Flatness of the bottom surface 1 µm

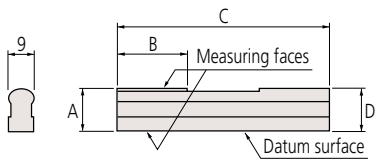
Half-round jaws

Type I



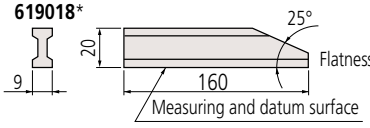
Flatness of the datum surface 0.5 µm
Parallelism of A 0.5 µm

Type II



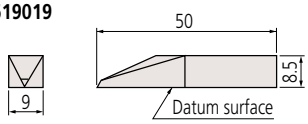
Code No.	Type	Size (mm)	A (mm)	B (mm)	C (mm)	D (mm)
619010*	I	2	2±0.0005	5.5	40	7.5
619011*		5	5±0.0005	15.5	45	7.5
619012*		8	8±0.0005	20	50	8.5
619013*	II	12	12±0.0005	25	75	13
619014*		20	20±0.0005	25	125	20.5

Plain jaw (B type) **619018***



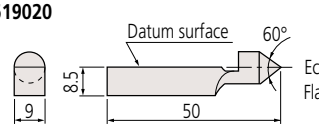
Flatness of the datum surface 1 µm

Scriber point **619019**



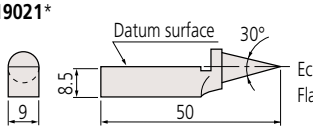
Flatness of the datum surface 0.5 µm

Center point **619020**



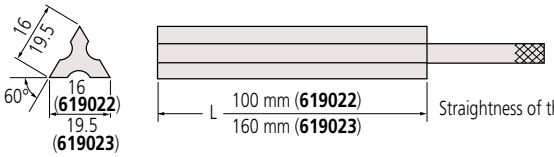
Eccentricity tolerance of the point ±10 µm
Flatness of the datum surface 0.5 µm

Tram point **619021***



Eccentricity tolerance of the point ±10 µm
Flatness of the datum surface 0.5 µm

Triangular straightedge (for handheld use only)



Straightness of the edges 1.2 µm

* A single piece is supplied for each code number, except for half-round jaws, plain jaws (B type) and tram points, which are supplied as a two-pack.

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Mitutoyo

Accessories for Rectangular Gauge Blocks over 100 mm SERIES 516

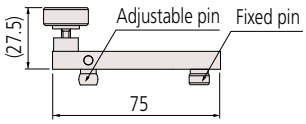
- Specially designed for long rectangular gauge blocks of 100 mm and over which have two coupling holes in the body: coupling of two long gauge blocks, a stack of regular gauge blocks and attachment of jaws is possible.
- Can be used with both long steel and CERA blocks.

516-605
(14 pcs.)

SPECIFICATIONS

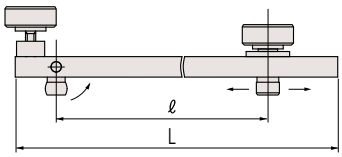
Set code No.	Code No.	Description	Quantity Supplied
516-605	619031	Connector A	1 pc.
	619032	Connector B	
	619033	Connector C	
	619034	Connector D	
	619035	Connector E	
	619036	Adapter	3 pcs.
	619009	Base	1 pc.
	619018	Plain jaw (B-type)	2 pcs.
	619013	Half-round jaw	
	619019	Scriber point	1 pc.

Connector A **619031**



Used for directly coupling two long gauge blocks.

Connectors B and C



Unit: mm

Code No.	ℓ (max.)	L		Adapter Qty.
619032	90	126	Connector B	2
619033	200	236	Connector C	

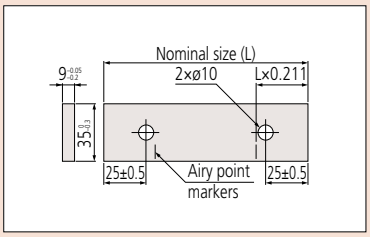
Adapter (2 pcs.) **619036**

In addition to connecting long gauge blocks, the holders can also connect long gauge blocks with other types of gauge blocks inserted in between. Connector B is for gauge blocks with nominal size of 40 mm or less, and connector C for gauge blocks with nominal size of 150 mm or less (connector C can also be used to connect hole-less gauge blocks of 100 mm or less with various types of jaw). Adapters can be used to attach jaws on the edges of long gauge blocks.

Typical application

Using an A-type connector

Use of B-type connectors in gage construction



Coupling holes in long gauge blocks

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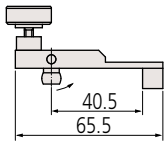
Typical application

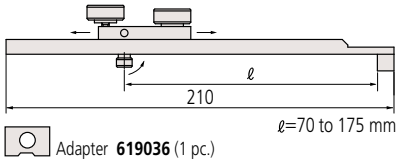
Setting a dial test indicator to a long-gauge-block stack attached to the base with a D-type connector

Connector D 619034



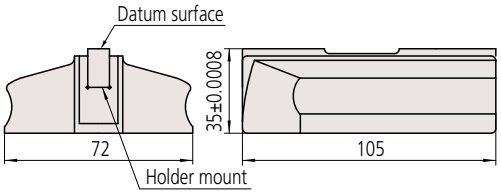
Used for attaching a long gauge block directly to the base.

Connector E 619035



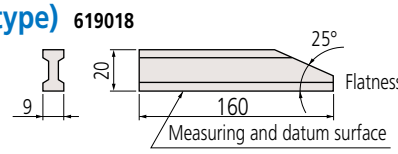
Used for attaching a long gauge block to the base over a stack of regular gauge blocks wrung between the base and long gauge block.
The length ℓ is highly adjustable to accommodate the variable length of the stack.

Base 619009



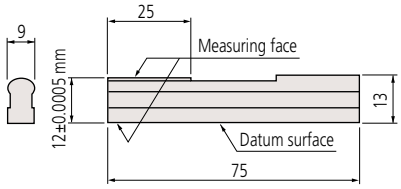
Flatness of the datum surface 0.5 µm
Parallelism 0.8 µm
Flatness of the bottom surface 1 µm

Plain jaw (B-type) 619018



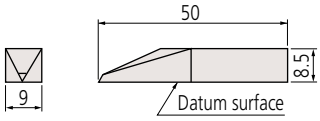
Flatness of the datum surface 1 µm

Half-round jaw 619013



Flatness of the datum surface 0.5 µm
Parallelism 0.5 µm

Scriber point 619019



Flatness of the datum surface 0.5 µm

Example of use of accessories with long gauge blocks

The table below shows the appropriate combination of long rectangular gauge blocks and accessories for making inside and outside measurements in the approximate range 300 mm to 1000 mm in 100 mm steps. The numbers in the table represent the number of gauge blocks or accessories in use. Note that the ranges shown do not take into account the combined thickness of the half-round jaws for inside measurement (24 mm) and the length of any regular gauge block stack used.

Items		Code No.	300 mm		400 mm		500 mm		600 mm		700 mm		800 mm		900 mm		1000 mm	
			Inner	Outer	Inner	Outer	Inner	Outer	Inner	Outer	Inner	Inner	Inner	Outer	Inner	Outer	Inner	Outer
Rectangular gauge block (nominal dimension)	200 mm	**611682**							1	1								
	300 mm	**611683**	1	1							1	1	1	1				
	400 mm	**611684**			1	1			1	1	1	1			1	1		
	500 mm	**611685**					1	1					1	1	1	1	2	2
Connector A		**619031**							1	1	1	1	1	1	1	1	1	1
Connector B*		**619032**	2		2		2		2		2		2		2		2	
Half-round jaws 2 pcs./set		**619013**	2		2		2		2		2		2		2		2	
Adapter		**619036**	(2)		(2)		(2)		(2)		(2)		(2)		(2)		(2)	

* Provided with adapters (2 pcs.).

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Mitutoyo

Metric/Inch Square Gauge Block Sets
SERIES 516 — Metric Block Sets, Long Block Sets, Wear Block Sets

- A square gauge block can retain stable orientation both longitudinally and laterally. A wide range of application measurements can be made. From various sets of 2 pieces up to 112 pieces, you can select the best type for your application.
- Always use genuine gauge block accessories.

Steel 112-block set

Steel 103-block set

Steel 76-block set

Steel 47-block set

Steel 32-block set

Wear block set

Tungsten Carbide

Long block set

Steel 8-block set

These square wear gauge blocks made of cemented carbide have excellent resistance to abrasion, making them ideal for protecting the ends of a stack of blocks subject to frequent use. Available in two nominal sizes: 1 mm and 2 mm. We recommend that these wear gauge blocks of both sizes be wrung firmly to the stack when in use.

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PROPRIETARY INSPECTION CERTIFICATE

*1: Suffix No. (■) for Selecting Standard and Certificate Provided

ISO / JIS

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✔	
6	✔	✔

ASME

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	✔	

Inspection Certificate

SPECIFICATIONS

Metric Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and Suffix No.*1 ISO/JIS	Standard/grade available and Suffix No.*1 ASME	Blocks included in set Size (mm)	Step (mm)	Qty.
112	516-437	—	—	00: -■6	1.005		1
	516-438	—	0: -■0	0: -■6	1.001 - 1.009	0.001	9
	516-439	—	1: -■0	1: -■6	1.01 - 1.49	0.01	49
	516-440	—	2: -■0	2: -■6	0.5 - 24.5	0.5	49
	—	—	—	—	25 - 100	25	4
103	516-441	—	—	00: -■6	1.005		1
	516-442	—	0: -■0	0: -■6	1.01 - 1.49	0.01	49
	516-443	—	1: -■0	1: -■6	0.5 - 24.5	0.5	49
	516-444	—	2: -■0	2: -■6	25 - 100	25	4
76	516-449	—	—	00: -■6	1.005		1
	516-450	—	0: -■0	0: -■6	1.01 - 1.49	0.01	49
	516-451	—	1: -■0	1: -■6	0.5 - 9.5	0.5	19
	516-452	—	2: -■0	2: -■6	10 - 40	10	4
	—	—	—	—	50 - 100	25	3
47	516-457	—	—	00: -■6	1.005		1
	516-458	—	0: -■0	0: -■6	1.01 - 1.09	0.01	9
	516-459	—	1: -■0	1: -■6	1.1 - 1.9	0.1	9
	516-460	—	2: -■0	2: -■6	1 - 24	1	24
		—	—	—	25 - 100	25	4
32	516-465	—	—	00: -■6	1.005		1
	516-466	—	0: -■0	0: -■6	1.01 - 1.09	0.01	9
	516-467	—	1: -■0	1: -■6	1.1 - 1.9	0.1	9
	516-468	—	2: -■0	2: -■6	1 - 9	1	9
	—	—	—	—	10 - 30	10	3
	—				60		1

Metric Long Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and Suffix No.*1 ISO/JIS	Standard/grade available and Suffix No.*1 ASME	Blocks included in set Size (mm)	Step (mm)	Qty.
8	516-751	—	—	00: -■6	125, 150, 175	25	3
	516-752	—	0: -■0	0: -■6	200, 250	50	2
	516-753	—	1: -■0	1: -■6	300, 400, 500	100	3
	516-754	—	2: -■0	2: -■6			

Metric Wear Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and Suffix No.*1 ISO/JIS	Standard/grade available and Suffix No.*1 ASME	Blocks included in set Size (mm)	Step (mm)	Qty.
2	516-820	—	0: -■0	—	1	—	2
	516-821	—	1: -■0	—			
2	516-822	—	0: -■0	—	2	—	2
	516-823	—	1: -■0	—			

Inch Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and Suffix No.*1 ISO/JIS	Standard/grade available and Suffix No.*1 ASME	Blocks included in set Size (in)	Step (in)	Qty.
81	516-401	516-201	—	00: -■6	0.1001 - 0.1009	0.0001	9
	516-402	516-202	—	0: -■6	0.101 - 0.149	0.001	49
	516-403	516-203	—	1: -■6	0.05 - 0.95	0.05	19
	516-404	516-204	—	2: -■6	1 - 4	1	4
36	516-421	516-221	—	00: -■6	0.05		1
	516-422	516-222	—	0: -■6	0.1001 - 0.1009	0.0001	9
	516-423	516-223	—	1: -■6	0.101 - 0.109	0.001	9
	516-424	516-224	—	2: -■6	0.11 - 0.19	0.01	9
	—	—	—	—	0.1 - 0.5	0.1	5
	—	—	—	—	1, 2, 4	1	3
28	516-417	—	—	00: -■6	0.02005		1
	516-418	—	—	0: -■6	0.0201 - 0.0209	0.0001	9
	516-419	—	—	1: -■6	0.021 - 0.029	0.001	9
	516-420	—	—	2: -■6	0.010 - 0.090	0.01	9
	—		—	—			

Inch Long Block Sets

Blocks per set	Code No. Steel	Code No. CERA	Standard/grade available and Suffix No.*1 ISO/JIS	Standard/grade available and Suffix No.*1 ASME	Blocks included in set Size (in)	Step (in)	Qty.
8	516-762	—	—	0: -■0	5 - 7	1	3
	516-763	—	—	1: -■0	8, 10, 12	2	3
	—	—	—		16, 20	4	2

Inch Wear Block Sets

Blocks per set	Code No. Carbide	Code No. CERA	Standard/grade available and Suffix No.*1 ISO/JIS	Standard/grade available and Suffix No.*1 ASME	Blocks included in set Size (in)	Step (in)	Qty.
2	516-824	516-846	—	0: -■0	0.05	—	2
	516-825	516-847	—	1: -■0			
2	516-826	516-844	—	0: -■0	0.1	—	2
	516-827	516-845	—	1: -■0			

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Mitutoyo

Gauge Blocks

Individual Metric Square Gauge Blocks

- One or more gauge blocks can be purchased separately. Purchasing them loose is helpful. If using only one length repeatedly, it is good practice to purchase discrete gauge blocks.
- Each gauge block is supplied with an inspection certificate. When placing an order, please give us the code number with the suffix number corresponding to the applicable standard (see the suffix list).
- We make custom length gauge blocks.
- Always use genuine gauge block accessories.

SPECIFICATIONS

Metric Blocks

Length (mm)	Code No.	
	Steel	CERA
0.5	**614506**	—
1	**614611**	—
1.0005	**614520**	—
1.001	**614521**	—
1.002	**614522**	—
1.003	**614523**	—
1.004	**614524**	—
1.005	**614525**	—
1.006	**614526**	—
1.007	**614527**	—
1.008	**614528**	—
1.009	**614529**	—
1.01	**614561**	—
1.02	**614562**	—
1.03	**614563**	—
1.04	**614564**	—
1.05	**614565**	—
1.06	**614566**	—
1.07	**614567**	—
1.08	**614568**	—
1.09	**614569**	—
1.1	**614570**	—
1.11	**614571**	—
1.12	**614572**	—
1.13	**614573**	—
1.14	**614574**	—
1.15	**614575**	—
1.16	**614576**	—
1.17	**614577**	—
1.18	**614578**	—
1.19	**614579**	—
1.2	**614580**	—
1.21	**614581**	—
1.22	**614582**	—
1.23	**614583**	—
1.24	**614584**	—
1.25	**614585**	—
1.26	**614586**	—
1.27	**614587**	—
1.28	**614588**	—
1.29	**614589**	—
1.3	**614590**	—
1.31	**614591**	—
1.32	**614592**	—

Length (mm)	Code No.	
	Steel	CERA
1.33	**614593**	—
1.34	**614594**	—
1.35	**614595**	—
1.36	**614596**	—
1.37	**614597**	—
1.38	**614598**	—
1.39	**614599**	—
1.4	**614600**	—
1.41	**614601**	—
1.42	**614602**	—
1.43	**614603**	—
1.44	**614604**	—
1.45	**614605**	—
1.46	**614606**	—
1.47	**614607**	—
1.48	**614608**	—
1.49	**614609**	—
1.5	**614641**	—
1.6	**614516**	—
1.7	**614517**	—
1.8	**614518**	—
1.9	**614519**	—
2	**614612**	—
2.5	**614642**	—
3	**614613**	—
3.5	**614643**	—
4	**614614**	—
4.5	**614644**	—
5	**614615**	—
5.5	**614645**	—
6	**614616**	—
6.5	**614646**	—
7	**614617**	—
7.5	**614647**	—
8	**614618**	—
8.5	**614648**	—
9	**614619**	—
9.5	**614649**	—
10	**614671**	—
10.5	**614650**	—
11	**614621**	—
11.5	**614651**	—
12	**614622**	—
12.5	**614652**	—

Length (mm)	Code No.	
	Steel	CERA
13	**614623**	—
13.5	**614653**	—
14	**614624**	—
14.5	**614654**	—
15	**614625**	—
15.5	**614655**	—
16	**614626**	—
16.5	**614656**	—
17	**614627**	—
17.5	**614657**	—
18	**614628**	—
18.5	**614658**	—
19	**614629**	—
19.5	**614659**	—
20	**614672**	—
20.5	**614660**	—
21	**614631**	—
21.5	**614661**	—
22	**614632**	—
22.5	**614662**	—
23	**614633**	—
23.5	**614663**	—
24	**614634**	—
24.5	**614664**	—
25	**614635**	—
30	**614673**	—
40	**614674**	—
50	**614675**	—
60	**614676**	—
75	**614801**	—
100	**614681**	—
125	**614802**	—
150	**614803**	—
175	**614804**	—
200	**614682**	—
250	**614805**	—
300	**614683**	—
400	**614684**	—
500	**614685**	—

Metric Wear Blocks

Length (mm)	Code No. Tungsten carbide
1	**615611**
2	**615612**

Note: Details of the overall sizes for forms of block are given on pages 01-3 and 01-26, and the accuracy standards to which they are manufactured are given on page 01-5.

PROPRIETARY INSPECTION CERTIFICATE

Suffix No. (-■■■) for Selecting Standard and Certificate Provided

ISO / JIS

Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-021	0	✔	
-026	0	✔	✔
-031	1	✔	
-036	1	✔	✔
-041	2	✔	
-046	2	✔	✔

ASME

Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-521	00	✔	
-531	0	✔	
-541	1	✔	
-551	2	✔	

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CERTIFICATE OF INSPECTION
SAMPLE

Inspection Certificate

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Individual Inch Square Gauge Blocks

*1: Suffix No. (-■■■) for Selecting Grade and Certificate Provided

ASME

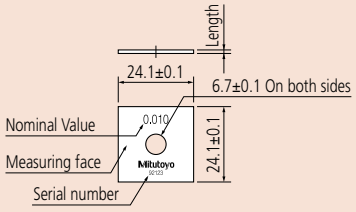
Suffix No.	Grade	Inspection Certificate	Calibration Certificate JCSS
-521	00	✔	
-531	0	✔	
-541	1	✔	
-551	2	✔	

Inspection Certificate

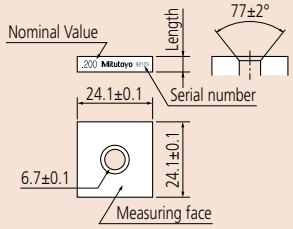
Dimensions

Unit: mm

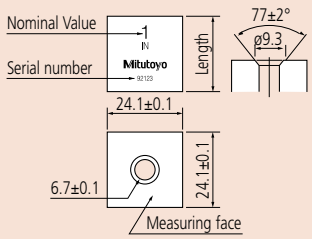
Nominal length: 0.5 mm to 4.5 mm (0.010 in to 0.19 in)



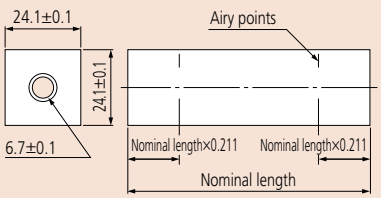
Nominal length: 5 mm to 14.5 mm (0.2 in to 0.450 in)



Nominal length: 15 mm to 500 mm (0.500 in to 20 in)



Nominal length: 125 mm to 500 mm (5 in to 20 in)



SPECIFICATIONS

Inch Blocks

Length (in)	Code No.*1 Steel	CERA
0.01	614310	—
0.02005	614240	—
0.0201	614231	—
0.0202	614232	—
0.0203	614233	—
0.0204	614234	—
0.0205	614235	—
0.0206	614236	—
0.0207	614237	—
0.0208	614238	—
0.0209	614239	—
0.02	614320	—
0.021	614321	—
0.022	614322	—
0.023	614323	—
0.024	614324	—
0.025	614325	—
0.026	614326	—
0.027	614327	—
0.028	614328	—
0.029	614329	—
0.03	614330	—
0.03125 (1/32)	614301	—
0.04	614340	—
0.046875 (3/64)	614302	—
0.05	614105	616105
0.06	614106	—
0.0625	614303	616303
0.07	614107	—
0.078125 (5/64)	614304	—
0.08	614108	—
0.09	614109	—
0.09375 (3/32)	614305	—
0.1	614191	616191
0.100025	614307	—
0.10005	614135	616135
0.100075	614308	—
0.1001	614121	616121
0.1002	614122	616122
0.1003	614123	616123
0.1004	614124	616124
0.1005	614125	616125
0.1006	614126	616126
0.1007	614127	616127
0.1008	614128	616128
0.1009	614129	616129
0.101	614141	616141
0.102	614142	616142
0.103	614143	616143
0.104	614144	616144
0.105	614145	616145
0.106	614146	616146
0.107	614147	616147
0.108	614148	616148
0.109	614149	616149
0.109375 (7/64)	614306	—
0.11	614150	616150
0.111	614151	616151
0.112	614152	616152
0.113	614153	616153
0.114	614154	616154
0.115	614155	616155
0.116	614156	616156
0.117	614157	616157
0.118	614158	616158
0.119	614159	616159
0.12	614160	616160
0.121	614161	616161
0.122	614162	616162
0.123	614163	616163
0.124	614164	616164
0.125	614165	616165
0.126	614166	616166
0.127	614167	616167
0.128	614168	616168
0.129	614169	616169
0.13	614170	616170
0.131	614171	616171
0.132	614172	616172
0.133	614173	616173
0.134	614174	616174
0.135	614175	616175
0.136	614176	616176
0.137	614177	616177
0.138	614178	616178
0.139	614179	616179
0.14	614180	616180
0.141	614181	616181
0.142	614182	616182
0.143	614183	616183
0.144	614184	616184
0.145	614185	616185
0.146	614186	616186
0.147	614187	616187
0.148	614188	616188
0.149	614189	616189
0.15	614115	616115
0.16	614116	616116
0.17	614117	616117
0.18	614118	616118
0.19	614119	616119
0.2	614192	616192
0.25	614212	616212
0.3	614193	616193
0.35	614213	616213
0.375 (3/8)	614309	—
0.4	614194	616194
0.45	614214	616214
0.5	614195	616195
0.55	614215	616215
0.6	614196	616196
0.65	614216	616216
0.7	614197	616197
0.75	614217	616217
0.8	614198	616198
0.85	614218	616218
0.9	614199	616199
0.95	614219	616219
1	614201	616201
2	614202	616202
3	614203	616203
4	614204	616204
5	614205	—
6	614206	—
7	614207	—
8	614208	—
10	614222	—
12	614223	—
16	614224	—
20	614225	—

Inch Wear Blocks

Length (in)	Code No. Tungsten carbide
0.05	615105
0.1	615191

Note: Details of the overall sizes for forms of block are given on page 01-3 and the accuracy standards to which they are manufactured are given on page 01-5.

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Square Gauge Block Accessories Set SERIES 516

- Mitutoyo offers the gauge block accessories set to expand the variety of square gauge block applications. Square gauge blocks with a hole at their center are much more widely used than rectangular gauge blocks. We also sell the accessories loose to meet your needs.
- Always use genuine gauge block accessories.

516-611

SPECIFICATIONS

Metric

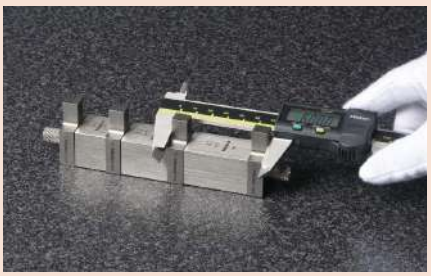
Code No. 516-611	Included in set	Quantity Supplied
619070	Half-round jaw 2 mm	2 pcs.
619071	Half-round jaw 5 mm	
619072	Plain jaw 10 mm	
619073	Center point 2 mm	1 pc.
619054	Scriber point	
619074	Base 10 mm	
619056	Stud	2 pcs.
619057	Flat head screw $1\frac{1}{4}$ in	
619058	Flat head screw $\frac{5}{8}$ in	
619059	Slotted head nut	
619060	Adjustable tie rod 6 in	
619061	Adjustable tie rod $4\frac{1}{2}$ in	
619062	Tie rod 3 in	1 pc.
619063	Tie rod $2\frac{1}{4}$ in	
619064	Tie rod $1\frac{1}{2}$ in	
619065	Tie rod $\frac{3}{4}$ in	
619066	Knurled head screw	2 pcs.

Inch

Code No. 516-612	Included in set	Quantity Supplied
619050	Half-round jaw 0.125 in	2 pcs.
619051	Half-round jaw 0.25 in	
619052	Plain jaw 0.5 in	
619053	Center point 0.1 in	1 pc.
619054	Scriber point	
619055	Base 0.5 in	
619056	Stud	2 pcs.
619057	Flat head screw $1\frac{1}{4}$ in	
619058	Flat head screw $\frac{5}{8}$ in	
619059	Slotted head nut	
619060	Adjustable tie rod 6 in	
619061	Adjustable tie rod $4\frac{1}{2}$ in	
619062	Tie rod 3 in	1 pc.
619063	Tie rod $2\frac{1}{4}$ in	
619064	Tie rod $1\frac{1}{2}$ in	
619065	Tie rod $\frac{3}{4}$ in	
619066	Knurled head screw	2 pcs.

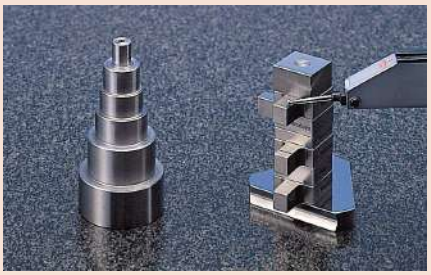
Note: 2 pcs. of half-round jaw, plain jaw, stud, flat head screw, slotted head nut, adjustable tie rod, and knurled head screw are included in each set. Please note that the abovementioned code number indicates only 1 set.

Typical application



Using plain jaws, tie rods, knurled head screws and gauge blocks, a gage was constructed to enable rapid comparison measurement of a stepped workpiece. (Sample workpiece)

Measurement example



Using a base, plain jaws, tie rods, flat head screws and gauge blocks, a gage was constructed to enable rapid comparison measurement of a stepped workpiece. (Sample workpiece)

Note: Accuracy when using third-party accessories is not guaranteed.

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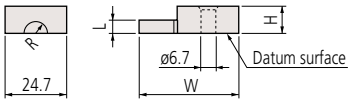
Half-round jaw

Unit: mm

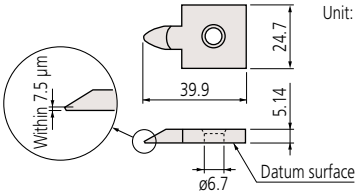


Code No.	R (mm)	L (mm)	W (mm)	H (mm)
619070	1.95	2	33.6	5.3
619071	4.95	5	39.9	10.3

- Flatness 0.5 µm
- Parallelism of L 0.5 µm
- Tolerance of L ±0.5 µm

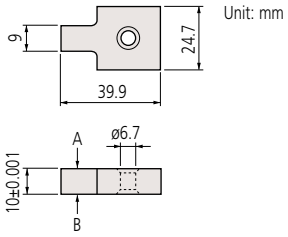
Scriber point 619054

Unit: mm



- Flatness of datum surface 0.5 µm

Plain jaw 619072

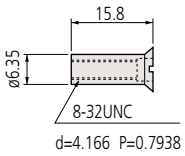


- Flatness 0.12 µm
- Parallelism 0.12 µm
- A and B are datum surfaces

Slotted head nut

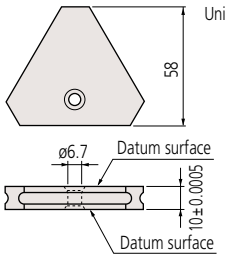
619059

Unit: mm



Base 619074

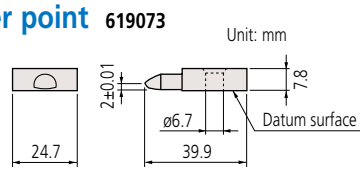
Unit: mm



- Flatness 1.5 µm
- Parallelism 1.5 µm
  (The surface within 1.5 mm of edge is excluded)

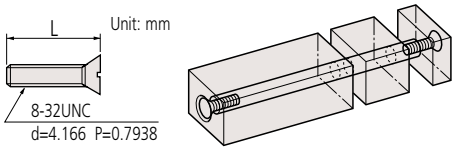
Center point 619073

Unit: mm



- Flatness 0.5 µm

Flat head screw

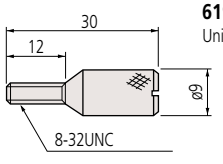


Code No.	L (mm)
619057	31.6
619058	15.8

Knurled head screw

619066

Unit: mm



- **Contraction caused by the clamping force**

The minimum recommended torque to be applied to the clamping screws is approximately 600 mN·m. The chart below shows the approximate length contraction of a 100 mm gage stack using typical torque values.

Driver	Contraction
Torque Driver 600 mN·m	0.2 µm/100 mm
Ordinary Driver 700 to 800 mN·m	0.3 µm/100 mm

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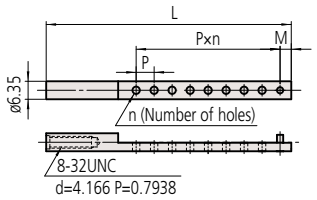
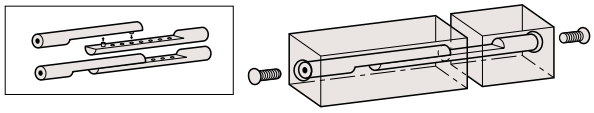
Square Gauge Block Accessories Set SERIES 516

Adjustable tie rod

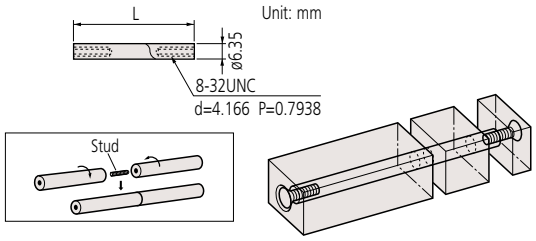
Unit: mm



Code No.	L (mm)	M (mm)	P (mm)	n (Number of holes)
619060	124.5	3.85	6.35	14
619061	86.5	3.95	6.35	8

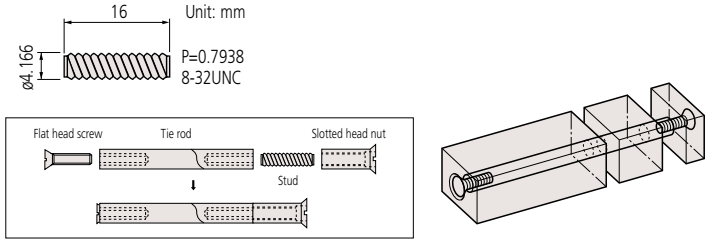


Tie rod



Code No.	L (mm)
619065	19
619064	38
619063	57
619062	76

Stud 619056



Accessories used for combining square gauge blocks

Overall length (mm)	Min.	21	36	34	41	45	58	64	72	77	82	91	95	109	117
Code No. / Included in set	Max.	30	43	43	50	60	72	79	88	91	97	107	109	125	135
619059 Slotted head nut		1	1		1										
619058 Flat head screw		1		2	1	2	1	2		1	2		1		1
619057 Flat head screw			1				1		2	1		2	1	2	1
619056 Stud					1										1
619065 Tie rod				1	1										1
619064 Tie rod						1	1		1						
619063 Tie rod								1		1		1			
619062 Tie rod											1		1	1	1
619061 Adjustable tie rod															
619060 Adjustable tie rod															

Overall length (mm)	Min.	130	148	121	167	143	160	205	180	223	240	258	295	375
Code No. / Included in set	Max.	150	169	180	184	210	255	270	285	288	345	363	445	520
619059 Slotted head nut														
619058 Flat head screw				2			2							
619057 Flat head screw		2	2		2	2		2	2	2	2	2	2	2
619056 Stud		1	1		1			1		1	1	1	1	2
619065 Tie rod		1												
619064 Tie rod			1											
619063 Tie rod					1			1			1			
619062 Tie rod		1	1		1					1		1		1
619061 Adjustable tie rod				2		2		2		2			2	2
619060 Adjustable tie rod							2		2		2	2	2	2

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Step Master
SERIES 516

- Step master is a master gage of different height that is useful for the z-axis (vertical direction) calibration of optical instruments.
- Each adjacent step is measured down to 0.01 µm by using a interferometer within ±0.20 µm allowance.
- Steel and ceramic types are available.

Steel type
516-199

Ceramic type
516-499

SPECIFICATIONS

Steel type

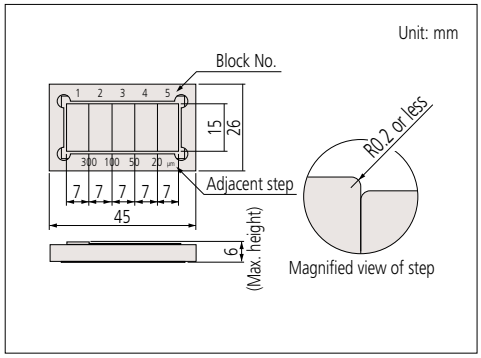
Code No.	516-198					516-199				
Block No.	1	2	3	4	5	1	2	3	4	5
Cumulative step (µm)	0	10	15	17	18	0	300	400	450	470
Step value between adjacent blocks (µm)		10	5	2	1		300	100	50	20

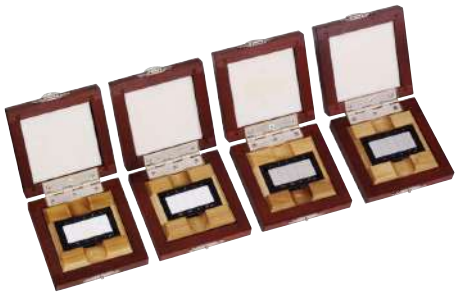
Ceramic type

Code No.	516-498					516-499				
Block No.	1	2	3	4	5	1	2	3	4	5
Cumulative step (µm)	0	10	15	17	18	0	300	400	450	470
Step value between adjacent blocks (µm)		10	5	2	1		300	100	50	20

Note: ○○○ - ○○○ **-24**: Provided with Calibration Certificate

DIMENSIONS





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Custom-made Blocks & Gages

Gauge blocks

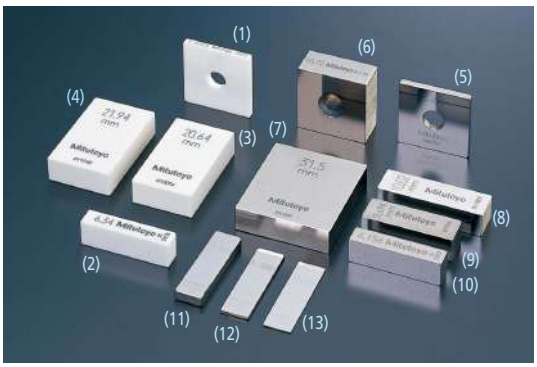
- We can provide gauge blocks in sizes for your specific needs. You can request a particular size you frequently use or a special size in small increments that cannot be created by wringing.
- Nominal size range
  - · 0.1 mm to 1000 mm (steel)
  - · 0.5 mm to 500 mm (ceramic)
  - · 30 mm to 1000 mm (ZERO CERA Blocks)
- Nominal size increment
  - · 0.0005 mm (up to 100 mm)
  - · 0.001 mm (over 100 mm)
- Cross section (same as the standard product)
  - · Nominal length of 10 mm or less: 30×9 mm
  - · Nominal length of more than 10 mm: 35×9 mm
  - · Square types are also available.

Reference gages

- We can provide gages in special dimensions not specified by JIS. Free yourself from the time-consuming work of gage creation by using our service that creates precision spacers and other gages in your preferred sizes. Gages with a hole or specified mark can also be created. Please contact us for details.
- Step masters
  We can create your preferred height difference between adjacent blocks.

Notes on "coupling holes" on custom gauge blocks:
· Steel, from 100 mm to less than 500 mm
Without coupling holes
(Let us know if a hole is required)
· Steel, from 500 mm to less than 1000 mm
With coupling holes
(Let us know if a hole is not required)
· Ceramic, from 100 mm to less than 500 mm
With coupling holes
(Let us know if a hole is not required)

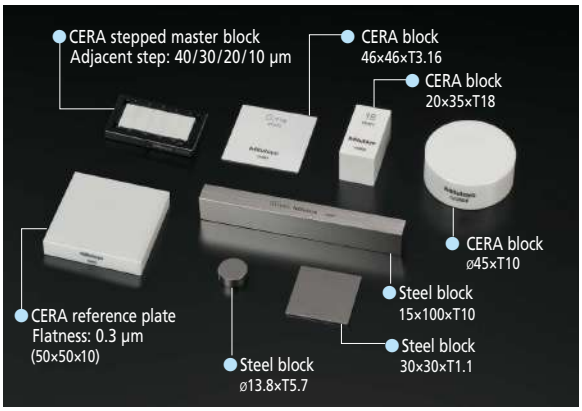
Special gauge blocks



Ceramic
(1) Square gauge block (2.1005 mm)
(2) Rectangular gauge block (6.34 mm)
(3) Rectangular gauge block (20.64 mm)
(4) Rectangular gauge block (21.94 mm)

Steel
(5) Square gauge block (2.2065 mm)
(6) Square gauge block (10.72 mm)
(7) Rectangular gauge block (31.5 mm)
(8) Rectangular gauge block (10.02 mm)
(9) Rectangular gauge block (9.694 mm)
(10) Rectangular gauge block (6.156 mm)
(11) Rectangular gauge block (3.603 mm)
(12) Rectangular gauge block (1.1505 mm)
(13) Rectangular gauge block (0.555 mm)

Special reference gages and step master (T: nominal size)



Unit: mm

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Maintenance Kit for Gauge Blocks SERIES 516

- Maintenance kit for gauge blocks includes all the necessary maintenance tools for removing burrs and contamination, and applying anti-corrosion treatment after use.

516-650E

Typical application

Recommendation for Regular Calibration

As is widely known, gauge blocks are end measures based on distance measurements traceable to the wavelength of the iodine stabilized He-Ne laser. Because they serve as the standard based on which measuring instruments are adjusted, even the smallest of errors can be critical. Therefore, we recommend periodical calibration even when use is infrequent. Please calibrate your gauge blocks as described in the table below (best practices may vary according to frequency of use and grade).

Application	Cycle (years)	Grade
Reference standard	1 to 2	K
Calibration	2	K or 0
Inspection	2	0 or 1
Shop floor	0.5 to 1	1 or 2

As an accredited calibration laboratory, Mitutoyo offers a periodical calibration service for gauge blocks.
Our regular calibration service features:
- Gauge blocks manufactured by any maker can be calibrated.
- Cleaning and removal of burrs.
- Central dimension and dimensional deviations of each block are measured.
- Calibration results are provided for immediate use and for building a calibration history of each block.
  For detailed information, contact the nearest Mitutoyo sales office.

Code No. 516-650E
Tools and accessories included:

(1) Ceraston (**601645**)
(both sides finished by lapping)
(100×25×12 mm)

(2) Optical flat (**158-117**)
(ø45, 12 mm thickness, Flatness 0.2 µm)
Used to check the wringing of thin gauge blocks and for the presence of burrs.

(3) Tweezers (**600004**)
Used for handling thin gauge blocks.

(4) Blower brush (**600005**)
Used for blowing dust from measuring surfaces.

(5) Cleaning paper (**600006**)
(lens paper, 82×304 mm, 500 pcs.)
Used for wiping off rust-preventative oil and contamination. Lint free.

(6) Artificial leather mat (B4 size, Artificial buckskin) (**600007**)
Used as a gauge block mat in order to avoid scratches on the work table.

(7) Reagent bottle (**600008**)
(polyethylene container, 100 ml)
Bottle of wiping solution.
(Mitutoyo employs n-Heptane for solvent.)

(8) Gloves (**600009**)
Used for handling large gauge blocks.
Effective for the prevention of corrosion and thermal expansion.

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Ceraston
SERIES 516 — Accessory for Gauge Block Maintenance

- Alumina-ceramic abrasive stone for removing burrs from hard materials such as ceramics that ordinary stones cannot handle.
- The grinding stones can be used on CERA Blocks and other steel gauge blocks. They are useful for removing burrs on any precision-processed surface.
- Excellent in durability and ease of removing burrs compared to Arkansas stones.
- Both sides can be used.

Typical application

601644
150 (W) ×50 (D) ×20 (H) mm

601645
100 (W) ×25 (D) ×12 (H) mm

Removing burrs

Figure 1

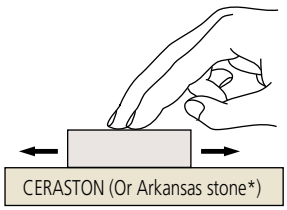
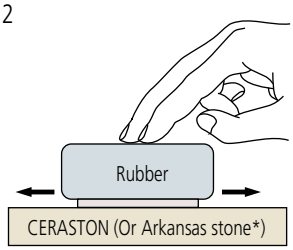


Figure 2



(1) Wipe any dust and oil film from the gauge block and the Ceraston (or Arkansas stone*) using a solvent.
(2) Place the gauge block on the Ceraston (or Arkansas stone*) so that the measuring face that has burrs is on the abrasive surface of the stone. While applying light pressure, move the gauge block back and forth about ten times (Fig. 1). Use a rubber block for thin gauge blocks to apply even pressure (Fig. 2).
(3) Check the measuring face for burrs with an optical flat. If the burrs have not been removed, repeat step (2). If burrs are too large, they may not be removed with an abrasive stone. If so, discard the gauge block.

* Mitutoyo does not offer Arkansas stones.

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Gauge Block Comparator GBCD-100A
SERIES 565 — Automatic Comparator with Dual Gage Heads

- Measures Rectangular Gauge Blocks and Square Gauge Blocks through automatic comparison with an appropriate Reference gauge block in the size range 0.5 mm to 100 mm.
- The measurement result is not affected by any warping of thinner gauge blocks due to the use of upper and lower gage heads (dual-head system).
- Measurement configuration: 1 cycle of automatic comparison measurement with a Reference gauge block.

Gauge block set for comparator calibration (optional)

Standard type **516-145-E2**

Special bridge-type block

516-145-E2

SPECIFICATIONS

Metric

Range	Resolution	Accuracy (95% confidence interval)	Upper gaging head		
			Type	Measuring force	Contact point
0.5 mm - 100 mm	0.01 µm	±(0.03 + 0.3L/1000) µm* L=Gauge block length (mm)	Mu-Checker	0.8 N	Carbide contact point of radius 20 mm

Lower gaging head			Operating conditions
Type	Measuring force	Contact point	
Mu-Checker	0.4 N	Carbide contact point of radius 5 mm	20 °C±1 °C Humidity: 58% RH ±15% RH (Under less temperature change, and hot or cold direct air flow should be avoided.)

* Not including the uncertainty of reference gauge block and influence of temperatures.

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Gauge Block Comparator GBCD-250
SERIES 565 — Manual Comparator with Dual Gage Heads

- Measures Rectangular Gauge Blocks and Square Gauge Blocks through manual comparison with an appropriate Reference gauge block in the size range 0.1 mm to 250 mm.
- The measurement result is not affected by any warping of thinner gauge blocks due to the use of upper and lower gage heads (dual-head system).

SPECIFICATIONS

Metric

Range	Resolution (Effective indication)	Accuracy (95% confidence interval) [Comparison measurement of the same nominal length]	Accuracy (95% confidence interval) [Dimensional deviations between Reference gauge block and measurement gauge block: ±3 mm]
0.1 mm - 250 mm	0.001 µm (0.01 µm)	±(0.03 + 0.3L/1000) µm* L=Gauge block length (mm)	±(0.06 + 0.3L/1000) µm* L=Gauge block length (mm)

Upper gaging head			Lower gaging head			Operating conditions
Type	Measuring force	Contact point	Type	Measuring force	Contact point	
Linear Gage	0.4 N	Carbide contact point of radius 20 mm	Linear Gage	0.2 N	Carbide contact point of radius 5 mm	20 °C±1 °C Humidity: 30% RH to 60% RH (Under less temperature change, and hot or cold direct air flow should be avoided.)

* Not including the uncertainty of reference gauge block and influence of temperatures.

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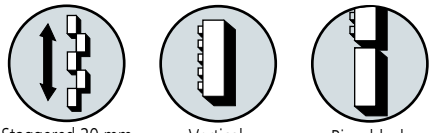
Height Master SERIES 515

- For calibrating and setting height gages.
- Staggered arrangement of block stack have two measuring faces on the same level, one facing up and the other down (except for **515-310**).

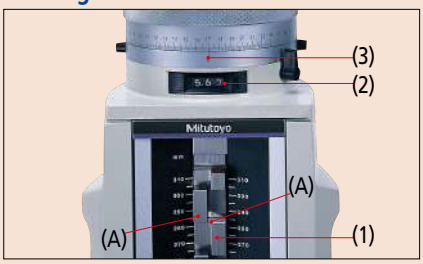
515-322



Staggered 20 mm blocks (movable) | Vertical orientation | Riser block

Typical application

Reading



(A) Height A

(1) Scale	280.	mm
(2) Counter	5.67	mm
(3) Thimble	0.000	mm
	285.670	mm

SPECIFICATIONS

Metric

Code No.	515-322
Range (H)	5 < H ≤ 310 mm
Graduation (analog scale)	0.001 mm
Block step	20 mm (staggered)
Micrometer adjustment	20 mm
Micrometer feed	0.5 mm/rev
Block pitch accuracy	±1.5 µm
Parallelism of blocks	1.0 µm
Feed error	±1.0 µm
Retrace error	1.0 µm
Mass	23 kg

Inch

Code No.	515-310	515-311
Range (H)	0.2 in < H ≤ 12.2 in	
Graduation (analog scale)	0.00001 in	
Block step	0.5 in (straight)	1 in (staggered)
Micrometer adjustment	1 in	
Micrometer feed	0.025 in/rev	
Block pitch accuracy	±50 µin	
Parallelism of blocks	40 µin	
Feed error	±40 µin	
Retrace error	40 µin	
Mass	23 kg	

Note 1: The block pitch accuracy and the parallelism of blocks are relative to the main unit reference surface.
Note 2: Supplied with a wooden storage case as standard.

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MeasurLink® ENABLED
Data Management Software by Mitutoyo

PROPRIETARY INSPECTION CERTIFICATE

Digital Height Master
SERIES 515

Function

Zero setting
Origin-setting
Origin restoration
Data hold
Auto power off
Data output

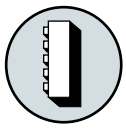
Optional Accessories

Code No.	Type	Description
959149	C	connection cable (1 m)
959150	C	connection cable (2 m)

- For calibrating and setting height gages.
- Staggered arrangement of block stack have two measuring faces on the same level, one facing up and the other down.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page 09-3 for details)

515-374

Staggered 20 mm blocks (movable)



Vertical orientation

Riser block

SPECIFICATIONS

Metric

Code No.		515-374	515-376	515-378
Range (H)		10 < H ≤ 310 mm	10 < H ≤ 460 mm	10 < H ≤ 610 mm
Resolution (digital display)		0.001 mm		
Block step		20 mm (staggered)		
Micrometer adjustment		20 mm		
Micrometer feed		0.5 mm/rev		
Block pitch accuracy	0 < H ≤ 310 mm	±1.5 µm		
	310 < H ≤ 460 mm	—	±2.5 µm	
	460 < H ≤ 610 mm	—	—	±3.5 µm
Parallelism of blocks	0 < H ≤ 310 mm	2.0 µm		
	310 < H ≤ 610 mm	—	2.5 µm	
Feed error		±2.0 µm		±2.5 µm
Retrace error		2.0 µm		2.5 µm
Mass		9.5 kg	13.6 kg	16 kg

Inch

Code No.		515-375	515-377	515-379
Range (H)		0.5 in < H ≤ 12 in	0.5 in < H ≤ 18 in	0.5 in < H ≤ 24 in
Resolution (digital display)		0.0001 in		
Block step		1 in (staggered)		
Micrometer adjustment		1 in		
Micrometer feed		0.025 in/rev		
Block pitch accuracy	0 < H ≤ 12 in	±100 µin		
	12 in < H ≤ 18 in	—	±100 µin	
	18 in < H ≤ 24 in	—	—	±150 µin
Parallelism of blocks	0 < H ≤ 12 in	50 µin		
	12 in < H ≤ 18 in	—	100 µin	
Feed error		±100 µin		
Retrace error		100 µin		
Mass		9.5 kg	13.6 kg	16 kg

- Display: 6 digits
- Power source: SR44 battery (2 pcs.), **938882** included as standard (for operational checks)
- Battery life: Approx. 1.8 years under normal use

Note: The block pitch accuracy and the parallelism of blocks are based on main unit reference surface, which does not include the retrace error.

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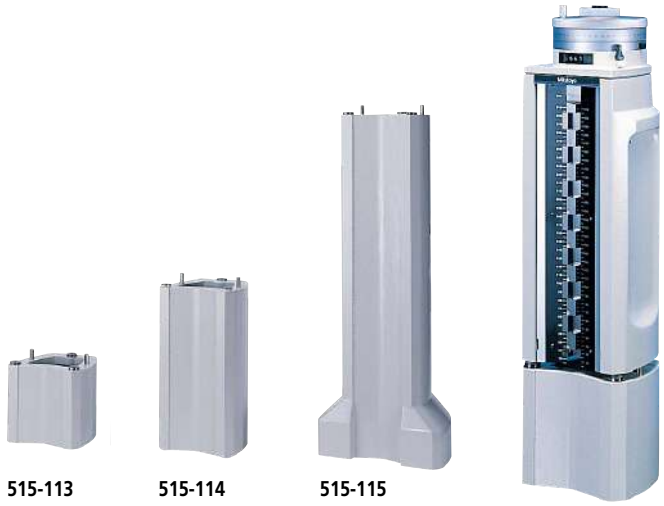
Height Master
SERIES 515 — Optional accessories

Riser Blocks
SERIES 515

- The measuring range of a Height Master can be extended by using riser blocks.
- They can also be used on Square Master models **311-215** and **311-225**. (Refer to page 01-46 for details)



515-113 **515-114** **515-115**

Typical application

Bore gage zero-setting

SPECIFICATIONS

Metric

Code No.	Height (mm)	Accuracy (µm)	Variation in length (µm)	Mass (kg)
515-113	150	±0.6	0.6	5.7
515-114	300	±1.0	0.8	9.8
515-115	600	±2.0	1.0	26.8

Inch

Code No.	Height (in)	Accuracy (µin)	Variation in length (µin)	Mass (kg)
515-116	6	±20	20	4.8
515-117	12	±40	30	11.3
515-118	24	±80	40	31

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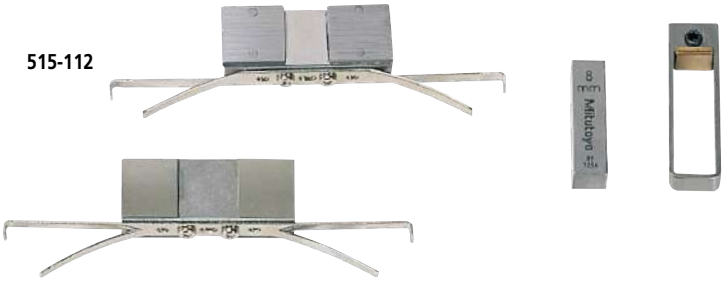
Auxiliary Block Kit
SERIES 515 – for Bore Gage

- Used for efficient zero-setting of dial bore gages and tubular inside micrometers (18 - 150 mm) on a Height Master.

515-112



SPECIFICATIONS

Metric

Code No.	Model
515-110	Universal Height Master
515-111	Digital Height Master (**515-374**/**376**/**378**)
515-112	Height Master (**515-322**)

Inch

Code No.	Model
515-119	Universal Height Master, Height Master (**515-310**)
515-120	Digital Height Master (**515-375**/**377**/**379**)
515-121	Height Master (**515-311**)

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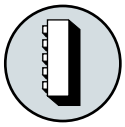
Universal Height Master
SERIES 515 — Usable in Vertical and Horizontal Orientations

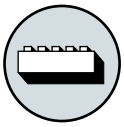
- The Universal Height Master is designed for both vertical and horizontal orientation, providing a wide range of applications such as accuracy checking of machine tool table movements.
- Analog display by the built-in counter – the appearance and specifications are the same as **515-322**.
(Refer to page 01-37 for details)

515-520

Single-row 10 mm blocks (movable)



Vertical orientation



Horizontal orientation

Riser block

SPECIFICATIONS

Metric

Code No.		515-520	515-523
Range (H)		5 < H ≤ 610 mm	5 < H ≤ 1010 mm
Graduation (analog scale)		0.001 mm	
Block step		10 mm (straight)	
Micrometer adjustment		20 mm	
Micrometer feed		0.5 mm/rev	
Block pitch accuracy	H ≤ 310 mm	±1.5 µm	
	310 < H ≤ 610 mm	±2.5 µm	
	610 < H ≤ 1010 mm	—	±3.5 µm
Parallelism of blocks	H ≤ 610 mm	1.5 µm	
	610 < H ≤ 1010 mm	—	2.0 µm
Feed error		±1.2 µm	±1.5 µm
Retrace error		1.2 µm	1.5 µm
Mass		42 kg	63.5 kg

Inch

Code No.		515-512	515-510	515-513
Range (H)		0.2 in < H ≤ 18.2 in	0.2 in < H ≤ 24.2 in	0.2 in < H ≤ 40.2 in
Graduation (analog scale)		0.00001 in		
Block step		0.5 in (straight)		
Micrometer adjustment		1 in		
Micrometer feed		0.025 in/rev		
Block pitch accuracy	H ≤ 12 in	±50 µin		
	12 in < H ≤ 24 in	—	±100 µin	
	24 in < H ≤ 40 in	—	—	±150 µin
Parallelism of blocks	H ≤ 24 in	60 µin		
	24 in < H ≤ 40 in	—	80 µin	
Feed error		±40 µin		±60 µin
Retrace error		40 µin		60 µin
Mass		42 kg		63.5 kg

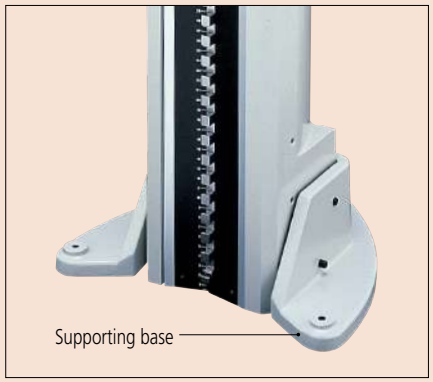
Note 1: The block pitch accuracy and the parallelism of blocks are relative to the main unit reference surface.
Note 2: Supplied with a wooden storage case as standard.

Typical application

Using in horizontal orientation

Optional Accessories

Supporting base
900574 (Dedicated for the Universal Height Master. Provided for **515-523** and **515-513** as standard.)
- Stable vertical orientation is available.



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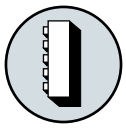
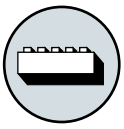
Check Master
SERIES 515

- Designed to check the accuracy of table movements of machine tools and calibrate CMMs. Permanently wrung stack of gauge blocks is housed in a rigid frame.
- Can be used in either vertical or horizontal orientation.

Single-row
10 mm (0.5 in) blocks


Vertical
orientation


Horizontal
orientation

SPECIFICATIONS

Metric

Code No.		515-720	515-721	515-722	515-723	515-724
Range (H)		310 mm	450 mm	610 mm	1010 mm	1510 mm
Block step		10 mm				
Block pitch accuracy	H ≤ 310 mm	±2.5 µm				
	310 < H ≤ 610 mm	—	±3.5 µm			
	610 < H ≤ 1010 mm	—	—	—	±5.0 µm	
	1010 < H ≤ 1510 mm	—	—	—	—	±8.0 µm
Parallelism of blocks	H ≤ 310 mm	1.2 µm				
	310 < H ≤ 610 mm	—	1.5 µm			
	610 < H ≤ 1010 mm	—	—	—	2.0 µm	
	1010 < H ≤ 1510 mm	—	—	—	—	2.5 µm
Mass		7 kg	10 kg	13 kg	22 kg	30 kg

Inch

Code No.		515-710	515-711	515-712	515-713
Range (H)		12.5 in	18.5 in	24.5 in	40.5 in
Block step		0.5 in			
Block pitch accuracy	H ≤ 12.5 in	±100 µin			
	12.5 in < H ≤ 24.5 in	—	±150 µin		
	24.5 in < H ≤ 40.5 in	—	—	—	±200 µin
Parallelism of blocks	H ≤ 12.5 in	50 µin			
	12.5 in < H ≤ 24.5 in	—	60 µin		
	24.5 in < H ≤ 40.5 in	—	—	—	80 µin
Mass		7 kg	10 kg	13 kg	22 kg

Note 1: The block pitch accuracy and the parallelism of blocks are relative to the main unit reference surface.
Note 2: Supplied with a wooden storage case as standard.
Note 3: High-accuracy type is available by special order.

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Standard Scales
SERIES 182 — Made of Low Expansion Glass

- High-precision glass scales manufactured under Mitutoyo's leading-edge Linear Scale production technology. They are considered top-grade length standards.
- Standard scales can be used as a traceable standard of length for calibrating measuring instruments.

182-501-50
182-501-60

182-502-50
182-502-60

SPECIFICATIONS

Metric

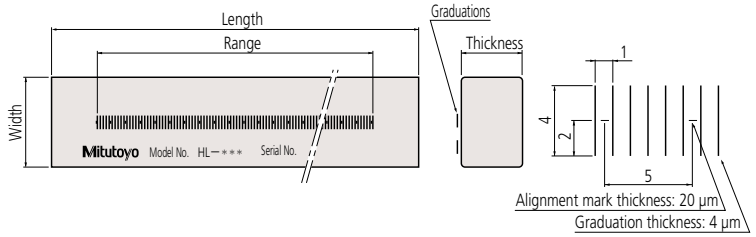
Code No.	Range (mm)	Length (mm)	Width (mm)	Thickness (mm)	Graduation thickness (µm)	Graduation (mm)
182-501-50	250	280	20	10	4	1
182-501-60*						
182-502-50	500	530	30	20		
182-502-60*						

- Material: Low expansion glass
- Thermal expansion coefficient: (0.00±0.02)×10^{-6}/K
- Accuracy (at 20 °C): (0.5 + L/1000) µm, L=Measured length (mm)

* With English JCSS certificate.

DIMENSIONS

Unit: mm



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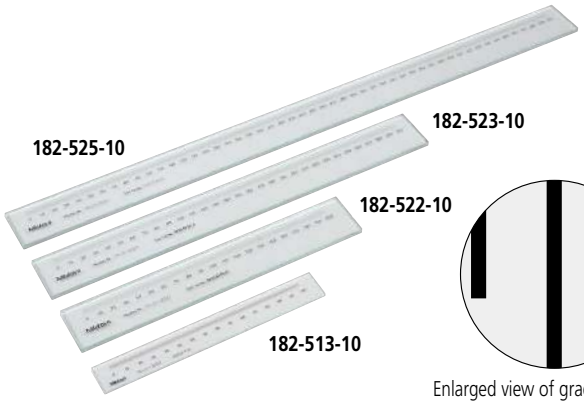
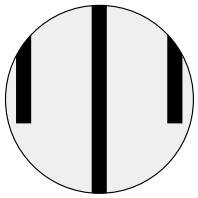
Working Standard Scales SERIES 182

- High-precision glass scales manufactured under Mitutoyo's leading-edge Linear Scale production technology. They are available in various types and sizes to suit to your application.
- Ideal for checking magnification accuracy of profile projectors and microscopes, and the table feeding accuracy of measuring equipment.





Enlarged view of graduation lines

SPECIFICATIONS

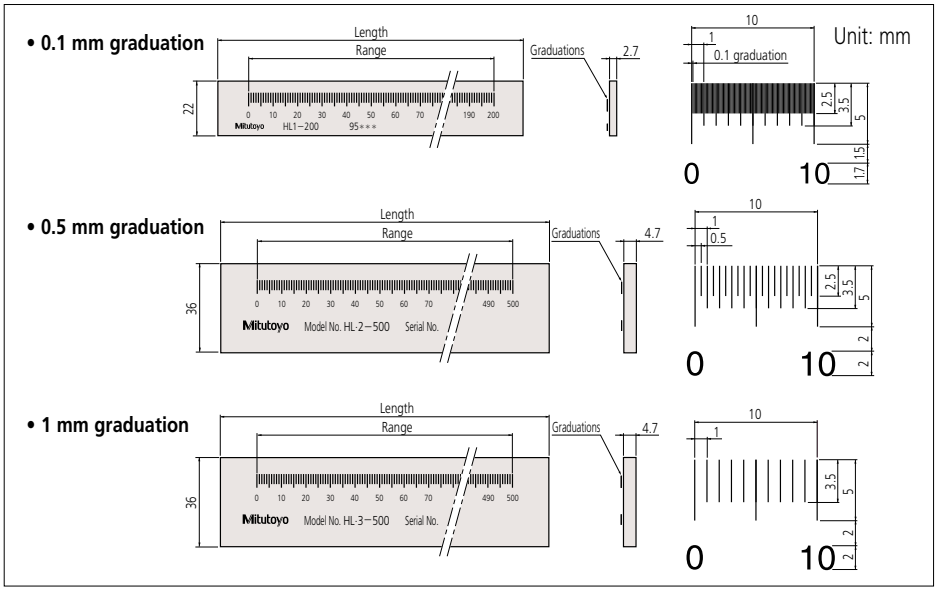
Metric

Code No.	Range (mm)	Graduation (mm)	Length (mm)	Inspection pitch (mm)	Graduation thickness (µm)	Mass (kg)
182-511-10	50	0.1	75	5	20	0.23
182-512-10	100		125	10		0.24
182-513-10	150		175			0.25
182-514-10	200		225			0.26
182-521-10	100	0.5	130	10	50	0.27
182-522-10	200		230	20		0.32
182-523-10	300		330			0.57
182-524-10	400		430			0.71
182-525-10	500		530			0.86
182-531-10	250	1	280	25	100	0.55
182-532-10	500		530			1.22
182-533-10	750		780			0.23
182-534-10	1000		1030			1.54

- Material: Soda-lime glass
- Thermal expansion coefficient: 8.5×10^{-6}/K
- Accuracy (at 20 °C): (1.5 + 2L/1000) µm, L=Measured length (mm)

Note: An inspection certificate produced by a standard scale automatic calibration system is supplied as standard.

DIMENSIONS



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High Precision Square SERIES 311

- The High-Precision Square gage is used for inspecting the travel straightness and axial perpendicularity of moving elements on equipment, such as machine tools and CMMs.
- Four precision-lapped reference surfaces, finished using ultra-precision technology built on our experience in gauge blocks.
- Better than 1 µm/300 mm straightness and perpendicularity of each (four) reference surface. In addition, front and back faces are accurate to better than 5 µm/300 mm.
- Three nominal sizes are available (90×110, 160×210 and 260×310 mm) so that you can select the size that best suits the application.

311-113

SPECIFICATIONS

Metric

Code No.	Dimension (W×L×T) (mm)	Perpendicularity tolerance (µm)		Straightness tolerance (µm)		Mass (kg)
		Reference surface	Front/ back faces	Reference surface	Front/ back faces	
311-111	90×110×25	1	5	1	5	1.5
311-112	160×210×25					5.0
311-113*	260×310×30					14.0

• Dedicated wooden case is provided.
* Supplied with a removable handle.

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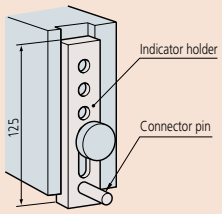
Square Master
SERIES 311 — Squareness/Straightness Measuring

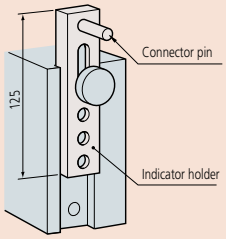
Typical application

Mounting the Indicator Holder

Example 1



Example 2



- Squareness (perpendicularity) and straightness measurements can be performed accurately and efficiently by just moving a lever. Use the vertical motion handle on the rear of the main unit for operation.
- Highly accurate measurement of squareness and straightness is available by calibrating a square as a master using the built-in perpendicularity adjustment mechanism. Prepare a square to be used for accuracy check/adjustment separately.
- Sliding force: Approx. 2 to 5 N

311-245

SPECIFICATIONS

Metric

Code No.	Vertical travel (mm)	Squareness (µm)	Straightness (µm)	Dimension (mm)			Mass (kg)
				Width	Depth	Height	
311-215*	150	3	2	180	200	420	13.7
311-225*	250	6	2.5	180	200	520	16.2
311-245	450	9	3.5	220	220	720	24

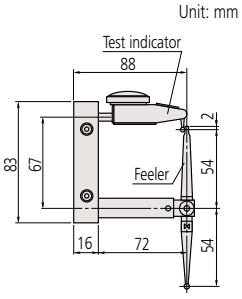
- **513-401-10H** (Metric): Dial test indicator
- **902053**: Clamp
- **601471**: Indicator holder
- **538616**: Hexagonal-head wrench (3 mm)

* Riser blocks to extend the height of Square Masters can be used. (Refer to page 01-39 for details)
Note: Inspection certificate is not attached. Contact your local Mitutoyo sales office.

Optional accessories

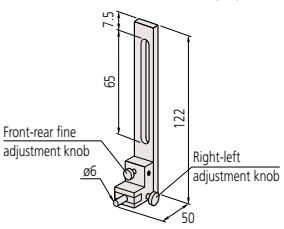
900565: Feeler
For probing surfaces that the contact point of a detector cannot reach.

Unit: mm

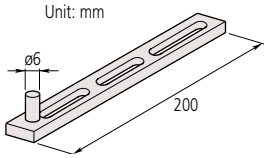


900571: Adjustable holder
Enables easy adjustment of indicator position.

Unit: mm



Unit: mm



900551: Extension holder
Measurement position can be extended by using this 200 mm length holder instead of the indicator holder.

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Mitutoyo

Steel Rules
SERIES 182

• Clear graduations on satin-chrome finish. • Stainless tempered.

182-101

182-201

182-302

SPECIFICATIONS

Metric Wide Rigid Rules

Code No.	Graduations (mm)	Range (mm)	Width (mm)
182-111	1, 0.5 (on both faces)	150	19
182-131		300	25
182-151		450	30
182-171		600	30

Metric Fully-Flexible Rules

Code No.	Graduations (mm)	Range (mm)	Width (mm)
182-211	1, 0.5 (on both faces)	150	12
182-231		300	12
182-251		450	19
182-271		600	19

Inch/Metric Semi-Flexible Rules

Code No.	Graduations*	Range	Width (in)
182-302	1/16 in, 1/32 in, 1/64 in, 1 mm, 0.5 mm	6 in/150 mm	0.51
182-303		8 in/200 mm	0.51
182-305		12 in/300 mm	0.59
182-307		20 in/500 mm	0.59
182-309		40 in/1000 mm	0.59

* Engraved on the front side only.

Inch/Metric Wide Rigid Rules

Code No.	Graduations	Range	Width (in)
182-105	1/32 in, 1/64 in, 1 mm, 0.5 mm	6 in/150 mm	0.75
182-125		12 in/300 mm	0.98
182-145		18 in/450 mm	1.18
182-165		24 in/600 mm	1.18
182-106	1/50 in, 1/100 in, 1 mm, 0.5 mm	6 in/150 mm	0.75
182-126		12 in/300 mm	0.98
182-107	1/10 in, 1/100 in, 1 mm, 0.5 mm	6 in/150 mm	0.75
182-108	1/10 in, 1/50 in, 1 mm, 0.5 mm	6 in/150 mm	0.75

Inch/Metric Fully-Flexible Rules

Code No.	Graduations	Range	Width (in)
182-205	1/32 in, 1/64 in, 1 mm, 0.5 mm	6 in/150 mm	0.47
182-225		12 in/300 mm	0.47
182-245		18 in/450 mm	0.75
182-265		24 in/600 mm	0.75
182-206	1/50 in, 1/100 in, 1 mm, 0.5 mm	6 in/150 mm	0.47
182-226		12 in/300 mm	0.47
182-207	1/10 in, 1/100 in, 1 mm, 0.5 mm	6 in/150 mm	0.47
182-208	1/10 in, 1/50 in, 1 mm, 0.5 mm	6 in/150 mm	0.47

Inch Wide Rigid Rules

Code No.	Graduations (in)	Range (in)	Width (in)
182-101	1/8, 1/16, 1/32, 1/64	6	0.75
182-121		12	0.98
182-141		18	0.71
182-161		24	1.18
182-102	1/50, 1/100, 1/32, 1/64	6	0.75
182-122		12	0.98
182-142		18	1.18
182-162		24	1.18
182-103	1/10, 1/100, 1/32, 1/64	6	0.75
182-123		12	0.98
182-143		18	1.18
182-163		24	1.18
182-104	1/10, 1/50, 1/32, 1/64	6	0.75
182-124		12	0.98

Inch Fully-Flexible Rules

Code No.	Graduations (in)	Range (in)	Width (in)
182-201	1/8, 1/16, 1/32, 1/64	6	0.47
182-221		12	0.47
182-241		18	1.18
182-261		24	0.75
182-202	1/50, 1/100, 1/32, 1/64	6	0.47
182-222		12	0.47
182-242		18	0.75
182-262		24	0.75
182-203	1/10, 1/100, 1/32, 1/64	6	0.47
182-223		12	0.47
182-243		18	0.75
182-263		24	0.75
182-204	1/10, 1/50, 1/32, 1/64	6	0.47
182-224		12	0.47

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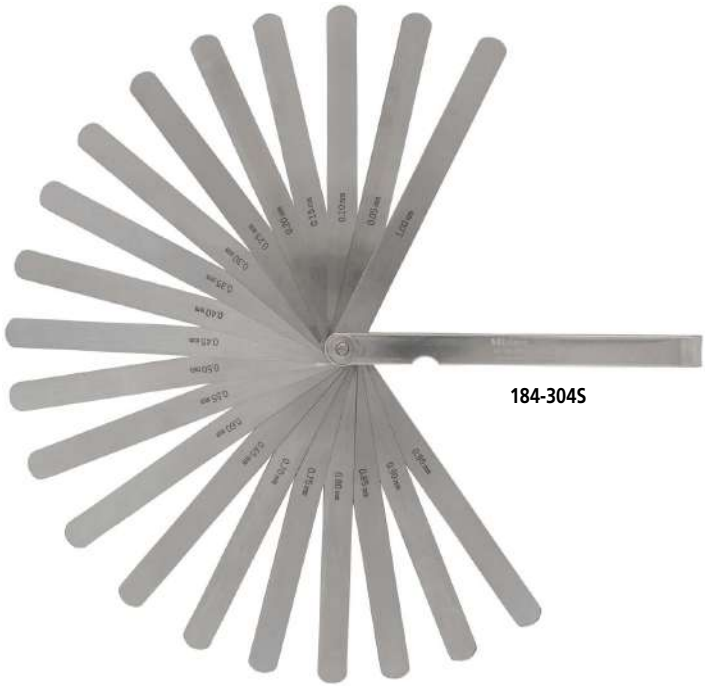
Thickness Gages
SERIES 184

- Metric thickness gages are available with tapered leaves.
- Each leaf is marked with its thickness.
- Each leaf is detachable if necessary.



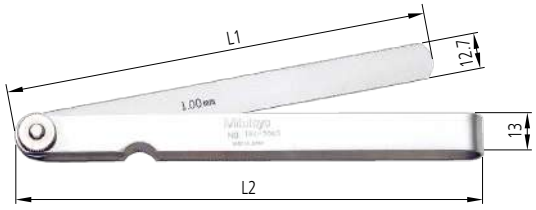
SPECIFICATIONS

Metric

Code No.	Range (mm)	Composition of leaves	Remarks
184-313S	0.05 - 1	28 leaves: 0.05 - 0.15 mm by 0.01 mm, 0.2 - 1 mm by 0.05 mm	—
184-303S		28 leaves: 0.05 - 0.15 mm by 0.01 mm, 0.2 - 1 mm by 0.05 mm	Long leaf
184-304S	0.05 - 1	20 leaves: 0.05 - 1 mm by 0.05 mm	Long leaf
184-305S	0.05 - 1	13 leaves: 0.05 - 0.3 mm by 0.05 mm, 0.4 - 1 mm by 0.1 mm	—
184-301S		13 leaves: 0.05 - 0.3 mm by 0.05 mm, 0.4 - 1 mm by 0.1 mm	Long leaf
184-306S	0.05 - 0.8	10 leaves: 0.05 - 0.2 mm by 0.05 mm, 0.3 - 0.8 mm by 0.1 mm	—
184-308S		10 leaves: 0.05 - 0.2 mm by 0.05 mm, 0.3 - 0.8 mm by 0.1 mm	Long leaf
184-307S	0.03 - 0.5	13 leaves: 0.03 - 0.1 mm by 0.01 mm, 0.2 - 0.5 mm by 0.1 mm, 0.15 mm	—
184-302S		13 leaves: 0.03 - 0.1 mm by 0.01 mm, 0.2 - 0.5 mm by 0.1 mm, 0.15 mm	Long leaf

DIMENSIONS

Unit: mm



Code No.	L1	L2
184-313S	100	106
184-303S	150	156
184-304S	150	156
184-305S	100	106
184-301S	150	156
184-306S	100	106
184-308S	150	156
184-307S	100	106
184-302S	150	156

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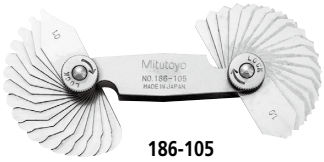
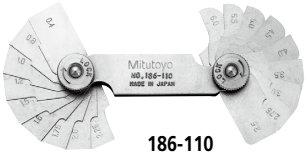
Reference Gages

Radius Gages SERIES 186



186-105



186-110

- Radius size is stamped on each gage leaf.
- Each leaf comprises an internal and an external radius gage of the same size.
- With locking clamp.

SPECIFICATIONS

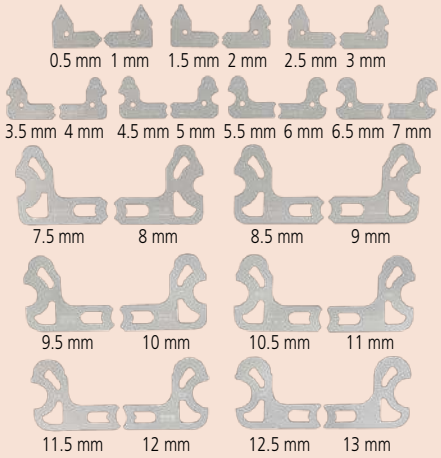
Metric

Code No.	Range (mm)	Accuracy	Composition of leaves	Remarks
186-110	0.4 - 6	±0.04 mm	18 leaves: 0.4, 0.8, 1, 1.2, 1.5, 1.6 mm, 1.75 - 3 mm by 0.25 mm, 3.5 - 6 mm by 0.5 mm	90° arc
186-902	0.5 - 13		26 leaves: 0.5 - 13 mm by 0.5 mm	90° arc, separate part type
186-105	1 - 7		34 leaves: 1 - 3 mm by 0.25 mm, 3.5 - 7 mm by 0.5 mm	180° arc
186-106	7.5 - 15		32 leaves: 7.5 - 15 mm by 0.5 mm	180° arc
186-107	15.5 - 25		30 leaves: 15.5 - 20 mm by 0.5 mm, 21 - 25 mm by 1 mm	180° arc

Inch

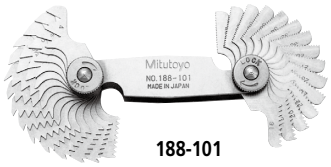
Code No.	Range (in)	Accuracy	Composition of leaves	Remarks
186-103	1/32 - 17/64	±0.002 in	16 leaves: 1/32 in - 17/64 in by 64ths	90° arc
186-101	1/32 - 1/4		30 leaves: 1/32 in - 1/4 in by 64ths	180° arc
186-102	17/64 - 1/2		32 leaves: 17/64 in - 1/2 in by 64ths	180° arc
186-104	9/32 - 33/64		16 leaves: 9/32 in - 33/64 in by 64ths	90° arc
186-901*	1/64 - 1/2		25 leaves: 1/64 in - 17/64 in by 64ths, 9/32 in - 1/2 in by 32nds	Holder
186-903	1/64 - 17/64	±0.0016 in	17 leaves: 1/64 in - 17/64 in by 64ths	—
186-904	9/32 - 1/2		8 leaves: 9/32 in - 1/2 in by 32nds	—
186-905	9/16 - 1		8 leaves: 9/16 in - 1 in by 16ths	Holder
186-906	0.010 - 0.500		26 leaves: 0.10 in - 0.30 in by 0.005 in 0.40 in - 0.100 in by 0.010 in 0.120 in - 0.300 in by 0.020 in 0.350 in - 0.500 in by 0.050 in	Holder
186-907	0.550 - 1		10 leaves: 0.550 in - 1 in by 0.50 in	—

* Each gage has five measuring locations.



Composition of leaves for **186-902**

Thread Pitch Gages SERIES 188



188-101

- Thread pitch is stamped on each gage.
- Metric, Unified, and Whitworth screw pitch gages.

SPECIFICATIONS

Metric Screw Pitch Gages

Code No.	Range (mm)	Integration pitch error	Composition of leaves
188-130	0.35 - 6	±0.05 mm	22 leaves: 0.35, 0.4, 0.45, 0.5, 0.6, 0.7, 0.75, 0.8, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6 mm and 60° angle gage
188-122	0.4 - 7		21 leaves: 0.4, 0.5, 0.7, 0.75, 0.8, 0.9, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7 mm
188-121	0.4 - 7		18 leaves: 0.4, 0.5, 0.75, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7 mm

Unified Screw Pitch Gages

Code No.	Range	Integration pitch error	Composition of leaves
188-111	4 - 42 TPI	±0.002 in	30 leaves: 4, $4^{1/2}$, 5, $5^{1/2}$, 6, 7, 8, 9, 10, 11, $11^{1/2}$, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42 TPI

Note: Metric and Unified Pitch Gage Set (**188-151**) is available.

Metric and Unified Screw Pitch Gage Set

Code No.	Range	Integration pitch error	Composition of leaves
188-151	0.4 - 7 mm/4 - 42 TPI	±0.05 mm/ ±0.002 in	51 leaves: Set of **188-122** and **188-111**

Whitworth Screw Pitch Gages

Code No.	Range	Integration pitch error	Composition of leaves
188-101	4 - 42 TPI	±0.002 in	30 leaves: 4, $4^{1/2}$, 5, $5^{1/2}$, 6, 7, 8, 9, 10, 11, $11^{1/2}$, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42 TPI
188-102	4 - 60 TPI		28 leaves: 4, $4^{1/2}$, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 34, 36, 40, 48, 60 TPI

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Digimatic Universal Protractor SERIES 187

Function
• Presetting

- Data output function makes it easy to gather statistical data.
- Can be attached to height gages using a gage holder (**950750**, metric)
- Setting preset value.
- Removable blade.

187-501

SPECIFICATIONS

Code No.	Blade length	Range	Resolution	Accuracy	Repeatability	Remarks (standard accessory)
187-501	150 mm	-360° to +360°	1' (0.01°)	±2' (±0.03°)	1'	Height gage holder (**950750**)
187-502	300 mm					Height gage holder (**950750**)
187-551	6 in					Height gage holder (**950749**)
187-552	12 in					Height gage holder (**950749**)

• Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
• Battery life: 2,000 hours

Universal Bevel Protractor SERIES 187

Typical application

- High-precision instrument for accurate angle measurement on machines, molds, and jigs.
- There is no height difference between the main scale and Vernier. The scale magnifier can reduce parallax differences.
- The fine adjustment knob allows for fine feed adjustment.
- Graduation: 5'

187-901-10

SPECIFICATIONS

Metric

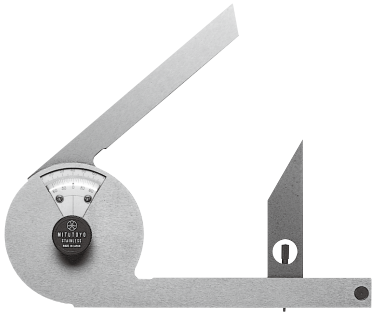
Code No.	Blade length (mm)	Remarks
187-901-10	150, 300	w/60°, 45°, 30° edges
187-907-10	150	w/60°, 45° edges
187-908-10	300	w/60°, 45° edges

Inch

Code No.	Blade length (in)	Remarks
187-902-10	6, 12	w/60°, 45°, 30° edges
187-904-10	6	w/60°, 45° edges
187-906-10	12	w/60°, 45° edges

Bevel Protractor SERIES 187

- Consists of three sheets of stainless steel, the middle one of which is made for angle measurements.



187-201

SPECIFICATIONS

Code No.	Blade length (mm)	Range	Graduation	Blade edge angle	Mass (g)	Remarks
187-201	137	90°×4 (360°)	5' (0° to 90° to 0°)	30° and 60°	260	w/60°, 30° edges

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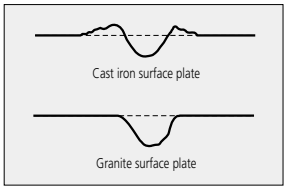
Black Granite Surface Plates SERIES 517

- The plates are made of natural granite that is uniform in structure and largely averse to deterioration. (Natural stones may have unique patterns on their surface.)
- Granite surface plate has many advantages over cast iron surface plates: Twice as hard as cast iron.
- Free from wringing effects, so there is no interruption of work.
- Free from burrs or protrusions because of the fine grain structure and insignificant stickiness; this ensures a high degree of flatness over a long service life and causes no damage to other parts or instruments.
- Use these plates in a stable temperature environment.
  Since flatness error occurs when there is a temperature difference between the working surface and the underside, avoid working in direct sunlight. Also, do not place a plate in the vicinity of an air conditioner or heater. (Recommended environment: Temperature 20±1 °C, Humidity 58±2%)



1000×750 mm

600×600 mm

Machining of optional through holes, screw bushings, etc.

Through holes and screw holes (bushings) can be machined to order on surface plates.
For detailed information, contact the nearest Mitutoyo sales office.

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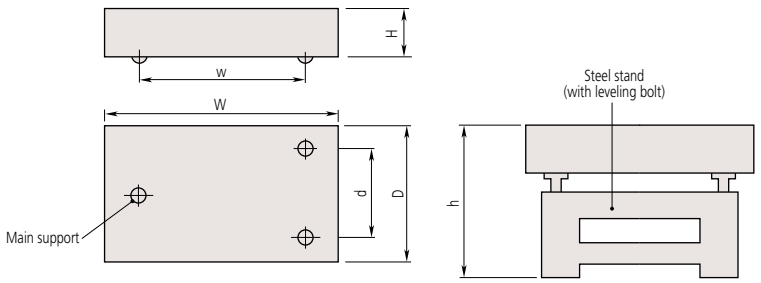
SPECIFICATIONS

Code No.	Grade	Size (mm)			Flatness (μm)	Mass (kg)	Optional stands for black granite surface plates			h (mm)
		W×D×H	d	w			Standard type	with safety frame	with casters (with safety frame)	
517-401-4	00	300×300×100	240	240	2	27	—	—	—	—
517-301	0				3					
517-101	1				5					
517-411-4	00	450×300×100	240	390	2	40	—	—	—	—
517-311	0				3					
517-111	1				6					
517-414-4	00	600×450×100	370	500	2.5	80	**517-203-2**	**517-203R**	**517-203CR**	755 to 775
517-314	0				4					
517-114	1				8					
517-403-4	00	600×600×130	500	500	2.5	140	**517-204-2**	**517-204R**	**517-204CR**	755 to 775
517-303	0				5					
517-103	1				8					
517-405-4	00	750×500×130	420	630	3	146	**517-205-2**	**517-205R**	**517-205CR**	755 to 775
517-305	0				5					
517-105	1				9					
517-407-4	00	1000×750×150	630	700	3	337	**517-206-2**	**517-206R**	**517-206CR**	755 to 775
517-307	0				6					
517-107	1				12					
517-409-4	00	1000×1000×150	700	700	3.5	450	**517-207-2**	**517-207R**	**517-207CR**	735 to 775
517-309	0				7					
517-109	1				13					
517-413-4	00	1500×1000×200	700	1100	4	900	**517-208-4**	**517-208R**	**517-208CR**	735 to 775
517-313-4	0				8					
517-113-4	1				16					
517-410-4	00	2000×1000×250	700	1500	4.5	1500	**517-209-4**	**517-209R**	**517-209CR**	735 to 775
517-310-4	0				9.5					
517-110-4	1				19					
517-416-4	00	2000×1500×300	1100	1500	5	2700	**517-210-4**	**517-210R**	**517-210CR**	735 to 775
517-316-4	0				10					
517-116-4	1				20					
*1	00	2000×2000×350	1500	1500	5.5	4200	—	—	—	700 to 706*2
*1	0				11					
*1	1				22					
*1	00	3000×1500×400	1100	2000	6.5	5400	—	—	—	700 to 706*2
*1	0				12.5					
*1	1				25					
*1	00	3000×2000×500	1500	2000	7	9000	—	—	—	700 to 706*2
*1	0				13.5					
*1	1				27					

*1 2000×2000 or larger is available by special order. Consult your local Mitutoyo sales office.
*2 Distance from the bottom of the large granite plate block mount to the granite plate top surface.

DIMENSIONS

Unit: mm



SPECIFICATIONS: Main and auxiliary supports for large surface plates

Code No.	Applicable surface plates Size (W×D×H) (mm)
06AAY174	2000×2000×350
06AAY175	3000×1500×400
06AAY176	3000×2000×500

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02

Micrometers

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

U-WAVE fit

Measurement Data Wireless Communication System

Bluetooth® communication enables wireless transfer of measurement data from Digimatic micrometers and callipers to PCs, smartphones, tablets and such other devices.

IP65

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level.
(Refer to page 3)

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TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

PROPRIETARY INSPECTION CERTIFICATE

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off.
The origin is set once - thereafter the live position is displayed when the power is turned on.

DIGIMATIC S1

DIGIMATIC S1

Mitutoyo's proprietary bidirectional serial communication protocol enables a connected PC to execute measurement data output, setting and control of a measuring instrument, and capture of information of a specific measuring instrument.

Ultra-high Accuracy Digimatic Micrometer

High-speed and High-accuracy Digimatic Micrometer QuantuMike

Coolant Proof Micrometers

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Mitutoyo

MeasurLink® ENABLED
Data Management Software by Mitutoyo

ABSOLUTE™

PROPRIETARY INSPECTION CERTIFICATE

Ultra-high Accuracy Digimatic Micrometer SERIES 293

- The flagship model, featuring unparalleled high accuracy and resolution.
- Maximum Permissible Error (J_{MPE}) of ±0.5 µm is achieved with our innovative 0.1 µm resolution ABS (absolute) rotary sensor and screw machining technology.
- A highly rigid frame and high-performance constant-force mechanism allow stable measurements.
- Body heat transferred to the instrument is reduced by a (removable) heat shield, minimizing the error caused by thermal expansion of the frame when performing handheld measurements.

293-100-20

Measurement example

Recommended micrometer stand: **156-101-10**

Functions

Preset (ABS measurement system):
The measurement origin can be preset to any value within the display range for convenience in measuring.
Zero-setting (INC measurement system):
The display can be zeroed at any position of the spindle, making comparison measurement easier. Returning to the absolute-measurement mode is easily accomplished.
Hold:
The function that holds the display of value is useful when it is difficult to see the measured value at the measurement point. When the function is cancelled, the previous zero-set point or a measured value with reference to the origin is displayed.
Resolution switching:
The resolution of the display can be switched. If 0.1 µm measurement is not required, the resolution can be switched to 0.5 µm.
Function lock:
Functions such as preset or zero-set can be locked to avoid inadvertently changing the origin position.
On/off:
The power can be turned off after measurement is complete. Even after the power is turned off, the origin or last zero-set position remains in the memory.
Auto power off:
Even if the power is left on, the power turns off automatically if the micrometer is not used within a 20-minute period.
Measurement data output:
Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
Error display:
In the unlikely event of a display overflow or calculation error, an error message is displayed and measurement stops. Measurement cannot continue until the error is corrected.
Also, if the battery voltage drops below a certain point, the battery indicator will turn on before measurement becomes impossible, warning the user that the battery needs to be replaced.

SPECIFICATIONS

	Metric	Inch/Metric
Code No.	**293-100-20**	**293-130-20**
Measuring range	0 – 25 mm	0 – 1 in
Resolution	0.0001 mm/0.0005 mm (switchable)	0.000005 in/0.00002 in 0.0001 mm/0.0005 mm (switchable)
Maximum permissible error J_{MPE}	±0.5 µm	±0.00002 in
Flatness	0.3 µm	0.000012 in
Parallelism	0.6 µm	0.000024 in
Measuring surface	ø3.2 mm	
Measuring force	7 to 9 N	
Position detection method	Electromagnetic induction type ABS rotary sensor	
Mass	405 g (445 g with heat shield attached)	
Power source	Lithium battery (CR2032) ×1	
Battery life	Approx. two years when used under normal conditions	

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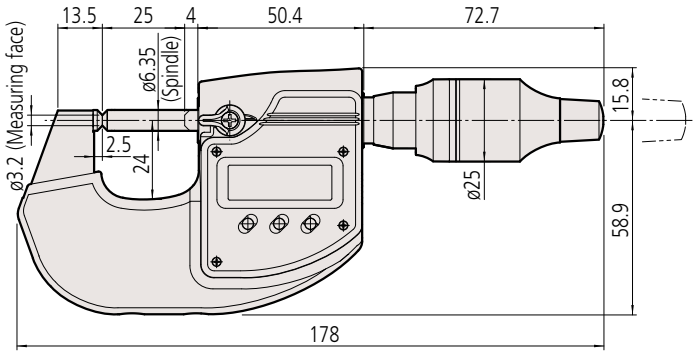
Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch

DIMENSIONS

Unit: mm



Standard Accessories

Heat shield (**04AAB969A**: **293-100-20**
04AAB969B: **293-130-20**) ×1
Spanner (**200877**) ×1
Screwdriver (**04AAB985**) ×1
Cleaning paper for measuring faces 20 sheets
Inspection certificate

Note: To install the heat shield, use the screws attached to the bottom of the micrometer frame.

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High-speed and High-accuracy Digimatic Micrometer QuantuMike

SERIES 293 — IP65 Micrometer with 2 mm/rev Spindle Feed

- The spindle moves four times faster than that of the standard micrometer, enabling faster, easier measurement even when it is repeated many times over.
- The approach speed warning function can detect collision with a workpiece at excessive speed, helping inexperienced users obtain reliable and accurate measurement results.
- The calculation function can calculate offsets added to measurement results before they are passed to a machine. This eliminates errors and the effort needed for calculation, helping reduce the number of rejected machined items.
- The Calibration alert function helps with effective measuring instrument management.
- Bidirectional serial communication supported.

293-140-40

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Measuring force*1 (N)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Mass (g)
With SPC data output							
293-140-40	0 - 25	0.001	7 to 12	±1	0.3	1	265
293-141-40	25 - 50						325
293-142-40	50 - 75			±2		2	465
293-143-40	75 - 100						620

Inch / Metric

Code No.	Range (in)	Resolution	Measuring force*1 (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)
With SPC data output							
293-180-40	0 - 1	0.00005 in/ 0.001 mm	7 to 12	±0.00005	0.000012	0.00004	265
293-181-40	1 - 2						325
293-182-40	2 - 3			±0.0001		0.00008	465
293-183-40	3 - 4						620

- Dust/Water protection level: IP65 (IEC60529)*2
- Power source: **CR2032** battery (1 pc.), included as standard (for operational checks)
- Battery life: Approx. 2 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

*1 Measuring force when using the speeder ratchet (Apply a measuring force in the same condition as for measurement and then set the origin.)
*2 Rustproofing shall be applied after use.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

U-WAVE fit

IP65

Dust- and Water-Protected
TÜVRheinland CERTIFIED
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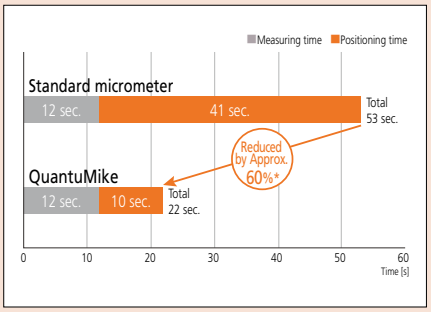
PROPRIETARY INSPECTION CERTIFICATE

DIGIMATIC S1

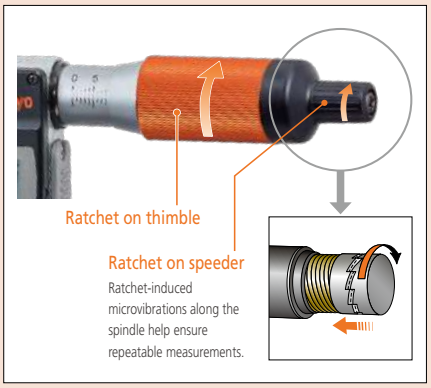
Measurement example

Comparison of time needed to measure a 6-stepped workpiece (with one hand)



* According to Mitutoyo's comparison test data for measuring time on typical workpieces.

Ratchet thimble mechanism



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Functions

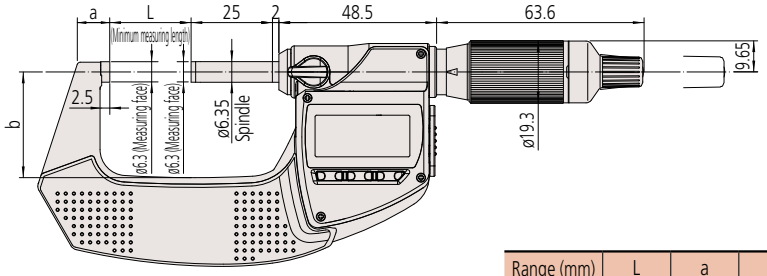
Preset (ABS measurement system):
The measurement origin can be preset to any value within the display range for convenience in measuring.
Zero-setting (INC measurement system):
The display can be zeroed at any position of the spindle, making comparison measurement easier.
Returning to the absolute-measurement mode is easily accomplished.
Hold:
The function that holds the display of value is useful when it is difficult to see the measured value at the measurement point.
When the function is cancelled, the previous zero-set point or a measured value with reference to the origin is displayed.
Calibration alert:
This function gives an alert when the instrument is approaching its calibration date and again on the actual calibration due date, helping to ensure better measuring instrument management by preventing missed calibrations.
Approach speed warning:
Reduces variation in measurement values and improves reliability of measurements.
Tolerance judgment:
The function determines whether a measured value is within the range between the upper and lower tolerance limits and displays the result with a tolerance judgment mark.
Function lock:
Functions such as preset or zero-set can be locked to avoid inadvertently changing the origin position.
Auto power ON/OFF:
The reading on the LCD disappears after this instrument is idle for approx. 20 minutes, but the origin point is retained. Turning the spindle causes the reading on the LCD to reappear.
Key customization:
Frequently used functions can be assigned to buttons and called back easily, improving work efficiency.
Measurement data output:
Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
Error display:
In the unlikely event of a display overflow or calculation error, an error message is displayed and measurement stops. Measurement cannot continue until the error is corrected.
Also, if the battery voltage drops below a certain point, the battery indicator will turn on before measurement becomes impossible, warning the user that the battery needs to be replaced.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
06AGL111	SA	Connection cable (1 m)
06AGL121	SA	Connection cable (2 m)
06AGQ001A	SA	USB Input Tool Direct (2 m)
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF960	IP67	Connecting unit for **U-WAVE-TM/TMB**

DIMENSIONS

Unit: mm



Range (mm)	L	a	b
0 - 25	0	9	25
25 - 50	25	9.8	32.5
50 - 75	50	12.6	47
75 - 100	75	14	60

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Coolant Proof Micrometers
SERIES 293 — IP65 Digimatic Micrometer

- Accurate and highly environmentally resistant, assisting with many types of measurements.
- Ratchet thimble provides better operability for one-handed operation.
- Oil-resistant material used for all plastic parts.
- Models equipped with a Digimatic output port can form part of a statistical process control or networked measurement system.

293-230-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Measuring force*1 (N)	Maximum permissible error J_{MPE} (µm)	Parallelism (µm)	Flatness (µm)	Constant measuring force	Mass (g)
With SPC data output								
293-230-30	0 - 25	0.001	5 - 10	±1	1	0.3	With ratchet stop	270
293-231-30	25 - 50							330
293-232-30	50 - 75			±2	2			470
293-233-30	75 - 100							625
293-234-30	0 - 25		7 - 12	±1	1		With ratchet thimble	280
293-235-30	25 - 50							340
293-236-30	50 - 75			±2	2			480
293-237-30	75 - 100							635
Without SPC data output								
293-240-30	0 - 25	0.001	5 - 10	±1	1	0.3	With ratchet stop	270
293-241-30	25 - 50							330
293-242-30	50 - 75			±2	2			470
293-243-30	75 - 100							625
293-244-30	0 - 25		7 - 12	±1	1		With ratchet thimble	280
293-245-30	25 - 50							340
293-246-30	50 - 75			±2	2			480
293-247-30	75 - 100							635

Inch / Metric

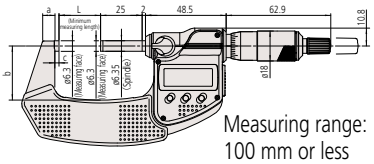
Code No.	Range (in)	Resolution	Measuring force*1 (N)	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Flatness (in)	Constant measuring force	Mass (g)
With SPC data output								
293-330-30	0 - 1	0.00005 in /0.001 mm	5 - 10	±0.00005	0.00004	0.000012	With ratchet stop	270
293-331-30	1 - 2							330
293-332-30	2 - 3			±0.0001	0.00008			470
293-333-30	3 - 4							625
293-334-30	0 - 1		7 - 12	±0.00005	0.00004		With ratchet thimble	280
293-335-30			5 - 10				With friction thimble	275
293-336-30	1 - 2							335
Without SPC data output								
293-340-30	0 - 1	0.00005 in /0.001 mm	5 - 10	±0.00005	0.00004	0.000012	With ratchet stop	270
293-341-30	1 - 2							330
293-342-30	2 - 3			±0.0001	0.00008			470
293-343-30	3 - 4							625
293-344-30	0 - 1		7 - 12	±0.00005	0.00004		With ratchet thimble	280
293-345-30	1 - 2							340
293-346-30	2 - 3			±0.0001	0.00008			480
293-347-30	3 - 4							635
293-348-30	0 - 1		5 - 10	±0.00005	0.00004		With friction thimble	275
293-349-30		0.0001 in /0.001 mm	7 - 12	±0.0001			With ratchet thimble	280

- Dust/water protection level: IP65 (IEC60529)*2
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

*1 Measuring force when using the speeder ratchet (Apply a measuring force in the same condition as for measurement and then set the origin.)
*2 Rustproofing shall be applied after use.
Note: All digits of models over 125 mm (5 in) measuring range are presettable.

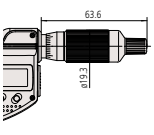
DIMENSIONS

Ratchet stop



Measuring range: 100 mm or less

Ratchet thimble type



Unit: mm

Range (mm)	Code No.	L	a	b	c
0 - 25	**293-230-30 / 293-240-30**	0	6.5	25	2.5
25 - 50	**293-231-30 / 293-241-30**	25	7.3	32.5	
50 - 75	**293-232-30 / 293-242-30**	50	10.1	47	
75 - 100	**293-233-30 / 293-243-30**	75	11.5	60	
0 - 25	**293-234-30 / 293-244-30**	0	6.5	25	
25 - 50	**293-235-30 / 293-245-30**	25	7.3	32.5	

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U-WAVE fit

IP65

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PROPRIETARY INSPECTION CERTIFICATE

Functions

Origin point setting (ABS measurement system):
Resets the ABS origin at the current spindle position to the minimum value of the measuring range and switches to ABS mode.
Zero-setting:
A brief press on the ZERO/ABS button sets display to zero at the current spindle position and switches to the incremental (INC) measuring mode. A longer press resets to the ABS measuring mode.
Hold:
The function that holds the display of value is useful when it is difficult to see the measured value at the measurement point. When the function is cancelled, the previous zero-set point or a measured value with reference to the origin is displayed.
Data output*:
Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.
* Only models with the data output function
Auto power ON / OFF:
The reading on the LCD disappears after this instrument is idle for about 20 minutes, but the reading and measurement mode are retained. Turning the spindle causes the reading to reappear.
Error display:
In case of an overflow on the LCD or a computing error, an error message appears on the LCD, and the measuring function stops. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the low-battery-voltage alarm indicator appears well before the micrometer becomes unusable.
Function lock:
This function allows the ORIGIN (origin point setting) function and the ZERO (zero-setting) function to be locked to prevent these points being reset accidentally.

Optional Accessories

Refer to page 02-8.

Micrometer sets

293-962-30 (Metric)
- Range: 0 - 75 mm (3 pcs./set)
- Models included:
  293-230-30, **293-231-30**, **293-232-30**

293-963-30 (Metric)
- Range: 0 - 100 mm (4 pcs./set)
- Models included:
  293-230-30, **293-231-30**, **293-232-30**, **293-233-30**

293-966-30 (Metric)
- Range: 0 - 50 mm (2 pcs./set)
- Models included: **293-230-30**, **293-231-30**

293-960-30 (Inch/Metric)
- Range: 0 - 2 in (3 pcs./set)
- Models included:
  293-330-30, **293-331-30**, **293-332-30**

293-961-30 (Inch/Metric)
- Range: 0 - 3 in (4 pcs./set)
- Models included:
  293-330-30, **293-331-30**, **293-332-30**, **293-333-30**

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Functions

Refer to page 02-7.

Optional Accessories

Only for models with data output function

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

Coolant Proof Micrometers
SERIES 293 — IP65 Digimatic Micrometer

- Accurate and highly environmentally resistant, assisting with many types of measurements.
- Oil-resistant material used for all plastic parts.
- Models equipped with a Digimatic output port can form part of a statistical process control or networked measurement system.

293-252-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Measuring force*1 (N)	Maximum permissible error J_{MPE} (µm)	Parallelism (µm)	Flatness (µm)	Constant measuring force	Mass (g)
With SPC data output								
293-250-30	100 - 125	0.001	5 - 10	±2	3	0.3	With ratchet stop	600
293-251-30	125 - 150							740
293-252-30	150 - 175			±3				800
293-253-30	175 - 200				4			970
293-254-30	200 - 225							1100
293-255-30	225 - 250			±4				1270
293-256-30	250 - 275							1370
293-257-30	275 - 300				5			1590

Inch/Metric

Code No.	Range (in)	Resolution	Measuring force*1 (N)	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Flatness (in)	Constant measuring force	Mass (g)
With SPC data output								
293-350-30	4 - 5	0.0001 in /0.001 mm	5 - 10	±0.0001	0.00012	0.000012	With ratchet stop	600
293-351-30	5 - 6							740
293-352-30	6 - 7							800
293-353-30	7 - 8			±0.00015	0.00016			970
293-354-30	8 - 9							1100
293-355-30	9 - 10							1270
293-356-30	10 - 11			±0.0002				1370
293-357-30	11 - 12				0.0002			1590

- Dust/water protection level: IP65 (IEC60529)*2
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

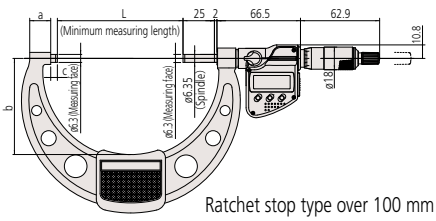
*1 Measuring force when using the speeder ratchet (Apply a measuring force in the same condition as for measurement and then set the origin.)

*2 Rustproofing shall be applied after use.

Note: All digits of models over 125 mm (5 in) measuring range are presettable.

DIMENSIONS

Unit: mm



Ratchet stop type over 100 mm

Range (mm)	Code No.	L	a	b	c
100 - 125	**293-250-30**	100	16.7	76	5.3
125 - 150	**293-251-30**	125	18.8	90	5.7
150 - 175	**293-252-30**	150	19.1	103	6.1
175 - 200	**293-253-30**	175	18.2	115	6.3
200 - 225	**293-254-30**	200	16.8	126	6.7
225 - 250	**293-255-30**	225	18	139	5.5
250 - 275	**293-256-30**	250		152	6.5
275 - 300	**293-257-30**	275		166	

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Digimatic Outside Micrometers SERIES 293

- This large Digimatic micrometer series is available in various sizes up to 500 mm. It features a ratchet stop for constant measuring force.
- Measuring faces: Carbide tipped
- All models have a measurement data output function that is useful for measuring large workpieces. This function allows you to easily send data via an optional communication cable or wireless system and import it to spreadsheet software or use it in various applications.

293-582

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)
With SPC data output						
293-582	300 - 325	0.001	10 - 15	±6	0.6	5
293-583	325 - 350					
293-584	350 - 375					
293-585	375 - 400			±7		6
293-586	400 - 425					
293-587	425 - 450					
293-588	450 - 475			±8		
293-589	475 - 500					7

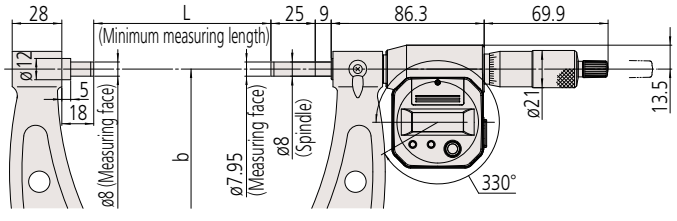
Inch / Metric

Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
With SPC data output						
293-782	12 - 13	0.0001 in /0.001 mm	10 - 15	±0.0003	0.000024	0.0002
293-783	13 - 14					
293-784	14 - 15					
293-785	15 - 16			±0.00035		0.00024
293-786	16 - 17					
293-787	17 - 18					
293-788	18 - 19			±0.0004		
293-789	19 - 20					0.00028

- Power source: SR44 battery (2 pcs.), **938882** included as standard (for operational checks)
- Battery life: Approx. 1.8 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc., Spanner (**200154**), 1 pc.

DIMENSIONS

Unit: mm



Range (mm)	L	b
300 - 325	300	187
325 - 350	325	199
350 - 375	350	212
375 - 400	375	224
400 - 425	400	236
425 - 450	425	248
450 - 475	450	261
475 - 500	475	273

Functions

Origin point setting (ABS measurement system):
Resets the ABS origin at the current spindle position to the minimum value of the measuring range and switches to ABS mode.
Zero-setting (INC measurement system):
A brief press on the ZERO/ABS button sets display to zero at the current spindle position and switches to the incremental (INC) measuring mode. A longer press resets to the ABS measuring mode.
Hold:
The function that holds the display of value is useful when it is difficult to see the measured value at the measurement point. When the function is cancelled, the previous zero-set point or a measured value with reference to the origin is displayed.
Function lock:
This function allows the PRESET (origin point setting) function and the ZERO (zero-setting) function to be locked to prevent these points being reset accidentally.
Auto power ON / OFF:
The reading on the LCD disappears after this instrument is idle for about 20 minutes, but the reading and measurement mode are retained. Turning the spindle causes the reading to reappear.
Data output:
Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.
Error display:
In case of an overflow on the LCD or a computing error, an error message appears on the LCD, and the measuring function stops. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the low-battery-voltage alarm indicator appears well before the micrometer becomes unusable.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
04AZB512	CR	Connection cable (1 m)
04AZB513	CR	Connection cable (2 m)
959149	C	Connection cable (1 m)
959150	C	Connection cable (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm)
02AZE140C	C	Connection cable for **U-WAVE-T** For foot switch

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Digimatic Outside Micrometers SERIES 293

- Simple design with no data output for accuracy at a lower cost.
- Provided only with an origin-set button for easy origin setting.
- Extended battery life of approximately 2.4 years, which helps reduce the number of battery replacements required.
- Equipped with Ratchet Stop for constant measuring force.
- Measuring faces: Carbide tipped

Functions

Zero-setting:
A brief press on the ORIGIN button sets display to zero at the current spindle position (zero-setting), which allows easy comparison measurement.

Auto power ON / OFF:
The reading on the LCD disappears after this instrument is idle for about 20 minutes, but the reading is retained. Turning the spindle causes the reading on the LCD to reappear.

Error display:
In case of an overflow on the LCD or a computing error, an error message appears on the LCD, and the measuring function stops. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the low-battery-voltage alarm indicator appears well before the micrometer becomes unusable.

293-821-30

SPECIFICATIONS

Metric With ratchet stop

Code No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Mass (g)
Without SPC data output							
293-821-30	0 - 25	0.001	5 - 10	±2	0.3	2	270

Inch / Metric With ratchet stop

Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)
Without SPC data output							
293-831-30	0 - 1	0.00005 in/0.001 mm	5 - 10	±0.0001	0.000012	0.00008	270

Inch / Metric With friction thimble

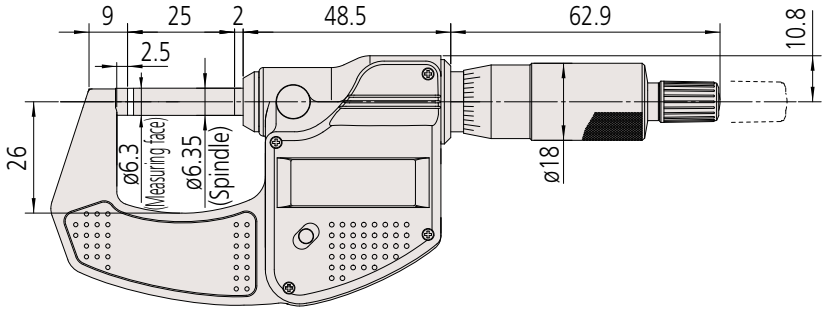
Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)
Without SPC data output							
293-832-30	0 - 1	0.00005 in/0.001 mm	5 - 10	±0.0001	0.000012	0.00008	270

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Spanner (**301336**), 1 pc.

DIMENSIONS

Unit: mm

Ratchet thimble type



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Quickmike
SERIES 293 — IP65 ABSOLUTE Digimatic Micrometers

- The Quickmike provides a speedy spindle feed of 10 mm per thimble rotation which enables quick measurements of many different-sized features.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

293-666-20

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Constant measuring force	Mass (g)
With SPC data output								
293-666-20	0 - 30	0.001	5 - 12	±2	0.3	2	Yes	275
293-667-20	25 - 55							340
293-668-20	50 - 80			±3				480
293-669-20	75 - 105					3		585

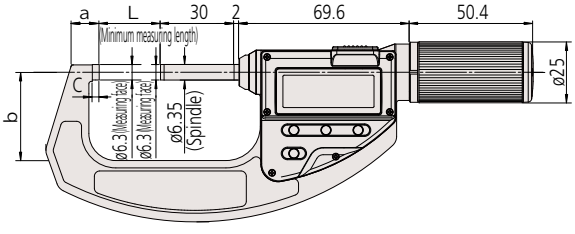
Inch / Metric

Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Constant measuring force	Mass (g)
With SPC data output								
293-676-20	0 - 1.2	0.00005 in/ 0.001 mm	5 - 12	±0.0001	0.000012	0.00008	Yes	275
293-677-20	1 - 2.2							340
293-678-20	2 - 3.2			±0.00015				480
293-679-20	3 - 4.2					0.00012		585

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: Electrostatic capacity absolute sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 30 mm (0 to 1.2 in) models)
- Maximum response speed: without limit
- The non-rotating spindle enables even inexperienced operators to perform measurements repeatably and accurately.

DIMENSIONS

Unit: mm



Range (mm)	L	a	b	c
0 - 30	0	9	25	2
25 - 55	25	11.3	36	2.5
50 - 80	50	13.1	47	
75 - 105	75	13.5	60	

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ABSOLUTE™

IP65 Dust- and Water-Protected

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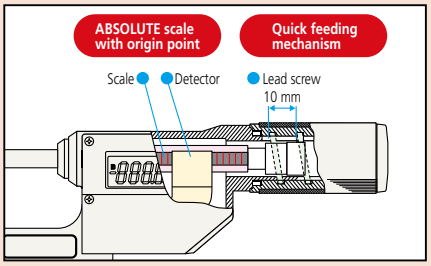
Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch

Mechanism



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ABSOLUTE™

ABSOLUTE Digimatic Micrometers
SERIES 227 — with Adjustable Measuring Force

- Digimatic micrometer equipped with a constant/low measuring force mechanism. The measurement-value hold function automatically retains the data at a specified measuring force. (Pressing with a larger force than the specified measuring force does not affect the measurement result.)
- It is suitable for measuring flexible workpieces such as electric wire, paper, and rubber.
- Non-rotating spindle reduces workpiece deformation.
- Measuring faces: Carbide tipped

227-201-20

Measurement example

Functions

Adjustable measuring force mechanism, Origin point setting, Zero setting, Hold, Function Lock, Auto power off, Measurement data output, Error display

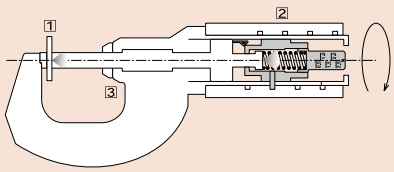
Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch

Adjustable Measuring Force

To preset the measuring force, adjust the measuring force setting scale on the thimble with the screwdriver supplied.

Constant-Measuring-Force Mechanism



1 Measuring force is generated by the action of trapping a workpiece between the spindle face and the anvil.
2 The constant-force unit applies the specified measuring force.
3 When the preset measuring force is reached, the count on the LCD is automatically held and the hold symbol appears.
(To cancel the hold, reverse the thimble more than 1/10 revolution and press the hold button.)

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Measuring force (N)	Accuracy of the selected measuring force* (N)	Repeatability of measuring force* (N)	Mass (g)
With SPC data output										
227-201-20	0 - 15	0.001	0.5 - 2.5 (adjustable)	±2	0.3	2	0.5, 1.0, 1.5, 2.0, 2.5	± (0.1+ the selected measuring force/10)	within 0.1	300
227-203-20	15 - 30									380
227-205-20	0 - 10		2 - 10 (adjustable)				2, 4, 6, 8, 10	± (0.4+ the selected measuring force/10)	within 0.4	345
227-206-20	10 - 20									425
227-207-20	20 - 30									415

Inch / Metric

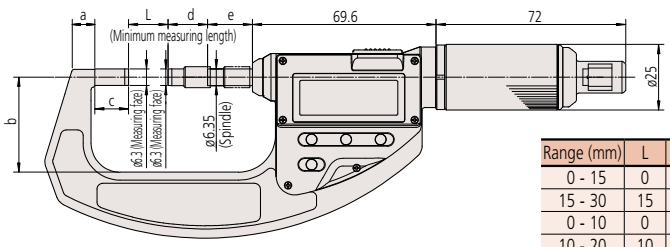
Code No.	Range (in)	Resolution	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring force (N)	Accuracy of the selected measuring force* (N)	Repeatability of measuring force* (N)	Mass (g)
With SPC data output										
227-211-20	0 - 0.6	0.00005 in/ 0.001 mm	0.5 - 2.5 (adjustable)	±0.0001	0.000012	0.00008	0.5, 1.0, 1.5, 2.0, 2.5	± (0.1+ the selected measuring force/10)	within 0.1	300
227-213-20	0.6 - 1.2									380
227-215-20	0 - 0.4		2 - 10 (adjustable)				2, 4, 6, 8, 10	± (0.4+ the selected measuring force/10)	within 0.4	345
227-216-20	0.4 - 0.8									425
227-217-20	0.8 - 1.2									415

- Measurement posture: horizontal orientation only (Recommended spindle inclination: within ±3°)
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: Electrostatic capacity absolute sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 15 mm (0 to 0.6 in)/0 to 10 mm (0 to 0.4 in) models), Screwdriver (**210183**), 1 pc.

* These values are guaranteed when micrometer is used in a horizontal orientation (within ±3 degrees)

DIMENSIONS

Unit: mm



Range (mm)	L	a	b	c	d	e
0 - 15	0	6.2	25	2	15	17
15 - 30	15	8.5	36	12.8		
0 - 10	0	6.2	25	2	10	22
10 - 20	10	8.5	36	17.8		
20 - 30	20			7.8		

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U-WAVE fit

Outside Micrometers
SERIES 406 — Non-rotating Spindle Type

- Non-rotating spindle eliminates torque on workpiece. Therefore, it is suitable for measuring flexible workpieces such as rubber and paper or thin workpieces such as film.
- Measuring faces: Carbide tipped
- Spindle ø6.35 mm
- Equipped with Ratchet Stop for constant measuring force.

406-250-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)
With SPC data output					
406-250-30	0 - 25	0.001	±3	0.3	3
406-251-30	25 - 50				
406-252-30	50 - 75				
406-253-30	75 - 100		±4		4

Inch / Metric

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
With SPC data output					
406-350-30	0 - 1	0.00005 in / 0.001 mm	±0.00015	0.000012	0.00012
406-351-30	1 - 2				
406-352-30	2 - 3				
406-353-30	3 - 4		±0.0002		0.00016

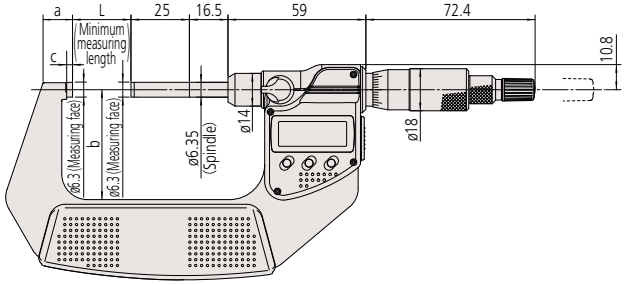
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
  Spanner (**301336**), 1 pc.

Note: For functional details of **series 406**, refer to page 02-7. Please note that these models are not water-proof.

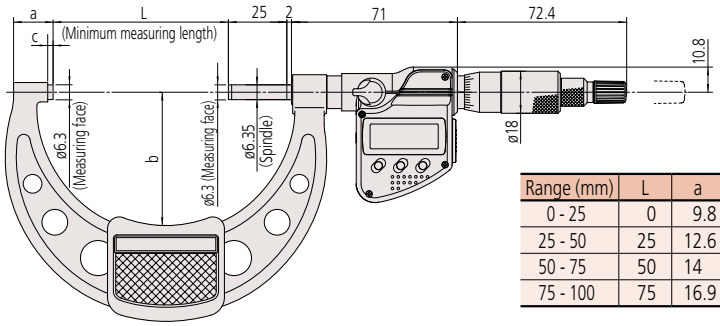
DIMENSIONS

Unit: mm

Digimatic models up to 75 mm measuring range



Digimatic models over 75 mm measuring range



Range (mm)	L	a	b	c
0 - 25	0	9.8	32	2.5
25 - 50	25	12.6	47	
50 - 75	50	14	60	
75 - 100	75	16.9	57	2.8

Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM / TMB**

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MeasurLink® ENABLED Data Management Software by Mitutoyo

U-WAVE fit

IP65

Dust- and Water-Protected

Applicable models:
340-251-30, **340-252-30**, **340-351-30**, **340-352-30**

Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable for **340-251-30**, **340-252-30**, **340-351-30** and **340-352-30** (1 m)
05CZA663	B	Connection cable for **340-251-30**, **340-252-30**, **340-351-30** and **340-352-30** (2 m)
04AZB512	CR	Connection cable (1 m) for **340-5XX**, **340-7XX**
04AZB513	CR	Connection cable (2 m) for **340-5XX**, **340-7XX**
959149	C	Connection cable (1 m) for **340-5XX**, **340-7XX**
959150	C	Connection cable (2 m) for **340-5XX**, **340-7XX**
06AFM380B	B	USB Input Tool Direct (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm)
02AZE140C	C	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM***
264-623	Buzzer	**U-WAVE-TM***
264-626	IP67	**U-WAVE-TMB***
264-627	Buzzer	**U-WAVE-TMB***
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB***

* Only **340-251-30**, **340-252-30**, **340-351-30** and **340-352-30** can be attached.

Outside Micrometers
SERIES 340 — with Interchangeable Anvils

- Wide measuring range with interchangeable anvils.
- Measuring face of the spindle is carbide tipped (standard model).
- IP65 water/dust protection.
- Equipped with Ratchet Stop for constant measuring force.

340-251-30

340-520

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)	Interchangeable anvils	Setting Standard Qty	Setting Standard Size (mm)	Micrometer head stroke (mm)
With SPC data output									
340-251-30*	0 - 75	0.001	3	0.6	2	6 pcs.	5	25 - 125	25
	75 - 150				3				
340-252-30*	150 - 300				5		6	150 - 275	
340-520	300 - 400			1.0	6	4 pcs.	4	300 - 375	
340-521	400 - 500				7			400 - 475	
340-522	500 - 600				8			500 - 575	
340-523	600 - 700				9			600 - 675	
340-524	700 - 800				10			700 - 775	
340-525	800 - 900				11			800 - 875	
340-526	900 - 1000				12			900 - 975	

Inch / Metric

Code No.	Range (in)	Resolution	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Interchangeable anvils	Setting Standard Qty	Setting Standard Size (in)	Micrometer head stroke (in)
With SPC data output									
340-351-30*	0 - 6	0.00005 in/ 0.001 mm	0.00015	0.000024	0.00012	6 pcs.	5	1 - 5	1
340-352-30*	6 - 12	0.0001 in/ 0.001 mm			0.0002		6	6 - 11	
340-720	12 - 18			0.00004	0.00028			12 - 17	
340-721	18 - 24				0.00036			18 - 23	
340-722	24 - 30				0.0004			24 - 29	
340-723	30 - 36				0.00044			30 - 35	

* IP65 model.
- Power source for **340-251-30**, **340-252-30**, **340-351-30**, **340-352-30**: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
  Power source for **340-520** to **340-526**, **340-720** to **340-723**: SR44 battery (2 pcs.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use (for **340-2XX**, **340-3XX**)
  Approx. 1.8 years under normal use (for **340-5XX**, **340-7XX**)
- Position detection method: Electromagnetic rotary sensor (for **series 340**)
- Standard accessories: Spanner (**301336**), 1 pc.
  (for maximum measuring range up to 300 mm (12 in)), Spanner (**200154**), 1 pc.
  (for maximum measuring range 400 mm (16 in) or over)

Note 1: For functional details of **340-251-30**, **340-252-30**, **340-351-30**, **340-352-30**, refer to page 02-7.
Please note that origin setting of these models is by presetting.
Optional connection cable is available only for water-proof type (Digimatic model).
Note 2: For functional details of **340-520** to **340-723**, refer to page 02-9.

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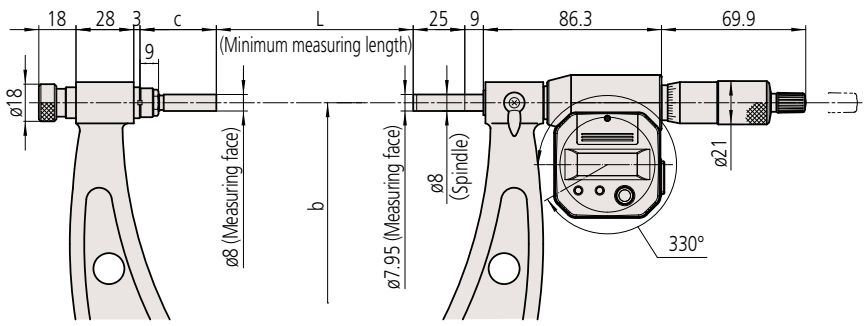
Outside Micrometers
SERIES 340 — with Interchangeable Anvils

DIMENSIONS

Over 400 mm up to 1000 mm

Unit: mm



		L: Range (mm)				b
Range	300 - 400 mm models	300 - 325	325 - 350	350 - 375	375 - 400	224
Range	400 - 500 mm models	400 - 425	425 - 450	450 - 475	475 - 500	273
Range	500 - 600 mm models	500 - 525	525 - 550	550 - 575	575 - 600	332
Range	600 - 700 mm models	600 - 625	625 - 650	650 - 675	675 - 700	382
Range	700 - 800 mm models	700 - 725	725 - 750	750 - 775	775 - 800	430
Range	800 - 900 mm models	800 - 825	825 - 850	850 - 875	875 - 900	480
Range	900 - 1000 mm models	900 - 925	925 - 950	950 - 975	975 - 1000	530
	Code No.	**304001**	**304002**	**304003**	**304004**	
	c: Overall (mm)	87	62	37	12	
	Interchangeable anvil	M3	M4	M5	M6	

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Outside Micrometers
SERIES 102

- Standard analog micrometer. Thanks to a heat-insulated frame, it is resistant to heat and therefore delivers accurate measurement results.
- Cut-away frame (behind anvil) for measuring in hard-to-reach places.
- Equipped with Ratchet Stop for constant measuring force.
- Measuring faces: Carbide tipped

Ratchet stop
102-301

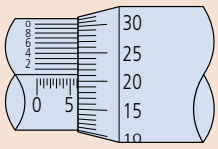
Measurement example

Mechanism

Ratchet stop type

Friction thimble type

Micrometer with Vernier scale (graduation: 0.001 mm)



SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Constant measuring force
102-301	0 - 25	0.01	5 - 10	±2	0.6	2	Ratchet stop
102-302	25 - 50						
102-303	50 - 75						
102-304	75 - 100			±3		3	

Metric With vernier scale

Code No.	Range (mm)	Graduation (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Constant measuring force
102-311	0 - 25	0.001	5 - 10	±1	0.3	1	Ratchet stop
102-313							Friction thimble
102-312	25 - 50			±2			Ratchet stop

Inch

Code No.	Range (in)	Graduation (in)	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Constant measuring force
102-327-10	0 - 1	0.0001	5 - 10	±0.0001	0.000024	0.00008	Ratchet stop
102-329-10							Friction thimble
102-328-10	1 - 2						Ratchet stop
102-330-10							Friction thimble
102-331-10	2 - 3						Ratchet stop
102-332-10	3 - 4			±0.00015		0.00012	Ratchet stop

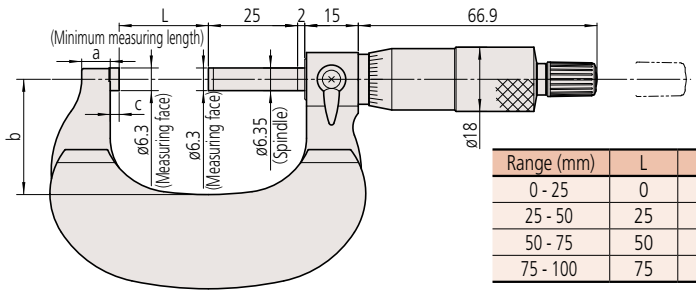
Metric Micrometer set

Code No.	Range (mm)	Models included
102-911-40	0 - 100 (Four micrometers per set)	• **102-301** **102-302** **102-303** **102-304** • 3 micrometer standards

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm models)
  Spanner (**301336**), 1 pc. (for measuring range 0 to 25 mm/25 to 50 mm models)
  Spanner (**200877**), 1 pc. (for measuring range 50 to 75 mm/75 to 100 mm models)

DIMENSIONS

Unit: mm



Range (mm)	L	a	b	c
0 - 25	0	5	26	2.5
25 - 50	25	7.8	32	
50 - 75	50	10.6	45	
75 - 100	75	11	58	

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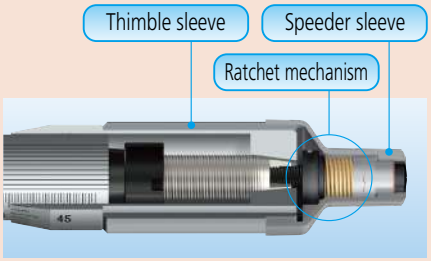
Ratchet Thimble Micrometer
SERIES 102 — Outside Micrometers

- The ratchet thimble mechanism enables easy one-handed operation, useful for inspecting samples during the manufacturing process.
- Ratchet function works both from the thimble and the speeder.
- Clearly audible ratchet operation for reassurance that measurement is being performed at constant, preset force.
- Heat-insulated frame.
- Measuring faces: Carbide tipped

102-701

Measurement example

Internal structure



SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Measuring force (N)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Mass (g)
102-701	0 - 25	0.01	5 - 10	±2	0.6	2	180
102-707		0.001					
102-702	25 - 50	0.01					270
102-708		0.001					

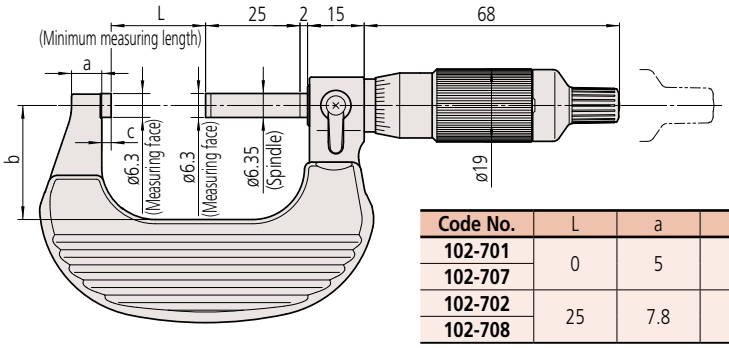
Inch

Code No.	Range (in)	Graduation (in)	Measuring force (N)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Mass (g)
102-717	0 - 1	0.0001	5 - 10	±0.0001	0.000024	0.00008	180
102-718	1 - 2						270

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

DIMENSIONS

Unit: mm



Code No.	L	a	b	c
102-701	0	5	26	2.5
102-707				
102-702	25	7.8	30	
102-708				

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PROPRIETARY INSPECTION CERTIFICATE

Measurement example

103-913-40
- Range: 0 - 150 mm (6 pcs./set)
- Models included: **103-137**, **103-138**, **103-139**, **103-140**, **103-141**, **103-142**, 5 micrometer standards

103-914-40
- Range: 0 - 300 mm (12 pcs./set)
- Models included: **103-137**, **103-138**, **103-139**, **103-140**, **103-141**, **103-142**, **103-143**, **103-144**, **103-145**, **103-146**, **103-147**, **103-148** 11 micrometer standards

103-915
- Range: 150 - 300 mm (6 pcs./set)
- Models included: **103-143**, **103-144**, **103-145**, **103-146**, **103-147**, **103-148**, 6 micrometer standards

103-927-10
- Range: 0 - 75 mm (3 pcs./set)
- Models included: **103-137**, **103-138**, **103-139-10**

103-913-50
- Range: 50 - 150 mm (6 pcs./set)
- Models included: **103-137**, **103-138**, **103-139-10**, **103-140-10**, **103-141-10**, **103-142-10**

103-914-50
- Range: 50 - 300 mm (12 pcs./set)
- Models included: **103-137**, **103-138**, **103-139-10**, **103-140-10**, **103-141-10**, **103-142-10**, **103-143-10**, **103-144-10**, **103-145-10**, **103-146-10**, **103-147-10**, **103-148-10**

103-915-10
- Range: 150 - 300 mm (6 pcs./set)
- Models included: **103-143-10**, **103-144-10**, **103-145-10**, **103-146-10**, **103-147-10**, **103-148-10**

Outside Micrometers SERIES 103

- This is a simple, classic analog micrometer that represents the roots of our company's foundation.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

103-137

103-139-10

Metric With ratchet stop

Code No.	Range (mm)	Measuring force (N)	Graduation (mm)	MPE*1 (µm)	Flatness (µm)	Parallelism (µm)
103-129	0 - 25	5 - 10	0.001	±2	0.6	2
103-130	25 - 50		0.01			
103-139-10	50 - 75					
103-140-10	75 - 100			±3		3
103-141-10	100 - 125					
103-142-10	125 - 150					
103-143-10	150 - 175			±4		4
103-144-10	175 - 200					
103-145-10	200 - 225					
103-146-10	225 - 250			±5		
103-147-10	250 - 275					
103-148-10	275 - 300					5
103-149	300 - 325	10 - 15		±6	1	
103-150	325 - 350					
103-151	350 - 375					
103-152	375 - 400			±7		6
103-153	400 - 425					
103-154	425 - 450					
103-155	450 - 475			±8		7
103-156	475 - 500					
103-157	500 - 525					
103-158	525 - 550			±9		
103-159	550 - 575					
103-160	575 - 600					8
103-161	600 - 625			±10		
103-162	625 - 650					
103-163	650 - 675					
103-164	675 - 700			±11		9
103-165	700 - 725					
103-166	725 - 750					
103-167	750 - 775			±12		
103-168	775 - 800					10
103-169	800 - 825					
103-170	825 - 850			±13		
103-171	850 - 875					
103-172	875 - 900					11
103-173	900 - 925			±14		
103-174	925 - 950					
103-175	950 - 975					
103-176	975 - 1000			±15		12

Metric With ratchet stop

Code No.	Range (mm)	Measuring force (N)	Graduation (mm)	MPE*1 *2 (µm)	Flatness (µm)	Parallelism (µm)
103-137	0 - 25	5 - 10	0.01	±2	0.6	2
103-138	25 - 50					
103-255	50 - 75		0.001	±3		3
103-256	75 - 100					
103-257	100 - 125					
103-258	125 - 150					

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc. (for maximum measuring range up to 300 mm (12 in)), Spanner (**200154**), 1 pc. (for maximum measuring range 325 mm (13 in) or over)

*1 MPE: Maximum permissible error J_{MPE}

*2 Maximum permissible error of the indication measured by contacting the full measuring face with the object to be measured. J_{MPE} is a term specified by JIS B 7502: 2016 which has been prepared based on ISO 3611: 2010 with some modifications of the technical contents. The measurement method has not been changed from JIS B 7502: 1994. For details refer to page 13-10.

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Micrometer

Inch With ratchet stop

Code No.	Range (in)	Measuring force (N)	Graduation (in)	MPE*1 (in)	Flatness (in)	Parallelism (in)
103-177	0 - 1	5 - 10	0.001	±0.0001	0.000024	0.00008
103-131			0.0001			
103-178	1 - 2		0.001			
103-132			0.0001			
103-179	2 - 3		0.001			
103-180	3 - 4			±0.00015		0.00012
103-181	4 - 5					
103-182	5 - 6					
103-183	6 - 7			±0.0002		0.00016
103-184	7 - 8					
103-185	8 - 9					
103-186	9 - 10			±0.00025		
103-187	10 - 11					
103-188	11 - 12					0.0002
103-189	12 - 13	10 - 15		±0.0003	0.00004	
103-190	13 - 14					
103-191	14 - 15					
103-192	15 - 16			±0.00035		0.00024
103-193	16 - 17					
103-194	17 - 18					
103-195	18 - 19			±0.0004		0.00028
103-196	19 - 20					
103-197	20 - 21					
103-198	21 - 22			±0.00045		
103-199	22 - 23					
103-200	23 - 24			±0.0005		0.00032
103-201	24 - 25					
103-202	25 - 26					
103-203	26 - 27			±0.00055		0.00036
103-204	27 - 28					
103-205	28 - 29					
103-206	29 - 30					
103-207	30 - 31			±0.0006		0.0004
103-208	31 - 32					
103-209	32 - 33					
103-210	33 - 34			±0.00065		
103-211	34 - 35					
103-212	35 - 36					0.00044
103-213	36 - 37			±0.0007		
103-214	37 - 38					
103-215	38 - 39					
103-216	39 - 40			±0.00075		0.00048
103-259	0 - 1	5 - 10	0.0001	±0.0001	0.000024	0.00008
103-217	2 - 3			±0.00015		0.00012
103-218	3 - 4					
103-219	4 - 5					
103-220	5 - 6					
103-221	6 - 7			±0.0002		0.00016
103-222	7 - 8					
103-223	8 - 9					
103-224	9 - 10			±0.00025		
103-225	10 - 11					
103-226	11 - 12					0.0002

Inch With friction thimble

Code No.	Range (in)	Measuring force (N)	Graduation (in)	MPE*1 *2(in)	Flatness (in)	Parallelism (in)
103-135	0 - 1	5 - 10	0.0001	±0.0001	0.000024	0.00008
103-136	1 - 2					

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)- (**301336**), 1 pc. (for maximum measuring range up to 300 mm (12 in)), Spanner (**200154**), 1 pc. (for maximum measuring range 325 mm (13 in) or over)

*1 MPE: Maximum permissible error J_{MPE}

*2 Maximum permissible error of the indication measured by contacting the full measuring face with the object to be measured. J_{MPE} is a term specified by JIS B 7502: 2016 which has been prepared based on ISO 3611: 2010 with some modifications of the technical contents. The measurement method has not been changed from JIS B 7502: 1994. For details refer to page 13-10.

103-904-10
- Range: 0 - 6 in (6 pcs./set)
- Models included: **103-177**, **103-178**, **103-179**, **103-180**, **103-181**, **103-182**, 5 micrometer standards

103-905-10
- Range: 0 - 12 in (12 pcs./set)
- Models included: All micrometers of **103-904-10** and **103-906** in one set, 11 micrometer standards

103-906
- Range: 6 - 12 in (6 pcs./set)
- Models included: **103-183**, **103-184**, **103-185**, **103-186**, **103-187**, **103-188**, 6 micrometer standards

103-907-40
- Range: 0 - 6 in (6 pcs./set)
- Models included: **103-135**, **103-136**, **103-217**, **103-218**, **103-219**, **103-220**

103-908-40
- Range: 0 - 12 in (12 pcs./set)
- Models included: **103-135**, **103-136**, **103-217**, **103-218**, **103-219**, **103-220**, **103-221**, **103-222**, **103-223**, **103-224**, **103-225**, **103-226**

103-909
- Range: 6 - 12 in (6 pcs./set)
- Models included: **103-221**, **103-222**, **103-223**, **103-224**, **103-225**, **103-226**

103-929
- Range: 0 - 3 in (3 pcs./set)
- Models included: **103-177**, **103-178**, **103-179**

103-930
- Range: 0 - 4 in (4 pcs./set)
- Models included: **103-177**, **103-178**, **103-179**, **103-180**

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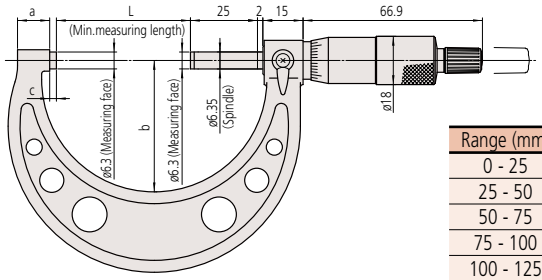
Outside Micrometers
SERIES 103

DIMENSIONS

103-137 and 103-138, Models 75 mm to 300 mm

Unit: mm

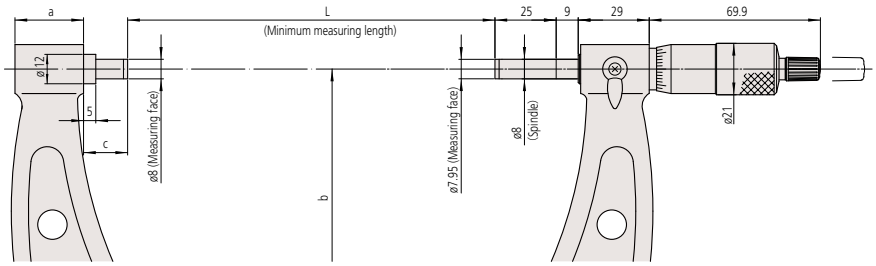


Range (mm)	L	a	b	c
0 - 25	0	9	28	2.5
25 - 50	25	10	38	
50 - 75	50	12	49	
75 - 100	75	14	60	
100 - 125	100	16.7	79	5.3
125 - 150	125	18.8	94	5.7
150 - 175	150	19.1	106	6.1
175 - 200	175	18.2	118	6.3
200 - 225	200	16.8	130	6.7
225 - 250	225	18	143	5.5
250 - 275	250		156	6.5
275 - 300	275		169	

DIMENSIONS

Models 325 mm to 1000 mm

Unit: mm



Range (mm)	L	a	b	c
300 - 325	300	28	187	18
325 - 350	325		199	
350 - 375	350		212	
375 - 400	375		224	
400 - 425	400		236	
425 - 450	425		248	
450 - 475	450		261	
475 - 500	475		273	
500 - 525	500		307	40
525 - 550	525			15
550 - 575	550		332	40
575 - 600	575			15
600 - 625	600		355	40
625 - 650	625			15

Range (mm)	L	a	b	c
650 - 675	650	28	382	40
675 - 700	675			15
700 - 725	700		405	40
725 - 750	725			15
750 - 775	750		430	40
775 - 800	775			15
800 - 825	800		455	40
825 - 850	825			15
850 - 875	850		480	40
875 - 900	875			15
900 - 925	900		505	40
925 - 950	925			15
950 - 975	950		530	40
975 - 1000	975			15

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Mitutoyo

Digit Outside Micrometers SERIES 193

- Mechanical digit counter with 0.01 mm or 0.001 in resolution for quick and error-free reading.
- Counter resolution 0.01 mm
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

193-101

SPECIFICATIONS

Metric With ratchet stop

Code No.	Range (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Graduation (mm)
193-111	0 - 25	±2	0.6	2	0.001 (reading is obtained with vernier)
193-112	25 - 50				
193-113	50 - 75				
193-114	75 - 100	±3		3	
193-101	0 - 25	±2		2	0.01
193-102	25 - 50				
193-103	50 - 75				
193-104	75 - 100	±3		3	

Inch With friction thimble

Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Graduation (in)
193-211	0 - 1	±0.0001	0.000024	0.00008	0.0001
193-212	1 - 2				

Inch With ratchet stop

Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Graduation (in)
193-213	2 - 3	±0.0001	0.000024	0.00008	0.0001
193-214	3 - 4	±0.00015		0.00012	

Metric Micrometer set

Code No.	Range (mm)	Models included	Flatness (µm)	Parallelism (µm)
193-901	0 - 75 (3 pcs./set)	• **193-101**, **193-102**, **193-103** • 2 micrometer standards	0.6	2
193-902	0 - 100 (4 pcs./set)	• **193-101**, **193-102**, **193-103**, **193-104** • 3 micrometer standards		3

Inch Micrometer set

Code No.	Range (in)	Models included	Flatness (in)	Parallelism (in)
193-923	0 - 3 (3 pcs./set)	• **193-211**, **193-212**, **193-213** • 2 micrometer standards	0.000024	0.00008

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

Measurement example

193-901
- Range: 0 - 75 mm
- Graduation: 0.01 mm
- Models included: **193-101**, **193-102**, **193-103**
  2 micrometer standards

193-902
- Range: 0 - 100 mm
- Graduation: 0.01 mm
- Models included: **193-101**, **193-102**, **193-103**, **193-104**
  3 micrometer standards

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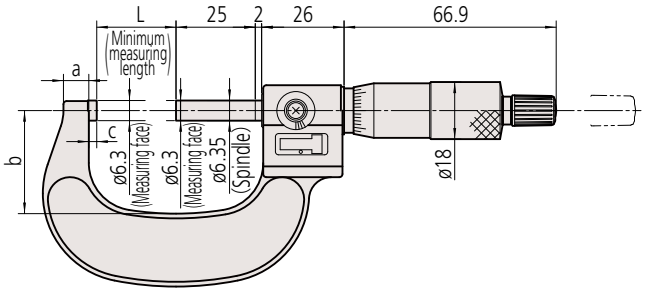
Digit Outside Micrometers
SERIES 193

DIMENSIONS

Unit: mm

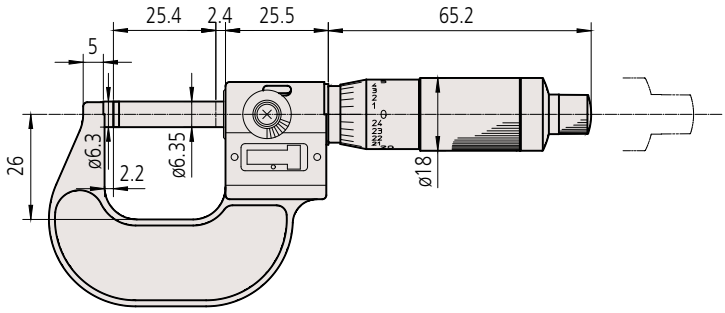


Range (mm)	L	a	b	c
0 - 25	0	5	26	2.5
25 - 50	25	8	32.5	2
50 - 75	50	9	45	
75 - 100	75		57	

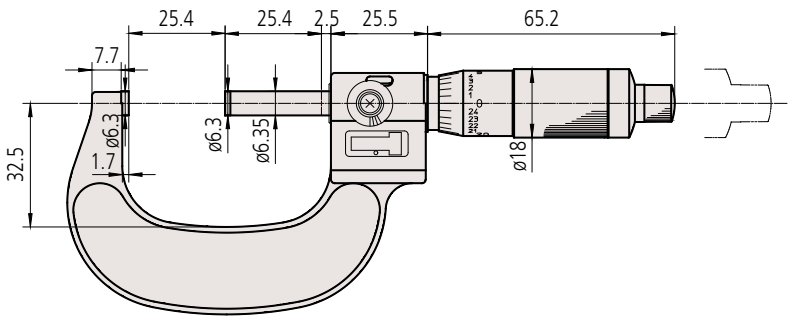
DIMENSIONS

Unit: mm

193-211



193-212



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Mitutoyo

Outside Micrometers
SERIES 104 — with Interchangeable Anvils

- Wide measuring range with interchangeable anvils.
- Measuring face of the spindle is carbide tipped (standard model).
- Equipped with Ratchet Stop for constant measuring force.

104-136

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Spindle feed error (µm)	Flatnessr (µm)	Parallelism (µm)	Interchangeable anvils	Setting Standard Qty	Setting Standard Size (mm)	Micrometer head stroke (mm)
Analog									
104-171*	0 - 50	0.01	3	0.6	2	1 pc.	1	25	25
104-139A	0 - 100				3	4 pcs.	3	25 - 75	
104-135A	0 - 150					6 pcs.	5	25 - 125	
104-161A	50 - 150					4 pcs.	4	50 - 125	
104-140A	100 - 200				4			100 - 175	
104-136A	150 - 300				5	6 pcs.	6	150 - 275	
104-141A	200 - 300					4 pcs.	4	200 - 275	
104-142A	300 - 400			1.0	6			300 - 375	
104-143A	400 - 500				7			400 - 475	
104-144A	500 - 600				8			500 - 575	
104-145A	600 - 700				9			600 - 675	
104-146A	700 - 800				10			700 - 775	
104-147A	800 - 900				11			800 - 875	
104-148A	900 - 1000				12			900 - 975	

Inch

Code No.	Range (in)	Graduation (in)	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Interchangeable anvils	Setting Standard Qty	Setting Standard Size (in)	Micrometer head stroke (in)
Analog									
104-165	0 - 2	0.0001	0.00015	0.000024	0.00008	1 pc.	1	1	1
104-149	0 - 4	0.001			0.00012	4 pcs.	3	1 - 3	
104-137	0 - 6					6 pcs.	5	1 - 5	
104-162	2 - 6					4 pcs.	4	2 - 5	
104-150	4 - 8				0.00016			4 - 7	
104-138	6 - 12				0.0002	6 pcs.	6	6 - 11	
104-151	8 - 12					4 pcs.	4	8 - 11	
104-152	12 - 16			0.00004	0.00024			12 - 15	
104-201	12 - 18					6 pcs.	6	12 - 17	
104-153	16 - 20				0.00028	4 pcs.	4	16 - 19	
104-202	18 - 24				0.00032	6 pcs.	6	18 - 23	
104-154	20 - 24					4 pcs.	4	20 - 23	
104-155	24 - 28				0.00036			24 - 27	
104-203	24 - 30					6 pcs.	6	24 - 29	
104-156	28 - 32				0.0004	4 pcs.	4	28 - 31	
104-204	30 - 36				0.00044	6 pcs.	6	30 - 35	
104-157	32 - 36					4 pcs.	4	32 - 35	
104-158	36 - 40				0.00048			36 - 39	
104-205	36 - 42					6 pcs.	6	36 - 41	

* The frame is fitted with a heat shield.

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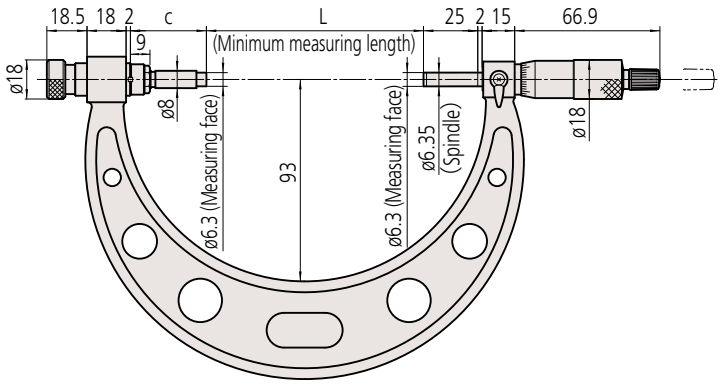
Outside Micrometers
SERIES 104 — with Interchangeable Anvils

DIMENSIONS

Unit: mm

104-135A



Interchangeable Anvil

		L: Range (mm)					
Range	0 - 150 mm models	0 - 25	25 - 50	50 - 75	75 - 100	100 - 125	125 - 150
Range	150 - 300 mm models	150 - 175	175 - 200	200 - 225	225 - 250	250 - 275	275 - 300
	Code No.	**303950**	**303951**	**303952**	**303953**	**303954**	**303955**
	c: Overall length (mm)	135	110	85	60	35	10
	Interchangeable anvil	M1	M2	M3	M4	M5	M6

		L: Range (mm)			
Range	300 - 400 mm models	300 - 325	325 - 350	350 - 375	375 - 400
Range	400 - 500 mm models	400 - 425	425 - 450	450 - 475	475 - 500
Range	500 - 600 mm models	500 - 525	525 - 550	550 - 575	575 - 600
Range	600 - 700 mm models	600 - 625	625 - 650	650 - 675	675 - 700
Range	700 - 800 mm models	700 - 725	725 - 750	750 - 775	775 - 800
Range	800 - 900 mm models	800 - 825	825 - 850	850 - 875	875 - 900
Range	900 - 1000 mm models	900 - 925	925 - 950	950 - 975	975 - 1000
	Code No.	**304001**	**304002**	**304003**	**304004**
	c: Overall length (mm)	87	62	37	12
	Interchangeable anvil	M3	M4	M5	M6

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Mitutoyo

Outside Micrometers
SERIES 105 — with Anvil Extension Collars

- Adjustable measuring range with extension collars.
- 50 mm/2 in spindle stroke.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

105-105

Extension collar

Measuring range 700 to 750 mm with **105-105**

Measuring range 750 to 800 mm with **105-105**

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Extension Collars	Setting Standard	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)
105-103	500 - 600	0.01	1 pc. (50 mm)	2 pcs.	6	1.3	8
105-104	600 - 700						9
105-105	700 - 800						10
105-106	800 - 900						11
105-107	900 - 1000						12

- Standard Accessories: Spanner (**200154**), 1 pc.

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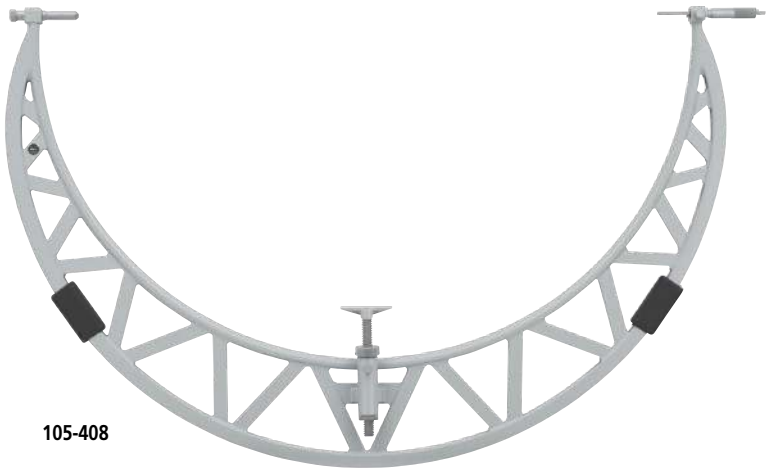
Outside Micrometers
SERIES 105 — with Anvil Extension Collars

- Square and round pipes are combined to create a lightweight, rigid frame.
- Wide measuring range with anvil extension collars.
- 50 mm/2 in spindle stroke.
- Includes workpiece stopper.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

Measurement example



105-408

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Extension Collars	Setting Standard (pcs.)	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)
(every 100 mm)							
105-408	1000 - 1100	0.01	1 pc. (50 mm)	2	6	1.3	13
105-409	1100 - 1200						14
105-410	1200 - 1300						15
105-411	1300 - 1400						16
105-412	1400 - 1500						17
105-413	1500 - 1600						18
105-414	1600 - 1700						19
105-415	1700 - 1800						20
105-416	1800 - 1900						21
105-417	1900 - 2000						22
(every 200 mm)							
105-418	1000 - 1200	0.01	2 pcs. (50 mm, 100 mm)	4 (every 50 mm)	6	1.3	14
105-419	1200 - 1400						16
105-420	1400 - 1600						18
105-421	1600 - 1800						20
105-422	1800 - 2000						22

Inch

Code No.	Range (in)	Graduation (in)	Extension Collars	Setting Standard (pcs.)	Spindle feed error (in)	Flatness (in)	Parallelism (in)
105-428	40 - 44	0.001	1 pc. (2 in)	2	0.0003	0.000052	0.00052
105-429	44 - 48						0.00056
105-430	48 - 52						0.00060
105-431	52 - 56						0.00064
105-432	56 - 60						0.00068
105-433	60 - 64						0.00072
105-434	64 - 68						0.00076
105-435	68 - 72						0.00080
105-436	72 - 76						0.00084
105-437	76 - 80						0.00088

• Standard Accessories: Spanner (**200154**), 1 pc.

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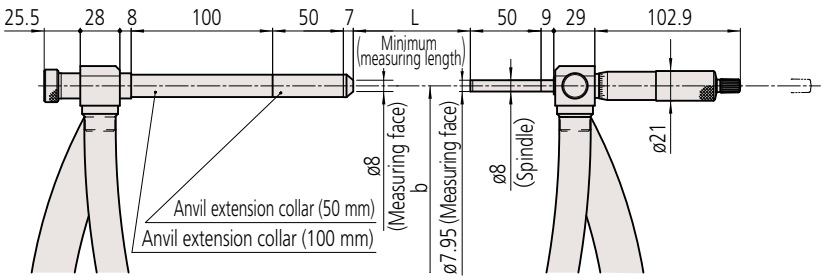
DIMENSIONS

Over 1200 mm up to 2000 mm

Unit: mm



b: distance to workpiece stop

Range (mm)	L	b
1000 - 1200	1000	500 - 600
1200 - 1400	1200	600 - 700
1400 - 1600	1400	700 - 800
1600 - 1800	1600	800 - 900
1800 - 2000	1800	900 - 1000

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Indicator Type Micrometers SERIES 107

- Designed to mount a dial indicator for direct GO/±NG judgment for mass-produced parts.
- Anvil retracting trigger for quick measurement.
- Various kinds of indicators* are available depending on the measurement type (accuracy required, measuring range, etc.).
- Measuring faces: Carbide tipped
- Anvil stroke: 3 mm

* Only stems of ø8 diameter are supported, but even these may not be supported by some models. Please contact our Customer Support Center or your nearest Mitutoyo sales office for detailed specifications.

Measurement example

Typical indicator choice

Dial indicator (0.01 mm): **2046AB**
Dial indicator (0.001 mm): **2109AB-10**
ABS Digimatic Indicator (0.01 mm): **543-710B**
ABS Digimatic Indicator (0.0005 mm): **543-700B**

107-201
(Indicator shown is optional)

SPECIFICATIONS

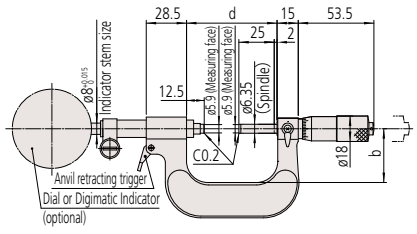
Metric

Code No.	Range (mm)	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)
107-201	0 - 25	3	0.6	2
107-202	25 - 50			
107-203	50 - 75			
107-204	75 - 100			3
107-205	100 - 125			
107-206	125 - 150			
107-207	150 - 175			
107-208	175 - 200			4

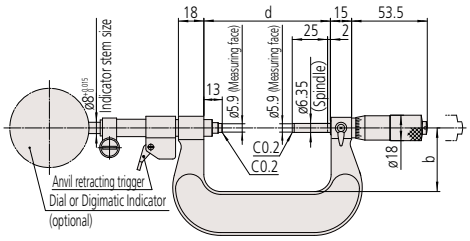
• Setting standard, 1 pc. (except for measuring range 0 to 25 mm models), Spanner (**301336**), 1 pc.

DIMENSIONS

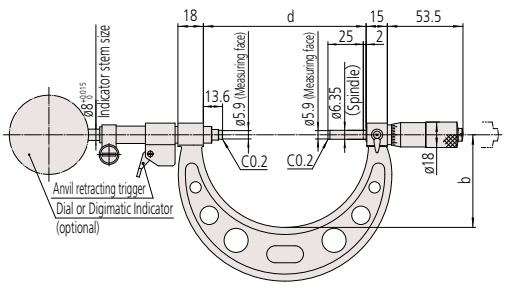
Measuring range up to 50 mm



Measuring range up to 75 mm Unit: mm



Measuring range up to 200 mm



Range (mm)	b	d
0 - 25	30	39
25 - 50	38	64
50 - 75	45	89.5
75 - 100	65	115.1
100 - 125	79	140.1
125 - 150	93	165.1
150 - 175	105	190
175 - 200	118	214

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MeasurLink® ENABLED
Data Management Software by Mitutoyo

U-WAVE fit

Caliper Type Micrometers SERIES 343

- Effective for measuring workpiece features where access is difficult with a standard micrometer.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

343-250-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)
With SPC data output					
343-250-30	0 - 25	0.001	±5	0.3	3
343-251-30	25 - 50		±6		
343-252-30	50 - 75		±7		4
343-253-30	75 - 100		±8		

Inch / Metric

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
With SPC data output					
343-350-30	0 - 1	0.00005 in / 0.001 mm	±0.00025	0.000012	0.00012
343-351-30	1 - 2		±0.0003		
343-352-30	2 - 3		±0.00035		0.00016
343-353-30	3 - 4		±0.0004		

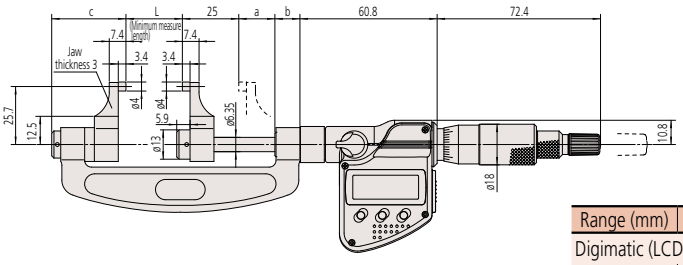
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

Note: For functional details of **series 343**, refer to page 02-7.
Please note that these models are not water-proof.

DIMENSIONS

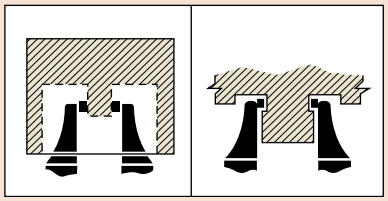
Digimatic
Measuring range up to 100 mm

Unit: mm



Range (mm)	L	a	b	C
Digimatic (LCD)				
0 - 25	0	16	11.1	32.9
25 - 50	25			
50 - 75	50			
75 - 100	75			

Measurement example



Optional Accessories (for series 343)

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM / TMB**

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Caliper Type Micrometers
SERIES 143

143-101

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)
143-101	0 - 25	0.01	±5	0.3	3
143-102	25 - 50		±6		
143-103	50 - 75		±7		4
143-104	75 - 100		±8		
143-105	100 - 125		±9		5
143-106	125 - 150				
143-107	150 - 175		±10		
143-108	175 - 200				6
143-109	200 - 225		±11		
143-110	225 - 250				
143-111	250 - 275		±12		7
143-112	275 - 300				

Inch

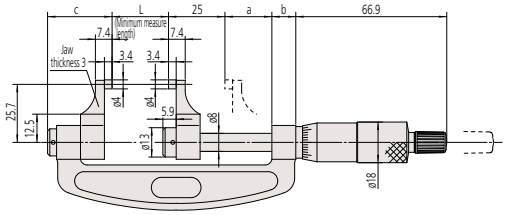
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
143-121	0 - 1	0.001	±0.00025	0.000012	0.00012
143-122	1 - 2		±0.0003		
143-123	2 - 3		±0.00035		

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

DIMENSIONS

Analog
Measuring range up to 300 mm

Unit: mm



Range (mm)	L	a	b	C
Analog				
0 - 25	0	20.8	10.6	28.6
25 - 50	25			
50 - 75	50			
75 - 100	75			
100 - 125	100			
125 - 150	125			
150 - 175	150			
175 - 200	175			
200 - 225	200	16.3	15	32.5
225 - 250	225			
250 - 275	250			
275 - 300	275			

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Screw Thread Micrometers SERIES 125

- Directly indicates screw pitch diameter (no need for calculation).
- Fixed anvil type. Select the right model to meet the specifications of your screw thread.
- Equipped with Ratchet Stop for constant measuring force.
- Supplied with a setting standard for adjusting zero point for metric (unified) 60° threads.

125-103

Measurement example

SPECIFICATIONS

Metric

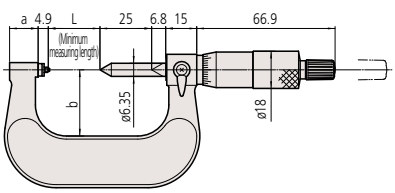
Code No.	Thread to be measured (Metric/Unified)	Range (mm)	Spindle feed error (µm)	Graduation (mm)
125-101	0.4 - 0.5 mm/64 - 48 TPI	0 - 25	3	0.01
125-102	0.6 - 0.9 mm/44 - 28 TPI			
125-103	1 - 1.75 mm/24 - 14 TPI			
125-104	2 - 3 mm/13 - 9 TPI			
125-105	3.5 - 5 mm/8 - 5 TPI			
125-106	0.4 - 0.5 mm/64 - 48 TPI	25 - 50		
125-107	0.6 - 0.9 mm/44 - 28 TPI			
125-108	1 - 1.75 mm/24 - 14 TPI			
125-109	2 - 3 mm/13 - 9 TPI			
125-110	3.5 - 5 mm/8 - 5 TPI			
125-111	0.6 - 0.9 mm/44 - 28 TPI	50 - 75		
125-112	1 - 1.75 mm/24 - 14 TPI			
125-113	2 - 3 mm/13 - 9 TPI			
125-114	3.5 - 5 mm/8 - 5 TPI			
125-115	5.5 - 7 mm/4.5 - 3.5 TPI			
125-116	0.6 - 0.9 mm/44 - 28 TPI	75 - 100		
125-117	1 - 1.75 mm/24 - 14 TPI			
125-118	2 - 3 mm/13 - 9 TPI			
125-119	3.5 - 5 mm/8 - 5 TPI			
125-120	5.5 - 7 mm/4.5 - 3.5 TPI			

• Standard Accessories: Spanner (**301336**), 1 pc.

Note: A matching setting standard is supplied with each model (except for 0 to 25 mm measuring range). (Refer to page 02-73 for details.) The setting standard is for metric threads (unified) 60°.

DIMENSIONS

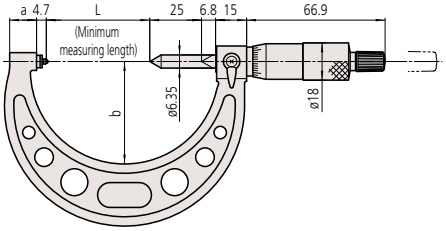
125-101, 125-106



Range (mm)	L	a	b
0 - 25	0	13.8	25
25 - 50	25		32

125-111, 125-116

Unit: mm



Range (mm)	L	a	b
50 - 75	50	12	49
75 - 100	75	14	63

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Applicable models: **series 326**

Measurement example

Optional Accessories (for series 326)

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

• For Metric/Unified threads (pair)

Code No.	Matching anvils/spindle tips included (mm)
126-801	0.4 - 0.5/64 - 48 TPI
126-802	0.6 - 0.9/44 - 28 TPI
126-803	1 - 1.75/24 - 14 TPI
126-804	2 - 3/13 - 9 TPI
126-805	3.5 - 5/8 - 5 TPI
126-806	5.5 - 7/4.5 - 3.5 TPI
126-800	Set with one each of **126-801** to **126-806**

• For Whitworth threads (pair)

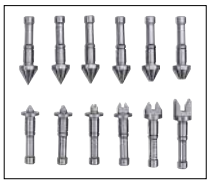
Code No.	Matching anvils/spindle tips included (mm)	Code No.	Matching anvils/spindle tips included (mm)
126-811	64 - 48 TPI	**126-817**	14 - 10 TPI
126-812	48 - 40 TPI	**126-818**	10 - 7 TPI
126-813	40 - 32 TPI	**126-819**	7 - 4.5 TPI
126-814	32 - 24 TPI	**126-820**	4.5 - 3.5 TPI
126-815	24 - 18 TPI	**126-810**	Set with one each of **126-811** to **126-820**
126-816	18 - 14 TPI		

Screw Thread Micrometers
SERIES 326, 126 — Interchangeable Anvil/Spindle Tip Type

- This is a screw thread micrometer with changeable anvil and spindle tips. It enables direct reading of screw pitch diameter. Both analog and digital types are available.
- Interchangeable anvil and spindle tips are optional. Select the right model to meet the specifications of your screw thread.
- Equipped with Ratchet Stop for constant measuring force.
- Supplied with a setting standard for adjusting zero point for metric (unified) 60° threads.

326-251-30

Interchangeable anvils/ spindle tips (optional)



SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Spindle feed error (µm)
With SPC data output			
326-251-30	0 - 25	0.001	3
326-252-30	25 - 50		
326-253-30	50 - 75		
326-254-30	75 - 100		

Inch/Metric

Code No.	Range (in)	Resolution	Spindle feed error (in)
With SPC data output			
326-351-30	0 - 1	0.00005 in/ 0.001 mm	0.00015
326-352-30	1 - 2		
326-353-30	2 - 3		
326-354-30	3 - 4		

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard Accessories: Spanner (**301336**), 1 pc.

Note 1: A matching setting standard is supplied with each model (except for 0 to 25 mm measuring range). (Refer to page 02-73 for details.) The setting standard is for metric threads (unified) 60°.

Note 2: For functional details, refer to page 02-7. Please note that origin setting of these models is by presetting. Optional connection cable is available only for water-proof type (Digimatic model).

126-125

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Spindle feed error (µm)
126-125	0 - 25	0.01	3
126-126	25 - 50		
126-127	50 - 75		
126-128	75 - 100		
126-129	100 - 125		
126-130	125 - 150		
126-131	150 - 175		
126-132	175 - 200		
126-133	200 - 225		
126-134	225 - 250		
126-135	250 - 275		
126-136	275 - 300		

Inch

Code No.	Range (in)	Graduation (in)	Spindle feed error (in)
126-137	0 - 1	0.001	0.00015
126-138	1 - 2		
126-139	2 - 3		
126-140	3 - 4		
126-141	4 - 5		
126-142	5 - 6		
126-143	6 - 7		
126-901	0 - 1		
126-902	1 - 2		
126-903	2 - 3		
126-904	3 - 4		
126-905	4 - 5		
126-906	5 - 6		

- Standard Accessories: Spanner (**301336**), 1 pc.

Note: A matching setting standard is supplied with each model (except for 0 to 25 mm measuring range). (Refer to page 02-73 for details.) The setting standard is for metric threads (unified) 60°.

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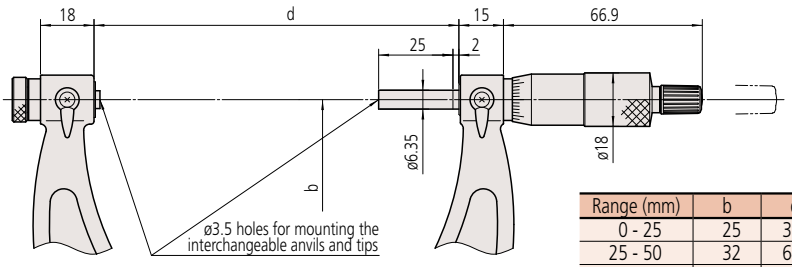
Screw Thread Micrometers
SERIES 326, 126 — Interchangeable Anvil/Spindle Tip Type

DIMENSIONS

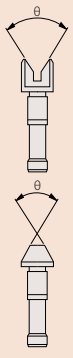
Unit: mm



Range (mm)	b	d
0 - 25	25	39
25 - 50	32	64
50 - 75	45	89.5
75 - 100	65	115.1
100 - 125	79	140.1
125 - 150	93	165.1
150 - 175	105	190
175 - 200	118	214
200 - 225	131	240
225 - 250	144	265
250 - 275	156	290
275 - 300	169	314

Technical description

- Anvils/spindle tips



- Allowable error of the angle of anvils and spindle tips

Type	Metric (Unified)	Whitworth (Unified)	Half angle error α
Pitch (mm), Nominal designation of threads per inch		W1	±30'
	M1 (U1)	W2	±30'
		W3	±20'
	M2 (U2)	W4	±20'
		W5	±15'
	M3 (U3)	W6	±15'
	M4 (U4)	W7	±10'
		W8	±10'
	M5 (U5)	W9	±10'
	M6 (U6)	W10	±10'

Note: This chart indicates the difference between the angle made by anvil's contact faces and spindle's axes and the half angle with error α.
Metric/Unified θ=60°
Whitworth θ=55°

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Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

Disc Micrometers SERIES 323

- Measures "root tangent length" of spur gears and helical gears.
- Determination of the root tangent length: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Equipped with Ratchet Stop for constant measuring force.

323-250-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Anvil dia. (mm)	Measurable module
With SPC data output							
323-250-30	0 - 25	0.001	±4	1	4	ø20	0.5 - 6
323-251-30	25 - 50						
323-252-30	50 - 75		±6		6		
323-253-30	75 - 100						

Inch/Metric

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Anvil dia. (in)	Measurable module
With SPC data output							
323-350-30	0 - 1	0.00005 in/ 0.001 mm	±0.0002	0.00004	0.0002	ø0.787	0.5 - 6
323-351-30	1 - 2						
323-352-30	2 - 3		±0.0003		0.0003		
323-353-30	3 - 4						

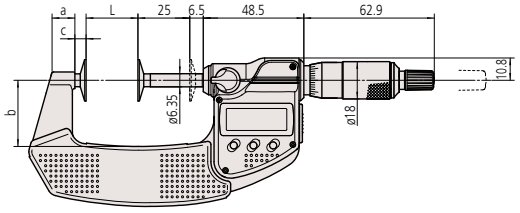
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

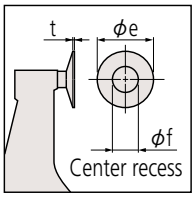
Note 1: Root tangent length measurement is not available for some types of gears.
Note 2: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

DIMENSIONS

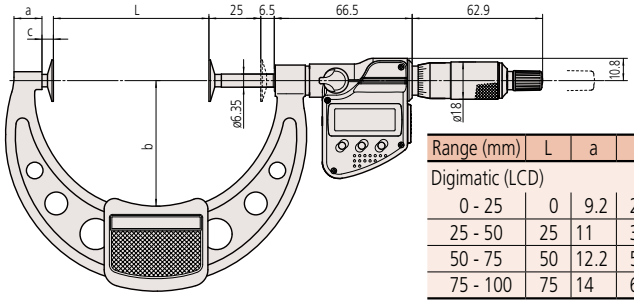
Digimatic models up to 75 mm measuring range

Unit: mm





Digimatic models up to 100 mm measuring range



Range (mm)	L	a	b	c	e	f	t
Digimatic (LCD)							
0 - 25	0	9.2	25	4.5	20	8	0.7
25 - 50	25	11	31	5.4			
50 - 75	50	12.2	50	5.5			
75 - 100	75	14	60				

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Disc Micrometers
SERIES 223, 123

- Can be used for making root tangent measurements on spur gears and helical gears.
- Determination of the root tangent length: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Equipped with Ratchet Stop for constant measuring force.

123-101

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Anvil dia. (mm)	Measurable module
Mechanical counter model							
223-101	0 - 25	0.01	±4	1	4	ø20	0.5 - 6
223-102	25 - 50						
Analog							
123-101	0 - 25	0.01	±4	1	4	ø20	0.5 - 6
123-113*							
123-102	25 - 50						
123-114*							
123-103	50 - 75		±6		6		
123-115*							
123-104	75 - 100						
123-116*							
123-105	100 - 125		±7	1.6	7	ø30	0.7 - 11
123-106	125 - 150						
123-107	150 - 175		±8		8		
123-108	175 - 200						
123-109	200 - 225						
123-110	225 - 250		±9		9		
123-111	250 - 275						
123-112	275 - 300						

Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Anvil dia. (in)	Measurable module
Mechanical counter model							
223-125	0 - 1	0.001	±0.0002	0.00004	0.0002	ø0.787	0.5 - 6
Analog							
123-125	0 - 1	0.001	±0.0002	0.00004	0.0002	ø0.787	0.5 - 6
123-126	1 - 2						
123-127	2 - 3		±0.0003		0.0003		
123-128	3 - 4						

* The measuring discs have carbide tips.
• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.
Note: Root tangent length measurement is not available for some types of gears.

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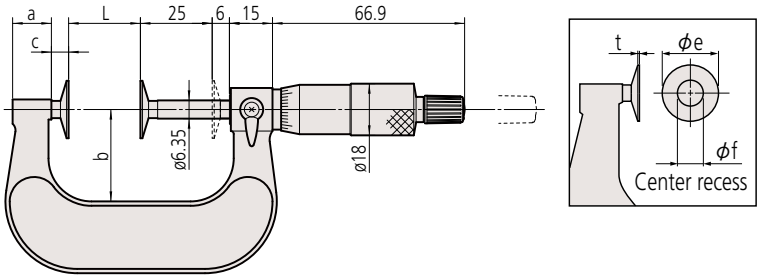
Disc Micrometers
SERIES 223, 123

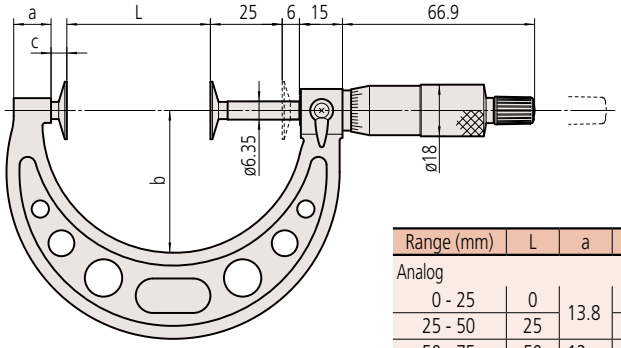
DIMENSIONS

Analog models up to 50 mm measuring range

Unit: mm



Analog models over 50 mm measuring range



Range (mm)	L	a	b	c	e	f	t
Analog							
0 - 25	0	13.8	25	5.7	20	8 (9.8)	0.7 (0.7)
25 - 50	25		32				
50 - 75	50	12	49	5.5			
75 - 100	75	14	63				
100 - 125	100	12	79	6	30	12	1
125 - 150	125	14.5	94				
150 - 175	150	15.2	106				
175 - 200	175	14.5	118				
200 - 225	200	13.5	130				
225 - 250	225		143				
250 - 275	250	14.5	156				
275 - 300	275		169				

Note: Data in ( ) applies to those with carbide-faced disks.

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Gear Tooth Micrometers
SERIES 324 — Interchangeable Ball Anvil/Spindle Tip Type

- This specialized micrometer series measures gear over-pin diameters. Attach optional ball probes to each measuring face before use.
- Determination of the over-pin diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Interchangeable ball anvils/spindle tips for various gear modules (0.5 to 5.25) are optional.

324-251-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Spindle feed error (µm)
With SPC data output			
324-251-30	0 - 25	0.001	3
324-252-30	25 - 50		
324-253-30	50 - 75		
324-254-30	75 - 100		

Inch / Metric

Code No.	Range (in)	Resolution	Spindle feed error (in)
With SPC data output			
324-351-30	0 - 1	0.00005 in/ 0.001 mm	0.00015
324-352-30	1 - 2		
324-353-30	2 - 3		
324-354-30	3 - 4		

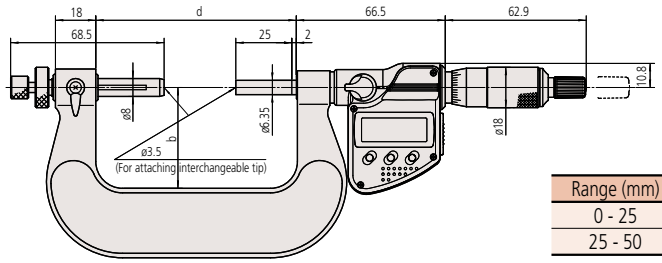
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

Note: For functional details, refer to page 02-7.
Please note that origin setting of these models is by presetting. Optional connection cable is available only for water-proof type (Digimatic model).

DIMENSIONS

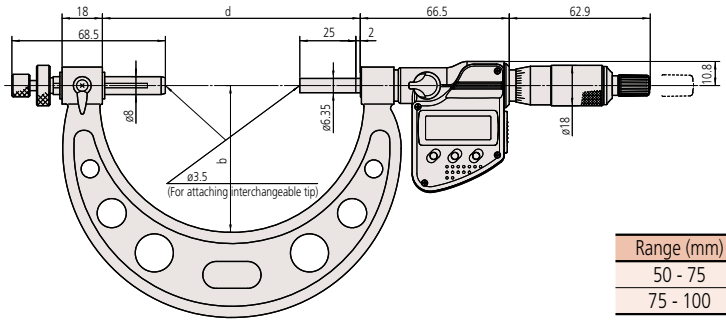
Digimatic models up to 50 mm

Unit: mm



Range (mm)	b	d
0 - 25	32	64
25 - 50	45	89.5

Digimatic models over 50 mm up to 100 mm



Range (mm)	b	d
50 - 75	65	115.1
75 - 100	79	140.1

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Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

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Gear Tooth Micrometers
SERIES 124 — Interchangeable Ball Anvil/Spindle Tip Type

- Intended for making over-pin diameter measurements on gears using precision ball anvils/spindle tips (optional).
- Determination of the over-pin diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Interchangeable ball anvils/spindle tips for various gear modules (0.5 to 5.25) are optional.
- Equipped with Ratchet Stop for constant measuring force.

124-173

Optional Accessories

• Interchangeable ball anvil/spindle tip set

Code No.	Diameter* (mm)	Gear module	Dia. pitch
124-801	0.8	0.5 - 0.55	50
124-802	1.0	0.6 - 0.65	45
124-803	1.191 (3/64 in)	0.7 - 0.8	35 - 30
124-821	1.5	0.9 - 1	28 - 26
124-804	1.588 (1/16 in)	0.9 - 1	28 - 26
124-805	2.0	1.25	22
124-806	2.381 (3/32 in)	1.5	17
124-822	2.5	1.5	17
124-807	3.0	1.75	15
124-808	3.175 (1/8 in)	—	14
124-823	3.5	2	13
124-809	3.969 (5/32 in)	2	13
124-810	4.0	2.25	11
124-824	4.5	2.5	10
124-811	4.763 (3/16 in)	2.5	10
124-812	5.0	2.75	9
124-813	5.556 (7/32 in)	3.0 - 3.25	8
124-814	6.0	3.5	7
124-815	6.35 (1/4 in)	3.75	7
124-816	7.0	4.0	6.5
124-817	7.144 (9/32 in)	4.25	6
124-818	7.938 (5/16 in)	4.5	5.5
124-819	8.0	4.75	5.5
124-820	8.731 (11/32 in)	5.0 - 5.25	5

* 2 mm less for/carbide-tipped type

SPECIFICATIONS

Metric

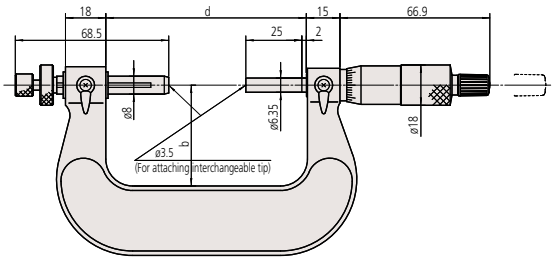
Code No.	Range (mm)	Graduation (mm)	Spindle feed error (µm)
124-173	0 - 25	0.01	3
124-174	25 - 50		
124-175	50 - 75		
124-176	75 - 100		
124-177	100 - 125		
124-178	125 - 150		
124-179	150 - 175		
124-180	175 - 200		
124-181	200 - 225		
124-182	225 - 250		
124-183	250 - 275		
124-195	275 - 300		

• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm models), Spanner (**301336**), 1 pc.

DIMENSIONS

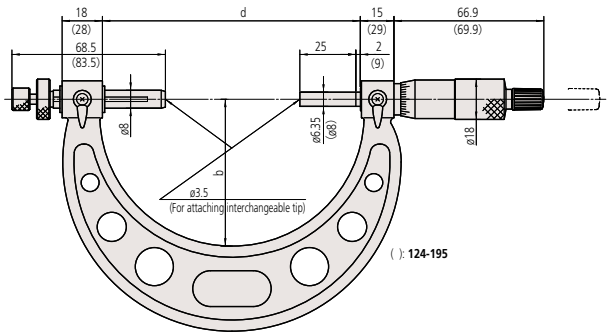
Analog models up to 50 mm

Unit: mm



Range (mm)	b	d
0 - 25	32	64
25 - 50	45	89.5

Analog models over 50 mm up to 300 mm



Range (mm)	b	d
50 - 75	65	115.1
75 - 100	79	140.1
100 - 125	93	165.1
125 - 150	105	190
150 - 175	118	214
175 - 200	131	240
200 - 225	144	265
225 - 250	156	290
250 - 275	169	314
275 - 300	187	352

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Disc Micrometers
SERIES 369 — Non-rotating Spindle Type

- Can be used for making root tangent measurements on spur gears and helical gears.
- Determination of the root tangent length: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Non-rotating spindle eliminates torque on workpiece.
- Measurable range of gear pitch: 0.5 to 6 module.
- Equipped with Ratchet Stop for constant measuring force.

Digimatic
369-250-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Anvil dia. (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Measuring force (N)
With SPC data output							
369-250-30	0 - 25	0.001	ø20	±4	1	4	3 - 8
369-251-30	25 - 50						
369-252-30	50 - 75			±6		6	
369-253-30	75 - 100						

Inch / Metric

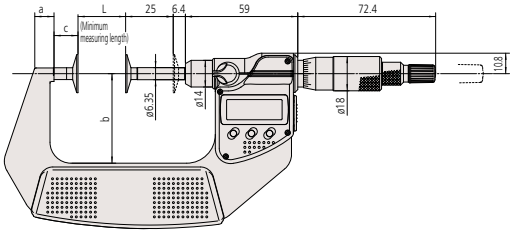
Code No.	Range (in)	Resolution	Anvil dia. (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
With SPC data output							
369-350-30	0 - 1	0.00005 in/ 0.001 mm	ø0.787	±0.0002	0.00004	0.0002	3 - 8
369-351-30	1 - 2						
369-352-30	2 - 3			±0.0003		0.0003	
369-353-30	3 - 4						

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
  Spanner (**301336**), 1 pc.

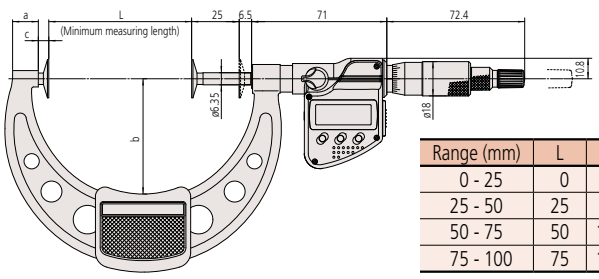
Note 1: For functional details, refer to page 02-7. Please note that these models are not water-proof.
Note 2: Root tangent length measurement is not available for some types of gears.

DIMENSIONS

Digimatic models up to 75 mm Unit: mm



Digimatic models over 75 mm



Range (mm)	L	a	b	c
0 - 25	0	7	32	12.9
25 - 50	25	9.8	47	
50 - 75	50	11.2	60	5.5
75 - 100	75	13.5		

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U-WAVE fit

IP65 ABSOLUTE™

Applicable models: **369-411-20/412-20**

Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

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Disc Micrometers
SERIES 369, 227 — Non-rotating Spindle Type

- Can be used for making root tangent measurements on spur gears and helical gears.
- Determination of the root tangent length: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Non-rotating spindle eliminates torque on workpiece.
- Measurable range of gear pitch: 0.5 to 6 module (**series 227**: 0.4 to 3 module).
- Equipped with Ratchet Stop for constant measuring force.

Quickmike type
369-411-20

SPECIFICATIONS

Metric

	Code No.	Range (mm)	Resolution (mm)	Anvil dia. (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Measuring force (N)
Quickmike type	**369-411-20**	0 - 30	0.001	ø20	±4	1	4	3 - 8
	369-412-20	25 - 55						
Quickmike type adjustable measuring force	**227-221-20**	0 - 15		ø14.3			3	0.5 - 2.5
	227-223-20	0 - 10						2 - 10

Inch / Metric

	Code No.	Range (in)	Resolution	Anvil dia. (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
Quickmike type	**369-421-20**	0 - 1.2	0.00005 in/ 0.001 mm	ø0.787	±0.0002	0.00004	0.0002	3 - 8
	369-422-20	1 - 2.2						

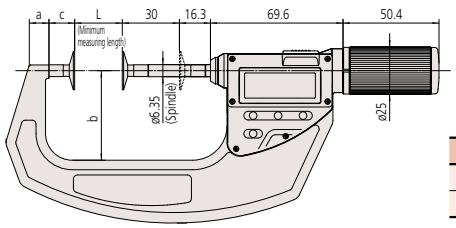
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: Electrostatic capacity absolute sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 10 mm/0 to 15 mm/0 to 30 mm (0 to 1/0 to 1.2 in) models), Screwdriver (**210183**), 1 pc.

Note: Root tangent length measurement is not available for some types of gears.

DIMENSIONS

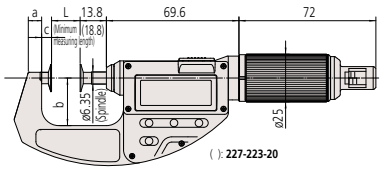
Quickmike type

Unit: mm



Range (mm)	L	a	b	c
0 - 30	0	8.5	36	13.5
25 - 55	25	10.3	47	

Quickmike adjustable measuring force type



Range (mm)	L	a	b	c
0 - 15	0	6.2	25	5.2
0 - 10				

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Disc Micrometers
SERIES 169 — Non-rotating Spindle Type

- Can be used for making root tangent measurements on spur gears and helical gears.
- Determination of the root tangent length: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Non-rotating spindle eliminates torque on workpiece.
- Measurable range of gear pitch: 0.5 to 6 module.
- Equipped with Ratchet Stop for constant measuring force.

169-201-10

SPECIFICATIONS

Metric

	Code No.	Range (mm)	Graduation (mm)	Anvil dia. (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Measuring force (N)
Analog	**169-201-10**	0 - 25	0.01	ø20	±4	1	4	3 - 8
	169-202-10	25 - 50						
	169-205-10	50 - 75			±6		6	
	169-207-10	75 - 100						

Inch

	Code No.	Range (in)	Graduation (in)	Anvil dia. (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring force (N)
Analog	**169-203-10**	0 - 1	0.001	ø0.787	±0.0002	0.00004	0.0002	3 - 8
	169-204-10	1 - 2						
	169-206-10	2 - 3			±0.0003		0.0003	
	169-208-10	3 - 4						

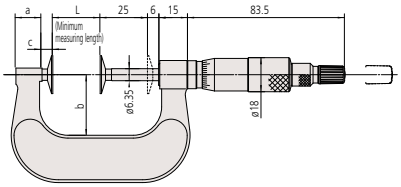
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
  Spanner (**301336**), 1 pc.

Note: Root tangent length measurement is not available for some types of gears.

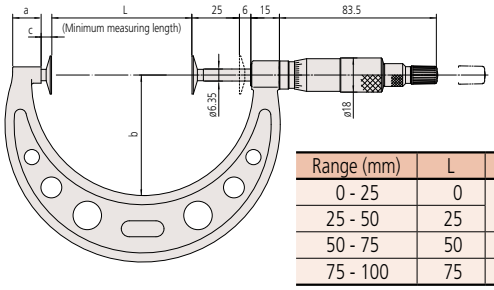
DIMENSIONS

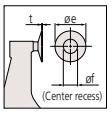
Analog models up to 50 mm

Unit: mm



Analog models over 50 mm





Range (mm)	L	a	b	c	e	f	t
0 - 25	0	13.8	25	5.7	20	8	0.7
25 - 50	25		32				
50 - 75	50	12	49	5.5			
75 - 100	75	14	63				

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Paper Thickness Micrometers
SERIES 169 — Non-rotating Spindle Type

Measurement example

- For paper thickness measurement.
- Non-rotating spindle eliminates torque on workpiece.
- Anvil diameter: ø14.3 mm (without recess)
- Equipped with Ratchet Stop for constant measuring force. (8.02±0.8 N)

169-101-10

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)
169-101-10	0 - 25	0.01	±4	1	3

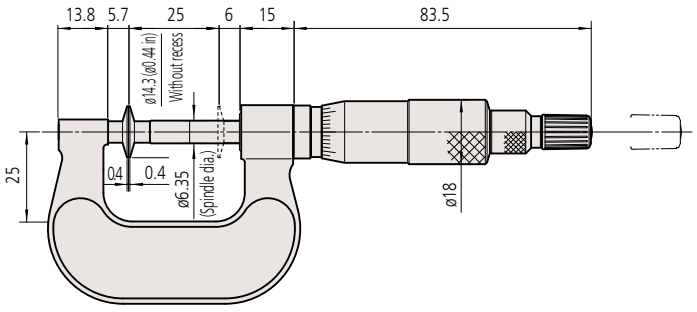
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
169-103-10	0 - 1	0.001	±0.0002	0.00004	0.00015

• Standard Accessories: Spanner (**301336**), 1 pc.

DIMENSIONS

Unit: mm



( ): inch model

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Sheet Metal Micrometers SERIES 389

- The U-shaped micrometer is ideal for measuring the thickness of sheet metal at a considerable distance from the edge.
- IP65 water/dust protection (except for **389-514** and **389-714**).
- Measuring faces: Carbide tipped
- Profile of measuring faces: Flat-Flat, Spherical-Flat and Spherical-Spherical.
- Equipped with Ratchet Stop for constant measuring force.

389-251-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Throat depth (mm)	Measuring surfaces
Digimatic							
389-251-30	0 - 25	0.001	±4	0.6	3	150	F-F
389-261-30							S-F
389-271-30							S-S
389-514			±5	1		300*	F-F
389-252-30	25 - 50		±4	0.6		150	F-F
389-262-30							S-F
389-272-30							S-S

Inch / Metric

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Throat depth (in)	Measuring surfaces
Digimatic							
389-351-30	0 - 1	0.00005 in/ 0.001 mm	±0.0002	0.000024	0.00012	6	F-F
389-361-30							S-F
389-371-30							S-S
389-714			±0.00025	0.00004		12*	F-F
389-352-30	1 - 2		±0.0002	0.000024		6	F-F
389-362-30							S-F
389-372-30							S-S

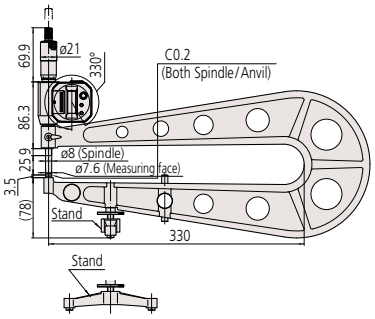
- Power source for **389-2XX**, **3XX**: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Power source for **389-514**, **714**: SR44 battery (2 pcs.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use (for **389-2XX**, **3XX**), Approx. 1.8 years under normal use (for **389-514**, **714**)
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
  Spanner (**301336**), 1 pc. (for **389-2XX**, **3XX**)
  Spanner (**200154**), 1 pc. (for **389-514**, **714**)

* Models with a 300 mm (12 in) throat are equipped with a stand for convenience of measurement in the horizontal orientation as standard.

Note 1: For functional details of **389-251-30**/**389-252-30**/**389-351-30**/**389-352-30** refer to page 02-7.
Note 2: For functional details of **389-514**/**389-714** refer to page 02-9.
Note 3: In spherical-flat anvil type micrometers, the measuring face on the anvil side is spherical.

DIMENSIONS

389-514 Unit: mm



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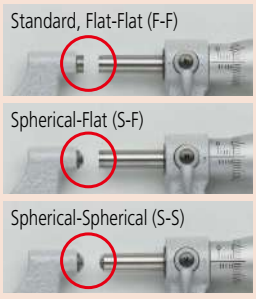
Applicable models: **series 389**
(excluding **389-514** and **389-714**)

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m): for **series 389**
05CZA663	B	Connection cable (2 m): for **series 389**
04AZB512	CR	Connection cable (1 m): for **389-514**
04AZB513	CR	Connection cable (2 m): for **389-514**
959149	C	Connection cable (1 m): for **389-514**
959150	C	Connection cable (2 m): for **389-514**
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm): for **series 389**
02AZE140B	B	Connection cable for **U-WAVE-T**: for **series 389** For foot switch
264-622	IP67	**U-WAVE-TM***
264-623	Buzzer	**U-WAVE-TM***
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM**/**TMB***

* Cannot be used with **389-514**.



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Sheet Metal Micrometers SERIES 118

- The U-shaped micrometer is ideal for measuring the thickness of sheet metal at a considerable distance from the edge.
- Measuring faces: Carbide tipped
- Profile of measuring faces: Flat-Flat, Spherical-Flat and Spherical-Spherical.
- Equipped with Ratchet Stop for constant measuring force.

118-102

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Throat depth (mm)	Measuring surfaces
Analog							
118-101	0 - 25	0.01	±4	0.6	3	100	F-F
118-102							
118-114						150	S-F
118-118							S-S
118-103			±5	1		300*	F-F
118-110	25 - 50		±4	0.6		150	
118-126							S-S

Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Throat depth (in)	Measuring surfaces
Analog							
118-129	0 - 1	0.0001	±0.0002	0.000024	0.00012	6	F-F
118-116							S-F
118-120							S-S
118-107		0.001	±0.00025	0.00004		12*	F-F
118-112	1 - 2		±0.0002	0.000024		6	

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
  Spanner (**200877**), 1 pc. (for **118-1XX**)
  Spanner (**200154**), 1 pc. (for **118-103**/**107**)

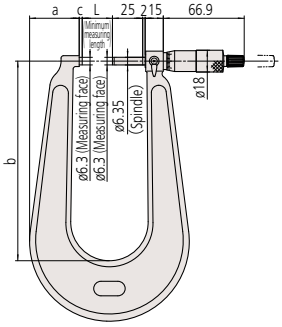
* Models with a 300 mm (12 in) throat are equipped with a stand for convenience of measurement in the horizontal orientation as standard.

Note: In spherical-flat anvil type micrometers, the measuring face on the anvil side is spherical.

DIMENSIONS

Analog models

Unit: mm



Code No.	L	a	b	c
118-101	0	34	110	2.5
118-102				
118-114		43	160	
118-118				
118-110	25	41	165	

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Sheet Metal Micrometer SERIES 119

- Large diameter dial model enables easy and quick measurement of sheet metal thickness.
- Adjustable anvil.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

119-202

Measurement example

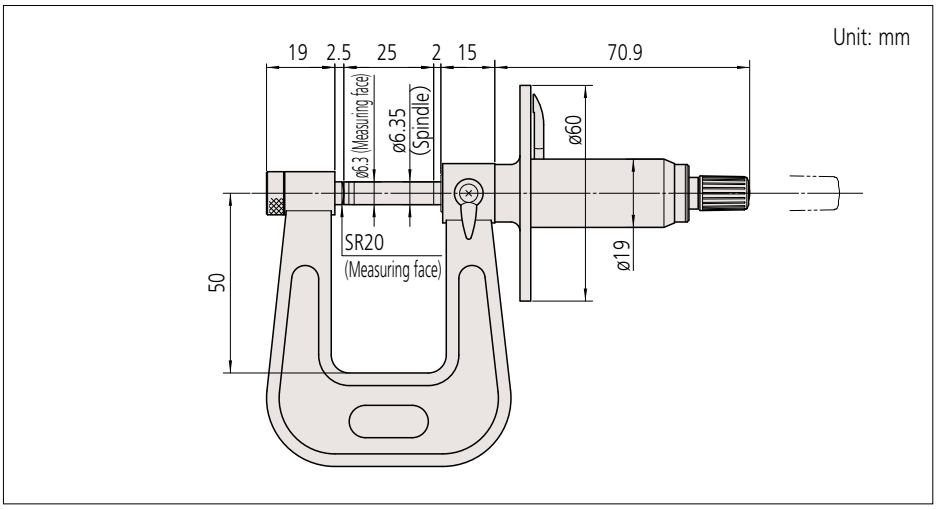
SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Throat depth (mm)
119-202	0 - 25	0.01	±4	50

- Standard Accessories: Spanner (**200168**), 1 pc.

DIMENSIONS



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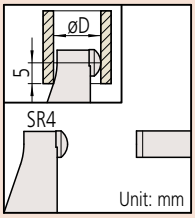
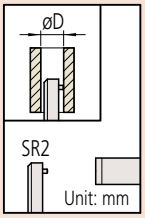
Applicable models: **series 395**

Measurement example



Other than **115-101**



115-101

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable for **series 395** (1 m)
05CZA663	B	Connection cable for **series 395** (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

Tube Micrometers SERIES 395, 115, 295

- The spherical anvil-type micrometer is convenient for measuring cylindrical workpieces. The spherical anvil comes into contact with a workpiece at a point instead of a surface area, thus increasing measurement accuracy.
- IP65 water/dust protection (**series 395**).
- Equipped with Ratchet Stop for constant measuring force.

395-251-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	øD (mm)	Flatness (µm)
Digimatic					
395-251-30	0 - 25	0.001	±2	ø15	0.3
395-252-30	25 - 50				
395-253-30	50 - 75			ø19	
395-254-30	75 - 100		±3	ø20	

Inch/Metric

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	øD (in)	Flatness (in)
Digimatic					
395-351-30	0 - 1	0.00005 in/ 0.001 mm	±0.0001	ø0.59	0.000012
395-352-30	1 - 2				
395-353-30	2 - 3			ø0.75	
395-354-30	3 - 4		±0.00015	ø0.79	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

Note: For functional details , refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

115-115

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	øD (mm)	Flatness (µm)
Analog					
115-101	0 - 15	0.01	±3	ø5.5	0.6
115-115	0 - 25			ø10	
115-116	25 - 50			ø11	
115-117	50 - 75			ø17	
115-118	75 - 100		±4	ø18	
Mechanical counter model					
295-115	0 - 25	0.01	±3	ø10	0.6

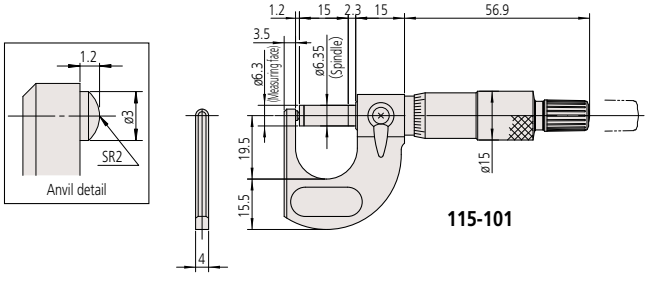
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	øD (in)	Flatness (in)
Analog					
115-153	0 - 1	0.0001	±0.00015	ø0.40	0.000024
Mechanical counter model					
295-153	0 - 1	0.0001	±0.00015	ø0.40	0.000024

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 15 mm/0 to 25 mm (0 to 1 in) models) Spanner (**200168**), 1 pc. (for **115-101**), Spanner (**301336**), 1 pc. (for models other than **115-101**)

DIMENSIONS

Unit: mm



115-101

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Mitutoyo

Tube Micrometers
SERIES 395, 115, 295 — Spherical Anvil and Spindle Type

- Designed to measure workpieces with concave-concave surfaces. The spherical anvil and spindle respectively come into contact with the workpiece at a point, thus increasing measurement accuracy.
- IP65 water/dust protection (**series 395**).
- Equipped with Ratchet Stop for constant measuring force.

395-271-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	øD (mm)
Digimatic				
395-271-30	0 - 25	0.001	±2	ø15
395-272-30	25 - 50			
395-273-30	50 - 75			ø19
395-274-30	75 - 100		±3	ø20

Inch / Metric

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	øD (in)
Digimatic				
395-371-30	0 - 1	0.00005 in / 0.001 mm	±0.0001	ø0.59
395-372-30	1 - 2			
395-373-30	2 - 3			ø0.75
395-374-30	3 - 4		±0.00015	ø0.79

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

115-215

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	øD (mm)
Analog				
115-201	0 - 15	0.01	±3	ø5.5
115-215	0 - 25			ø10
115-216	25 - 50			ø11
115-217	50 - 75			ø17
115-218	75 - 100		±4	ø18
Mechanical counter model				
295-215	0 - 25	0.01	±3	ø10

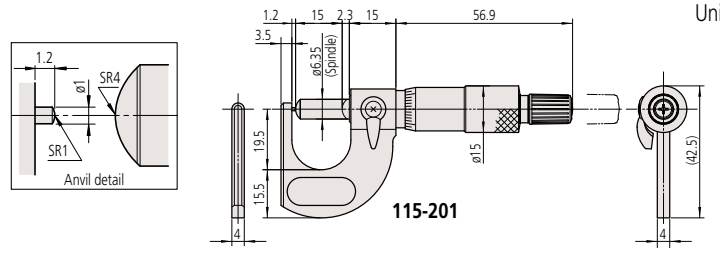
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	øD (in)
Analog				
115-253	0 - 1	0.0001	±0.00015	ø0.40
115-242	1 - 2	0.001		ø0.44
115-243	2 - 3			ø0.67
Mechanical counter model				
295-253	0 - 1	0.0001	±0.00015	ø0.40

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 15 mm/0 to 25 mm (0 to 1 in) models) Spanner (**200168**), 1 pc. (for **115-201**), Spanner (**301336**), 1 pc. (for models other than **115-201**)

DIMENSIONS

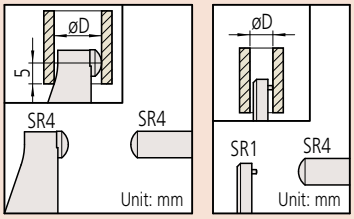
Unit: mm



MeasurLink® ENABLED Data Management Software by Mitutoyo
U-WAVE fit
IP65
Dust- and Water-Protected
TÜVRheinland CERTIFIED www.tuv.com ID 0000040191

Applicable models: **series 395**

Measurement example



Other than **115-201** **115-201**

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable for **series 395** (1 m)
05CZA663	B	Connection cable for **series 395** (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

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U-WAVE fit

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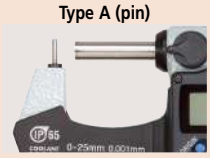
Dust- and Water-Protected

TÜVRheinland CERTIFIED www.tuv.com ID 0000040191

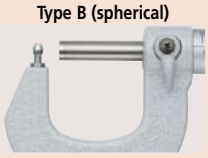
Applicable models: **series 395**

Measurement example

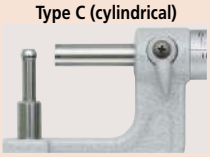
Type A (pin)



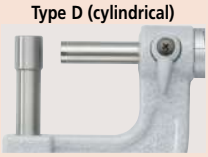
Type B (spherical)



Type C (cylindrical)



Type D (cylindrical)

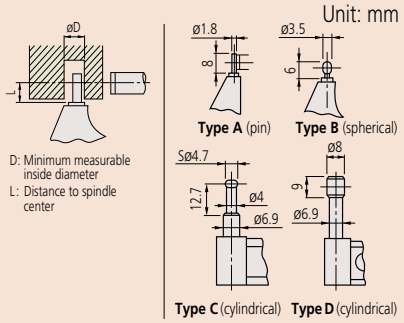


Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable for **series 395** (1 m)
05CZA663	B	Connection cable for **series 395** (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

Anvil shape

Unit: mm



Anvil	øD	L
Type A	ø2.0	4
Type B	ø3.6	
Type C	ø4.8	12
Type D	ø8.2	22

Tube Micrometers
SERIES 395, 115, 295 — Spherical and Cylindrical Anvil Type

- Designed to measure the wall thickness of various tubing.
- Spindle face: Carbide tipped
- IP65 water/dust protection (**series 395**).
- Equipped with Ratchet Stop for constant measuring force.

395-261-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Remarks
Digimatic				
395-261-30	0 - 25	0.001	±3	Type A
395-262-30				Type B
395-263-30				Type C
395-264-30				Type D

Inch / Metric

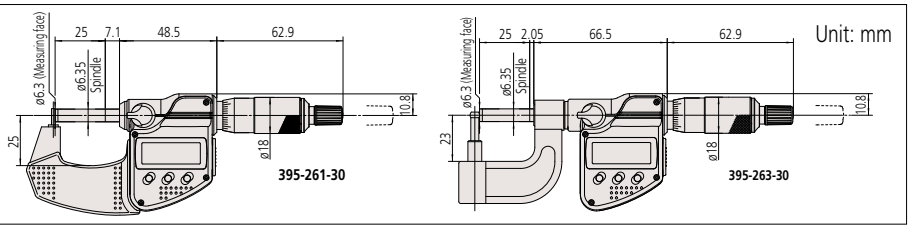
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Remarks
Digimatic				
395-362-30	0 - 1	0.00005 in/ 0.001 mm	±0.00015	Type B
395-363-30				Type C
395-364-30				Type D

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Spanner (**301336**), 1 pc.

Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

DIMENSIONS

Unit: mm



SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Remarks
Analog				
115-302	0 - 25	0.01	±3	Type A
115-308				Type B
115-303	25 - 50			Type A
115-309				Type B
115-315	0 - 25			Type C
115-316				Type D

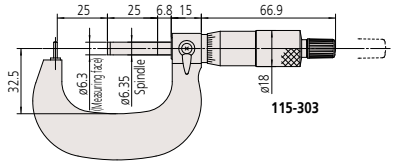
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Remarks
Analog				
115-305	0 - 1	0.001	±0.00015	Type A
115-313		0.0001		Type C
115-314				Type D

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models) Spanner (**301336**), 1 pc.

DIMENSIONS

Unit: mm



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Mitutoyo

Spline Micrometers SERIES 331

- The anvil and spindle have a small diameter for measuring splined shafts, slots and keyways.
- IP65 water/dust protection.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

331-251-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Measuring face
Digimatic						
331-251-30	0 - 25	0.001	±2	0.3	2	Type A
331-252-30	25 - 50					
331-253-30	50 - 75					
331-254-30*	75 - 100		±3		3	
331-261-30	0 - 25		±2		2	Type B
331-262-30	25 - 50					
331-263-30	50 - 75					
331-264-30*	75 - 100		±3		3	

Inch / Metric

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring face
Digimatic						
331-351-30	0 - 1	0.00005 in/ 0.001 mm	±0.0001	0.000012	0.00008	Type A
331-352-30	1 - 2					
331-353-30	2 - 3					
331-354-30	3 - 4		±0.00015		0.00012	
331-361-30	0 - 1		±0.0001		0.00008	Type B
331-362-30	1 - 2					
331-363-30	2 - 3					
331-364-30	3 - 4		±0.00015		0.00012	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

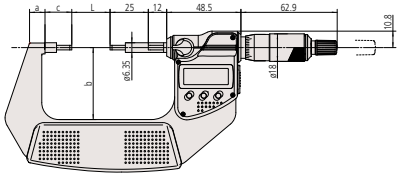
* Made to order.

Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

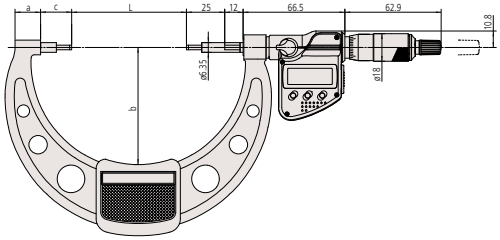
DIMENSIONS

Unit: mm

Digimatic models
Models up to 75 mm measuring range



Digimatic models
Models over 75 mm measuring range



Code No.	L	a	b	c
331-251-30	0	7.3	32.5	17.5
331-261-30				
331-252-30	25	10.1	47	
331-262-30				
331-253-30	50	11.5	60	
331-263-30				
331-254-30	75	16.7	76	20.3
331-264-30				

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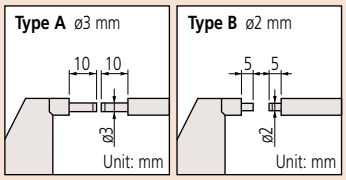
Measurement example



Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

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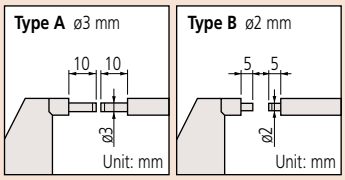
Spline Micrometers
SERIES 111, 131

- The anvil and spindle have a small diameter for measuring splined shafts, slots and keyways.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

111-115



SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)	Measuring face
Analog						
111-215	0 - 25	0.01	±3	0.3	2	Type B
111-115	0 - 25					Type A
111-116	25 - 50					
111-117	50 - 75					
111-118	75 - 100		±4		3	
111-119	100 - 125					
111-120	125 - 150					
111-121	150 - 175		±5		4	
111-122	175 - 200					
111-123	200 - 225					
111-124	225 - 250		±6			
111-125	250 - 275					
111-126	270 - 300				5	
Mechanical counter model						
131-115	0 - 25	0.01	±3	0.3	2	Type A

Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)	Measuring face
Analog						
111-166	0 - 1	0.0001	±0.00015	0.000012	0.00008	Type A
131-166			±0.000015			

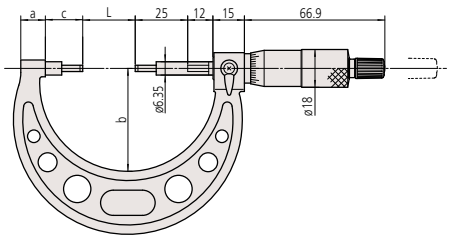
• Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

DIMENSIONS

Analog models

Unit: mm

Models up to 300 mm measuring range



Code No.	L	a	b	c
111-215	0	10	38	17.5
111-115				
111-116	25	12	49	
111-117	50	14	60	
111-118	75	16.7	79	20.3
111-119	100	18.8	94	20.7
111-120	125	19.1	106	21.1
111-121	150	18.2	118	21.3
111-122	175	16.8	130	21.7
111-123	200	18	143	20.5
111-124	225		156	21.5
111-125	250		169	
111-126	275		181	

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Point Micrometers SERIES 342

- Pointed spindle and anvil for measuring the web thickness of drills, small grooves, keyways, and other hard-to-reach dimensions.
- The measuring points (carbide tipped) have approximately 0.3 mm radius.
- Measuring faces: Carbide tipped
- IP65 water/dust protection
- Equipped with Ratchet Stop for constant measuring force.

342-251-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Point
Digimatic (With carbide tip)				
342-251-30	0 - 25	0.001	±2	15°
342-252-30	25 - 50			
342-253-30	50 - 75			
342-254-30	75 - 100		±3	
342-261-30	0 - 25		±2	30°
342-262-30	25 - 50			
342-263-30	50 - 75			
342-264-30	75 - 100		±3	

Inch / Metric

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Point
Digimatic (With carbide tip)				
342-351-30	0 - 1	0.00005 in/ 0.001 mm	±0.0001	15°
342-352-30	1 - 2			
342-353-30	2 - 3			
342-354-30	3 - 4		±0.00015	
342-361-30	0 - 1		±0.0001	30°
342-362-30	1 - 2			
342-363-30	2 - 3			
342-364-30	3 - 4		±0.00015	

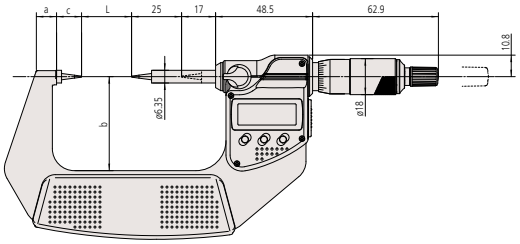
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

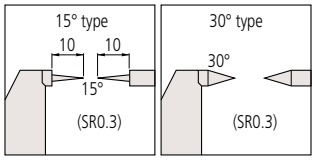
Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

DIMENSIONS

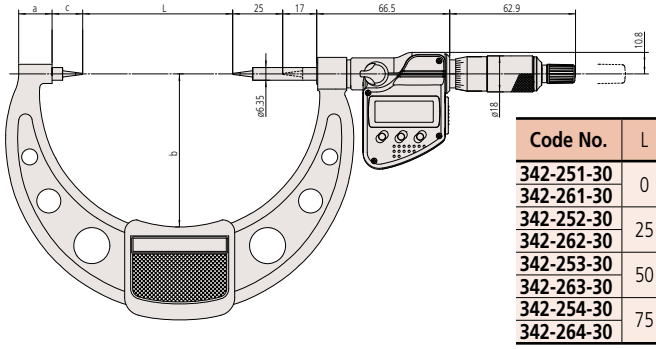
Digimatic models up to 75 mm measuring range

Unit: mm





Digimatic models over 75 mm measuring range



Code No.	L	a	b	c	Frame thickness*
342-251-30	0	7.3	32.5	12.5	(11.2)
342-261-30					
342-252-30	25	10.1	47		(12.8)
342-262-30					
342-253-30	50	11.5	60		
342-263-30					
342-254-30	75	16.7	76	15.3	(20.8)
342-264-30					

* Digimatic type: thickness over heat shield

MeasurLink® ENABLED Data Management Software by Mitutoyo

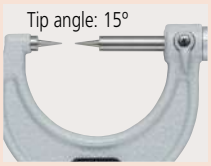
U-WAVE fit

IP65

Dust- and Water-Protected

TÜVRheinland CERTIFIED www.tuv.com ID 0000040191

Measurement example



Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

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Point Micrometers SERIES 112, 142

- Pointed spindle and anvil for measuring the web thickness of drills, small grooves, keyways, and other hard-to-reach dimensions.
- The measuring points have approximately 0.3 mm radius.
- Carbide measuring tips are also available.
- Equipped with Ratchet Stop for constant measuring force.

112-201

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Point
Analog				
112-153	0 - 25	0.01	±3	15°
112-154	25 - 50			
112-155	50 - 75			
112-156	75 - 100		±4	
112-201	0 - 25		±3	30°
112-202	25 - 50			
112-203	50 - 75			
112-204	75 - 100		±4	
Analog (With carbide tip)				
112-165	0 - 25	0.01	±3	15°
112-166	25 - 50			
112-167	50 - 75			
112-168	75 - 100		±4	
112-213	0 - 25		±3	30°
112-214	25 - 50			
112-215	50 - 75			
112-216	75 - 100		±4	
Mechanical counter model				
142-153	0 - 25	0.01	±3	15°
142-201				30°

Inch

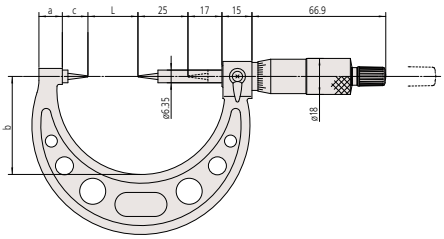
Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Point
Analog				
112-177	0 - 1	0.001	±0.00015	15°
112-178	1 - 2			
112-225	0 - 1			30°
112-226	1 - 2			
Analog (With carbide tip)				
112-189	0 - 1		±0.00015	15°
112-190	1 - 2			
112-191	2 - 3			
112-237	0 - 1			30°
112-238	1 - 2			
Mechanical counter model				
142-177	0 - 1		±0.00015	15°
142-225				30°

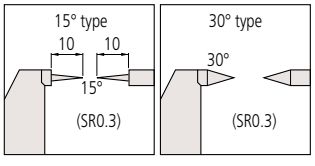
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

DIMENSIONS

Analog models measuring range

Unit: mm





Code No.	L	a	b	c	Frame thickness
112-153	0	10	38	12.5	(9)
112-154	25	12	49		(10)
112-155	50	14	60		(11)
112-156	75	16.7	79	15.3	(13)

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MeasurLink ENABLED Data Management Software by Mitutoyo

U-WAVE fit

V-Anvil Micrometers SERIES 314 — 3 Flutes

- Measures the outside diameter of cutting tools (such as taps, reamers, end mills) with an odd number of flutes.
- Measures pitch diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

314-251-30

SPECIFICATIONS

Metric For 3-flute cutting tools

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Anvil	Remarks
Digimatic					
314-251-30	1 - 15	0.001	±4	60°	w/groove
314-252-30	10 - 25				
314-253-30	25 - 40		±5		—
314-261-30	1 - 15		±4		—
314-262-30	10 - 25				—

Inch / Metric For 3-flute cutting tools

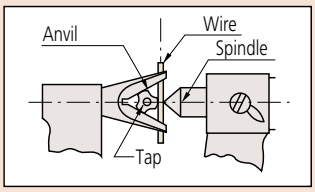
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Anvil	Remarks
Digimatic					
314-351-30	0.05 - 0.6	0.00005 in / 0.001 mm	±0.0002	60°	w/groove
314-352-30	0.4 - 1				
314-353-30	1 - 1.6		±0.00025		—
314-361-30	0.05 - 0.6		±0.0002		—
314-362-30	0.4 - 1				—

- Flatness: 0.3 µm/0.000012 in (Spindle), 1.0 µm/0.00004 in (Anvil)
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Spanner (**301336**), 1 pc. (for maximum measuring range up to 40 mm (1.6 in)), Setting Standards for V-Anvil Micrometer

Note: For functional details, refer to page 02-7.
The models above use the same connection cables and connection units as our IP rated micrometers but these digital V-Anvil Micrometers are not IP rated.

Measurement example

Pitch diameter measurement of tap by single-wire method



Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

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V-Anvil Micrometers
SERIES 114 — 3 Flutes and 5 Flutes

- Measures the outside diameter of cutting tools (such as taps, reamers, end mills) with an odd number of flutes.
- Measures pitch diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

114-121

SPECIFICATIONS

Metric For 3-flute cutting tools

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Anvil	Remarks
Analog Anvil, Spindle (With carbide tip)					
114-204	2.3 - 25	0.01	±4	60°	—
Analog Spindle (With carbide tip)					
114-101	1 - 15	0.01	±4	60°	w/groove
114-102	10 - 25				
114-103	25 - 40		±5		—
114-104	40 - 55		±6		—
114-105	55 - 70				—
114-106	70 - 85		±7		—
114-107	85 - 100				—
114-108	100 - 115		±8		—
114-109	115 - 130		±9		—
114-110	130 - 145				—
114-161	1 - 15		±4		—
114-162	10 - 25				—

Inch For 3-flute cutting tools

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Anvil	Remarks
Analog Anvil, Spindle (With carbide tip)					
114-202	0.09 - 1	0.0001	±0.0002	60°	—
Analog Spindle (With carbide tip)					
114-163	0.05 - 0.6	0.001	±0.0002	60°	—
114-113	1 - 1.6		±0.00025		—
114-114	1.6 - 2.2		±0.0003		—

Metric For 5-flute cutting tools

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Anvil	Remarks
Analog Anvil, Spindle (With carbide tip)					
114-137	2.3 - 25	0.01	±4	108°	—
Analog Spindle (With carbide tip)					
114-121	5 - 25	0.01	±4	108°	w/groove
114-122	25 - 45		±5		—
114-123	45 - 65		±6		—
114-124	65 - 85		±7		—
114-165	5 - 25		±4		—

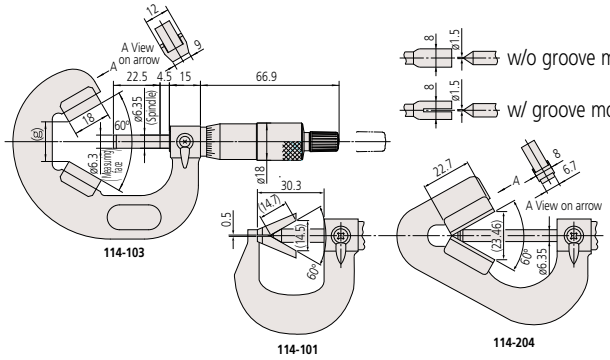
Inch For 5-flute cutting tools

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Anvil	Remarks
Analog Anvil,Spindle (With carbide tip)					
114-135	0.09 - 1	0.0001	±0.0002	108°	—

- Flatness: 0.6 µm/0.000024 in (Spindle), 1.3 µm/0.000052 in (Anvil)
- Standard accessories: Spanner (**301336**), 1 pc. (for **114-204**, **202**, **101**, **102**, **103**, **104**, **161**, **162**, **163**, **113**, **114**, **137**, **135**, **121**, **122**, **165**)
  Spanner (**200877**), 1 pc. (for **114-105**, **106**, **107**, **108**, **109**, **110**, **123**, **124**)
  Setting Standards for V-Anvil Micrometer

DIMENSIONS

Unit: mm



For 3-flute cutting tools

Range (mm)	(g)
10 - 25	6.2
25 - 40	19.14
40 - 55	32.13
55 - 70	45.12
70 - 85	58.11

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Blade Micrometers
SERIES 422 — Non-rotating Spindle Type

- The anvil and the spindle have a blade for measuring the groove diameter of shafts, keyways and other hard-to-reach areas.
- Carbide-tipped measuring faces are available.
- Non-rotating spindle type.
- Equipped with Ratchet Stop for constant measuring force.

Digimatic
422-230-30

Quickmike type
422-411-20

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Parallelism (µm)	Remark
Digimatic					
422-230-30	0 - 25	0.001	±3	3	Type A
422-231-30	25 - 50				
422-232-30	50 - 75				
422-233-30	75 - 100		±4	4	
422-260-30	0 - 25		±3	3	Type B
422-261-30	25 - 50				
422-270-30	0 - 25				Type C
422-271-30					Type D

Inch / Metric

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Remark
Digimatic					
422-330-30	0 - 1	0.00005 in/ 0.001 mm	±0.00015	0.00015	Type A
422-331-30	1 - 2				
422-332-30	2 - 3				
422-333-30	3 - 4		±0.0002	0.0002	
422-360-30	0 - 1		±0.00015	0.00015	Type B
422-361-30	1 - 2				
422-370-30	0 - 1				Type C
422-371-30					Type D

Metric Quickmike type

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Parallelism (µm)	Remark
Digimatic					
422-411-20	0 - 30	0.001	±3	3	Type A
422-412-20	25 - 55				

Inch / Metric Quickmike type

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Remark
Digimatic					
422-421-20	0 - 1.2	0.00005 in/ 0.001 mm	±0.00015	0.00015	Type A
422-422-20	1 - 2.2				

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use (for **422-2XX**, **3XX**)
  Approx. 5 years under normal use (for **422-4XX**)
- Position detection method: Electromagnetic rotary sensor (for **422-2XX**, **3XX**)
  Electrostatic capacity absolute sensor (for **422-4XX**)
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm/0 to 30 mm (0 to 1 in/0 to 1.2 in) models), Spanner (**301336**), 1 pc. (for **422-2XX**, **3XX**)

Note 1: For functional details, refer to page 02-7. Please note that these models are not water-proof.
Note 2: A heat shield is provided with Digimatic models as standard.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

U-WAVE fit

ABSOLUTE™

IP65

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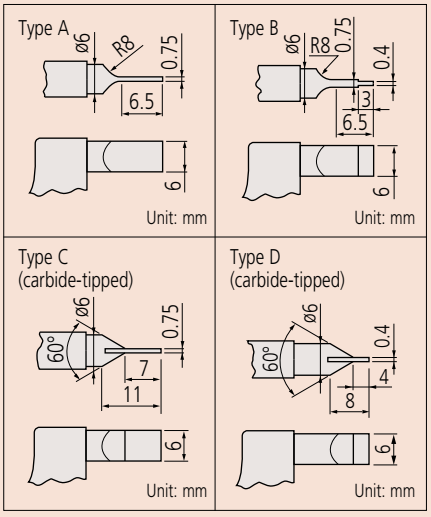
Applicable models:
series 422 Quickmike type

Measurement example

Type and dimensions



Optional Accessories

Code No.	Type	Description
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM***
264-623	Buzzer	**U-WAVE-TM***
264-626	IP67	**U-WAVE-TMB***
264-627	Buzzer	**U-WAVE-TMB***
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB***

* Only **series 422** (except for Quickmike type) can be attached.

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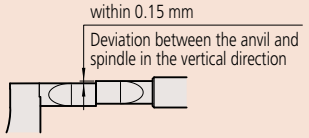
Deviation between the anvil and spindle in the vertical direction

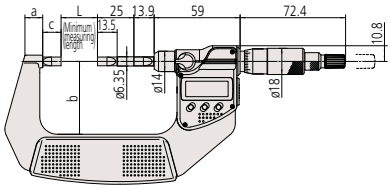


Deviation of 0.15 mm or less* is guaranteed between the anvil and spindle in the vertical direction.

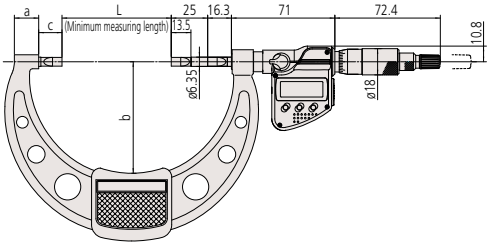
* When the measuring range is 0 to 25 mm

DIMENSIONS

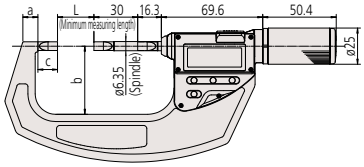
Digimatic models up to 50 mm measuring range



Digimatic models over 50 mm to 100 mm measuring range Unit: mm



Quickmike type



Code No.	L	a	b	C
422-230-30	0	11	31	12.5
422-231-30	25	12.2	50	12.6
422-232-30	50	14.6	57	13
422-233-30	75	16.7	76	16
422-260-30	0	11	31	12.5
422-261-30	25	12.2	50	12.6
422-270-30	0	11	31	12.5
422-271-30				
422-411-20		8.5	36	13.5
422-412-20	25	10.3	47	

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Blade Micrometers
SERIES 122 — Non-rotating Spindle Type

- The anvil and the spindle have a blade for measuring the groove diameter of shafts, keyways and other hard-to-reach areas.
- Non-rotating spindle type.
- Carbide-tipped measuring faces are available.
- Equipped with Ratchet Stop for constant measuring force.

122-101-10

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Parallelism (µm)	Remark
Analog					
122-101-10	0 - 25	0.01	±3	3	Type A
122-102-10	25 - 50				
122-103-10	50 - 75				
122-104-10	75 - 100		±4	4	
122-105-10	100 - 125			5	
122-106-10	125 - 150				
122-107-10	150 - 175		±5		
122-108-10	175 - 200				
122-109-10	200 - 225			6	
122-110-10	225 - 250		±6		
122-115-10	250 - 275				
122-116-10	275 - 300				
122-111-10	0 - 25		±3	3	Type B
122-112-10	25 - 50				
Analog (With carbide tip)					
122-161-10	0 - 25	0.01	±3	3	Type C
122-162-10	25 - 50				
122-141-10	0 - 25				Type D
122-142-10	25 - 50				

Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Remark
Analog					
122-125-10	0 - 1	0.0001	±0.00015	0.00015	Type A
122-126-10	1 - 2				
122-127-10	2 - 3				
122-128-10	3 - 4		±0.0002	0.0002	
122-135-10	0 - 1		±0.00015	0.00015	Type B
122-151-10					Type D

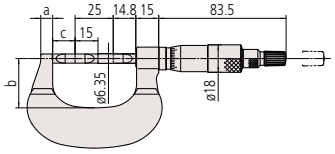
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
  Spanner (**301336**), 1 pc.

Note: A heat shield is provided with **122-125-10**, **122-135-10**, **122-151-10** as standard.

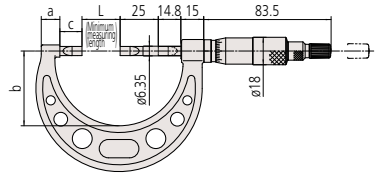
DIMENSIONS

Analog models up to 25 mm measuring range

Unit: mm



Analog models over 25 mm to 300 mm measuring range



Code No.	L	a	b	C
122-101-10	0	7.8	32	15
122-102-10	25	12.2	49	14.5
122-103-10	50	14.6	60	
122-104-10	75	16.7	79	17.5
122-105-10	100	18.8	94	17.9
122-106-10	125	19.1	106	18.3
122-107-10	150	18.2	118	18.5
122-108-10	175	16.8	130	18.9
122-109-10	200	18	143	17.7
122-110-10	225		156	18.7
122-115-10	250		169	
122-116-10	275		181	

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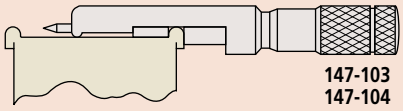
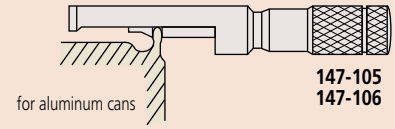
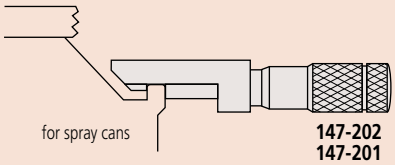
Measurement example



147-103
147-104



147-105
147-106



147-202
147-201

Can Seam Micrometers SERIES 147

- Measures the width, height, and depth of can seams.

147-103

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Remarks
147-103*	0 - 13	0.01	±3	—
147-105				for aluminum cans
147-202				for spray cans

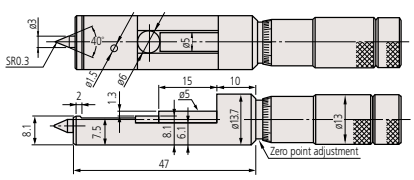
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Remarks
147-104*	0 - 0.5	0.001	±0.00015	—
147-106				for aluminum cans
147-201				for spray cans

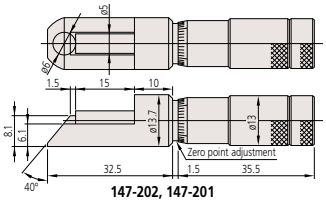
• Standard Accessories: Spanner (**200168**), 1 pc. Spanner (**202863**), 1 pc.
* For depth measurements up to 5 mm.

DIMENSIONS

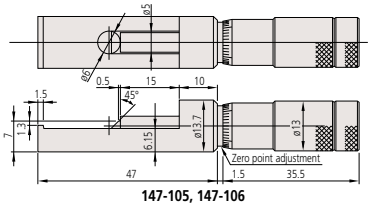
Unit: mm



147-103, 147-104



147-202, 147-201



147-105, 147-106

Hub Micrometers SERIES 147

- Measures hub thickness and shoulders inside a bore.
- Measuring faces: Carbide tipped
- Equipped with Ratchet Stop for constant measuring force.

147-301

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)
147-301	0 - 25	0.01	±2	0.6	3
147-302	25 - 50				
147-303	50 - 75				
147-304	75 - 100		±3		

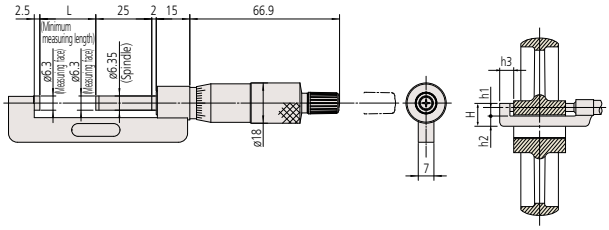
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness (in)	Parallelism (in)
147-351	0 - 1	0.001	±0.0001	0.000024	0.00012
147-352	1 - 2				
147-353	2 - 3				
147-354	3 - 4		±0.00015		

• Standard Accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**301336**), 1 pc.

DIMENSIONS

Unit: mm



Range (mm)	h_1	h_2	h_3	H	L
0 - 25	6	8.5	13.5	17.5	0
25 - 50	6.5	11	14	20.5	25
50 - 75			13		50
75 - 100					75

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Crimp Height Micrometers SERIES 342

- Measures the height of crimp contacts.
- Point spindle
- IP65 water/dust protection (Digimatic model).
- Equipped with Ratchet Stop for constant measuring force.

Digimatic
342-271-30

Quickmike type
342-451-20

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)
Digimatic			
342-271-30	0 - 20	0.001	±3
Quickmike			
342-451-20	0 - 15	0.001	±3

Inch/Metric

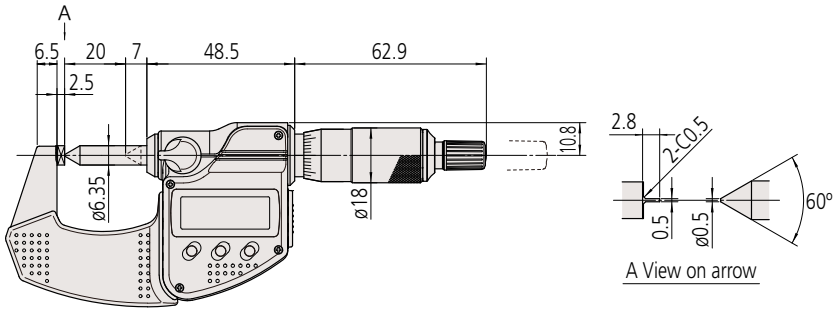
Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)
Digimatic			
342-371-30	0 - 0.8	0.00005 in/ 0.001 mm	±0.00015

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use (for **342-271-30**/**342-371-30**)
  Approx. 5 years under normal use (for **342-451-20**)
- Position detection method: Electromagnetic rotary sensor (for **342-271-30**/**342-371-30**)
  Electrostatic capacity absolute sensor (for **342-451-20**)
- Standard accessories: Spanner (**301336**), 1 pc. (except for **342-451-20**)

Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

DIMENSIONS

342-271-30 Unit: mm



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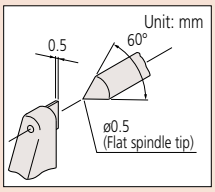
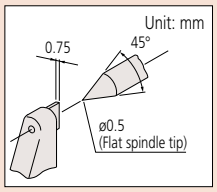
www.tuv.com ID 0000063013

Measurement example

Anvil and spindle tip detail



342-271-30, 342-371-30



342-451-20

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM***
264-623	Buzzer	**U-WAVE-TM***
264-626	IP67	**U-WAVE-TMB***
264-627	Buzzer	**U-WAVE-TMB***
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB***

* **342-271-30** and **342-371-30** can be attached.
Not available for **342-451-20**.

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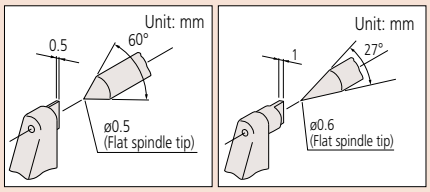
Crimp Height Micrometers SERIES 112,142

- Measures the height of crimp contacts.
- Point spindle
- Equipped with Ratchet Stop for constant measuring force.

112-401

Anvil and spindle tip detail



112-401 **142-402, 142-403**

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)
Mechanical counter model			
142-402	0 - 25	0.01	±3
142-403		0.001	

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)
Analog			
112-401	0 - 25	0.01	±3

- Standard accessories: Spanner (**301336**), 1 pc.

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Mitutoyo

"Uni-Mike"
SERIES 317, 117 — Interchangeable Anvil Type

- Measures tubing thickness, shoulder-edge distance, rivet head height, etc., with interchangeable anvils (flat anvil, rod anvil, V-anvil).
- IP65 water/dust protection (**series 317**).
- Equipped with Ratchet Stop for constant measuring force.

317-251-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)
Digimatic					
317-251-30	0 - 25	0.001	3	0.6 (Spindle face)/ 2 (Anvil face)	3
317-252-30	25 - 50				

Inch/Metric

Code No.	Range (in)	Resolution	Spindle feed error (in)	Flatness (in)	Parallelism (in)
Digimatic					
317-351-30	0 - 1	0.00005 in/0.001 mm	0.00015	0.000024 (Spindle face)/ 0.00008 (Anvil face)	0.00012
317-352-30	1 - 2				

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic rotary sensor
- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
  Spanner (**301336**), 1 pc.

Note: For functional details, refer to page 02-7.
Optional connection cable is available only for water-proof type (Digimatic model).

117-101

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)
Analog					
117-101	0 - 25	0.01	3	0.6 (Spindle face)/ 2 (Anvil face)	3
117-102	25 - 50				

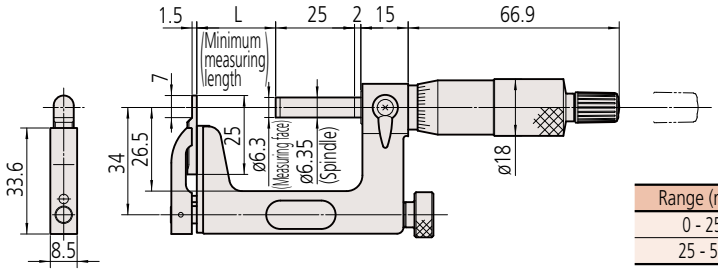
Inch

Code No.	Range (in)	Graduation (in)	Spindle feed error (in)	Flatness (in)	Parallelism (in)
Analog					
117-107	0 - 1	0.0001	0.00015	0.000024 (Spindle face)/ 0.00008 (Anvil face)	0.00012
117-108	1 - 2				

- Standard accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models), Spanner (**200877**), 1 pc.

DIMENSIONS

Unit: mm



Range (mm)	L
0 - 25	0
25 - 50	25

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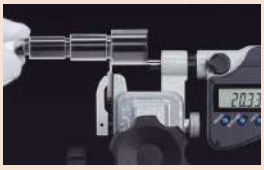
Applicable models: **series 317**

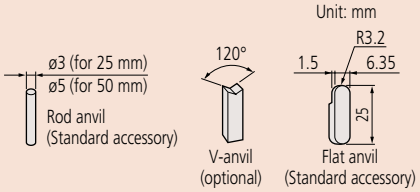
Measurement example



Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

Unit: mm



Code No.	Item
201216	Flat anvil (standard accessory)
201217	Rod anvil (standard accessory for **117-101/117-107/317-251-30/317-351-30**)
201379	Rod anvil (standard accessory for **117-102/117-108/317-252-30/317-352-30**)
201218	V-anvil (optional)
950758	Round Base for **series 117**, for 0-25 mm ø58×14.2 mm (optional)

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Limit Micrometers
SERIES 113

Measurement example

- Can be used as a Go/No-go gage by setting the upper and lower limits.
- Measuring faces: Carbide tipped

113-102

SPECIFICATIONS

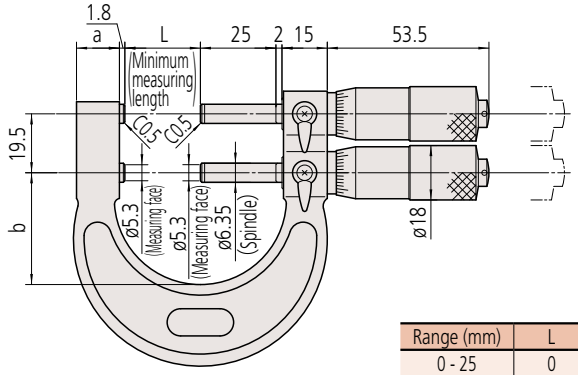
Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Flatness (µm)	Parallelism (µm)
113-102	0 - 25	0.01	±3	0.6	3
113-103	25 - 50				

- Standard Accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm and 0 to 1 in models)
  Spanner (**200877**), 1 pc.

DIMENSIONS

Unit: mm



Range (mm)	L	a	b
0 - 25	0	14.2	23
25 - 50	25		37

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Indicating Micrometers SERIES 510

- The micrometer with a built-in dial indicator enables accurate Go/No-go judgement without interruption. Pushing the retractable anvil button causes the anvil and pointer to move, enabling speedy measurements.
- Easy to use when operating one-handed due to retractable anvil.
- In the 25 mm measuring range, models are available that offer left or right positioning of the anvil-retraction button.
- Greatly improved accuracy: indication error and graduation of 1 µm.
- IP protection level: 54, coolant-splash resistant during grinding process.

510-121

SPECIFICATIONS

Metric

Code No.	Range (mm)	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)	Dispersion of indication (µm)	Dial indication accuracy (µm)	Indicating range (mm)	Graduation (mm)	Dial graduation (mm)	Measuring force (N)	Anvil retraction button	Mass (g)
510-121	0 - 25	3	0.3	0.6	0.4	1	±0.06	0.001	0.001	5 - 10	Right side	520

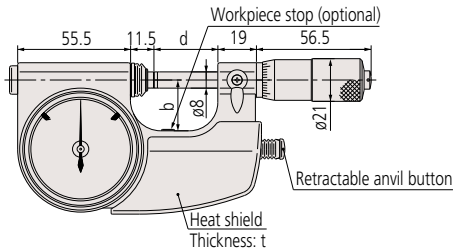
Inch

Code No.	Range (in)	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)	Graduation (in)	Dial graduation (in)	Measuring force (N)	Anvil retraction button	Mass (g)
510-131	0 - 1	0.00015	0.000012	0.000024	0.00002	0.00005	±0.0023	0.0001	0.00005	5 - 10	Right side	520

- Standard Accessories: Spanner (**200154**), 1 pc.

DIMENSIONS

Up to 25 mm measuring range (anvil-retraction button on the right side) Unit: mm



Range (mm)	b	d	t
0 - 25	25	31.5	16.4

IP54

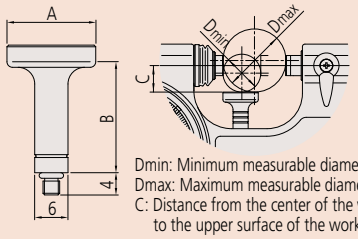
Measurement example

Workpiece stop (optional)

- Produces more stable measurement.
- Three types are available to suit workpieces of different sizes.

Unit: mm

Range	A	B
Workpiece stop A **04AZA124**	ø16	23
Workpiece stop B **04AZA125**	ø14	20.5
Workpiece stop C **04AZA126**	ø14	15



Dmin: Minimum measurable diameter
Dmax: Maximum measurable diameter
C: Distance from the center of the workpiece to the upper surface of the workpiece stop

- Code No. **510-121**, **510-141**, **510-131**, **510-151** Unit: mm

	Dmin	Dmax	C
Workpiece stop A	N/A	N/A	N/A
Workpiece stop B	4	16	5.0
Workpiece stop C	15	25	10.5

- **510-122** and **510-132**

	Dmin	Dmax	C
Workpiece stop A	25	37	15.5
Workpiece stop B	30	42	18.0
Workpiece stop C	41	50	23.5

- **510-123** and **510-133**

	Dmin	Dmax	C
Workpiece stop A	50	61	27.5
Workpiece stop B	54	66	30.0
Workpiece stop C	65	75	35.5

- **510-124** and **510-134**

	Dmin	Dmax	C
Workpiece stop A	75	87	40.5
Workpiece stop B	80	92	43.0
Workpiece stop C	91	100	48.2

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Measurement example

510-141

SPECIFICATIONS

Metric

Code No.	Range (mm)	Spindle feed error (µm)	Flatness (µm)	Parallelism (µm)	Dispersion of indication (µm)	Dial indication accuracy (µm)	Indicating range (mm)	Graduation (mm)	Dial graduation (mm)	Measuring force (N)	Anvil retraction button	Mass (g)
510-141	0 - 25	3	0.3	0.6	0.4	1	±0.06	0.001	0.001	5 - 10	Left side	530
510-122	25 - 50											670
510-123	50 - 75			1								820
510-124	75 - 100											970

Inch

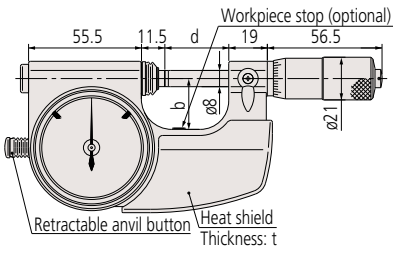
Code No.	Range (in)	Spindle feed error (in)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)	Graduation (in)	Dial graduation (in)	Measuring force (N)	Anvil retraction button	Mass (g)
510-151	0 - 1	0.00015	0.000012	0.000024	0.00002	0.00005	±0.0023	0.0001	0.00005	5 - 10	Left side	530
510-132	1 - 2											670
510-133	2 - 3			0.00004								820
510-134	3 - 4											970

• Standard Accessories: Setting standard, 1 pc. (except for measuring range 0 to 25 mm (0 to 1 in) models)
Spanner (**200154**), 1 pc.

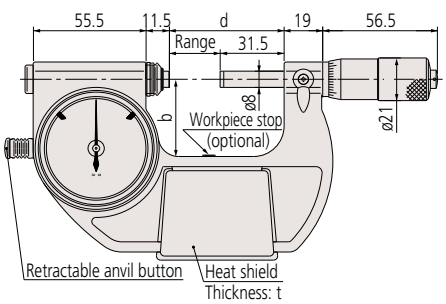
DIMENSIONS

Up to 25 mm measuring range
(anvil-retraction button on the left side)

Unit: mm



Over 25 mm measuring range
(anvil-retraction button on the left side)



Range (mm)	b	d	t
0 - 25	25	31.5	16.4
25 - 50	38	56.5	16
50 - 75	50	81.5	
75 - 100	63	106.5	

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Dial Snap Meters
SERIES 523

- The snap meter with a built-in dial indicator enables accurate Go/No-go judgement without interruption. Pushing the retractable anvil button causes the anvil and pointer to move, enabling speedy measuremets.
- Designed for use with a stand to enable a more stable measurement.
- Greatly improved accuracy: indication accuracy and graduation of 1 µm.
- IP protection level: 54, coolant-splash resistant during grinding process.
- Hard-coated crystal: enhanced oil and scratch resistance.

IP54

Measurement example

523-121

SPECIFICATIONS

Metric

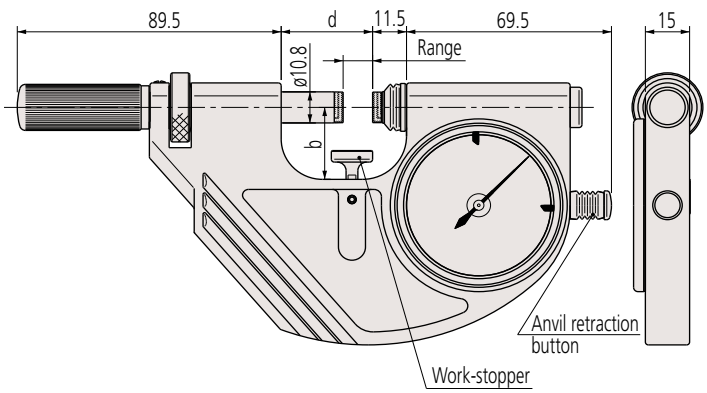
Code No.	Range (mm)	Dial graduation (mm)	Measuring force (N)	Flatness (µm)	Parallelism (µm)	Dispersion of indication (µm)	Dial indication accuracy (µm)	Indicating range (mm)	Mass (g)
523-121	0 - 25	0.001	5 - 10	0.3	0.6	0.4	1	±0.06	740
523-122	25 - 50								840
523-123	50 - 75				1				950
523-124	75 - 100								1080

Inch

Code No.	Range (in)	Dial graduation (in)	Measuring force (N)	Flatness (in)	Parallelism (in)	Dispersion of indication (in)	Dial indication accuracy (in)	Indicating range (in)	Mass (g)
523-131	0 - 1	0.00005	5 - 10	0.000012	0.000024	0.00002	0.00005	±0.0023	740
523-132	1 - 2								840
523-133	2 - 3				0.00004				950
523-134	3 - 4								1080

DIMENSIONS

Unit: mm



Range (mm)	b	d
0 - 25	25	31
25 - 50	35	56
50 - 75	47	81
75 - 100	60	106

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Snap Meters
SERIES 523

- The snap meter with an external indicator enables accurate Go/No-go judgement without interruption. Pushing the retractable anvil button causes the anvil and pointer to move, enabling speedy measuremets.
- Select your preferred indicator. The measurement result can be externally output using an indicator with an output function.
- Measuring faces: Carbide tipped

523-141
(Indicator: optional)

Mounting example

ABS Digimatic Indicator

Linear Gage and counter

Typical indicators used with gage

- ID-C (0.0005 mm): **543-700B**
- LGF-L (0.0001 mm): **542-192** & Counter **542-075** & Conversion plug **21HZA195**

SPECIFICATIONS

Metric

Code No.	Range (mm)	Anvil movement (mm)	Measuring force* (N)	Repeatability of indication (µm)	Flatness (µm)	Parallelism (µm)	Mass (g)
523-141	0 - 25	2	5 - 10	0.4	0.3	0.6	710
523-142	25 - 50						810
523-143	50 - 75					1	920
523-144	75 - 100						1050

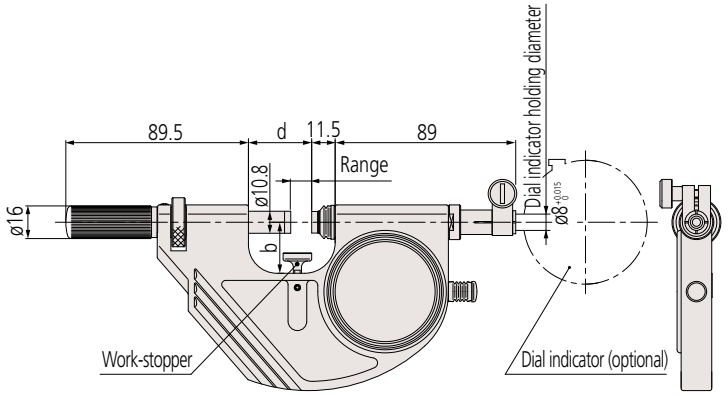
Inch

Code No.	Range (in)	Anvil movement (in)	Measuring force* (N)	Repeatability of indication (in)	Flatness (in)	Parallelism (in)	Mass (g)
523-151	0 - 1	0.078	5 - 10	0.00002	0.000012	0.000024	710
523-152	1 - 2						810
523-153	2 - 3					0.00004	920
523-154	3 - 4						1050

* Measuring force before an indicator is mounted.
Measured at the position where the anvil is retracted by 1 mm from the free position without installing the indicator.

DIMENSIONS

Unit: mm



Range (mm)	b	d
0 - 25	25	31
25 - 50	35	56
50 - 75	47	81
75 - 100	60	106

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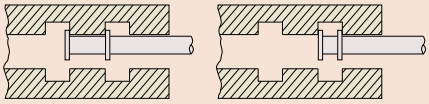
Groove Micrometers
SERIES 146

- Flanged spindle and anvil for measuring width and location of grooves inside bores and tubes.
- Two-directional ratchet stop.
- For OD (except for 0 - 25 mm) and ID measurements, a master gage is required for adjusting the reference point.
- Non-rotating spindle.

146-221

Measurement example



SPECIFICATIONS

Metric

Code No.	Range Inside (mm)	Range Outside (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Parallelism (µm)	Flange (mm)
146-221	1.6 - 26.5	0 - 25	0.01	±10	10	ø6.35
146-222						ø12.7
146-223	26.5 - 51.5	25 - 50				
146-224	51.5 - 76.5	50 - 75				
146-225	76.5 - 101.5	75 - 100				

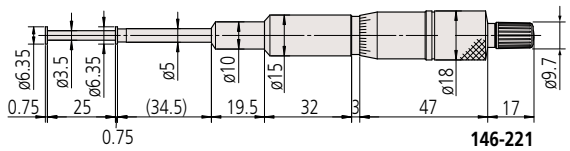
Inch

Code No.	Range Inside (in)	Range Outside (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Parallelism (in)	Flange (in)
146-231	0.055 - 1.05	0 - 1	0.001	±0.0004	0.0004	ø0.25
146-232						ø0.5
146-233	1.05 - 2.05	1 - 2				
146-234	2.05 - 3.05	2 - 3				
146-235	3.05 - 4.05	3 - 4				

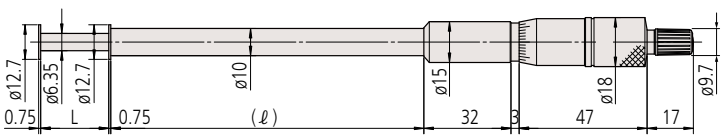
- Standard accessories: Spanner (**301336**), 1 pc.

DIMENSIONS

Unit: mm



146-221



146-222, 146-223, 146-224, 146-225

L	(ℓ)
25	(115)
50	(90)
75	(65)
100	(40)

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QUICKmini SERIES 700

- Lightweight and palm-sized.
- Highly suitable for quick dimensional inspection of small, thin and delicate objects.

700-119-30

Measurement example

Functions

ABS measurement function:
after a data is displayed, next measurement can be performed without zero-setting. Also, the ABS origin point can be changed with ORIGIN switch.
INC measurement function:
clears the displayed data at any point. The comparative measurement can be easily performed.
Low battery alarm:
notifies that the battery is wearing down with "B" mark before becoming immeasurable. Thus, the timing for battery replacement can be confirmed in advance.

Typical applications:

- Measurement of small workpieces:
Pearl, jewel, engine tappet shim, screws.
- Measurement of thin workpieces:
Printing paper, polyethylene bags, sheet material, noodles and other food products, medium substrate, foil, thin plate, filter cloth and other medical supplies.
- Measurement of thin lines and bars: Fishing line, dental reamers, spaghetti, drill for PCBs, wiring.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Accuracy* (mm)	Maximum response speed	Measuring force (N)	Mass (g)
700-119-30	0 - 12	0.01	±0.02	Unlimited	2 or less	100

Inch / Metric

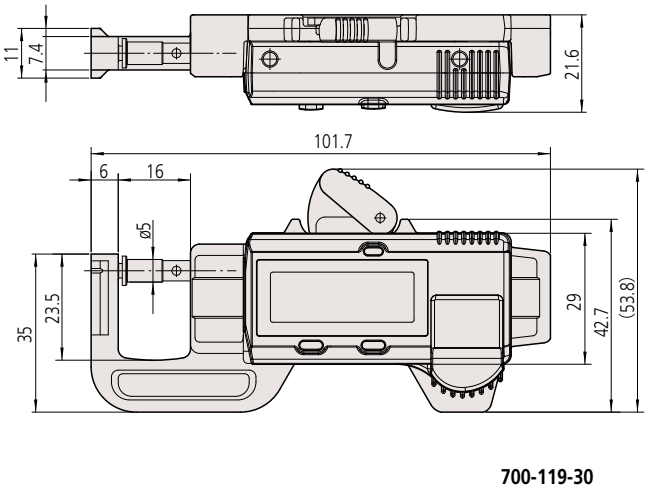
Code No.	Range (in)	Resolution	Accuracy* (in)	Maximum response speed	Measuring force (N)	Mass (g)
700-118-30	0 - 0.5	0.0005 in/0.01 mm	±0.001	Unlimited	2 or less	100

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use

* Excluding quantizing error of ±1 count

DIMENSIONS

Unit: mm



700-119-30

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Telescoping Gage Set
SERIES 155

- The tools are for comparing and measuring the diameters of extremely small holes or the widths of narrow grooves that are hard to measure with the other measuring instruments.
- A spring-loaded plunger expands within a bore (or groove) and is locked in place allowing diameter measurements (or width) with an outside micrometer after extraction.

155-905

Typical application

SPECIFICATIONS

Metric

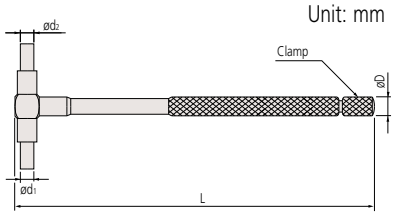
Code No.	Range (mm)
6-gage Set	
155-905	8 - 150
Gages included	
155-127	8 - 12.7
155-128	12.7 - 19
155-129	19 - 32
155-130	32 - 54
155-131	54 - 90
155-132	90 - 150
5-gage Set	
155-904	0.5 - 6
Gages included	
155-122	0.5 - 0.75
155-123	0.75 - 1.25
155-124	1.25 - 2.125
155-125	2.125 - 3.5
155-126	3.5 - 6

Inch

Code No.	Range (in)
6-gage Set	
155-903	0.313 - 6
Gages included	
155-121	0.313 - 0.5
155-122	0.5 - 0.75
155-123	0.75 - 1.25
155-124	1.25 - 2.125
155-125	2.125 - 3.5
155-126	3.5 - 6
4-gage Set	
155-907	0.313 - 2.125
Gages included	
155-121	0.313 - 0.5
155-122	0.5 - 0.75
155-123	0.75 - 1.25
155-124	1.25 - 2.125

DIMENSIONS

Unit: mm



Range (mm)	L	øD	ød1	ød2
8 - 12.7	110	5	4	3
12.7 - 19		5.5	5	3.5
19 - 32				
32 - 54	150	8	7.5	6
54 - 90				
90 - 150				

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Optical Parallels
SERIES 157

Typical application

- Designed to inspect parallelism and flatness of measuring faces of micrometers. For details, refer to "Quick Guide to Precision Measuring Instruments" on page 13-9.
- Each set consists of 4 sizes to enable testing parallelism at quarter-turn positions of the micrometer spindle.

157-903

SPECIFICATIONS

Metric

Code No.	Range of micrometer to be checked (mm)	Sizes of parallels included in set (mm)	Diameter (mm)	Flatness (μm)	Parallelism (μm)	Remarks (mm)
157-903	0 - 25	12.00, 12.12, 12.25, 12.37	ø30	0.1	0.2	For 25
157-904	25 - 50	25.00, 25.12, 25.25, 25.37				For 50

Inch

Code No.	Range of micrometer to be checked (in)	Sizes of parallels included in set (in)	Diameter (mm)	Flatness (μm)	Parallelism (μm)	Remarks (mm)
157-901	0 - 1	0.5000, 0.5062, 0.5125, 0.5187	ø30	0.1	0.2	For 25
157-902	1 - 2	1.0000, 1.0062, 1.0125, 1.0187				For 50

Note: Also available individually, using the following Code No.

Metric

Code No.	Thickness (mm)
157-101	12.00
157-102	12.12
157-103	12.25
157-104	12.37

Metric

Code No.	Thickness (mm)
157-105	25.00
157-106	25.12
157-107	25.25
157-108	25.37

Inch

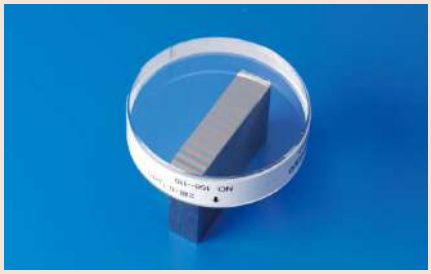
Code No.	Thickness (in)
157-109	0.5000
157-110	0.5062
157-111	0.5125
157-112	0.5187

Inch

Code No.	Thickness (in)
157-113	1.0000
157-114	1.0062
157-115	1.0125
157-116	1.0187

Optical Flats
SERIES 158

Typical application



- Used for inspecting the flatness of measuring faces with high accuracy. For details, refer to "Quick Guide to Precision Measuring Instruments" on page 13-9.

158-118

SPECIFICATIONS

Metric

Code No.	Thickness (mm)	Diameter (mm)	Flatness grade (μm)
158-117	12	45	0.2
158-118			0.1
158-119	15	60	0.2
158-120			0.1

Inch

Code No.	Thickness (in)	Diameter (in)	Flatness grade (in)
158-121	0.5	1.8	0.000008
158-122			0.000004
158-123	0.6	2.4	0.000008
158-124			0.000004

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Setting Standards for Outside Micrometers SERIES 167

- Used for setting the zero point on outside micrometers.

167-108

Typical application

SPECIFICATIONS and DIMENSIONS

167-101 to **167-103**
167-141 to **167-143**

Unit: mm

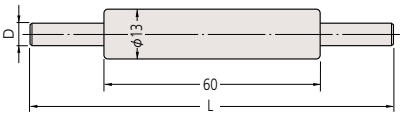
Metric

Code No.	Length <L> (mm)	Accuracy (µm)	Parallelism (µm)	Flatness (µm)	ℓ (mm)	Diameter <D> (mm)
167-101	25	±1.5	2.0	0.3	18	6.35
167-102	50	±2.0			40	
167-103	75	±2.5				

Inch

Code No.	Length <L> (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter <D> (in)
167-141	1	±0.00005	0.00008	0.000012	18	0.25
167-142	2	±0.0001			40	
167-143	3	±0.0001				

167-104 to **167-107**
167-144 to **167-147**



Unit: mm

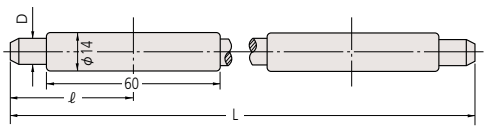
Metric

Code No.	Length <L> (mm)	Accuracy (µm)	Parallelism (µm)	Flatness (µm)	Diameter <D> (mm)
167-104	100	±3	2.0	0.3	7.9
167-105	125	±3.5			
167-106	150	±4			
167-107	175	±4.5			

Inch

Code No.	Length <L> (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	Diameter <D> (in)
167-144	4	±0.0001	0.00008	0.000012	0.31
167-145	5	±0.00015			
167-146	6				
167-147	7				

167-108 to **167-119**
167-148 to **167-159**



Unit: mm

Metric

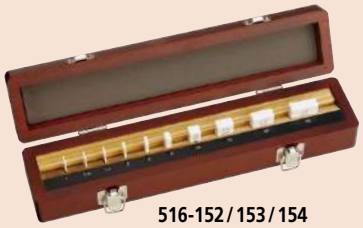
Code No.	Length <L> (mm)	Accuracy (µm)	Parallelism (µm)	Flatness (µm)	ℓ (mm)	Diameter <D> (mm)
167-108	200	±5.0	2.0	0.3	47	9.4
167-109	225	±5.5				
167-110	250	±6.0			52	
167-111	275	±6.5			57	
167-112	300	±7			64	
167-113	325	±7.5			69	
167-114	350	±8			74	
167-115	375	±8.5			80	
167-116	400	±9			85	
167-117	425	±9.5			90	
167-118	450	±10			95	
167-119	475	±10.5			101	

Inch

Code No.	Length <L> (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter <D> (in)
167-148	8	±0.00015	0.00008	0.000012	47	0.37
167-149	9	±0.0002				
167-150	10	±0.0002			52	
167-151	11	±0.0002			57	
167-152	12	±0.00025			64	
167-153	13	±0.00025			69	
167-154	14	±0.00025			74	
167-155	15	±0.00025			80	
167-156	16	±0.00025			85	
167-157	17	±0.00025			90	
167-158	18	±0.00025			95	
167-159	19	±0.0003			101	

Micrometer Inspection Gauge Block Set

Refer to page 01-13 for details.



516-152 / 153 / 154

Micro Checker (holder only)
516-607

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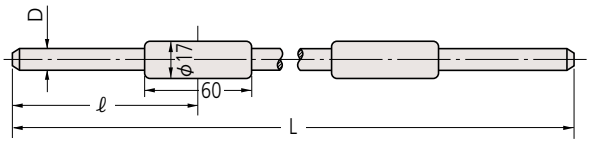
Setting Standards for Outside Micrometers SERIES 167

167-120 to **167-404**
167-160 to **167-180**



Unit: mm

Metric

Code No.	Length <L> (mm)	Accuracy (µm)	Parallelism (µm)	Flatness (µm)	ℓ (mm)	Diameter <D> (mm)
167-120	500	±11			106	
167-121	525	±11.5			112	
167-122	550	±12			117	
167-123	575	±12.5			122	
167-124	600	±13			128	
167-125	625	±13.5			133	
167-126	650	±14			138	
167-127	675	±14.5			142	
167-128	700	±15			147	
167-129	725	±15.5			153	
167-130	750	±16			158	
167-131	775	±16.5			164	
167-132	800	±17			170	
167-133	825	±17.5			175	
167-134	850	±18			180	
167-135	875	±18.5			185	
167-136	900	±19			191	
167-137	925	±19.5			196	
167-138	950	±20			201	
167-139	975	±20.5			207	
167-140	1000	±21			211	
167-365	1025	±21.5			217	
167-366	1050	±22			222	
167-367	1075	±22.5			227	
167-368	1100	±23			232	
167-369	1125	±23.5			238	
167-370	1150	±24			243	
167-371	1175	±24.5			248	
167-372	1200	±25			254	
167-373	1225	±25.5			259	
167-374	1250	±26	2.0	0.3	264	11.9
167-375	1275	±26.5			269	
167-376	1300	±27			275	
167-377	1325	±27.5			280	
167-378	1350	±28			285	
167-379	1375	±28.5			291	
167-380	1400	±29			296	
167-381	1425	±29.5			301	
167-382	1450	±30			306	
167-383	1475	±30.5			312	
167-384	1500	±31			317	
167-385	1525	±31.5			322	
167-386	1550	±32			328	
167-387	1575	±32.5			333	
167-388	1600	±33			338	
167-389	1625	±33.5			343	
167-390	1650	±34			349	
167-391	1675	±34.5			354	
167-392	1700	±35			359	
167-393	1725	±35.5			364	
167-394	1750	±36			370	
167-395	1775	±36.5			375	
167-396	1800	±37			380	
167-397	1825	±37.5			386	
167-398	1850	±38			391	
167-399	1875	±38.5			396	
167-400	1900	±39			401	
167-401	1925	±39.5			407	
167-402	1950	±40			412	
167-403	1975	±40.5			417	
167-404	2000	±41			423	

Inch

Code No.	Length <L> (in)	Accuracy (in)	Parallelism (in)	Flatness (in)	ℓ (mm)	Diameter <D> (in)
167-160	20	±0.0003			106	
167-161	21	±0.0003			112	
167-162	22	±0.0003			117	
167-163	23	±0.0003			122	
167-164	24	±0.0003			128	
167-165	25	±0.00035			133	
167-166	26	±0.00035			138	
167-167	27	±0.00035			142	
167-168	28	±0.00035			147	
167-169	29	±0.00035			153	
167-170	30	±0.00035	0.00008	0.000012	158	0.47
167-171	31	±0.00035			164	
167-172	32	±0.00035			170	
167-173	33	±0.00035			175	
167-174	34	±0.00035			180	
167-175	35	±0.00035			185	
167-176	36	±0.00035			191	
167-177	37	±0.0004			196	
167-178	38	±0.0004			201	
167-179	39	±0.0004			207	
167-180	40	±0.0004			211	

Note: Available up to 79 in

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Setting Standards for Screw Thread Micrometers SERIES 167

• Used to set the zero point of screw thread micrometers.

167-264
(60° screw)

Typical application

Metric

Code No.	Length <L> (mm)	Accuracy (µm)
Metric (unified) θ=60°		
167-261	25	±4
167-262	50	±5
167-263	75	±6
167-264	100	±7
167-265	125	±8
167-266	150	±9
167-267	175	±10
167-268	200	±11
167-269	225	±12
167-270	250	±13
167-271	275	±14
Whitworth θ=55°		
167-272	25	±4
167-273	50	±5
167-274	75	±6
167-275	100	±7
167-276	125	±8
167-277	150	±9
167-278	175	±10
167-279	200	±11
167-280	225	±12
167-281	250	±13
167-282	275	±14

Inch

Code No.	Length <L> (in)	Accuracy (in)
Metric (unified) θ=60°		
167-294	1	±0.00015
167-295	2	±0.0002
167-296	3	±0.00025
167-297	4	±0.0003
167-298	5	±0.00035
167-299	6	±0.0004
Whitworth θ=55°		
167-283	1	±0.00015
167-284	2	±0.0002
167-285	3	±0.00025
167-286	4	±0.0003
167-287	5	±0.00035
167-288	6	±0.0004

Setting Standards for V-anvil Micrometers SERIES 167

• Used for setting the zero point of V-anvil micrometers.

167-329

Typical application

Metric

Code No.	Length <L> (mm)	Accuracy (µm)	Type
167-327	5	±2	Plug
167-328	10		
167-329	25		
167-330	40	±3	Ring
167-331	55		
167-332	70		
167-333	85		
167-334	100	±5	
167-335	115		
167-336	130		

Inch

Code No.	Length <L> (in)	Accuracy (in)	Type
167-337	0.2	±0.0001	Plug
167-338	0.4		
167-339	1		
167-340	1.6	±0.00015	Ring

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3-Wire Units
SERIES 313

Measurement example

- Enables pitch diameter measurements of screw threads when attached to the measuring faces of both the spindle and anvil of a micrometer.
- Determination of the pitch diameter: refer to "Quick Guide to Precision Measuring Instruments" on page 13-8.

952141

SPECIFICATIONS

Code No. (One pair) (Support spindle dia.) 6.35 mm (0.25 in)	Wire dia. (mm)	Accuracy of wire diameter (mm)	Pitch		
			Metric thread (mm)	Unified thread (threads per inch)	Whitworth thread (threads per inch)
952131	0.170	±0.002	0.2, 0.25, 0.3	80	—
952132	0.195		0.35	72	—
952133	0.220		0.4	64	—
952134	0.250		0.45	56	60
952135	0.290		0.5	48	48
952136	0.335		0.6	44, 40	40
952137	0.390		0.7	36	36
952138	0.455		0.75, 0.8	32	32
952139	0.530		0.9	28	28, 26
952140	0.620		1.0	24	24, 22
952141	0.725		1.25	20	20, 19, 18
952142	0.895		1.5	18, 16	16
952143	1.100		1.75, 2.0	14, 13, 12	14, 12
952144	1.350		2.5	11, 10	11, 10
952145	1.650		3.0	9, 8	9, 8
952146	2.050		3.5	7	7
952147	2.550		4, 4.5	6	6
952148	3.200		5, 5.5, 6	5, 4.5	5, 4.5

3-Wire Units set

Code No.	Set	Wire dia. (mm)	Support spindle dia. (mm)
313-101	18	0.170 - 3.200	6.35

Note 1: Special-specification 3-wire units with a wire diameter other than those listed above (ø0.15 mm or more) can also be made to order.
Note 2: Due to potential obstruction, the 3-wire unit cannot be used with screws having an external diameter exceeding ø50 mm.

Lubricant for Measuring Tools

- The oil is for maintaining measuring tools.

Note: May not be used for some parts such as the spindle of a dial indicator or Digimatic indicator.

207000
(32 ml)

SPECIFICATIONS

Code No.	Product name	Remarks
207000*	Micrometer oil	Grease (32 ml)

* Not available in certain countries and regions.

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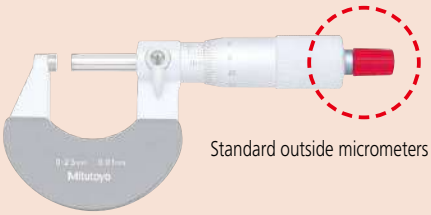
Mitutoyo

Color-Coded Ratchet and Speeder Covers

- Ratchet and speeder covers in a choice of seven colors for use in instrument identification control schemes: red, blue, yellow, green, brown, black and gray.

Ratchet

Speeder



Standard outside micrometers

SPECIFICATIONS

Analog type: 0 to 300 mm

Code No.		Color	Material
Ratchet	Speeder		
04GZA239	**04GAA260**	Gray	Plastic
985056	**301708**	Black	
985061	**301709**	Red	
985081	**301713**	Blue	
985071	**301711**	Yellow	
985076	**301712**	Green	
985066	**301710**	Brown	
950700	—	Gray	Steel

Analog / Digimatic types: 300 to 1000 mm

Code No.		Color	Material
Ratchet	Speeder		
04GZA243	**04GAA260**	Gray	Plastic
—	**301708**	Black	
—	**301709**	Red	
—	**301713**	Blue	
—	**301711**	Yellow	
—	**301712**	Green	
—	**301710**	Brown	
950701	—	Gray	Steel

Digimatic type 0 to 300 mm*

Code No.*		Color	Material
Ratchet	Speeder		
04AZB661	**04GAA260**	Gray	Plastic
04GZA241	**04GAA260**	Gray	
—	**301708**	Black	
—	**301709**	Red	
—	**301713**	Blue	
—	**301711**	Yellow	
—	**301712**	Green	
—	**301710**	Brown	
951588	—	Gray	Steel

* Cannot be used for analog types.

Color-coded speeder covers

SPECIFICATIONS

Code No.	Color
04GAA899	Black
04GAA900	Red
04GAA901	Yellow
04GAA902	Green
04GAA903	Blue
04AAB208	Gray

QuantuMike

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Micrometer Stands SERIES 156

- Dedicated stand for micrometers.
- Designed to allow benchtop use of hand-held micrometers or other gages which have frames suitable for gripping by the clamp. Reduces the influence of temperature changes due to body heat, enabling higher-accuracy measurement.

156-101-10

Typical application

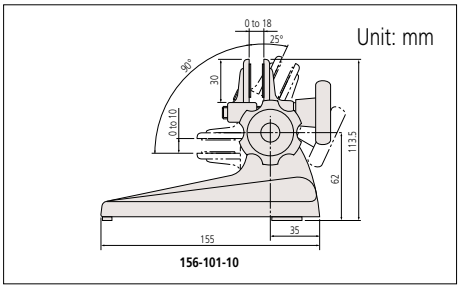
156-101-10

SPECIFICATIONS

Code No.	Measuring range of standard outside micrometer	Remarks
156-101-10	15 - 100 mm (0.6- 4 in)*	Adjustable angle type

* Items that cannot be mounted on these stands (**Code No. 406-253-30**, **323-253-30**, **331-254-30**, **342-254-30**, **342-264-30**, **369-253-30**, **422-232-30**, **422-233-30**, etc.)

DIMENSIONS



156-101-10

156-105-10

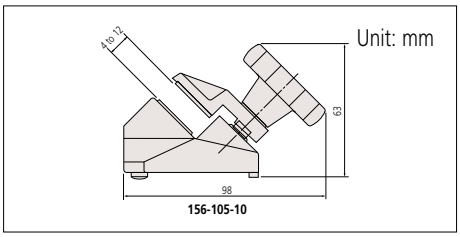
Typical application

156-105-10

SPECIFICATIONS

Code No.	Measuring range of standard outside micrometer	Remarks
156-105-10	25, 50 mm (1, 2 in)	Fixed angle type

DIMENSIONS



156-105-10

Typical application

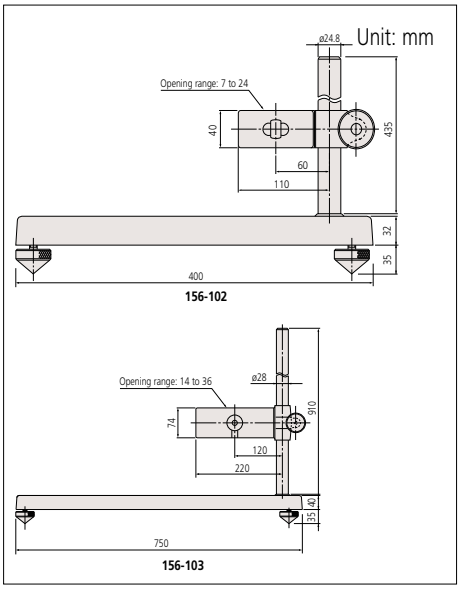
156-102

156-102 156-103

SPECIFICATIONS

Code No.	Measuring range of standard outside micrometer	Remarks
156-102	100 - 300 mm (4 - 12 in)	Vertical type
156-103	325 - 1000 mm (13 - 40 in)	Vertical type

DIMENSIONS



156-102

156-103

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03

Micrometer Heads

Digimatic Micrometer Heads

U-WAVE fit

Measurement Data Wireless Communication System

Bluetooth® communication enables wireless transfer of measurement data from Digimatic micrometers and callipers to PCs, smartphones, tablets and such other devices.

IP65

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level.
(Refer to page 3)

Dust- and Water-Protected
TÜVRheinland CERTIFIED
www.tuv.com ID 0000040191

TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

Micrometer Heads (Fine Spindle Feed of 0.1 mm/rev)

INDEX

Digimatic Micrometer Heads (Digital display)

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Digimatic Micrometer Heads ····· 03-4

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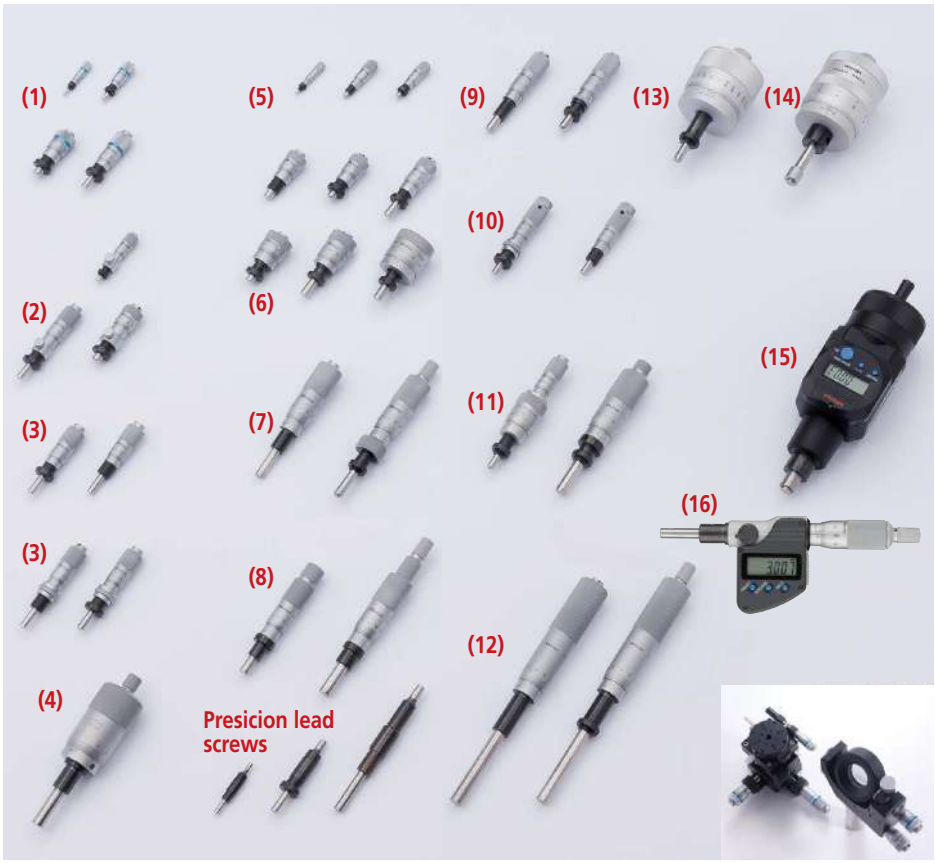
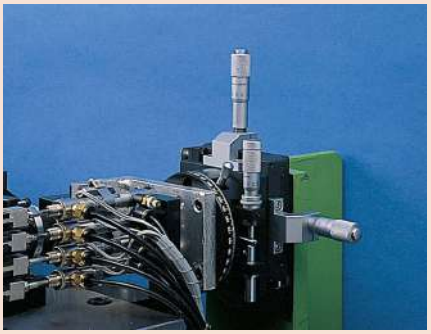
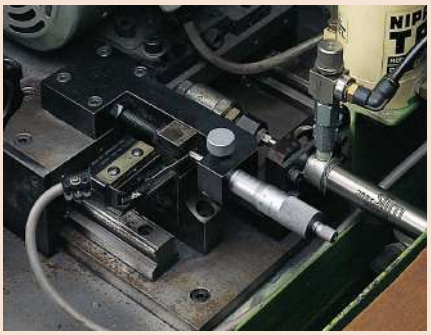
Micrometer Head Selection Guide







Also refer to "Quick Guide to Precision Measuring Instruments" from page 13-11.

Range	Main feature of head			Series	Page
1 mm/0.02 in	High-Function	Differential Screw Thread Translator (Extra-Fine Feed) Type		110	03-37 to 03-38
2.5 mm/0.05 in	High-Function	Differential Screw Thread Translator (Extra-Fine Feed) Type	(11)		03-37 to 03-38
5 mm/0.2 in	High-Function	Fine Spindle Feed of 0.1 mm/rev	(1)	148	03-34 to 03-35
	Standard	Small/Ultra-small Type	(5)		03-7 to 03-8
6.5 mm/0.25 in	Standard	Locking-screw Type	(2)		03-28 to 03-31
	High-Function	Fine Spindle Feed of 0.1 mm/rev	(1)		03-34 to 03-35
	High-Function	Fine Spindle Feed of 0.25 mm/rev			03-36
	Standard	Small/Ultra-small Type	(5)		03-7 to 03-8
		Short Thimble with Choice of Diameter	(6)		03-9 to 03-11
10 mm	High-Function	Large Thimble Type	(13)	152	03-39 to 03-40
13 mm/0.5 in	Standard	Locking-screw Type	(2)	148	03-28 to 03-31
	High-Function	Fine Spindle Feed of 0.25 mm/rev			03-36
		Differential Screw Thread Translator (Extra-Fine Feed) Type	(11)	110	03-37 to 03-38
		Short Thimble with Choice of Diameter	(6)	148	03-9 to 03-11
	Standard	Small Standard Type	(3)		03-12 to 03-14
		Small Thimble Diameter Standard Type	(10)		03-15 to 03-17
15 mm/0.5 in	High-Function	Non-rotating Spindle Type	(8)	153	03-32
	High-Function	Quick Spindle Feed of 1 mm/rev	(4)	152	03-33
	Standard	Small Standard Type with Carbide-tipped Spindle	(9)	149	03-18 to 03-19
25 mm/1 in	Digimatic	Clear digital display, Non-rotating spindle and IP 65 rated version	(16)	350	03-4 to 03-6
		Clear digital display, Non-rotating spindle			
	High-Function	Non-rotating Spindle Type	(8)	153	03-32
		Quick Spindle Feed of 1 mm/rev		152	03-33
		Large Thimble Type			03-39 to 03-40
		XY-Stage Type	(14)		03-41
		High Accuracy and Resolution		153	03-42
		Digit Counter Type		250	03-43
	Standard	Medium-sized Standard Type	(7)	150	03-20 to 03-23
		Medium-sized Standard Type with 8 mm Diameter Spindle		151	03-24 to 03-27
50 mm/2 in	Digimatic		(15)	164	03-4
	High-Function	Large Thimble Type		152	03-39 to 03-40
		Long Stroke Non-rotating Spindle		197	03-42
	Standard	Medium-sized Standard Type with 8 mm Diameter Spindle	(12)	151	03-24 to 03-27
60 - 75 mm	Micro Jack			7	03-43

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IP65 U-WAVE fit

Dust- and Water-Protected TÜVRheinland CERTIFIED www.tuv.com ID 0000040191

Applicable models:
350-261-30, **350-271-30**, **350-273-30**, **350-28X-30**, **350-361-30** and **350-38X-30**

Digimatic Micrometer Heads SERIES 164, 350

- Easy-to-read digital display.
- All models support data output.

164-163

350-281-30 (IP65)

Functions (series 164)

Origin point setting (ABS measurement system):
Resets the ABS origin at the current spindle position to the minimum value of the measuring range and switches to ABS mode.
Zero-setting (INC measurement system):
A brief press on the ZERO/ABS button sets display to zero at the current spindle position and switches to the incremental (INC) measuring mode. A longer press resets to the ABS measuring mode.
Data output:
Equipped with output port for transferring measurement data to a Statistical Process Control (SPC) and measurement system.
Auto power ON/OFF:
The reading on the display disappears after this instrument is idle for about 20 minutes, but the reading and measurement mode are retained. Turning the spindle causes the reading on the display to reappear.
Error alarm:
In case of an overflow on the display or a computing error, an error message appears on the display and the measuring function stops. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the low-battery indicator appears well before the micrometer becomes unusable.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m): for **series 350** (IP65)
05CZA663	B	Connection cable (2 m): for **series 350** (IP65)
959149	C	Connection cable for **series 164** (1 m)
959150	C	Connection cable for **series 164** (2 m)
06AFM380B	B	USB Input Tool Direct for **series 350** (IP65) (2 m)
06AFM380C	C	USB Input Tool Direct for **series 164** (2 m)
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm): for **series 350** (IP65)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch: for **series 350** (IP65)
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm): for **series 164**
02AZE140C	C	Connection cable for **U-WAVE-T** For foot switch: for **series 164**
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB***

* Cannot be used with **164-163** and **164-164**

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Graduation (mm)	Stem	Stem dia. (mm)	Spindle end	Graduation features	Maximum permissible error J_{MPE} (µm)
164-163	0 - 50	0.001	—	Plain	18	Flat (carbide tip)	—	±3
350-251-30*1	0 - 25		0.01	Plain	10	Flat (carbide tip)	Standard	±2
350-252-30*1				W/clamp nut				
350-253-30*1				Plain		Spherical (SR4) (carbide tip)		
350-254-30*1				W/clamp nut				
350-281-30*2				Plain	12	Flat (carbide tip)		
350-282-30*2				W/clamp nut				
350-283-30*2				Plain		Spherical (SR4) (carbide tip)		
350-284-30*2				W/clamp nut				
350-261-30*2				Plain		Flat		
350-271-30*2								
350-272-30*1				W/clamp nut				
350-273-30*2				Plain		Spherical (SR4) (carbide tip)		
350-274-30*1				W/clamp nut				

Inch/Metric

Code No.	Range (in)	Resolution	Graduation	Stem	Stem dia. (in)	Spindle end	Graduation features	Maximum permissible error J_{MPE} (in)
164-164	0 - 2	0.00005 in/ 0.001 mm	—	Plain	0.709	Flat (carbide tip)	—	±0.00015
350-351-30*1	0 - 1		0.001 in/ 0.01 mm	Plain	0.375	Flat (carbide tip)	Standard	±0.0001
350-352-30*1				W/clamp nut				
350-353-30*1				Plain		Spherical (SR4) (carbide tip)		
350-354-30*1				W/clamp nut				
350-357-30*1				Plain	0.5	Flat (carbide tip)		
350-381-30*2								
350-382-30*2				W/clamp nut				
350-383-30*2				Plain		Spherical (SR4) (carbide tip)		
350-384-30*2				W/clamp nut				
350-361-30*2				Plain		Flat		

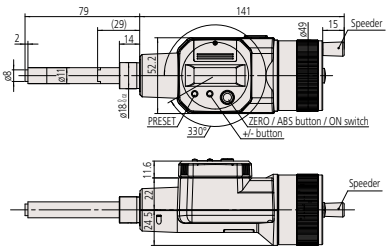
- Power source for **series 350**: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
  Power source for **series 164**: SR44 battery (2 pcs.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use (for **350-XXX**)
  Approx. 1.8 years under normal use (for **164-163**, **164**)
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated

*1 These models are not water-proof.
*2 IP65 dust/water protection type. Stem diameter of IP65 type is 12 mm.
Note: For functional details of **series 350** refer to page 02-7. Origin setting is by presetting.

DIMENSIONS

Plain Stem

Plain stem



Unit: mm

164-163 Rotatable display Mass: 490 g
( ): with spindle fully retracted.

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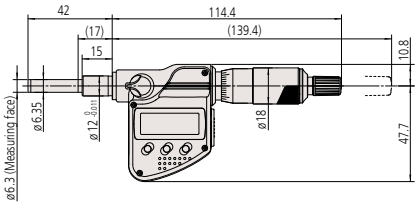
Digimatic Micrometer Heads
SERIES 164, 350

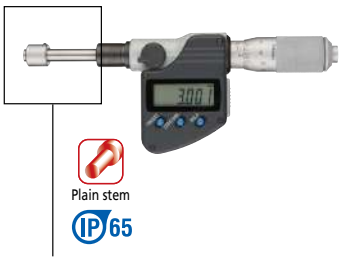
DIMENSIONS

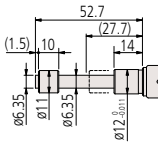
Plain Stem

Unit: mm

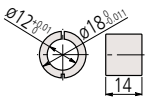


350-281-30
(Stem dia. 12 mm, water-proof type) Mass: 230 g

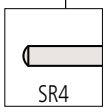




Equipped with a non-rotating device
350-261-30
(Stem dia. 12 mm, water-proof type)
Mass: 235 g



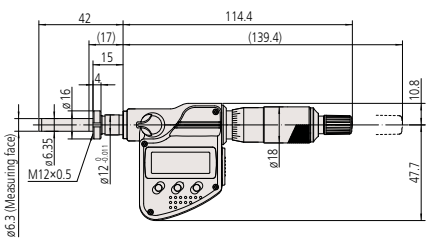
Bush (standard accessory)
350-261-30



Spherical face
350-283-30
*1

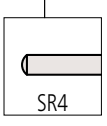
*1 Other dimensions are the same as **350-281-30**.
( ): with spindle fully retracted.

Stem locknut



- Fixture thickness: 11.5 mm

350-282-30 (Stem dia. 12 mm, equipped with locknut, water-proof type) Mass: 230 g



Spherical face
350-284-30
*2

*2 Other dimensions are the same as **350-282-30**.
( ): with spindle fully retracted.

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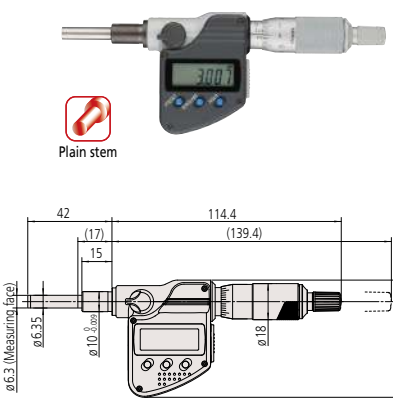
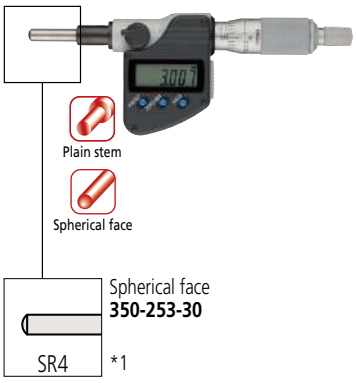
DIMENSIONS

Plain Stem

Unit: mm

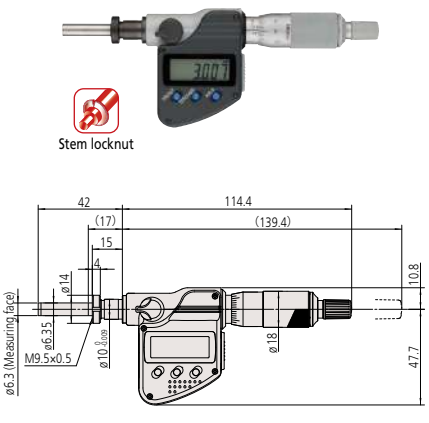


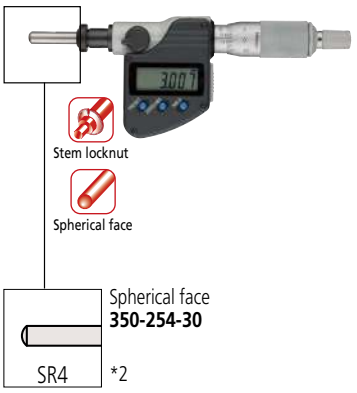


350-251-30
(Stem dia. 10 mm, for general use) Mass: 230 g

*1 Other dimensions are the same as **350-251-30**.
( ): with spindle fully retracted.

Stem Locknut





- Fixture thickness: 11.5 mm

350-252-30
(Stem dia. 10 mm, for general use) Mass: 230 g

*2 Other dimensions are the same as **350-252-30**.
( ): with spindle fully retracted.

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Micrometer Heads
SERIES 148 — Small/Ultra-small Type

- Miniature and light-weight micrometer heads for easier incorporation into machines, jigs and fixtures.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Stem dia. (mm)	Stem	Spindle end	Graduation	Maximum permissible error J_{MPE} (µm)
148-215	0 - 5	3.5	Plain	Spherical (SR1.5)	Standard	±5
148-216			W/clamp nut			
148-201-10	0 - 6.5	6	Plain	Flat		
148-203-10			W/clamp nut			
148-205-10			Plain	Spherical (SR3)		
148-207-10			W/clamp nut			
148-209-10			Plain	Flat	Reverse reading	
148-211-10			W/clamp nut			

Inch

Code No.	Range (in)	Stem dia. (in)	Stem	Spindle end	Graduation	Maximum permissible error J_{MPE} (in)
148-217	0 - 0.2	0.156	Plain	Spherical (SR1.5)	Standard	±0.00025
148-218			W/clamp nut			
148-202-10	0 - 0.25	0.25	Plain	Flat		
148-204-10			W/clamp nut			
148-206-10			Plain	Spherical (SR3)		
148-208-10			W/clamp nut			
148-210-10*			Plain	Flat	Reverse reading	
148-212-10*			W/clamp nut			

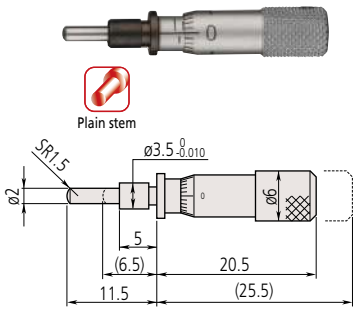
- Graduation: 0.02 mm (**148-215**, **148-216**), 0.01 mm or 0.001 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

* Made-to-order models

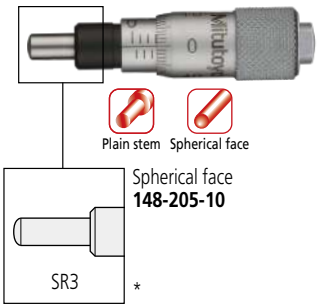
DIMENSIONS

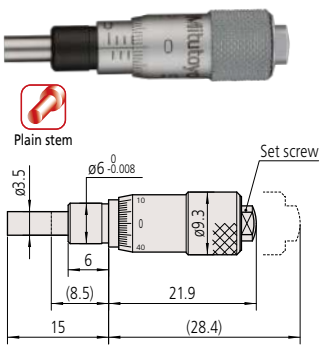
Plain Stem

Unit: mm

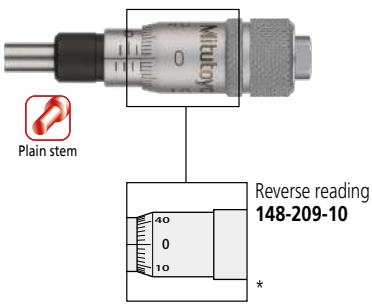


148-215 Mass: 4 g





148-201-10 Mass: 10 g



* Other dimensions are the same as **148-201-10**.
( ): with spindle fully retracted.

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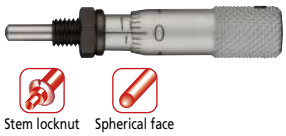
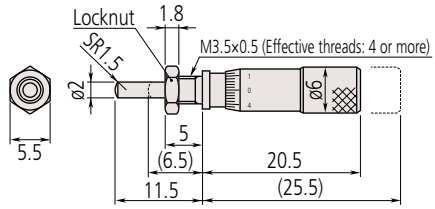
Micrometer Heads
SERIES 148 — Small/Ultra-small Type

DIMENSIONS

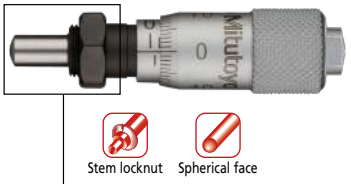
Stem Locknut

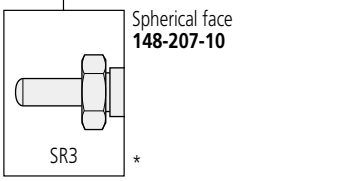
Unit: mm

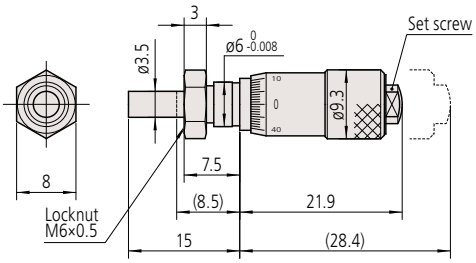




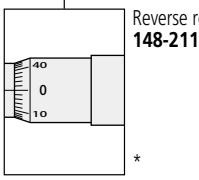
• Fixture thickness: 3 mm
148-216 Mass: 4 g







• Fixture thickness: 4 mm
148-203-10 Mass: 10 g



* Other dimensions are the same as **148-203-10**.
( ): with spindle fully retracted.

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Micrometer Heads
SERIES 148 — Short Thimble with Choice of Diameter

- Short body design maintains measuring range for limited space applications.
- Three types of thimble diameters can be selected depending on applications.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Maximum permissible error J_{MPE} (µm)	Stem dia. (mm)	Stem	Spindle end	Thimble dia. (mm)
148-301-10	0 - 6.5	±2	9.5	Plain	Flat	15
148-302-10				W/clamp nut		
148-303-10				Plain		20
148-304-10				W/clamp nut		
148-313-10				Plain	Spherical (SR4)	15
148-314-10				W/clamp nut		
148-307-10	0 - 13			Plain	Flat	15
148-308-10				W/clamp nut		
148-309-10				Plain		20
148-310-10				W/clamp nut		
148-311-10				Plain		29
148-312-10				W/clamp nut		

- Graduation: 0.01 mm
- Spindle pitch: 0.5 mm
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

Inch

Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Thimble dia. (in)
148-351-10	0 - 0.25	±0.0001	0.375	Plain	Flat	0.59
148-352-10				W/clamp nut		
148-353-10				Plain		0.79
148-354-10				W/clamp nut		
148-357-10	0 - 0.5			Plain		0.59
148-358-10				W/clamp nut		
148-359-10				Plain		0.79
148-360-10				W/clamp nut		

- Graduation: 0.001 in
- Spindle pitch: 0.025 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

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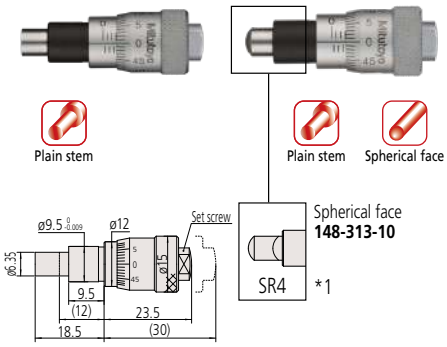
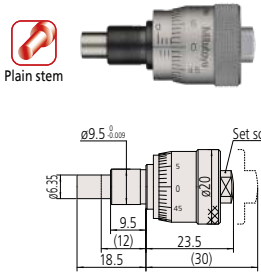
DIMENSIONS

Plain Stem



148-301-10
Mass: 26 g
Thimble diameter: 15

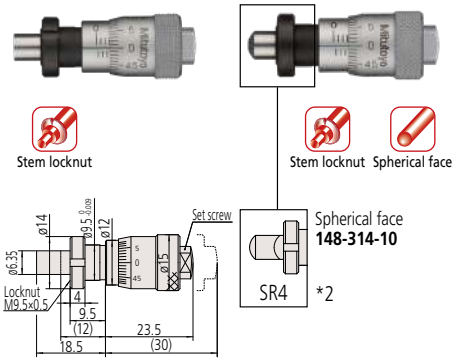
*1 Other dimensions are the same as **148-301-10**.



148-303-10
Mass: 39 g
Thimble diameter: 20

Stem Locknut

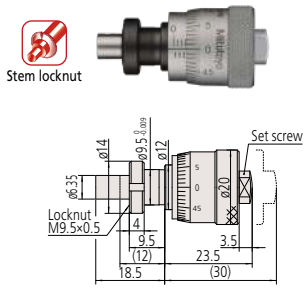
Unit: mm



- Fixture thickness: 6 mm

148-302-10
Mass: 26 g
Thimble diameter: 15

*2 Other dimensions are the same as **148-302-10**.



- Fixture thickness: 6 mm

148-304-10
Mass: 39 g
Thimble diameter: 20

( ): with spindle fully retracted.

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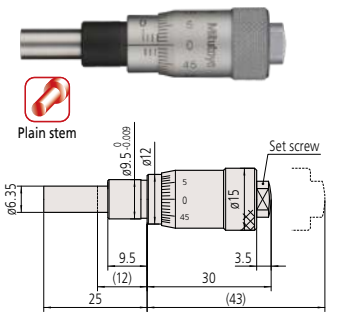
Micrometer Heads
SERIES 148 — Short Thimble with Choice of Diameter

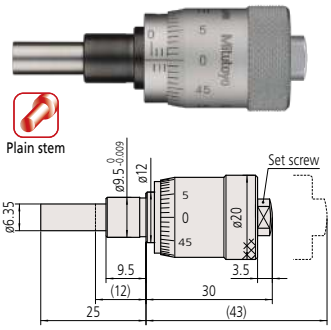
DIMENSIONS

Unit: mm

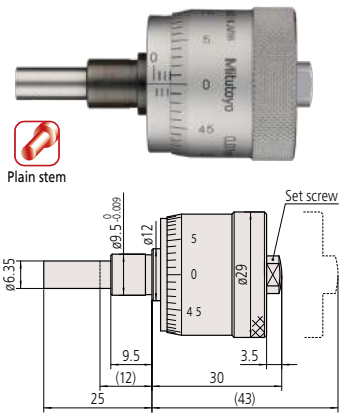
Plain Stem



148-307-10
Mass: 35 g Thimble diameter: 15

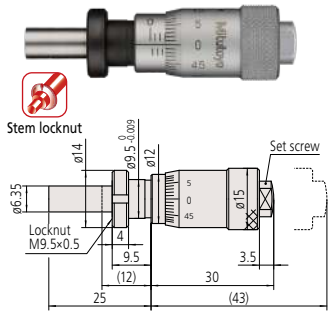


148-309-10
Mass: 55 g Thimble diameter: 20

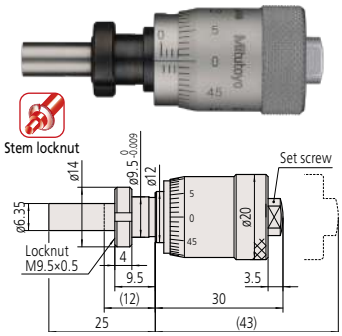


148-311-10
Mass: 103 g Thimble diameter: 29

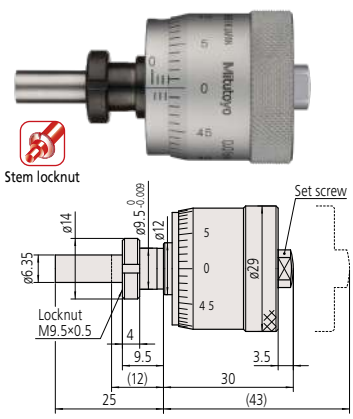
Stem Locknut



• Fixture thickness: 6 mm
148-308-10
Mass: 35 g Thimble diameter: 15



• Fixture thickness: 6 mm
148-310-10
Mass: 55 g Thimble diameter: 20



• Fixture thickness: 6 mm
148-312-10
Mass: 103 g Thimble diameter: 29

( ): with spindle fully retracted.

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Micrometer Heads
SERIES 148 — Small Standard Type

• Measuring range: 13 mm

SPECIFICATIONS

Metric

Code No.	Range (mm)	Maximum permissible error J_{MPE} (µm)	Stem dia. (mm)	Stem	Spindle end	Graduation features
148-104-10	0 - 13	±2	9.5	Plain	Flat	Standard
148-103-10				W/clamp nut		
148-121-10				Plain*		
148-120-10				W/clamp nut*		
148-801-10				Plain	Spherical (SR4)	
148-802-10				W/clamp nut		
148-803-10				Plain*		
148-804-10				W/clamp nut*		
148-821-10				Plain	Flat	Reverse reading
148-822-10				W/clamp nut		
148-823-10				Plain*		
148-824-10				W/clamp nut*		

• Graduation: 0.01 mm
• Spindle pitch: 0.5 mm
• Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
• Scale finishing: Satin-chrome plated
* With spindle lock

Inch

Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Graduation features
148-112-10	0 - 0.5	±0.0001	0.375	Plain	Flat	Standard
148-111-10*2				W/clamp nut		
148-123-10				Plain*1		
148-122-10				W/clamp nut*1		
148-811-10				Plain	Spherical (SR4)	
148-812-10				W/clamp nut		
148-813-10				Plain*1		
148-814-10				W/clamp nut*1		
148-831-10				Plain	Flat	Reverse reading
148-832-10				W/clamp nut		
148-833-10				Plain*1		
148-834-10				W/clamp nut*1		

• Graduation: 0.001 in
• Spindle pitch: 0.025 in
• Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
• Scale finishing: Satin-chrome plated
*1 With spindle lock
*2 Made-to-order models

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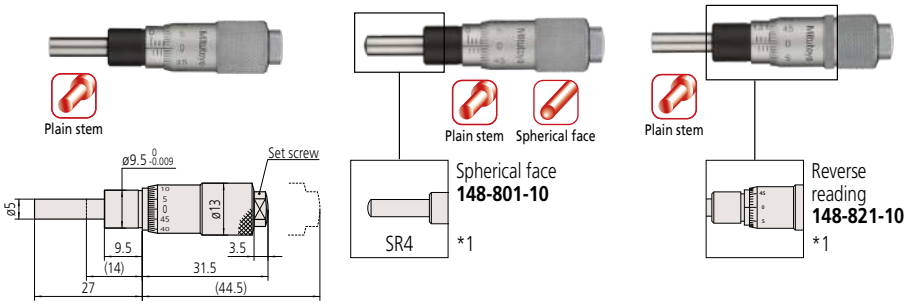
Micrometer Heads
SERIES 148 — Small Standard Type

DIMENSIONS

Plain Stem

Mass: 30 g

Unit: mm

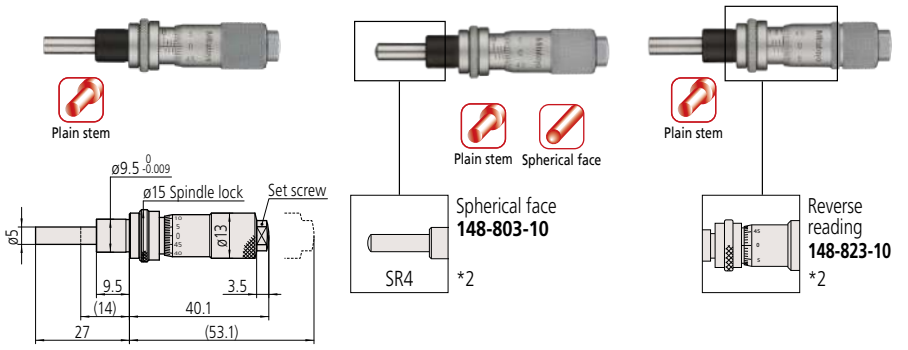


148-104-10

*1 Other dimensions are the same as **148-104-10**.

Plain Stem and Spindle Lock

Mass: 40 g



148-121-10

*2 Other dimensions are the same as **148-121-10**.

( ): with spindle fully retracted.

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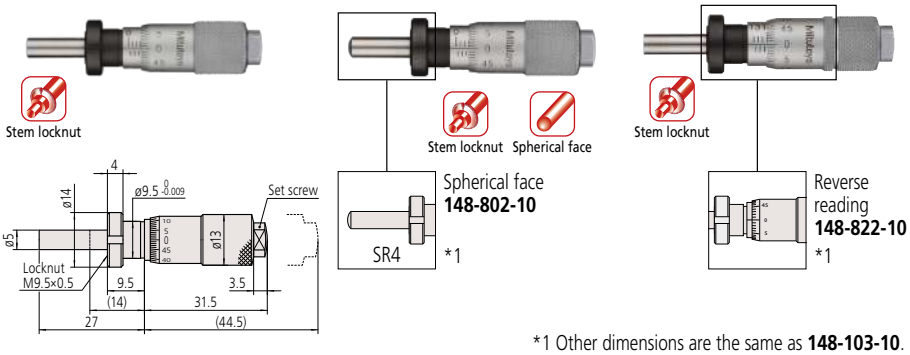
DIMENSIONS

Stem Locknut

Mass: 35 g

Unit: mm

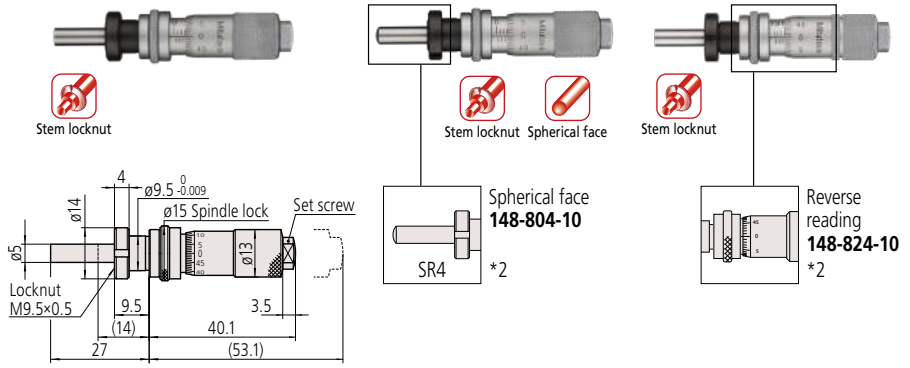


*1 Other dimensions are the same as **148-103-10**.

• Fixture thickness: 6 mm
148-103-10

Stem Locknut and Spindle Lock

Mass: 45 g



• Fixture thickness: 6 mm
148-120-10

*2 Other dimensions are the same as **148-120-10**.

( ): with spindle fully retracted.

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Micrometer Heads
SERIES 148 — Small Thimble Diameter Standard Type

- Measuring range: 13 mm
- The thimble can be set to zero at any position by loosening the setscrew.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Maximum permissible error J_{MPE} (µm)	Stem dia. (mm)	Stem	Spindle end	Special features
148-503	0 - 13	±2	9.5	Plain	Flat	Standard
148-508				W/clamp nut		
148-506				Plain*1		
148-504				W/clamp nut*1		
148-853				Plain	Spherical (SR4)	
148-854				W/clamp nut*1		
148-863				Plain	Flat	Reverse reading
148-864				W/clamp nut*1		
148-858*2				W/clamp nut	Spherical (SR4)	Standard
148-866*2				Plain*1	Flat	Reverse reading
148-856*2				Plain*1	Spherical (SR4)	Standard
148-868*2				W/clamp nut	Flat	Reverse reading

- Graduation: 0.01 mm
- Spindle pitch: 0.5 mm
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

*1 With spindle lock
*2 Made-to-order models

Inch

Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Special features
148-501	0 - 0.5	±0.0001	0.375	Plain	Flat	Standard
148-507*2				W/clamp nut		
148-505				Plain*1		
148-502				W/clamp nut*1		
148-851				Plain	Spherical (SR4)	
148-852				W/clamp nut*1		
148-861				Plain	Flat	Reverse reading
148-862				W/clamp nut*1		

- Graduation: 0.001 in
- Spindle pitch: 0.025 in
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

*1 With spindle lock
*2 Made-to-order models

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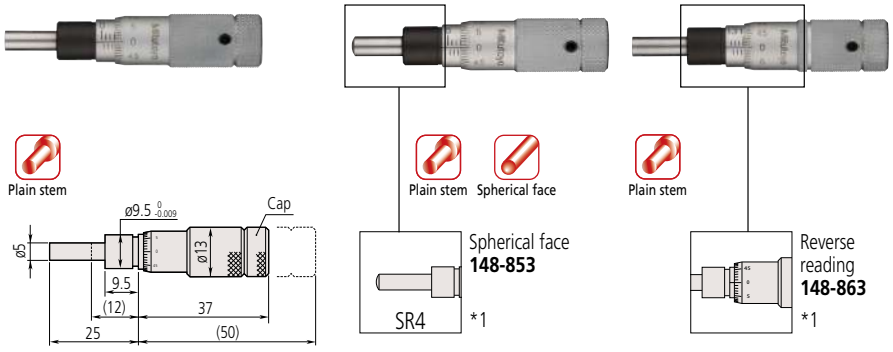
DIMENSIONS

Plain Stem

Mass: 35 g

Unit: mm

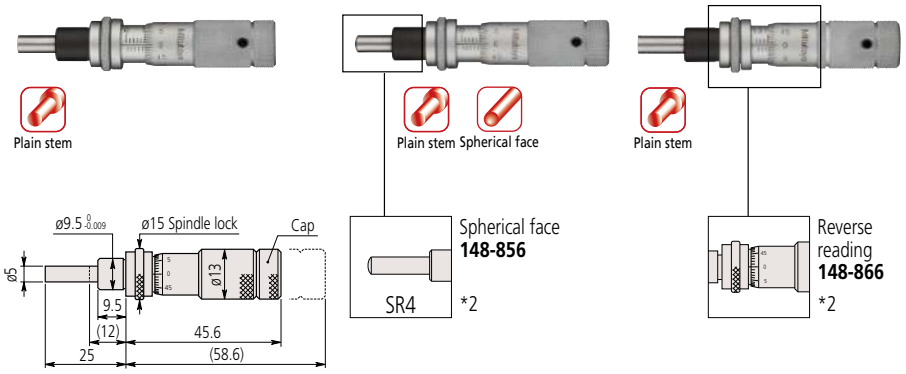


148-503

*1 Other dimensions are the same as **148-503**.

Plain Stem and Spindle Lock

Mass: 35 g



148-506

*2 Other dimensions are the same as **148-506**.

( ): with spindle fully retracted.

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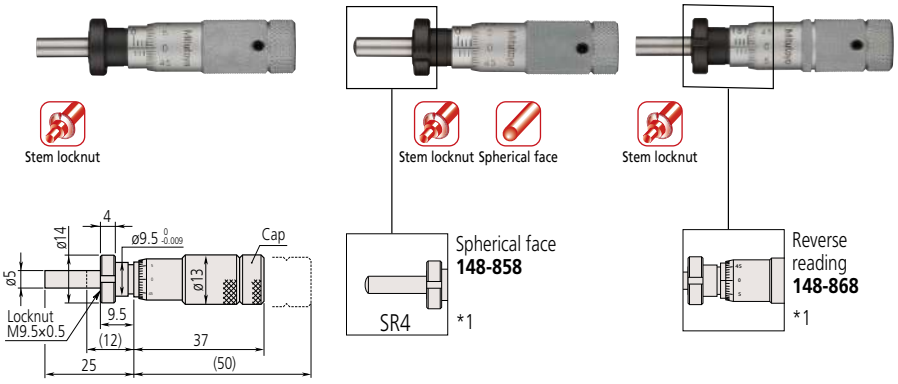
Micrometer Heads
SERIES 148 — Small Thimble Diameter Standard Type

DIMENSIONS

Stem Locknut

Mass: 40 g

Unit: mm

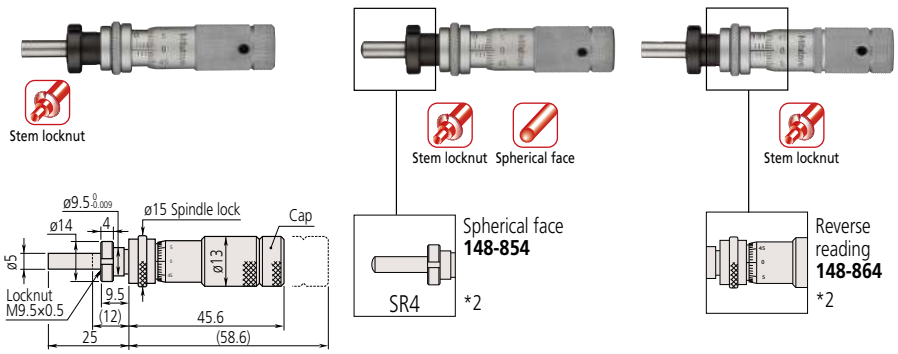


• Fixture thickness: 6 mm
148-508

*1 Other dimensions are the same as **148-508**.

Stem Locknut and Spindle Lock

Mass: 40 g



• Fixture thickness: 6 mm
148-504

*2 Other dimensions are the same as **148-504**.
( ): with spindle fully retracted.

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Micrometer Heads
SERIES 149 — Small Standard Type with Carbide-tipped Spindle

• Carbide-tipped spindle provides high abrasion resistance.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Maximum permissible error J_{MPE} (µm)	Stem dia. (mm)	Stem	Spindle end	Graduation features
149-132-10	0 - 15	±2	9.5	Plain	Flat (carbide tip)	Standard
149-131-10				W/clamp nut		
149-183-10				Plain*1		
149-184-10				W/clamp nut*1		
149-801-10				Plain	Spherical (SR4) (carbide tip)	
149-802-10				W/clamp nut		
149-821-10				Plain	Flat (carbide tip)	Reverse reading
149-822-10				W/clamp nut		
149-803-10*2				Plain*1	Spherical (SR4) (carbide tip)	Standard
149-804-10*2				W/clamp nut*1		
149-823-10*2				Plain*1	Flat (carbide tip)	Reverse reading
149-824-10*2				W/clamp nut*1		

Inch

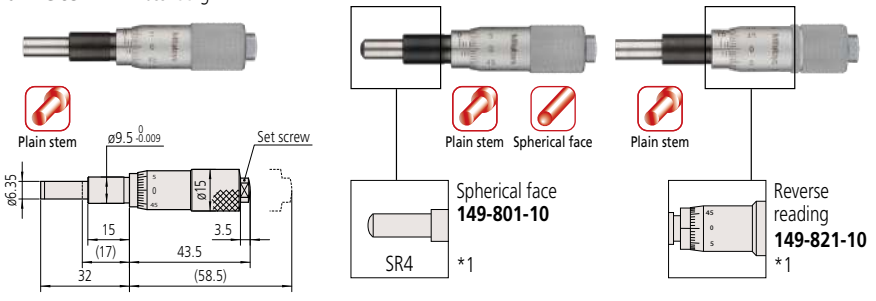
Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Graduation features
149-148-10	0 - 0.5	±0.0001	0.375	Plain	Flat (carbide tip)	Standard
149-147-10				W/clamp nut		
149-185-10*3				Plain*1		
149-182-10				W/clamp nut*1		
149-811-10				Plain	Spherical (SR4) (carbide tip)	
149-812-10				W/clamp nut		
149-831-10*2				Plain	Flat (carbide tip)	Reverse reading
149-832-10*2				W/clamp nut		
149-181*2				Plain*1		Standard

• Graduation: 0.01 mm or 0.001 in
• Spindle pitch: 0.5 mm or 0.025 in
• Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
• Scale finishing: Satin-chrome plated
*1 With spindle lock *2 Made-to-order models *3 W/rachet (**149-181**) is available

DIMENSIONS

Plain Stem Mass: 55 g

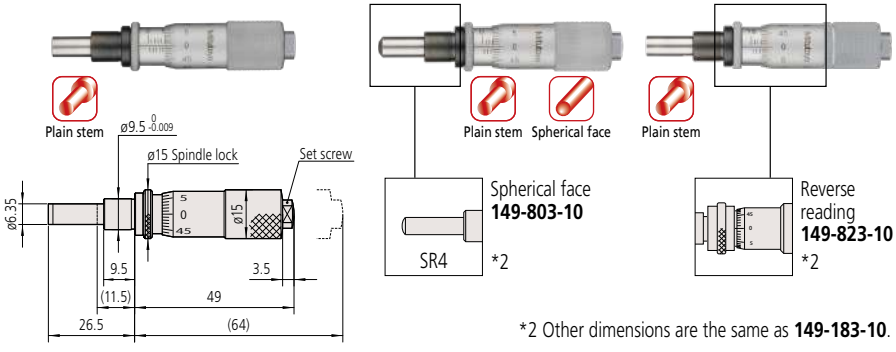
Unit: mm



149-132-10

*1 Other dimensions are the same as **149-132-10**.

Plain Stem and Spindle Lock Mass: 55 g



149-183-10

*2 Other dimensions are the same as **149-183-10**.
( ): with spindle fully retracted.

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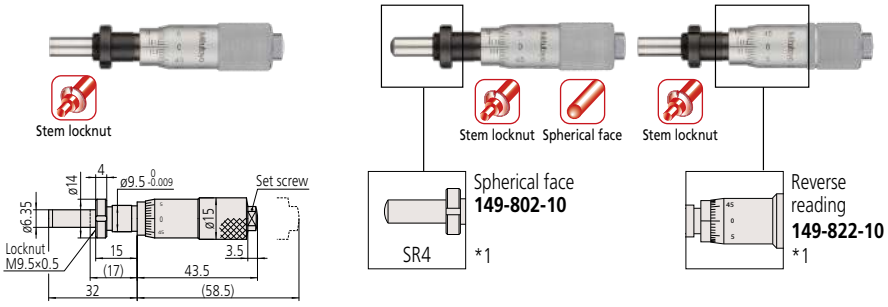
Micrometer Heads
SERIES 149 — Small Standard Type with Carbide-tipped Spindle

DIMENSIONS

Stem Locknut

Mass: 60 g

Unit: mm

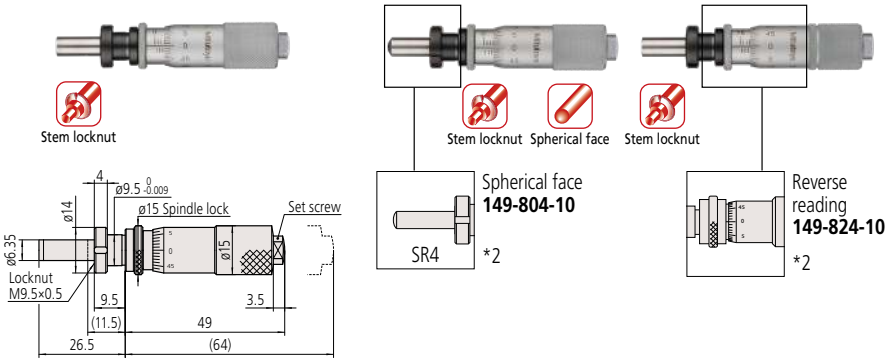


- Fixture thickness: 11.5 mm
  149-131-10

*1 Other dimensions are the same as **149-131-10**.

Stem Locknut and Spindle Lock

Mass: 60 g



- Fixture thickness: 6 mm
  149-184-10

*2 Other dimensions are the same as **149-184-10**.
( ): with spindle fully retracted.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Micrometer Heads
SERIES 150 — Medium-sized Standard Type

• Measuring range: 25 mm

SPECIFICATIONS

Metric

Code No.	Range (mm)	Maximum permissible error J_{MPE} (µm)	Stem dia. (mm)	Stem	Spindle end	Special features
150-192	0 - 25	±2	10	Plain	Flat (carbide tip)	Standard
150-191				W/clamp nut		
150-209				Plain*1		
150-210				W/clamp nut*1		
150-801				Plain	Spherical (SR4) (carbide tip)	
150-802				W/clamp nut		
150-821				Plain	Flat (carbide tip)	Reverse reading
150-822				W/clamp nut		
150-190				Plain		W/vernier (0.001 mm)
150-189				W/clamp nut		
150-183*2				Plain*1		
150-184				W/clamp nut*1		
150-196-10				Plain		W/o ratchet stop
150-195-10				W/clamp nut		
150-211-10				Plain*1		
150-212-10				W/clamp nut*1		
150-803*2				Plain*1	Spherical (SR4) (carbide tip)	Standard
150-804*2				W/clamp nut*1		
150-823*2				Plain*1	Flat (carbide tip)	Reverse reading
150-824*2				W/clamp nut*1		

• Graduation: 0.01 mm, 0.001 mm (w/vernier)
• Spindle pitch: 0.5 mm
• Measuring face: Material/Carbide tip (Only long spindle model is alloy tool steel),
Hardness/90 HRA or more (Only long spindle model is 60 HRC or more), Lapped
• Scale finishing: Satin-chrome plated
*1 With spindle lock
*2 Made-to-order models

Inch

Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Special features
150-208	0 - 1	±0.0001	0.375	Plain	Flat (carbide tip)	Standard
150-207				W/clamp nut		
150-213*2				Plain*1		
150-214*2				W/clamp nut*1		
150-811				Plain	Spherical (SR4) (carbide tip)	
150-812				W/clamp nut		
150-831				Plain	Flat (carbide tip)	Reverse graduation
150-832				W/clamp nut		
150-206				Plain		W/vernier (0.0001 in)
150-205*2				W/clamp nut		
150-215*2				Plain*1		
150-216*2				W/clamp nut*1		
150-198-10				Plain		W/ o ratchet stop
150-197-10				W/clamp nut		
150-217*2				Plain*1		
150-218*2				W/clamp nut*1		

• Graduation: 0.001 in or 0.0001 in (w/vernier)
• Spindle pitch: 0.025 in
• Measuring face: Material/Carbide tip (Only long spindle model is alloy tool steel),
Hardness/90 HRA or more (Only long spindle model is 60 HRC or more), Lapped
• Scale finishing: Satin-chrome plated
*1 With spindle lock
*2 Made-to-order models

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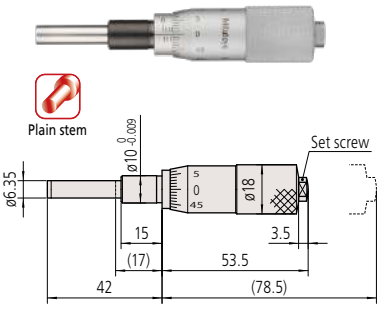
Mitutoyo

Micrometer Heads
SERIES 150 — Medium-sized Standard Type

DIMENSIONS

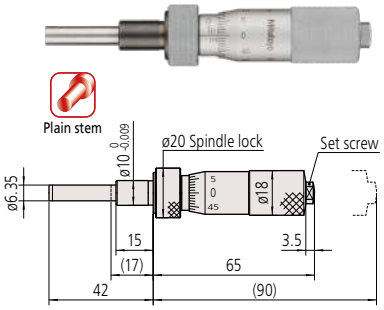
Plain Stem



150-196-10 Mass: 95 g

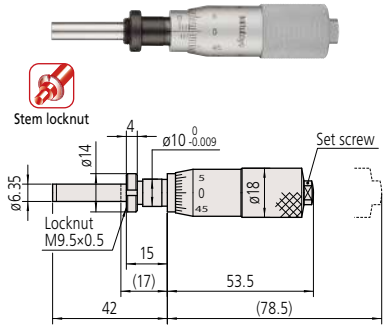
Plain Stem and Spindle Lock

Unit: mm



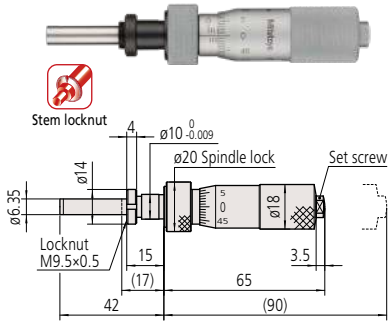
150-211-10 Mass: 115 g

Stem Locknut



Fixture thickness: 11.5 mm
150-195-10 Mass: 110 g

Stem Locknut and Spindle Lock



Fixture thickness: 11.5 mm
150-212-10 Mass: 115 g

( ): with spindle fully retracted.

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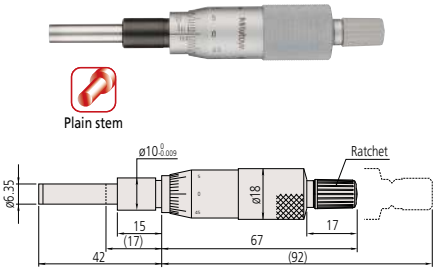
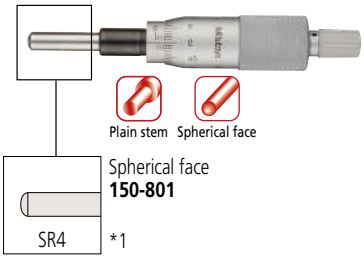
DIMENSIONS

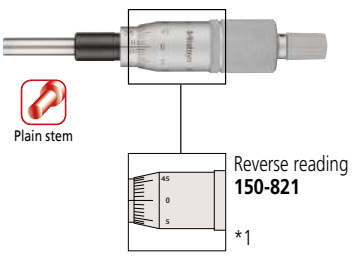
( ): with spindle fully retracted. Unit: mm

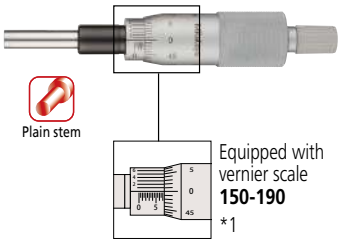
Plain Stem Mass: 95 g



150-192

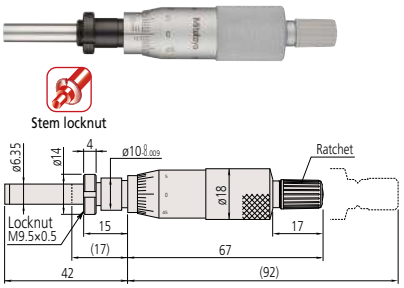




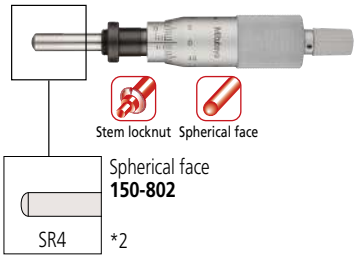


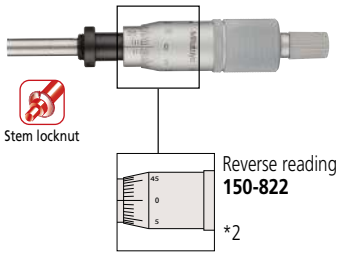
*1 Other dimensions are the same as **150-192**.

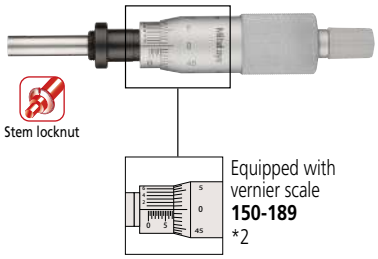
Stem Locknut Mass: 100 g



• Fixture thickness: 11.5 mm
150-191







*2 Other dimensions are the same as **150-191**.

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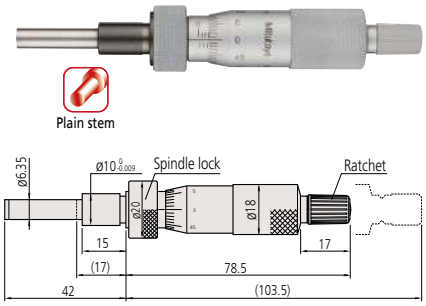
Micrometer Heads
SERIES 150 — Medium-sized Standard Type

DIMENSIONS

( ): with spindle fully retracted. Unit: mm

Plain Stem and Spindle Lock

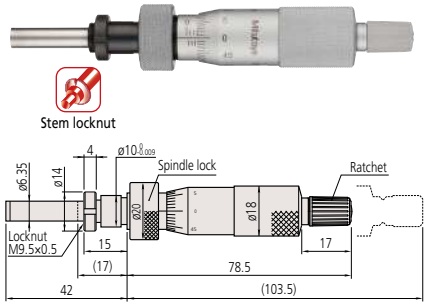
Mass: 110 g



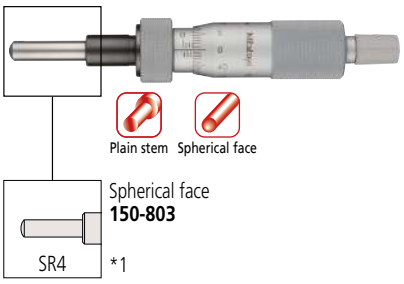
150-209

Stem Locknut and Spindle Lock

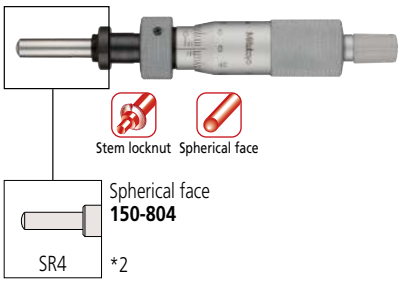
Mass: 115 g



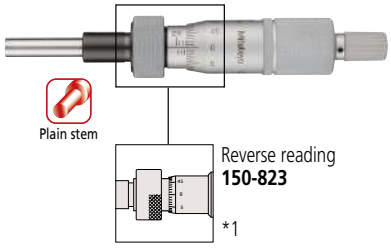
• Fixture thickness: 11.5 mm
150-210



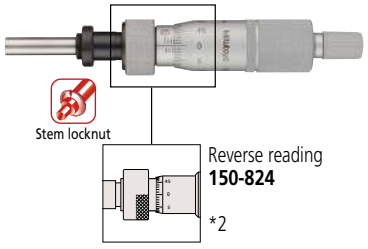
Spherical face
150-803
*1



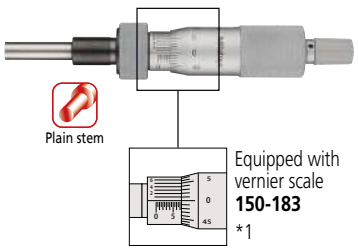
Spherical face
150-804
*2



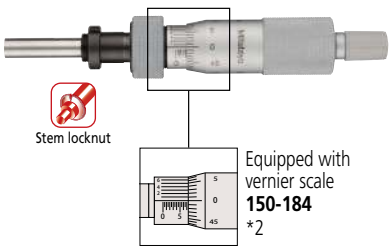
Reverse reading
150-823
*1



Reverse reading
150-824
*2



Equipped with vernier scale
150-183
*1



Equipped with vernier scale
150-184
*2

*1 Other dimensions are the same as **150-209**.

*2 Other dimensions are the same as **150-210**.

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Micrometer Heads
SERIES 151 — Medium-sized Standard Type with 8 mm Diameter Spindle

- Larger spindle (ø8 mm) for heavy-duty applications (normally ø6.35 mm).

SPECIFICATIONS

Metric

Code No.	Range (mm)	Maximum permissible error J_{MPE} (µm)	Stem dia. (mm)	Stem	Spindle end	Special features
151-224	0 - 25	±2	12	Plain	Flat (carbide tip)	—
151-223				W/clamp nut		
151-214*2				Plain*1		
151-213*2				W/clamp nut*1		
151-222				Plain		W/vernier (0.001 mm)
151-221				W/clamp nut		
151-212*2				Plain*1		
151-211*2				W/clamp nut*1		
151-227-10				Plain		W/o ratchet stop
151-228-10				W/clamp nut		
151-225-10				Plain*1		
151-226-10				W/clamp nut*1		
151-256	0 - 50	±4		Plain		—
151-255				W/clamp nut		
151-260-10				Plain		W/o ratchet stop
151-259-10				W/clamp nut		

- Graduation: 0.01 mm, 0.001 mm (w/vernier)
- Spindle pitch: 0.5 mm
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated

*1 With spindle lock
*2 Made-to-order models

Inch

Code No.	Range (in)	Maximum permissible error J_{MPE} (in)	Stem dia. (in)	Stem	Spindle end	Special features
151-240	0 - 1	±0.0001	0.5	Plain	Flat (carbide tip)	—
151-239				W/clamp nut		
151-238				Plain		W/vernier (0.0001 in)
151-237				W/clamp nut		
151-241-10*2				Plain*1		W/o ratchet stop
151-242-10*2				W/clamp nut*1		
151-243-10*2				Plain*1		W/o ratchet stop (0.0001 in)
151-244-10*2				W/clamp nut*1		
151-272	0 - 2	±0.0002		Plain		—
151-271				W/clamp nut		

- Graduation: 0.001 in or 0.0001 in (w/vernier)
- Spindle pitch: 0.025 in
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated

*1 With spindle lock
*2 Made-to-order models

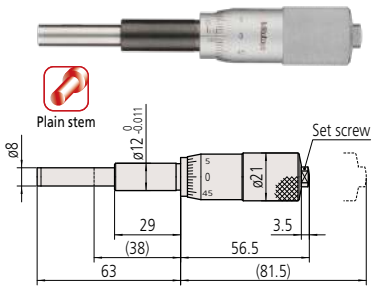
Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Micrometer Heads
SERIES 151 — Medium-sized Standard Type with 8 mm Diameter Spindle

DIMENSIONS

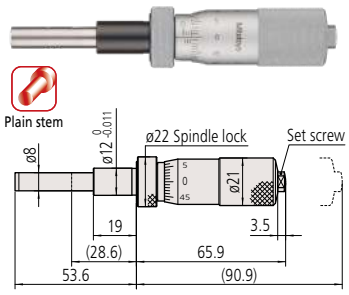
Unit: mm

Plain Stem



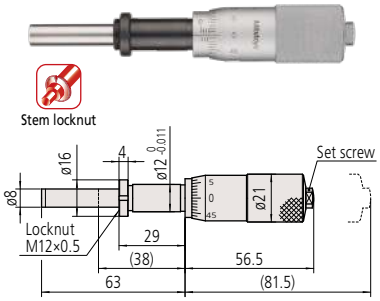
151-227-10 Mass: 150 g

Plain Stem and Spindle Lock



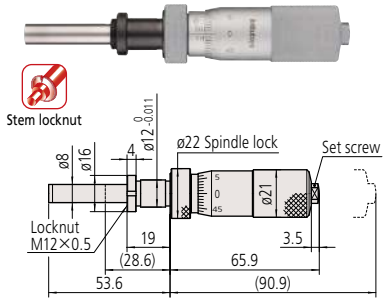
151-225-10 Mass: 165 g

Stem Locknut



• Fixture thickness: 25.5 mm
151-228-10 Mass: 155 g

Stem Locknut and Spindle Lock



• Fixture thickness: 15.5 mm
151-226-10 Mass: 165 g

( ): with spindle fully retracted.

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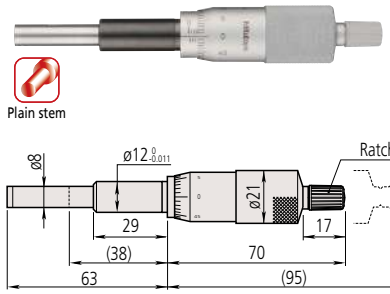
DIMENSIONS

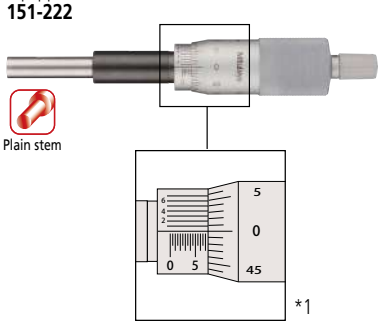
Plain Stem

Unit: mm



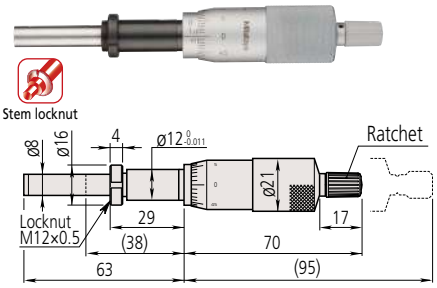
151-224 Mass: 150 g

Equipped with vernier scale
151-222



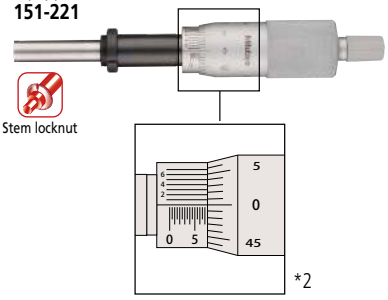
*1 Other dimensions are the same as **151-224**.

Stem Locknut



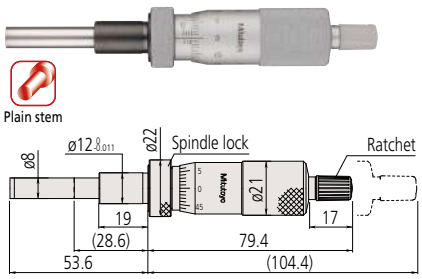
• Fixture thickness: 25.5 mm
151-223 Mass: 155 g

Equipped with vernier scale
151-221



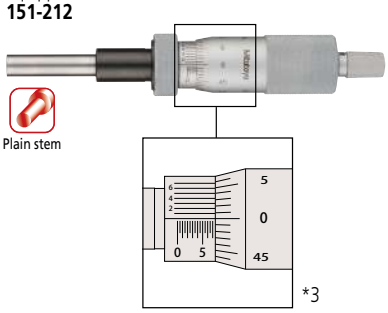
*2 Other dimensions are the same as **151-223**.

Stem Locknut and Spindle Lock



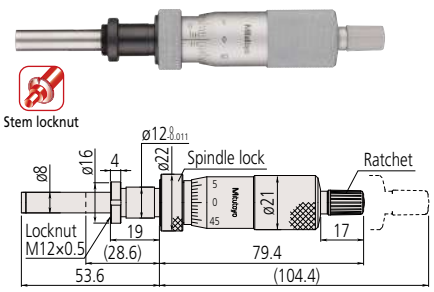
151-214 Mass: 160 g

Equipped with vernier scale
151-212



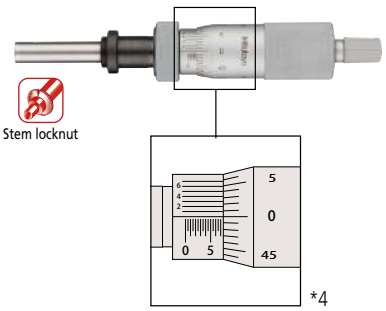
*3 Other dimensions are the same as **151-214**.

Stem Locknut and Spindle Lock



• Fixture thickness: 15.5 mm
151-213 Mass: 165 g

Equipped with vernier scale
151-211



*4 Other dimensions are the same as **151-213**.
( ): with spindle fully retracted.

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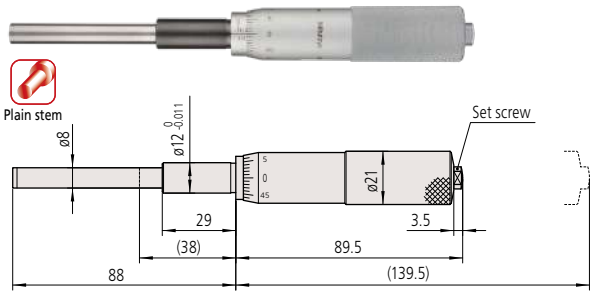
Mitutoyo

Micrometer Heads
SERIES 151 — Medium-sized Standard Type with 8 mm Diameter Spindle

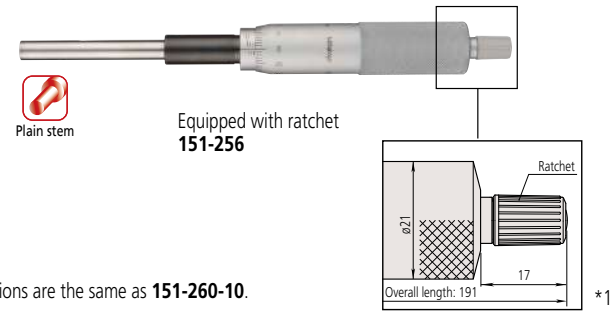
DIMENSIONS

Plain Stem

Unit: mm



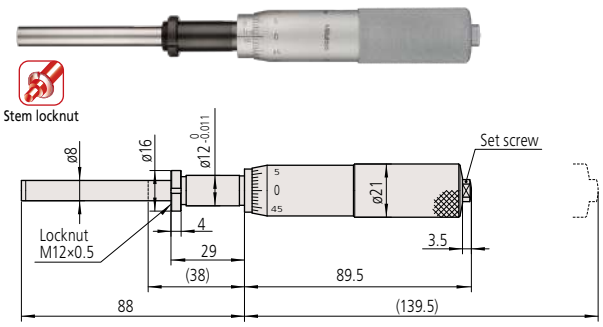
151-260-10 Mass: 240 g



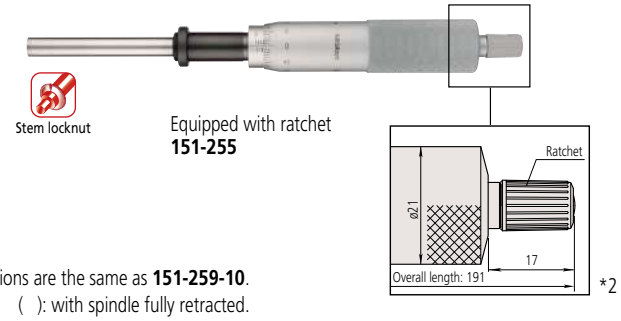
*1 Other dimensions are the same as **151-260-10**.

*1

Stem Locknut



• Fixture thickness: 25.5 mm
151-259-10 Mass: 250 g



*2 Other dimensions are the same as **151-259-10**.
( ): with spindle fully retracted.

*2

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Micrometer Heads
SERIES 148 — Locking-screw Type

- This model with enhanced clamping force created by a locking screw can be reliably used on positioning equipment or instruments constantly exposed to vibration.
- Position of the locking screw is the same as the sleeve index line.

Secure spindle

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Graduation features	Maximum permissible error J_{MPE} (µm)
148-220-10	0 - 6.5	0.01	6	Plain	Flat	Standard	±5
148-221-10				W/clamp nut			
148-222-10				Plain	Spherical (SR3)		
148-223-10				W/clamp nut			
148-150-10	0 - 13		9.5	Plain	Flat		±2
148-151-10				W/clamp nut			
148-152-10				Plain	Spherical (SR4)		
148-153-10				W/clamp nut			
148-316-10	0 - 6.5			Plain	Flat		
148-317-10				W/clamp nut			
148-318-10				Plain	Spherical (SR4)		
148-319-10				W/clamp nut			

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

Inch

Code No.	Range (in)	Graduation (in)	Stem dia. (in)	Stem	Spindle end	Graduation features	Maximum permissible error J_{MPE} (in)
148-230-10	0 - 0.25	0.001	0.25	Plain	Flat	Standard	±0.00025
148-231-10				W/clamp nut			
148-232-10				Plain	Spherical (SR3)		
148-233-10				W/clamp nut			
148-160-10	0 - 0.5		0.375	Plain	Flat		±0.0001
148-161-10				W/clamp nut			
148-162-10				Plain	Spherical (SR4)		
148-163-10				W/clamp nut			
148-326-10	0 - 0.25			Plain	Flat		
148-327-10				W/clamp nut			
148-328-10				Plain	Spherical (SR4)		
148-329-10				W/clamp nut			

- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

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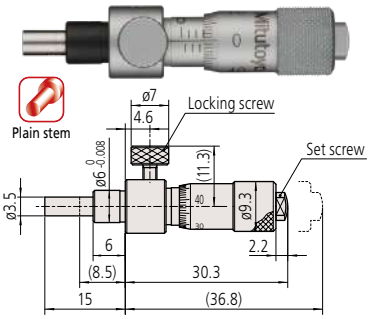
Micrometer Heads
SERIES 148 — Locking-screw Type

DIMENSIONS

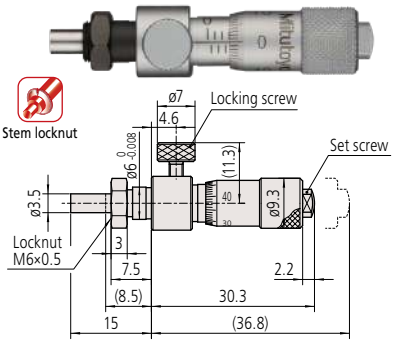
Unit: mm

Plain Stem



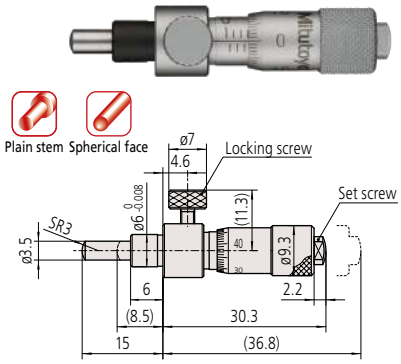
148-220-10 Mass: 16 g

Stem Locknut



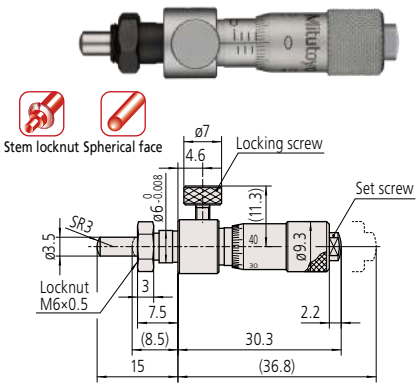
• Fixture thickness: 4 mm
148-221-10 Mass: 17 g

Plain Stem



Spherical face (SR3)
148-222-10 Mass: 16 g

Stem Locknut



Spherical face (SR3) • Fixture thickness: 4 mm
148-223-10 Mass: 17 g

( ): with spindle fully retracted.

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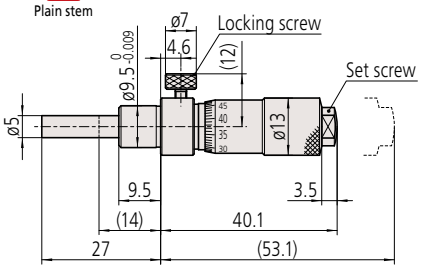
DIMENSIONS

Unit: mm

Plain Stem

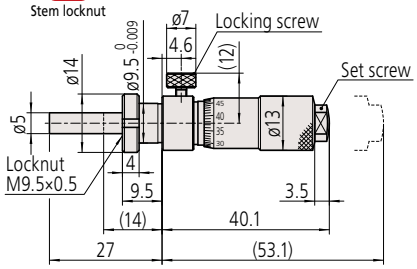
Plain stem



148-150-10 Mass: 40 g

Stem Locknut

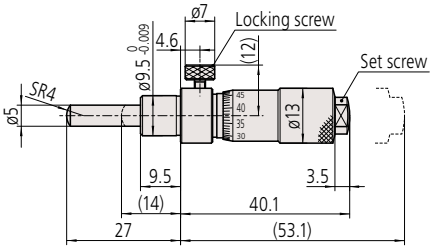
Stem locknut



• Fixture thickness: 6 mm
148-151-10 Mass: 43 g

Plain Stem

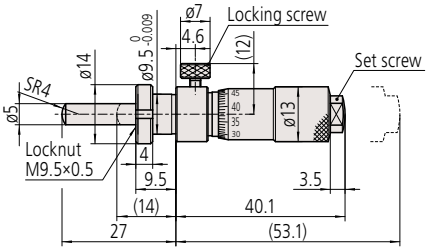
Plain stem Spherical face



Spherical face (SR4)
148-152-10 Mass: 40 g

Stem Locknut

Stem locknut Spherical face



Spherical face (SR4) • Fixture thickness: 6 mm
148-153-10 Mass: 43 g

( ): with spindle fully retracted.

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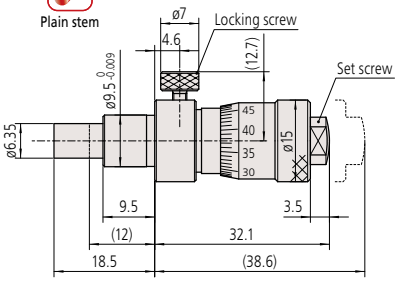
Micrometer Heads
SERIES 148 — Locking-screw Type

DIMENSIONS

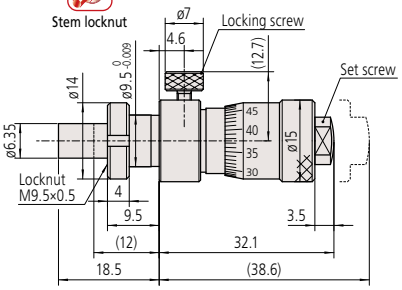
Plain Stem



148-316-10 Mass: 40 g

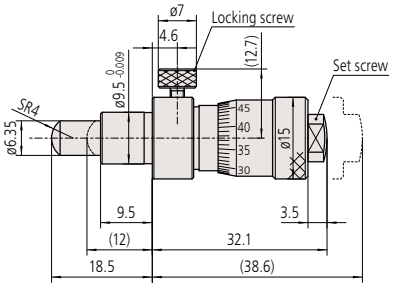
Stem Locknut

Unit: mm



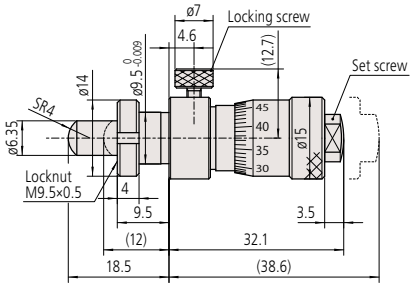
• Fixture thickness: 6 mm
148-317-10 Mass: 43 g

Plain Stem



Spherical surface (SR4)
148-318-10 Mass: 40 g

Stem Locknut



Spherical surface (SR4) • Fixture thickness: 6 mm
148-319-10 Mass: 43 g

( ): with spindle fully retracted.

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Micrometer Heads
SERIES 153 — Non-rotating Spindle Type

- Micrometer head with non-rotating spindle.
- Torsion-free feed reduces workpiece deformation and wear.
- Allows highly accurate positioning.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (µm)
153-101	0 - 15	0.01	Standard	9.5	Plain	Flat (carbide tip)	0.5	±3
153-201*1	0 - 25	0.01	Standard	12				
153-202*1		0.001	W/vernier (0.001 mm)					
153-203		0.01	Standard					
153-204		0.001	W/vernier (0.001 mm)					

Inch

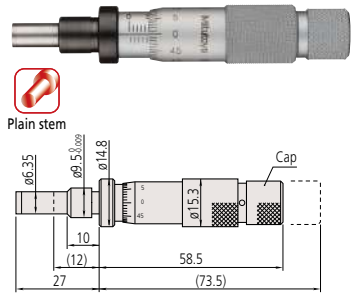
Code No.	Range (in)	Graduation (in)	Special features	Stem dia. (in)	Stem	Spindle end	Spindle pitch (in)	Maximum permissible error J_{MPE} (in)
153-108*2	0 - 0.5	0.001	W/vernier (0.0001 in)	0.375	Plain	Flat (carbide tip)	0.025	±0.00015
153-205*1	0 - 1	0.001	Standard	0.5				
153-206*1		0.0001	W/vernier (0.0001 in)					
153-207		0.001	Standard					
153-208		0.0001	W/vernier (0.0001 in)					

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated

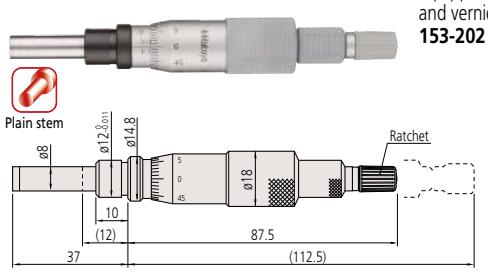
*1 With ratchet stop *2 Made-to-order model

DIMENSIONS

Unit: mm

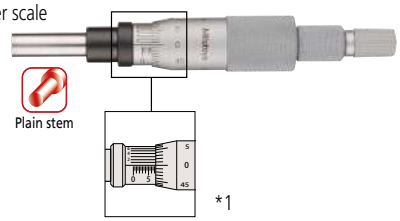


153-101 Mass: 70 g

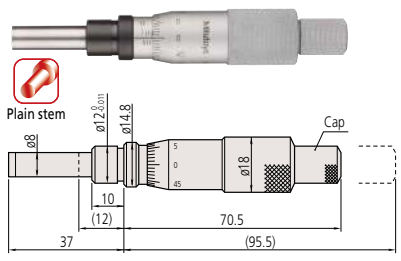


153-201 Mass: 125 g

Equipped with ratchet and vernier scale
153-202

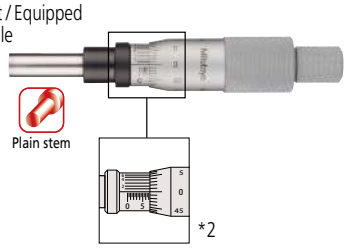


*1 Other dimensions are the same as **153-201**.



153-203 Mass: 125 g

Without ratchet/Equipped with vernier scale
153-204



*2 Other dimensions are the same as **153-203**.

( ): with spindle fully retracted.

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Micrometer Heads
SERIES 152 — Quick Spindle Feed of 1 mm/rev

- This model enables double-speed spindle feeding of 1 mm/rev (compared with 0.5 mm/rev on typical products) to enable quick positioning.
- It also has a good load-bearing capacity.

SPECIFICATIONS

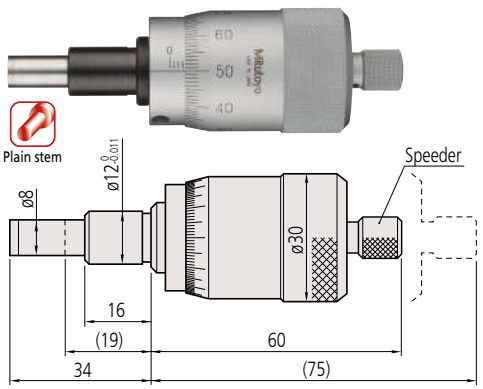
Metric

Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (µm)
152-101	0 - 15	0.01	12	Plain	Flat (carbide tip)	1	±2
152-102	0 - 25						

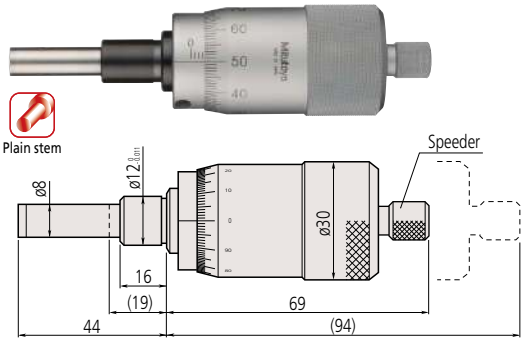
- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: Satin-chrome plated

DIMENSIONS

Unit: mm



152-101 Mass: 220 g



152-102 Mass: 230 g

( ): with spindle fully retracted.

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Micrometer Heads
SERIES 148 — Fine Spindle Feed of 0.1 mm/rev

- Fine spindle feeding of just 0.1 mm/rev (one fifth compared with standard model). Suitable for extra-fine adjustment and positioning.
- External dimensions are compatible with standard 0.5 mm pitch heads.
- Suitable for the fine feeding of precision stages on semiconductor equipment and optical-axis alignment device.

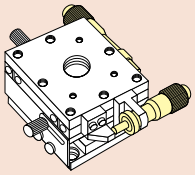
Spindle Pitch

Pitch=0.1 mm

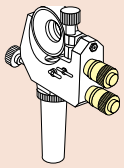
Pitch=0.5 mm

Typical Applications

- Semiconductor-wafer positioning machinery and optical component alignment units, etc.
- Precision X-Y table positioning

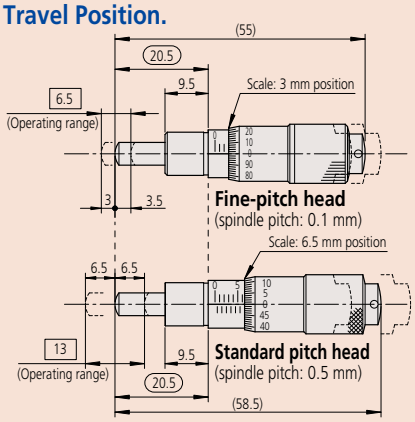


- Precision adjustment of mirror in holder



Precision adjustment of mirror in holder

Comparison of Mounting Dimensions Between a Fine-pitch Head and a Standard-pitch Head at the Mid-range Travel Position.



Note: While the fine-pitch micrometer head has a measuring range of 6.5 mm, the standard head has a larger range of 13 mm.
When replacing a standard head, the fine-pitch type can use the common range in the middle of the spindle travel. The standard and compact types of fine-pitch head are otherwise completely interchangeable.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (µm)	Special features
148-142-10	0 - 6.5	0.002	9.5	Plain	Spherical (SR4)	0.1	±2	—
148-143-10				W/clamp nut				
148-342-10				Plain				Thicker & shorter thimble
148-343-10				W/clamp nut				
148-242-10			6	Plain	Spherical (SR3)		±5	Small thimble diameter
148-243-10				W/clamp nut				
148-244	0 - 5	0.004	3.5	Plain	Spherical (SR1.5)			
148-245				W/clamp nut				

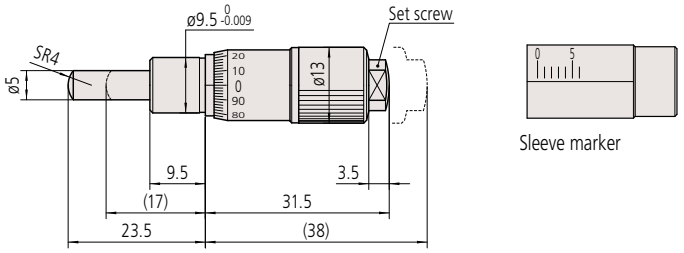
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

DIMENSIONS

Plain Stem

Unit: mm

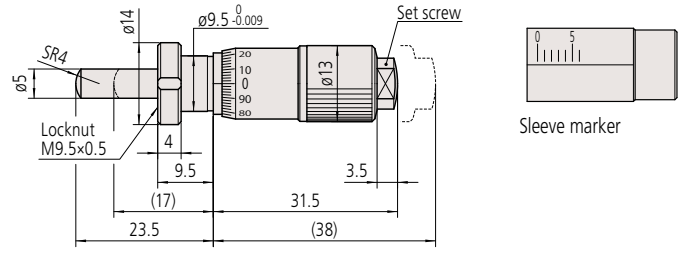
Plain stem Spherical face



148-142-10 Mass: 31 g

Stem Locknut

Stem locknut Spherical face



- Fixture thickness: 6 mm

148-143-10 Mass: 34 g

( ): with spindle fully retracted.

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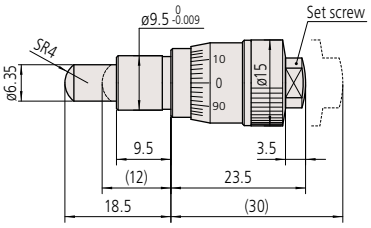
Micrometer Heads
SERIES 148 — Fine Spindle Feed of 0.1 mm/rev

DIMENSIONS

Unit: mm

Plain Stem

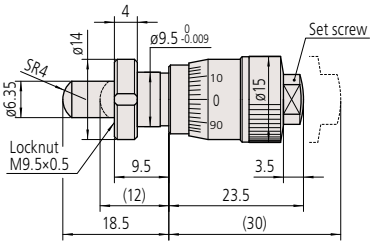
Plain stem Spherical face

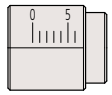


148-342-10 Mass: 29 g

Stem Locknut

Stem locknut Spherical face



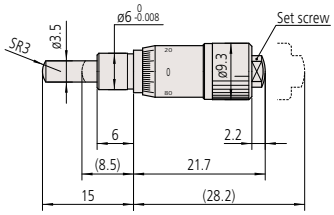


Sleeve marker

• Fixture thickness: 6 mm
148-343-10 Mass: 31 g

Plain Stem

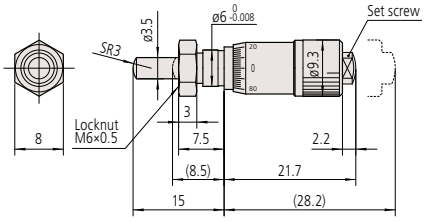
Plain stem Spherical face

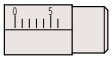


148-242-10 Mass: 10 g

Stem Locknut

Stem locknut Spherical face



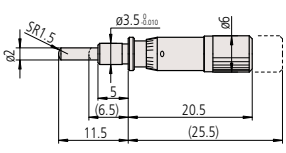


Sleeve marker

• Fixture thickness: 4 mm
148-243-10 Mass: 10 g

Plain Stem

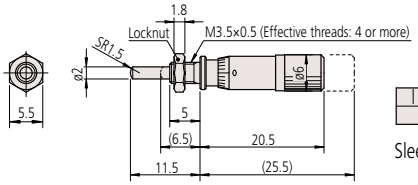
Plain stem Spherical face



148-244 Mass: 4 g

Stem Locknut

Stem locknut Spherical face



Sleeve marker

• Fixture thickness: 3 mm
148-245 Mass: 5 g

( ): with spindle fully retracted.

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Micrometer Heads
SERIES 148 — Fine Spindle Feed of 0.25 mm/rev

- Fine spindle feeding of just 0.25 mm/rev for fine adjustment and positioning.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (µm)
148-132-10	0 - 13	0.01	9.5	Plain	Spherical (SR4)	0.25	±2
148-133-10				W/clamp nut			
148-322-10	0 - 6.5			Plain			
148-323-10				W/clamp nut			

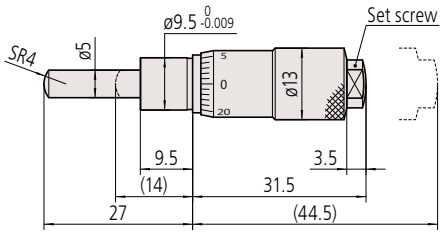
- Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
- Scale finishing: Satin-chrome plated

DIMENSIONS

Plain Stem

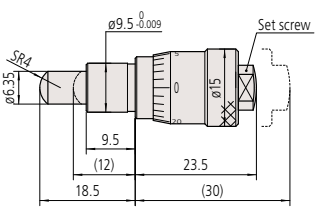
Unit: mm

Plain stem Spherical face



148-132-10 Mass: 30 g

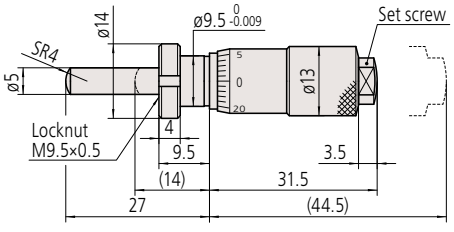
Plain stem Spherical face



148-322-10 Mass: 30 g

Stem Locknut

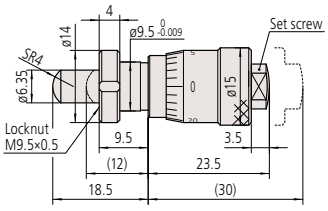
Stem locknut Spherical face



- Fixture thickness: 6 mm

148-133-10 Mass: 35 g

Stem locknut Spherical face



- Fixture thickness: 6 mm

148-323-10 Mass: 35 g

( ): with spindle fully retracted.

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Mitutoyo

Micrometer Heads
SERIES 110 — Differential Screw Thread Translator (Extra-Fine Feed) Type

- Differential movements of spindle threads and units allow extra-fine spindle feeding (0.05 mm/rev), resulting in high-resolution measurements.

SPECIFICATIONS

Metric

Code No.	Range (mm)		Graduation (mm)		Graduation features
110-101	0 - 2.5		0.001		Standard
110-102			0.0001		Fine
110-105-10	0 - 1		0.001		Standard
110-106-10			0.0001		Fine
110-107-10			0.001		Standard
110-108-10			0.0001		Fine
110-502-10	Thimble (fine)	0 - 0.2	Thimble (fine)	0.0005	Dual scales; 0.2 mm fine-feed range
	Thimble (coarse)	0 - 13	Thimble (coarse)	0.01	

Code No.	Stem dia. (mm)	Stem	Spindle end	Maximum permissible error J_{MPE}*2 (µm)
110-101	12	W/clamp nut	Flat (carbide tip)	±5/±1.5
110-102				
110-105-10				±3/±1.5
110-106-10				
110-107-10			Spherical (SR10) (carbide tip)	
110-108-10				
110-502-10	9.5		Spherical	±3/±1.5

Inch

Code No.	Range (in)		Graduation (in)		Graduation features
110-111	0 - 0.05		0.00002		Standard
110-112			0.000005		Fine
110-115-10*1	0 - 0.02		0.00002		Standard
110-116-10*1			0.000005		Fine
110-117-10*1			0.00002		Standard
110-118-10*1			0.000005		Fine
110-504-10	Thimble (fine)	0 - 0.006	Thimble (fine)	0.00002	Dual scales; 0.2 mm/0.006 in fine-feed range
	Thimble (coarse)	0 - 0.5	Thimble (coarse)	0.001	

Code No.	Stem dia. (in)	Stem	Spindle end	Maximum permissible error J_{MPE}*2 (in)
110-111	0.5	W/clamp nut	Flat (carbide tip)	±0.00025/±0.00006
110-112				
110-115-10*1				±0.00015/±0.00006
110-116-10*1				
110-117-10*1			Spherical (SR10) (carbide tip)	
110-118-10*1				
110-504-10	0.375		Spherical	±0.00015/±0.00006

- Measuring face: Material/Carbide tip (**110-502-10**/**504-10** are alloy tool steel), Hardness/90 HRA or more (Only **110-502-10**/**504-10** are 60 HRC or more), Lapped
- Scale finishing: Satin-chrome plated

*1 Made-to-order models
*2 Wide range/narrow range

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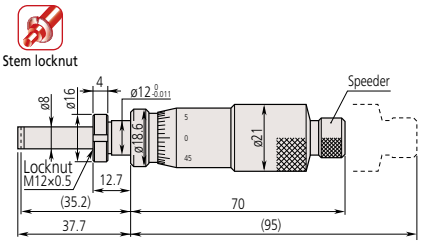
DIMENSIONS

Unit: mm

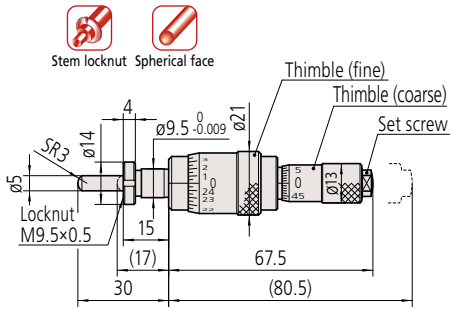
- Differential movement mechanism with double spindle.
- Non-rotating spindle.
- Fixture thickness: 9.5 mm

Equipped with vernier scale



110-101
110-102 Equipped with vernier scale

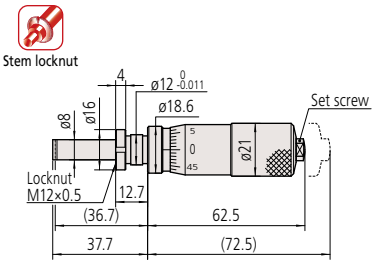
- Dual thimble
- Fixture thickness: 11.5 mm



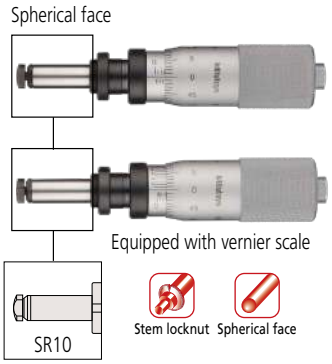
110-502-10 Mass: 95 g

- Differential movement mechanism with double spindle.
- Non-rotating spindle.
- Fixture thickness: 9.5 mm

Equipped with vernier scale



110-105-10
110-106-10 Equipped with vernier scale Mass: 150 g



110-107-10
110-108-10 Equipped with vernier scale

( ): with spindle fully retracted.

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Micrometer Heads
SERIES 152 — Large Thimble Type

- Large-diameter thimble for fine adjustment and positioning.

SPECIFICATIONS

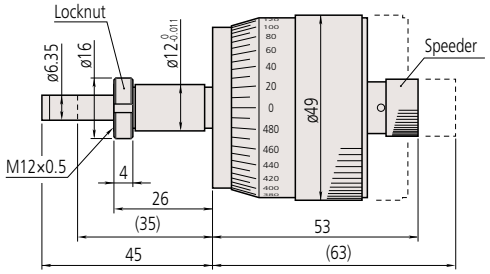
Metric

Code No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Maximum permissible error J_{MPE} (µm)
152-283	0 - 10	0.002	Standard	12	W/clamp nut	Flat (carbide tip)	0.5	±2
152-332	0 - 25				Plain			
152-380	0 - 50		Bidirectional					±4

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: White anodized aluminum

DIMENSIONS

Unit: mm



- Fixture thickness: 22.5 mm

152-283 Mass: 190 g

( ): with spindle fully retracted.

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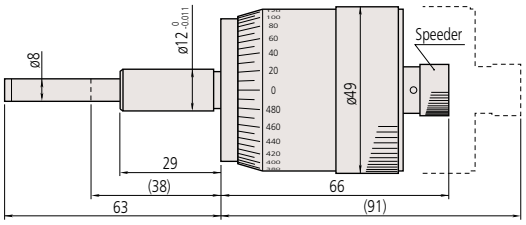
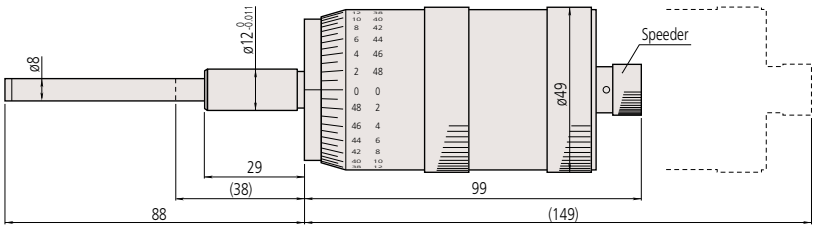
DIMENSIONS

Unit: mm



152-332 Mass: 310 g



152-380 Mass: 460 g

( ): with spindle fully retracted.

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Micrometer Heads
SERIES 152 — XY-Stage Type

• Designed for cross-travel stage translation in the X and Y axes. Bidirectional graduation for easy reading in both directions.

SPECIFICATIONS

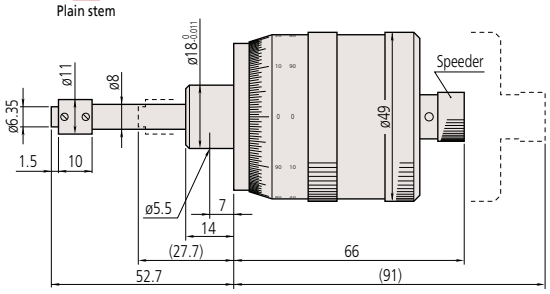
Metric

Code No.	Range (mm)	Graduation (mm)	Graduation features	Stem dia. (mm)	Stem	Spindle pitch (mm)	Maximum permissible error J_{MPE} (µm)
152-390	0 - 25	0.005	for Y axis, bidirectional	18	Plain	1	±2
152-389							

• Measuring face: Material/Carbide tip (**152-389**/**390** are alloy tool steel), Hardness/90 HRA or more (**152-389**/**390** are 60 HRC or more), Lapped
• Scale finishing: White anodized aluminum

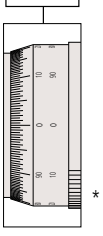
DIMENSIONS

Unit: mm



152-390 Mass: 270 g

• The thimble can be rotated to a better reading position while maintaining the spindle position.



152-389

* Other dimensions are the same as **152-390**.
( ): with spindle fully retracted.

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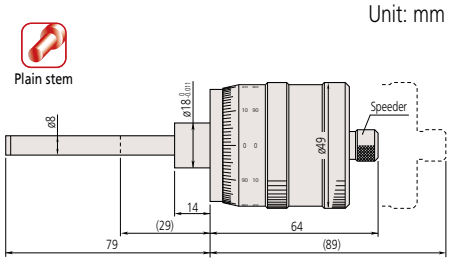
Micrometer Heads
SERIES 197 — Long Stroke Non-rotating Spindle

- Large-thimble micrometer head with non-rotating spindle. Dual-spindle mechanism for quick feeding and bidirectional graduation for easy reading.
- Floating thimble allows easy zero setting at any spindle position.

197-101

DIMENSIONS

Unit: mm



197-101 Mass: 300 g

( ): with spindle fully retracted.

SPECIFICATIONS

Metric

Code No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Maximum permissible error J_{MPE}
197-101	0 - 50 mm	0.005 mm	Bidirectional	18 mm	Plain	Flat (carbide tip)	1 mm	±5 µm

Inch

Code No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Maximum permissible error J_{MPE}
197-201	0 - 2 in	0.0002 in	Bidirectional	0.709 in	Plain	Flat (carbide tip)	0.05 in	±0.0001 in

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: White anodized aluminum

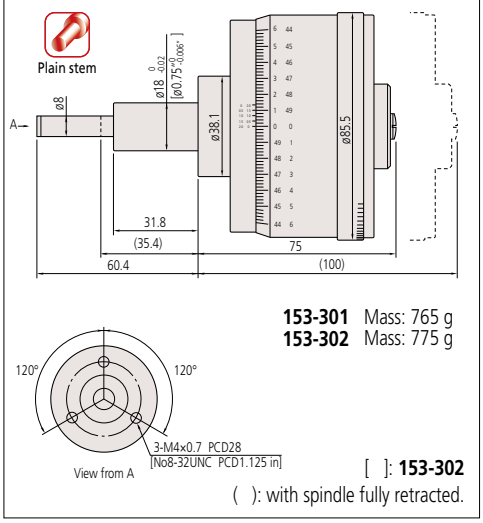
Micrometer Heads
SERIES 153 — High Accuracy and Resolution

- Fine graduation and high accuracy model, suitable for inspection equipment.
- Non-rotating spindle type.

153-301

DIMENSIONS

Unit: mm



153-301 Mass: 765 g
153-302 Mass: 775 g

[ ]: **153-302**

( ): with spindle fully retracted.

SPECIFICATIONS

Metric

Code No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Maximum permissible error J_{MPE}*
153-301	0 - 25 mm	0.0005 mm (vernier)	Bidirectional	18 mm	Plain	Flat (carbide tip)	0.5 mm	±1/±0.5 µm

Inch

Code No.	Range	Graduation	Graduation features	Stem dia.	Stem	Spindle end	Spindle pitch	Maximum permissible error J_{MPE}*
153-302	0 - 1 in	0.00001 in (vernier)	Bidirectional	0.75 in	Plain	Flat (carbide tip)	0.025 in	±0.00005 in/ ±0.00003 in

- Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
- Scale finishing: White anodized aluminum

* Wide range/narrow range

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Micrometer Heads
SERIES 250 — Digit Counter Type

• Digit counter for easy reading of spindle movement.

250-301

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Stem dia. (mm)	Stem	Spindle end	Spindle pitch (mm)	Graduation features	Maximum permissible error J_{MPE} (µm)
250-301	0 - 25	0.01	10	Plain	Flat (carbide tip)	0.5	—	±2

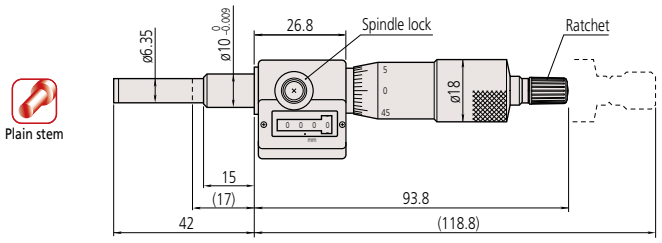
Inch

Code No.	Range (in)	Graduation (in)	Stem dia. (in)	Stem	Spindle end	Spindle pitch (in)	Graduation features	Maximum permissible error J_{MPE} (in)
250-312	0 - 1	0.0001	0.375	Plain	Flat (carbide tip)	0.025	Vernier scale	±.0001

• Measuring face: Material/Carbide tip, Hardness/90 HRA or more, Lapped
• Scale finishing: Satin-chrome plated

DIMENSIONS

Unit: mm



250-301 Mass: 165 g

( ): with spindle fully retracted.

Micro Jack
SERIES 7

• Used for accurate leveling of machines, surface plates, and other precision instruments.
• Zero-setting is possible at any position.
• Easy adjustment under heavy load.

7850

SPECIFICATIONS

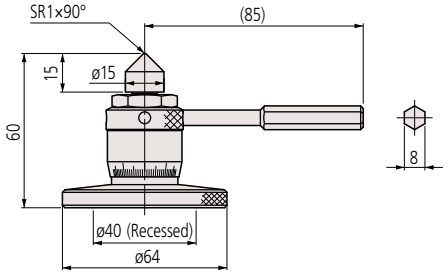
Metric

Code No.	Range (mm)	Graduation (mm)	Remarks (kg)	Handle power at the max. loading (N)
7850	60 - 75	0.01	Max. load: 400	90

• Measuring face: Material/Alloy tool steel, Hardness/60 HRC or more, Lapped
• Scale finishing: Satin-chrome plated

DIMENSIONS

Unit: mm



Measurement example

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Micrometer Head Mounting Fixtures

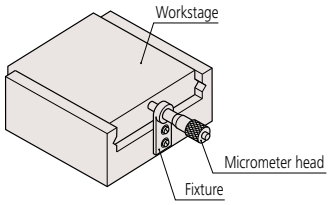
- The act of fabricating brackets to mount micrometer heads for each particular application can be laborious and costly. Mitutoyo offers various types of fixtures for micrometer heads to meet a range of applications. These fixtures are made of nickel-plated cast iron.

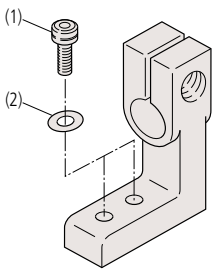
SPECIFICATIONS

Mounting hole size

Micrometer Head	Fixtures (**Code No.**)	Mounting hole size
148 Series	**303560, 303562, 303564, 303566** **303559, 303561, 303563, 303565**	ø9.5×9.5 long for plain stem or stem locknut type micrometer heads
149 Series	**303569, 303571, 303573, 303575** **303568, 303570, 303572, 303574**	ø9.5×15 long for plain stem or stem locknut type micrometer heads
150 Series	**303579, 303581, 303583, 303585** **303578, 303580, 303582, 303584**	ø10×15 long for plain stem or stem locknut type micrometer heads

Note: Supplied with a socket head screw (M3×0.5×12) for fixtures to be used with a micrometer head without stem locknut (plain stem type micrometer head).





SPECIFICATIONS

Recommended socket head screws for the fixtures

Fixtures (**Code No.**)	Socket head screw (1)	Washer (2)
303559, 303560, 303561, 303562, 303563, 303564 **303565, 303566**	M3×0.5×8 M3×0.5×12	Small, Nominal dia.: 3 Small, Nominal dia.: 3
303568, 303569, 303570, 303571, 303572, 303573 **303578, 303579, 303580, 303581, 303582, 303583**	M4×0.7×10	Small, Nominal dia.: 4
303574, 303575 **303584, 303585**	M4×0.7×12	Small, Nominal dia.: 4

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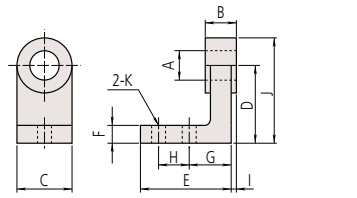
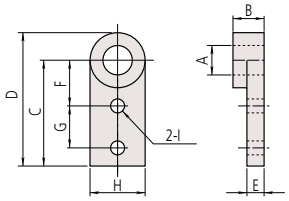
Micrometer Heads Mounting Fixtures

Fixtures for micrometer heads with stem locknut



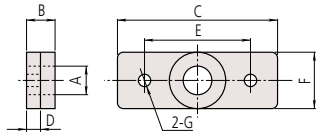
(Unit: mm)

Code No.	A	B	C	D	E	F	G	H	I	J	K
303559	ø9.5	6	15	20	24	5	11	8	0.5	27.5	ø3.4
303568		11.5	20	30	35	7	16	12	1.75	40	ø4.5
303578	ø10										



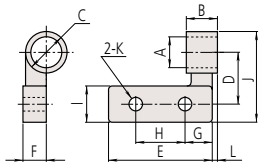
(Unit: mm)

Code No.	A	B	C	D	E	F	G	H	I
303563	ø9.5	6	30	37.5	4.5	15	10	15	ø3.4
303572		11.5	40	50	6.5	18	15	20	ø4.5
303582	ø10								



(Unit: mm)

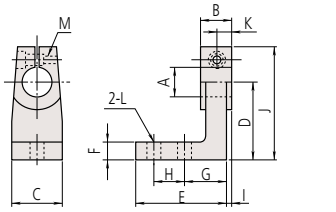
Code No.	A	B	C	D	E	F	G
303561	ø9.5	6	40	3.5	30	15	ø3.4
303570		11.5	60	5.5	40	20	ø4.5
303580	ø10						



(Unit: mm)

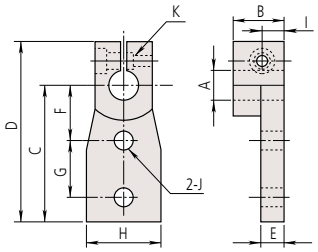
Code No.	A	B	C	D	E	F	G	H	I	J	K	L
303565	ø9.5	6	ø15	15	25	8.5	7.5	10	10	27.5	ø3.4	0.75
303574		11.5		20	40		10	20	15	35	ø4.5	1.25
303584	ø10											

Fixtures for plain stem type micrometer heads



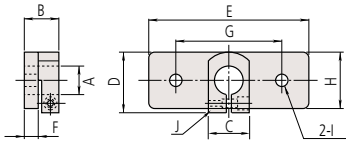
(Unit: mm)

Code No.	A	B	C	D	E	F	G	H	I	J	K	L	M
303560	ø9.5	9	15	20	23	5	11	8	1.5	3.25	4.5	ø3.4	M3x 0.5
303569		14.5	20	30	35	7	16	12	3.25	4.25	7.25	ø4.5	
303579	ø10												



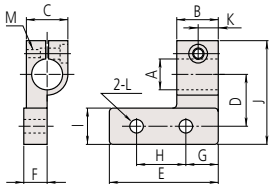
(Unit: mm)

Code No.	A	B	C	D	E	F	G	H	I	J	K
303564	ø9.5	9	30	42.5	4	15	10	15	4.5	ø3.4	M3x 0.5
303573		14.5	40	52.5	6	18	15	20	7.25	ø4.5	
303583	ø10										



(Unit: mm)

Code No.	A	B	C	D	E	F	G	H	I	J
303562	ø9.5	9	15	20	40	3	30	15	ø3.4	M3x 0.5
303571		14.5		22.5	60	5	40	20	ø4.5	
303581	ø10									



(Unit: mm)

Code No.	A	B	C	D	E	F	G	H	I	J	K	L	M
303566	ø9.5	9	15	15	25	8.5	7.5	10	10	32.5	4.5	ø3.4	M3x 0.5
303575		14.5		20	40		10	20	15	40	7.25	ø4.5	
303585	ø10												

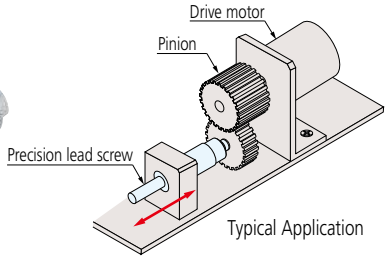
Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Precision Lead Screws

Main applications:
- Precision feed stages
- Fine adjustment of optical elements (mirrors, prisms)
- Fiber optic centering devices
- Various assembly and adjustment jigs

- Mitutoyo manufactures simple and economical precision lead screws for precise positioning mechanisms and fine-feed mechanisms, in addition to the conventional micrometer heads.
- Mitutoyo also manufactures lead screws with special specifications, such as 0.25 mm pitch, as well as those with the standard 0.5 mm feed pitch and with dimensions and forms that meet cusotmer's requirements.

Micrometer Head



Typical Application

SPECIFICATIONS

Code No.	Model*	Range (mm)	Feed pitch (mm)	Feed accuracy (μm)	Stem diameter (mm)	Tip diameter (mm)	Tail diameter (mm)	Screw nominal diameter	Sleeve diameter (mm)	Measuring face	Mass (g)
04AZA160	AS-6.5	0 - 6.5	0.5	±5	ø6 $^{0}_{-0.008}$	ø3.5	ø3 $^{0}_{-0.01}$	M4.5×0.5	ø7	Hardened	10
04AZA161	BS-6.5										11
04AZA162	AS-13	0 - 13		±2	ø9.5 $^{0}_{-0.009}$	ø5	ø5 $^{0}_{-0.012}$	M7.35×0.5	ø10.5		27
04AZA163	BS-13										30
04AZA164	AS-25	0 - 25			ø10 $^{0}_{-0.009}$	ø6.35	ø6 $^{0}_{-0.015}$		ø12	Carbide tip	61
04AZA165	BS-25										64

- Measuring face: Material/Alloy tool steel (**AS-25** and **BS-25** are Carbide tip), Hardness/60 HRC or more (**AS-25** and **BS-25** are 90 HRA or more), Lapped
- Durability: 100,000 operations are guaranteed (use condition: 4 kg load; 2 kg for **AS-6.5** and **BS-6.5**)

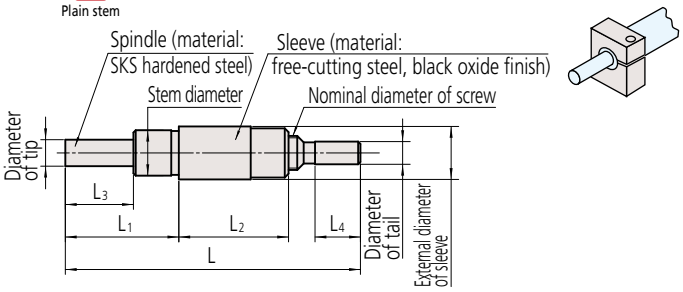
* AS type: Flat spindle tip without nut, BS type: Spherical spindle tip with nut

DIMENSIONS

Type AS: Plain Stem

Unit: mm

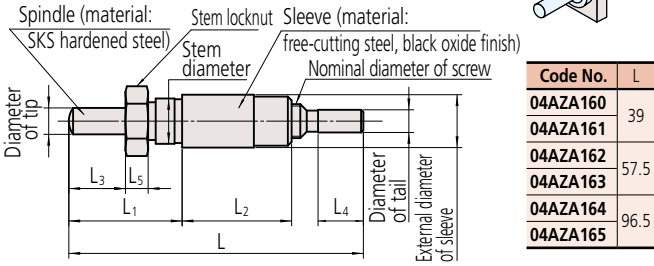
Plain stem



Type BS: Stem with Locknut

Stem locknut

Spherical face



Code No.	L	L1	L2	L3	L4	L5
04AZA160	39	15	14.5	9	6	—
04AZA161				7.5		3
04AZA162	57.5	25	21.5	15.5	8	—
04AZA163						4
04AZA164	96.5	42	39.5	27	10	—
04AZA165						4

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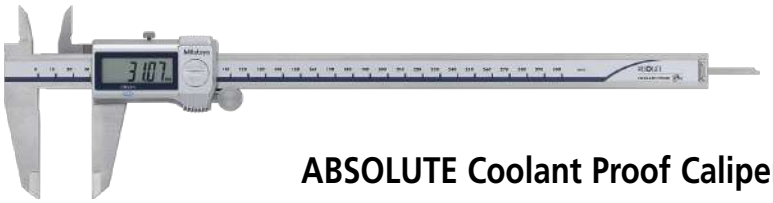
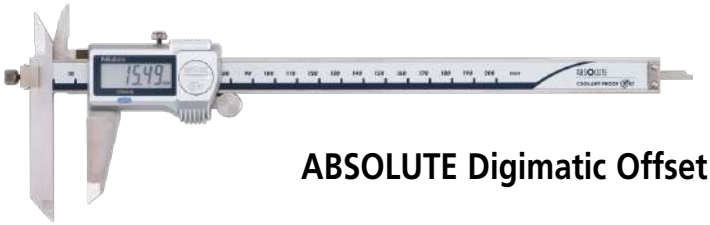
04

Calipers



ABSOLUTE Coolant Proof Caliper

ABSOLUTE Digimatic Caliper



ABSOLUTE Digimatic Offset Caliper

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

U-WAVE fit

Measurement Data Wireless Communication System

Bluetooth® communication enables wireless transfer of measurement data from Digimatic micrometers and callipers to PCs, smartphones, tablets and such other devices.

IP67

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level.
(Refer to page 3)

TÜVRheinland CERTIFIED
Dust- and Water-Protected
www.tuv.com
ID 0000040191

TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

Mitutoyo guarantees the product quality
PROPRIETARY INSPECTION CERTIFICATE
Mitutoyo guarantees the product quality

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off.
The origin is set once - thereafter the live position is displayed when the power is turned on.

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Calipers

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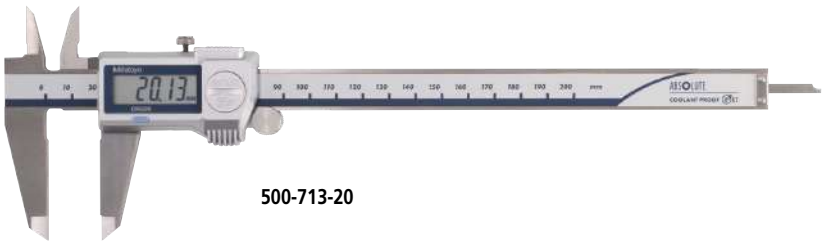
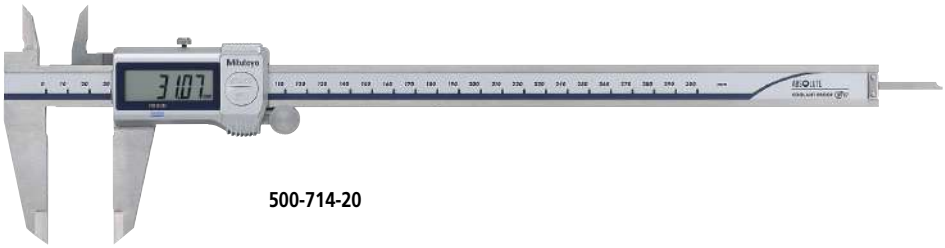
ABSOLUTE Coolant Proof Caliper
SERIES 500 — with Dust/Water Protection Conforming to IP67 Level

- Rated to IP67: can be used in workshop conditions exposed to coolant, water, dust or oil. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Incorporates Mitutoyo's ABSOLUTE measurement system. No need to reset the origin after switching on. Eliminates overspeed errors.
- Battery cap does not require a screw driver for battery replacement.
- SPC data output models can be integrated into statistical process control and measurement systems. (Refer to page 09-3.)
- Carbide-tipped jaw calipers are optimal for rough finished parts, castings, grindingstones, etc.

500-712-20



500-713-20



500-714-20

MeasurLink® ENABLED
Data Management Software by Mitutoyo

U-WAVE fit

ABSOLUTE™

IP67

Dust- and Water-Protected
TÜVRheinland CERTIFIED
www.tuv.com ID 0000045042

PROPRIETARY INSPECTION CERTIFICATE

Functions

- Origin-set: ABSOLUTE origin position can be changed.
- Data output: Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.
  Note: Excludes models without measurement output data port. See SPECIFICATIONS on page 04-4.
- Automatic power on/off: Turns off the LCD display if the caliper remains unused for approximately 20 minutes after measurement, although the origin is still memorized. Moving the slider restores the display.
- Alarm: Should a computing error occur, the display shows an error message, causing the measurement function to stop. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the "B" mark appears to indicate low battery voltage before the measurement becomes unavailable.

Optional Accessories

(Note: Usable only for models with SPC data output. Refer to page 09-23 for details.)

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)*1
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)*1
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T***2
02AZD880G	Buzzer	**U-WAVE-T***2
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC***2
264-621	Buzzer	**U-WAVE-TC***2
264-624	IP67	**U-WAVE-TCB***2
264-625	Buzzer	**U-WAVE-TCB***2
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

*1 Cannot be used for other than water resistant type Digital calipers with external output function.
*2 IP67 model is water/dust-proofed suitable for the factory floor. Buzzer type is not water/dust-proofed.

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LCD

Remarkably easy to read display

IP67 protection level

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*1 E_{MPE}	Maximum permissible error (mm)*1 S_{MPE}	Measurement data output port	Mass (g)	Thumb roller	Remarks
500-702-20*3	0 - 150	0.01	±0.02	±0.04	—	168	✓	—
500-703-20*3	0 - 200					198		
500-706-20*3	0 - 150					168	—	
500-707-20*3	0 - 200					198		
500-709-20	0 - 150					168		Depth bar ø1.9 mm
500-716-20					✓	168		—
500-717-20	0 - 200					198		
500-712-20	0 - 150					168	—	
500-713-20	0 - 200					198		
500-719-20	0 - 150					168		Depth bar ø1.9 mm
500-721-20	0 - 150					168	✓	Carbide-tipped jaws for outside measurement
500-722-20	0 - 200					198		
500-723-20	0 - 150					168	—	Carbide-tipped jaws for outside and inside measurement
500-724-20	0 - 200					198		
500-727-20	0 - 150					168		
500-728-20	0 - 200					198		
500-714-20	0 - 300		±0.03	±0.05		350	✓	—
500-718-20						345	—	
500-704-20*3					—	350	✓	
500-708-20*3						345	—	

Inch / Metric

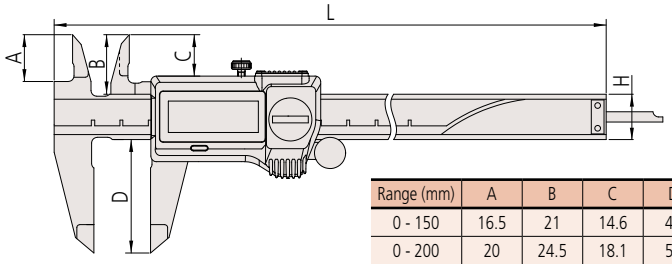
Code No.	Range	Resolution	Maximum permissible error*1 E_{MPE}	Maximum permissible error*1 S_{MPE}	Measurement data output port	Mass (g)	Thumb roller	Remarks
500-720-20	0 - 6 in/0 - 150 mm	0.0005 in/ 0.01 mm	±0.001 in/ ±0.02 mm	±0.002 in/ ±0.04 mm	✓	168	—	Depth bar ø1.9 mm
500-731-20*3					—		✓	Carbide-tipped jaws for outside measurement
500-732-20*3	0 - 8 in/0 - 200 mm					198		
500-733-20*3	0 - 6 in/0 - 150 mm					168		Carbide-tipped jaws for outside and inside measurement
500-734-20*3	0 - 8 in/0 - 200 mm					198		
500-735-20	0 - 6 in/0 - 150 mm				✓	168		Carbide-tipped jaws for outside measurement
500-736-20	0 - 8 in/0 - 200 mm					198		
500-737-20	0 - 6 in/0 - 150 mm					168		Carbide-tipped jaws for outside and inside measurement
500-738-20	0 - 8 in/0 - 200 mm					198		
500-752-20*3	0 - 6 in/0 - 150 mm				—	168		—
500-753-20*3	0 - 8 in/0 - 200 mm					198		
500-762-20	0 - 6 in/0 - 150 mm				✓	168		
500-763-20	0 - 8 in/0 - 200 mm					198		
500-768-20*3	0 - 6 in/0 - 150 mm				—	168		Depth bar ø1.9 mm
500-769-20					✓	168		Depth bar ø1.9 mm
500-764-20	0 - 12 in/0 - 300 mm		±0.0015 in/ ±0.03 mm	±0.0025 in/ ±0.05 mm	✓	350	✓	—
500-754-20*3					—	350		

- Dust/Water protection level: IP67 (IEC60529)*2
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Battery life: Approx. 5 years under normal use
- Response speed: Unlimited
- With depth bar

*1 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*2 Although these models are IP67 rated, care should be taken to dry tool after use.
*3 Without SPC data output.

DIMENSIONS

Unit: mm



Range (mm)	A	B	C	D	H	L
0 - 150	16.5	21	14.6	40	16	233
0 - 200	20	24.5	18.1	50		290
0 - 300	22	27.5	19.8	64	20	404

Outside jaw thickness = 3.5 mm for 0 to 150 mm/0 to 200 mm models
3.8 mm for 0 to 300 mm model

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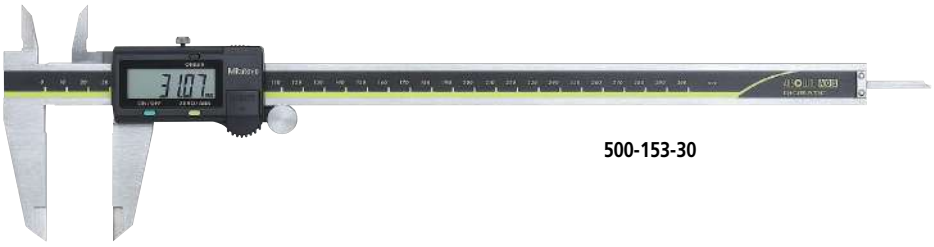
ABSOLUTE Digimatic Caliper
SERIES 500 — with Exclusive ABSOLUTE Encoder Technology

- This is a standard digital calliper. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Incorporates Mitutoyo's ABSOLUTE measurement system. No need to reset the origin after switching on. Eliminates overspeed errors.
- Carbide-tipped jaw calipers are optimal for rough finished parts, castings, grinding stones, etc.
- SPC data output models can be integrated into statistical process control and measurement systems. (Refer to page 09-3.)

500-151-30

500-182-30



500-153-30

Functions

- ABSOLUTE measurement: after a data is displayed, next measurement can be performed without zero-setting. Also, the ABS origin point can be changed with ORIGIN switch.
- Incremental measurement: Sets the displayed value to zero (zero-setting) at any position, making comparative measurement easier.
- Low-voltage alert: notifies that the battery is worn with "B" mark before becoming immeasurable. Thus, the timing for battery replacement can be confirmed in advance.
- Data output: Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.
  Note: Excludes models without measurement output data port. See SPECIFICATIONS on page 04-6.
- Data hold: With the optional hold unit, the function can hold the displayed value (cannot be used with the output function).

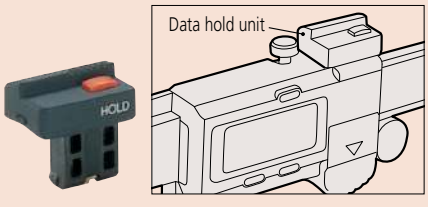
Optional Accessories

(Note: Usable only for models with SPC data output. Refer to page 09-23 for details.)

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
959149	C	Connection cable for **IT/DP/MUX** (1 m)
959150	C	Connection cable for **IT/DP/MUX** (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67*	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm)
02AZE140C	C	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67*	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67*	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF300	Buzzer	Connecting unit for **U-WAVE-TC/TCB**

* IP-67 is applied to these **U-WAVE-T/-TC/-TCB**, but not to the calipers on page 04-6 to 04-7.

- **Data hold unit**



959143

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SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)* E_{MPE}	Maximum permissible error (mm)* S_{MPE}	Measurement data output port	Mass (g)	Depth bar	Fine adjustment	Remarks
500-150-30	0 - 100	0.01	±0.02	±0.04	✓	143	ø1.9 mm rod	with thumb roller	—
500-180-30					—			—	
500-151-30	0 - 150				✓	168	Blade	with thumb roller	
500-154-30									Carbide-tipped jaws for outside measurement
500-155-30									Carbide-tipped jaws for outside and inside measurement
500-158-30							ø1.9 mm rod		—
500-181-30					—		Blade	—	
500-152-30	0 - 200				✓	198		with thumb roller	
500-156-30									Carbide-tipped jaws for outside measurement
500-157-30									Carbide-tipped jaws for outside and inside measurement
500-182-30					—			—	—
500-153-30	0 - 300		±0.03	±0.05	✓	350		with thumb roller	
500-161-30	0 - 150		±0.02	±0.04		168		—	
500-162-30	0 - 200					198			
500-184-30	0 - 150				—	168	ø1.9 mm rod		
500-201-30	0 - 100				✓	143	Blade		
500-203-30	0 - 150					168	ø1.9 mm rod		
500-205-30	0 - 300		±0.03	±0.05		345	Blade		
500-233-30	0 - 150		±0.02	±0.04		168			Carbide-tipped jaws for outside measurement
500-234-30									Carbide-tipped jaws for outside and inside measurement
500-235-30	0 - 200					198			Carbide-tipped jaws for outside measurement
500-236-30									Carbide-tipped jaws for outside and inside measurement

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Battery life: Approx. 5 years under normal use
- Response speed: Unlimited

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

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Mitutoyo

ABSOLUTE Digimatic Caliper
SERIES 500 — with Exclusive ABSOLUTE Encoder Technology

Inch / Metric

Code No.	Range	Resolution	Maximum permissible error* E_{MPE}	Maximum permissible error* S_{MPE}	Measurement data output port	Mass (g)	Depth bar	Fine adjustment	Remarks
500-170-30	0 - 4 in/ 0 - 100 mm	0.0005 in/ 0.01 mm	±0.001 in/ ±0.02 mm	±0.002 in/ ±0.04 mm	✓	143	ø0.075 inch rod	with thumb roller	—
500-195-30					—				
500-171-30	0 - 6 in/ 0 - 150 mm				✓	168	Blade		
500-174-30									Carbide-tipped jaws for outside measurement
500-175-30									Carbide-tipped jaws for outside and inside measurement
500-178-30							ø0.075 inch rod		—
500-196-30					—		Blade		
500-159-30									Carbide-tipped jaws for outside measurement
500-160-30									Carbide-tipped jaws for outside and inside measurement
500-191-30					✓			—	—
500-202-30									
500-172-30	0 - 8 in/ 0 - 200 mm					198		with thumb roller	
500-176-30									Carbide-tipped jaws for outside measurement
500-177-30									Carbide-tipped jaws for outside and inside measurement
500-197-30					—				—
500-163-30									Carbide-tipped jaws for outside measurement
500-164-30									Carbide-tipped jaws for outside and inside measurement
500-204-30					✓			—	—
500-173-30	0 - 12 in/ 0 - 300 mm		±0.0015 in/ ±0.03 mm	±0.0025 in/ ±0.05 mm		350		with thumb roller	
500-167-30									Carbide-tipped jaws for outside measurement
500-168-30									Carbide-tipped jaws for outside and inside measurement
500-193-30					—				—
500-165-30									Carbide-tipped jaws for outside measurement
500-166-30									Carbide-tipped jaws for outside and inside measurement

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Battery life: Approx. 5 years under normal use
- Response speed: Unlimited

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

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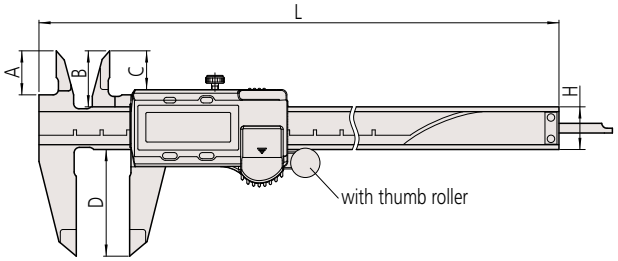
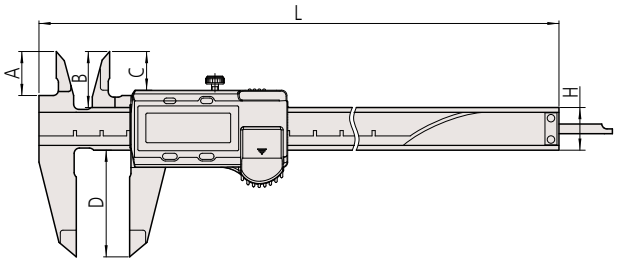
DIMENSIONS

Unit: mm

With thumb roller



Without thumb roller



Range (mm)	A	B	C	D	H	L
0 - 100	16.5	21	14.5	40	16	182
0 - 150						233
0 - 200	20	24.5	18	50		290
0 - 300	22	27.5	19.8	64	20	404

Jaw thickness: 3.5 mm for 0 to 100 mm/0 to 150 mm/0 to 200 mm models and 3.8 mm for 0 to 300 mm model

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MeasurLink® ENABLED Data Management Software by Mitutoyo

ABSOLUTE™

ABSOLUTE Digimatic Long Caliper SERIES 500 — with Exclusive ABSOLUTE Encoder Technology

- This is a long-scale digital caliper. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Incorporates Mitutoyo's ABSOLUTE measurement system. No need to reset the origin after switching on. Eliminates overspeed errors.
- Data output function allows integration into statistical process control and measurement systems. (Refer to page 09-3.)

500-500-10

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*		Mass (g)
			E_{MPE}	S_{MPE}	
500-500-10	0 - 450	0.01	±0.05	±0.07	1170
500-501-10	0 - 600				1350
500-502-10	0 - 1000		±0.07	±0.09	3300

Inch / Metric

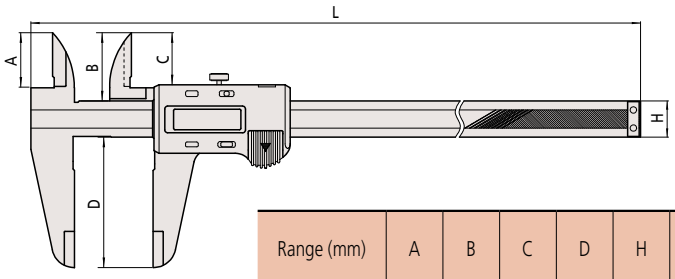
Code No.	Range	Resolution	Maximum permissible error*		Mass (g)
			E_{MPE}	S_{MPE}	
500-505-10	0 - 18 in/0 - 450 mm	0.0005 in/0.01 mm	±0.002 in/±0.05 mm	±0.003 in/±0.07 mm	1170
500-506-10	0 - 24 in/0 - 600 mm				1350
500-507-10	0 - 40 in/0 - 1000 mm		±0.003 in/±0.07 mm	±0.004 in/±0.09 mm	3300

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 3.5 years under normal use
- Response speed: Unlimited

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



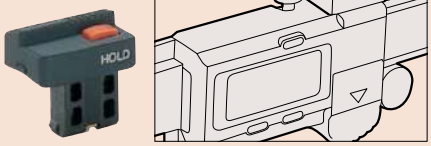
Range (mm)	A	B	C	D	H	L	Outside jaw width
0 - 450	38	47	35.9	90	25	630	6
0 - 600						780	
0 - 1000	50	60	49.8	130	32	1240	8

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
959149	C	Connection cable for **IT/DP/MUX** (1 m)
959150	C	Connection cable for **IT/DP/MUX** (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67*	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm)
02AZE140C	C	Connection cable for **U-WAVE-T**

* IP-67 is applied to this **U-WAVE-T**, but not to the calipers on page 04-9.

- **Data hold unit**



959143

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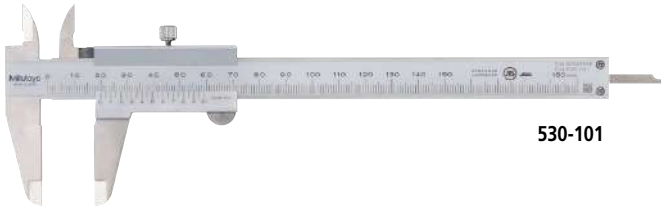
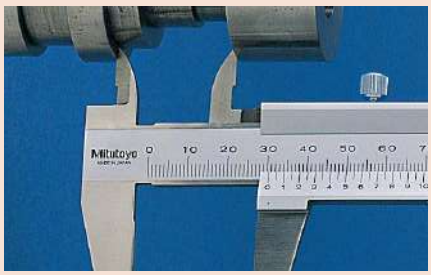
Vernier Caliper
SERIES 530 — Standard Model

- This is a standard analog caliper. It can measure the outside, inside, depth, and step.
- The small Vernier face angle (14°) provides easy reading.
- Carbide-tipped jaw calipers are optimal for rough finished parts, castings, grinding stones, etc.

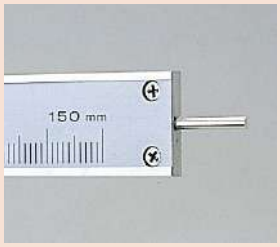


530-101

Measurement example



Round depth bar type



530-102

Carbide-tipped jaws for outside measurement

530-320

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)* E_{MPE}	Maximum permissible error (mm)* S_{MPE}	Depth bar	Remarks
530-101	0 - 150	0.05	±0.05	±0.07	Blade	—
530-122		0.02	±0.03	±0.05		High accuracy model
530-108	0 - 200	0.05	±0.05	±0.07		—
530-123		0.02	±0.03	±0.05		High accuracy model
530-109	0 - 300	0.05	±0.08	±0.10		—
530-124		0.02	±0.04	±0.06		High accuracy model

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)* E_{MPE}	Maximum permissible error (mm)* S_{MPE}	Depth bar	Remarks
530-100	0 - 100	0.05	±0.05	±0.07	ø1.9 mm rod	—
530-102	0 - 150					—
530-320					Blade	Carbide-tipped jaws for outside measurement
530-335						Carbide-tipped jaws for outside and inside measurement
530-321	0 - 200					Carbide-tipped jaws for outside measurement
530-322	0 - 300		±0.08	±0.10		Carbide-tipped jaws for outside measurement
530-501	0 - 600		±0.10	±0.12	—	—
530-502	0 - 1000		±0.15	±0.17		

Metric/Inch with metric/inch double scale

Code No.	Range	Graduation	Maximum permissible error E_{MPE}	Maximum permissible error S_{MPE}	Depth bar	Remarks
530-104	0 - 150 mm/ 0 - 6 in	0.05 mm (1/128 in)	±0.05 mm/ ±0.5/128 in	±0.07 mm/ ±0.5/128 in	Blade	—
530-316						Clamping screw below the slider
530-312		0.02 mm (0.001 in)	±0.03 mm/ ±0.001 in	±0.05 mm/ ±0.002 in		High accuracy model: ±0.03 mm
530-114	0 - 200 mm/ 0 - 8 in	0.05 mm (1/128 in)	±0.05 mm/ ±0.5/128 in	±0.07 mm/ ±0.5/128 in		—
530-118		0.02 mm (0.001 in)	±0.03 mm/ ±0.001 in	±0.05 mm/ ±0.002 in		High accuracy model: ±0.03 mm
530-115	0 - 300 mm/ 0 - 12 in	0.05 mm (1/128 in)	±0.08 mm/ ±0.5/128 in	±0.10 mm/ ±0.5/128 in		—
530-119		0.02 mm (0.001 in)	±0.04 mm/ ±0.0015 in	±0.06 mm/ ±0.0025 in		High accuracy model: ±0.04 mm

Inch with inch/inch double scale

Code No.	Range (in)	Graduation (in)	Maximum permissible error (in) E_{MPE}	Maximum permissible error (in) S_{MPE}	Depth bar	Remarks
530-105	0 - 6	0.001 (1/128)	±0.001/±0.5/128	±0.002/±0.5/128	Blade	—
530-116	0 - 8					

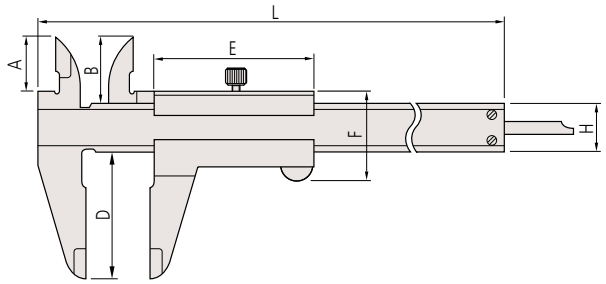
* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Vernier Caliper
SERIES 530 — Standard Model

DIMENSIONS

Unit: mm



Range (mm)	A	B	D	E	F	H	L	Outside jaw thickness
0 - 100	17	21.5	40	53.5	30	16	182	3
0 - 150							229	
0 - 200	20.5	25	50				288	
0 - 300	22	27.5	64	66.5	36	20	404	3.8
0 - 600	38	47	90	89	50	25	780	6
0 - 1000	50	60	130	111	61	32	1240	8

Note: **530-100** and **530-102** incorporate a round depth bar (ø1.9 mm).
The depth bar shown in the illustration above is a different type.

Calipers

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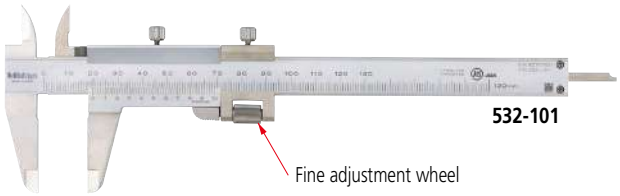
Vernier Caliper
SERIES 532 — with Fine Adjustment

- Fine-adjustment thumbwheel aids slider positioning.



SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Depth bar	Remarks
			E_{MPE}	S_{MPE}		
532-101	0 - 130	0.02	±0.03	±0.05	Blade	with fine adjustment
532-102	0 - 180					
532-103	0 - 280		±0.04	±0.06		

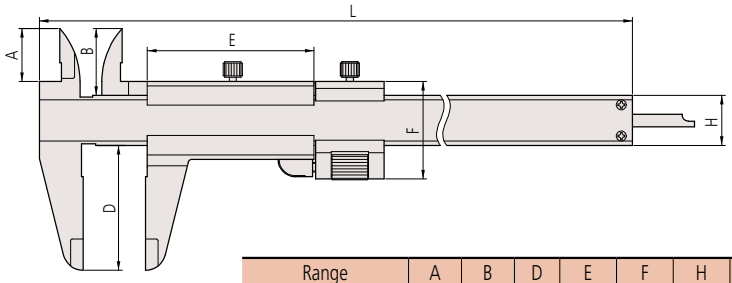
Metric / Inch with metric/inch double scale

Code No.	Range	Graduation	Maximum permissible error*		Depth bar	Remarks
			E_{MPE}	S_{MPE}		
532-119	0 - 130 mm/0 - 5 in	0.02 mm (0.001 in)	±0.03 mm/0.001 in	±0.05 mm/0.002 in	Blade	with fine adjustment
532-120	0 - 180 mm/0 - 7 in					
532-121	0 - 280 mm/0 - 11 in		±0.04 mm/0.0015 in	±0.06 mm/0.0025 in		

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



Range	A	B	D	E	F	H	L
0 - 130 mm/0 - 5 in	17	21.5	40	53.5	31.2	16	229
0 - 180 mm/0 - 7 in	20.5	25	50				288
0 - 280 mm/0 - 11 in	22	27.5	64	66.5	38	20	404

Jaw thickness: 3 mm for 0 to 130 mm/0 to 5 inch and 0 to 180 mm/0 to 7 inch models
3.8 mm for 0 to 280 mm/0 to 11 inch model

Calipers

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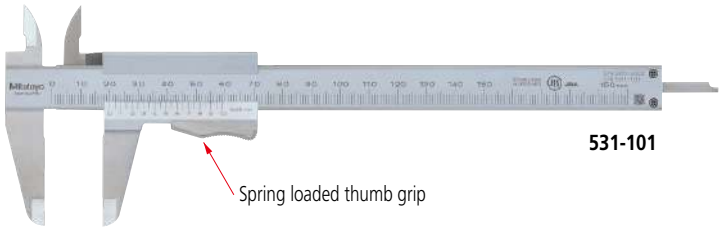
Vernier Caliper
SERIES 531 — with Thumb Grip

- The slider position is fixed by an automatic clamp, and the measured value can be kept after a workpiece is removed.
- This feature is helpful when measuring at an invisible point of a workpiece or reading a value without a workpiece.



SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Depth bar	Remarks
			E_{MPE}	S_{MPE}		
531-101	0 - 150	0.05	±0.05	±0.07	Blade	—
531-102	0 - 200					
531-103	0 - 300		±0.08	±0.10		

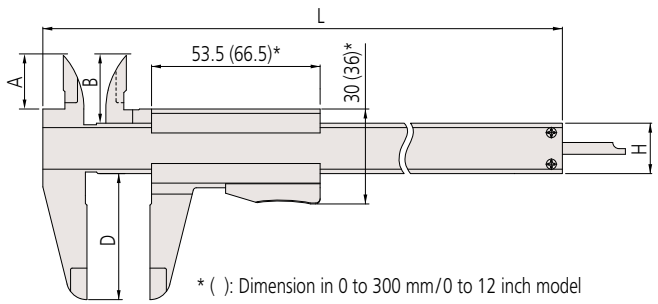
Metric/Inch with metric/inch double scale

Code No.	Range	Graduation	Maximum permissible error*		Depth bar	Remarks
			E_{MPE}	S_{MPE}		
531-122	0 - 150 mm/0 - 6 in	0.05 mm (1/128 in)	±0.05 mm/±0.5/128 in	±0.07 mm/±0.5/128 in	Blade	with inch/mm conversion label
531-128		0.02 mm (0.001 in)	±0.03 mm/0.001 in	±0.05 mm/0.002 in		High accuracy model
531-108	0 - 200 mm/0 - 8 in	0.05 mm (1/128 in)	±0.05 mm/±0.5/128 in	±0.07 mm/±0.5/128 in		—
531-129		0.02 mm (0.001 in)	±0.03 mm/0.001 in	±0.05 mm/0.002 in		High accuracy model
531-109	0 - 300 mm/0 - 12 in	0.05 mm (1/128 in)	±0.08 mm/±0.5/128 in	±0.10 mm/±0.5/128 in		—
531-112		0.02 mm (0.001 in)	±0.04 mm/0.0015 in	±0.06 mm/0.0025 in		High accuracy model

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



* ( ): Dimension in 0 to 300 mm/0 to 12 inch model

Range	A	B	D	H	L
0 - 150 mm/0 - 6 in	17	21.5	40	16	229
0 - 200 mm/0 - 8 in	20.5	25	50		288
0 - 300 mm/0 - 12 in	22	27.5	64	20	404

Jaw thickness: 3 mm for 0 to 150 mm/0 to 6 inch and 0 to 200 mm/0 to 8 inch models
3.8 mm for 0 to 300 mm/0 to 12 inch model

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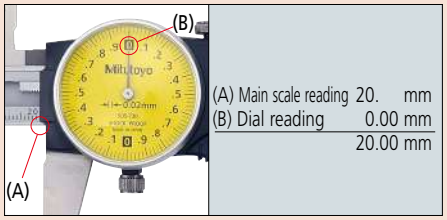
Dial Caliper
SERIES 505

- Easy-to-read yellow dial reduces the effect of parallax.
- The font used on the dial face and the main scale is easy to read.
- Large finger rest aids ease of use.

Reading



The series provides two types; Graduation 0.02 mm (2 mm/rev.) and Graduation 0.01 mm (1 mm/rev.).

SPECIFICATIONS

Metric

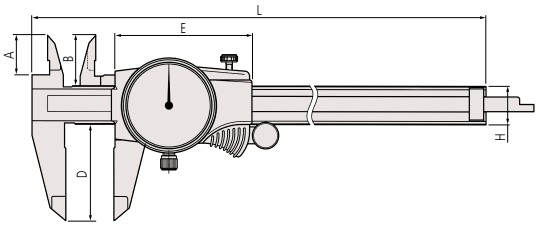
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*2 E_{MPE}	Maximum permissible error (mm)*2 S_{MPE}	Remarks
505-730	0 - 150	0.02, 2/rev	±0.03	±0.05	—
505-734					Carbide-tipped jaws for outside measurement
505-735					Carbide-tipped jaws for outside and inside measurement
505-731	0 - 200				—
505-745	0 - 300		±0.04	±0.06	
505-732*1	0 - 150	0.01, 1/rev	±0.02	±0.04	
505-733*1	0 - 200		±0.03	±0.05	

Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error (in)*2 E_{MPE}	Maximum permissible error (in)*2 S_{MPE}	Remarks
505-740J	0 - 6	0.001, 0.2/rev	±0.001	±0.002	—
505-742J*1		0.001, 0.1/rev			
505-742-56J					
505-742-51J					
505-736*1					Carbide-tipped jaws for outside measurement
505-738*1					Carbide-tipped jaws for outside and inside measurement
505-744		0.001, 0.2/rev			Carbide-tipped jaws for outside measurement
505-742-52J		0.001, 0.1/rev			—
505-742-53J					
505-742-54J					
505-742-55J					
505-741J	0 - 8	0.001, 0.2/rev	±0.002	±0.0025	
505-743J*1		0.001, 0.1/rev			
505-737*1		0.001, 0.2/rev			Carbide-tipped jaws for outside measurement
505-739*1					Carbide-tipped jaws for outside and inside measurement
505-749	0 - 12				—
505-746*1		0.001, 0.1/rev			
505-750		0.001, 0.2/rev			Carbide-tipped jaws for outside measurement
505-747*1		0.001, 0.1/rev			
505-748*1					Carbide-tipped jaws for outside and inside measurement

*1 Silver cover type
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS



Unit: mm

Range (mm)	A	B	D	E	H	L
0 - 150	16.5	21	40	57.2	16	231
0 - 200	20	24.5	50			288
0 - 300	22	27.5	64	70.2	20	404

Outside jaw thickness: 3.5 mm
(**505-745**: 3.8 mm)

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ABSOLUTE Coolant Proof Carbon Fiber Caliper SERIES 552 — with Standard Jaws

- Digimatic Calipers employ CFRP (Carbon-Fiber Reinforced Plastics) in the beam and jaws. Leightweight and easy to handle.
- Rated to IP66: can be used in adverse environments where the caliper is subject to splashing by cutting fluid or coolant. The digital display can reduce human error by preventing incorrect reading of measurement results.

552-303-10

SPECIFICATIONS

Metric

Code No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
552-302-10	0 - 450 (20.1 - 470)	0.01	±0.04	±0.04
552-303-10	0 - 600 (20.1 - 620)			
552-304-10	0 - 1000 (20.1 - 1020)		±0.05	±0.05
552-305-10	0 - 1500 (20.1 - 1520)		±0.09	±0.09
552-306-10	0 - 2000 (20.1 - 2020)		±0.12	±0.12

Inch / Metric

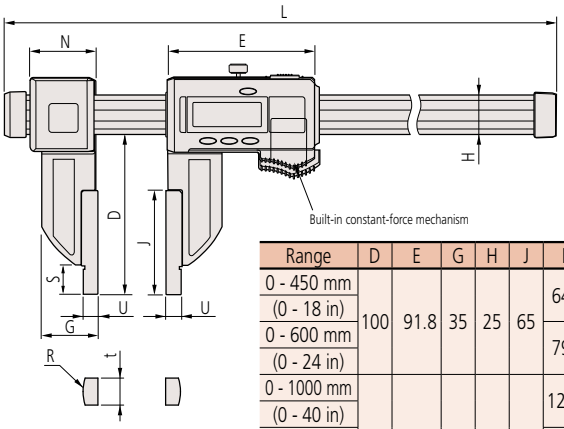
Code No.	Range*1	Resolution	Maximum permissible error*2	
			E_{MPE}	S_{MPE}
552-312-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7mm)	0.0005 in/0.01 mm	±0.002 in/±0.04 mm	±0.002 in/±0.04 mm
552-313-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)			
552-314-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.002 in/±0.05 mm	±0.002 in/±0.05 mm
552-315-10	0 - 60 in/0 - 1500 mm (1.004 - 61 in/25.5 - 1525.4 mm)		±0.004 in/±0.09 mm	±0.004 in/±0.09 mm
552-316-10	0 - 80 in/0 - 2000 mm (1.004 - 81 in/25.5 - 2025.4 mm)		±0.005 in/±0.12 mm	±0.005 in/±0.12 mm

- Dust/Water protection level: IP66 (IEC60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5,000 hours in continuous use
- Response speed: Unlimited
- Material of jaws: Stainless Steel Hardened

*1 ( ): Dimension in inside measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.
Note: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page 13-21 for details.

DIMENSIONS

Unit: mm



Range	D	E	G	H	J	L	N	R	S	t	U
0 - 450 mm	100	91.8	35	25	65	640	41.2	R10	18	8	10
(0 - 18 in)											(0.25 in)
0 - 600 mm						790					10
(0 - 24 in)											(0.25 in)
0 - 1000 mm	150	113.8	45	32	100	1230	62.8		24		10
(0 - 40 in)											(0.5 in)
0 - 1500 mm						1740					10
(0 - 60 in)											(0.5 in)
0 - 2000 mm						2250					10
(0 - 80 in)											(0.5 in)

MeasurLink® ENABLED Data Management Software by Mitutoyo

ABSOLUTE™

IP66

Dust- and Water-Protected TÜVRheinland CERTIFIED www.tuv.com ID 0000022582

Measurement example

Functions

- Zero-setting
- Data hold: Pressing the HOLD switch displays "H" on the LCD display and holds (retains) the display of value. Moving the slider in this state does not change the displayed value. Pressing the switch again cancels the state, allowing you to start measurement again.
- Offsetting: Pressing the OFFSET switch adds an offset for inside measurement to the displayed value so that you can directly obtain an inside measurement value.
- Presetting: This function presets a desired value as the displayed value at the origin. When using optional jaws, presetting an offset of the jaws enables you to directly obtain the necessary measurement value.
- Data output: Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
- Low-power and low-voltage alert: When the battery voltage becomes low, "B" appears on the LCD, signalling the need for battery replacement before the calliper stops working.
- Counting value composition error: If a measurement error occurs due to dirt on the scale, etc., an error message appears on the display and measurement stops.
- Automatic power on/off, inch/mm reading (inch/mm models): LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch

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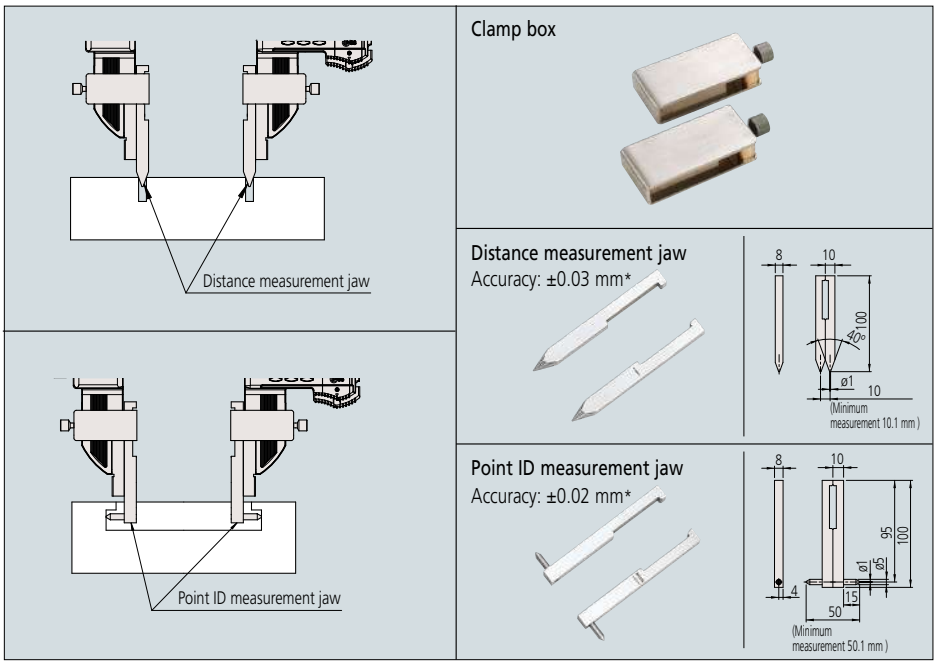
Optional accessories

Metric

	552-302-10, **552-155-10**, **552-303-10** and **552-156-10**	**552-304-10**, **552-305-10** and **552-306-10**
Clamp box (1 pair)	**914053**	**914054**
Distance measurement jaw (1 pair)	**914055**	
Point ID measurement jaw (1 pair)	**914057**	

Inch / Metric

	552-312-10, **552-165-10**, **552-313-10** and **552-166-10**	**552-314-10**, **552-315-10** and **552-316-10**
Clamp box (1 pair)	**914053**	**914054**
Distance measurement jaw (1 pair)	**914056**	
Point ID measurement jaw (1 pair)	**914058**	



* Accuracies shown in the diagrams are of each accessory and accuracy resulting in mounting them on the main body is not guaranteed.

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ABSOLUTE Coolant Proof Carbon Fiber Caliper SERIES 552 — with Long Jaws

- Digimatic Calipers employ CFRP (Carbon-Fiber Reinforced Plastics) in the beam and jaws. Lightweight and easy to handle. The long jaw is suitable for measuring a large pipe diameter, etc.
- Rated to IP66: can be used in adverse environments where the caliper is subject to splashing by cutting fluid or coolant. The digital display can reduce human error by preventing incorrect reading of measurement results.

552-151-10

SPECIFICATIONS

Metric

Code No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
552-150-10	0 - 450 (20.1 - 470)	0.01	±0.06	±0.06
552-151-10	0 - 600 (20.1 - 620)			
552-152-10	0 - 1000 (20.1 - 1020)		±0.07	±0.07
552-153-10	0 - 1500 (20.1 - 1520)		±0.11	±0.11
552-154-10	0 - 2000 (20.1 - 2020)		±0.14	±0.14

Inch / Metric

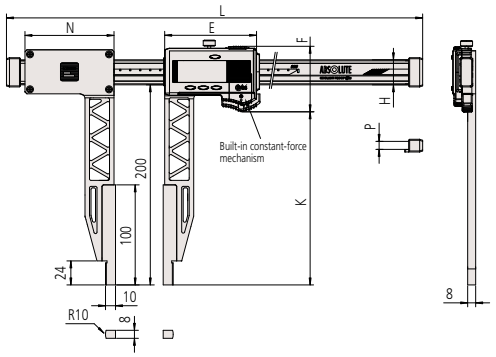
Code No.	Range*1	Resolution	Maximum permissible error*2	
			E_{MPE}	S_{MPE}
552-160-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)	0.0005 in/0.01 mm	±0.0025 in/±0.06 mm	±0.0025 in/±0.06 mm
552-161-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)			
552-162-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.003 in/±0.07 mm	±0.003 in/±0.07 mm
552-163-10	0 - 60 in/0 - 1500 mm (1.004 - 61 in/25.5 - 1525.4 mm)		±0.0045 in/±0.11 mm	±0.0045 in/±0.11 mm
552-164-10	0 - 80 in/0 - 2000 mm (1.004 - 81 in/25.5 - 2025.4 mm)		±0.0055 in/±0.14 mm	±0.0055 in/±0.14 mm

- Dust/Water protection level: IP66 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5,000 hours in continuous use
- Response speed: Unlimited
- Material of jaws: Stainless Steel Hardened

*1 ( ): Dimension in inside measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.
Note: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page 13-21 for details.

DIMENSIONS

Unit: mm



Range	E	F	H	K	L	N	P
0 - 450 mm	91.8	65.5	25	173	680	89	8
0 - 600 mm					830		
0 - 1000 mm	113.8	73	32	170.5	1280	110	12
0 - 1500 mm					1790		
0 - 2000 mm					2300		

MeasurLink® ENABLED Data Management Software by Mitutoyo

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IP66

Dust- and Water-Protected

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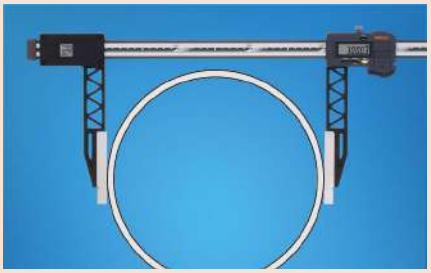
Measurement example



Functions

- Zero-setting
- Data hold: Pressing the HOLD switch displays "H" on the LCD display and holds (retains) the display of value. Moving the slider in this state does not change the displayed value. Pressing the switch again cancels the state, allowing you to start measurement again.
- Offsetting: Pressing the OFFSET switch adds an offset for inside measurement to the displayed value so that you can directly obtain an inside measurement value.
- Presetting: This function presets a desired value as the displayed value at the origin. When using optional jaws, presetting an offset of the jaws enables you to directly obtain the necessary measurement value.
- Data output: Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
- Low-power and low-voltage alert: When the battery voltage becomes low, "B" appears on the LCD, signalling the need for battery replacement before the calliper stops working.
- Counting value composition error: If a measurement error occurs due to dirt on the scale, etc., an error message appears on the display and measurement stops.
- Automatic power on/off, inch/mm reading (inch/mm models): LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch

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MeasurLink® ENABLED Data Management Software by Mitutoyo

ABSOLUTE™

IP66

Dust- and Water-Protected

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ABSOLUTE Coolant Proof Carbon Fiber Caliper SERIES 552 — with Ceramic Jaws

- Digimatic Calipers employ CFRP (Carbon-Fiber Reinforced Plastics) in the beam and jaws. Leightweight and easy to handle.
- Rated to IP66: can be used in adverse environments where the caliper is subject to splashing by cutting fluid or coolant. The digital display can reduce human error by preventing incorrect reading of measurement results.
- Zirconia ceramic contact surfaces make it possible to measure weakly magnetic workpieces; however, measurement of strongly magnetic workpieces may not be possible, as metal parts are used for the caliper's main body.

552-156-10

Functions

- Zero-setting
- Data hold: Pressing the HOLD switch displays "H" on the LCD display and holds (retains) the display of value. Moving the slider in this state does not change the displayed value. Pressing the switch again cancels the state, allowing you to start measurement again.
- Offsetting: Pressing the OFFSET switch adds an offset for inside measurement to the displayed value so that you can directly obtain an inside measurement value.
- Presetting: This function presets a desired value as the displayed value at the origin. When using optional jaws, presetting an offset of the jaws enables you to directly obtain the necessary measurement value.
- Data output: Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
- Low-power and low-voltage alert: When the battery voltage becomes low, "B" appears on the LCD, signalling the need for battery replacement before the caliper stops working.
- Counting value composition error: If a measurement error occurs due to dirt on the scale, etc., an error message appears on the display and measurement stops.
- Automatic power on/off, inch/mm reading (inch/mm models): LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch

SPECIFICATIONS

Metric

Code No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
552-155-10	0 - 450 (20.1 - 470)	0.01	±0.04	±0.04
552-156-10	0 - 600 (20.1 - 620)		±0.04	±0.04

Inch/Metric

Code No.	Range*1	Resolution	Maximum permissible error*2	
			E_{MPE}	S_{MPE}
552-165-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)	0.0005 in/0.01 mm	±0.002 in/±0.04 mm	±0.002 in/±0.04 mm
552-166-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)			

- Dust/Water protection level: IP66 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5,000 hours in continuous use
- Response speed: Unlimited
- Material of jaws: Zirconia

*1 ( ): Dimension in inside measurement

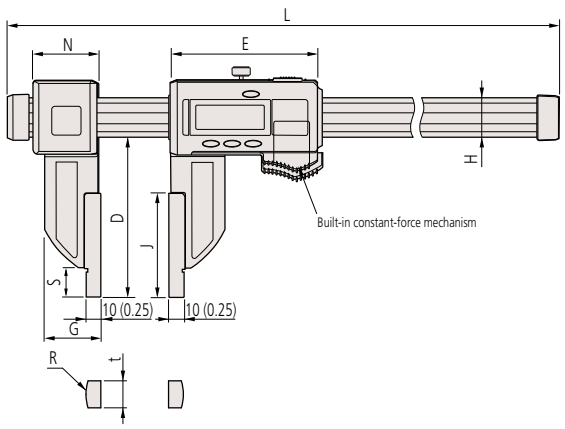
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

Note: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page 13-21 for details.

DIMENSIONS

Unit: mm



Range	D	E	G	H	J	L	N	R	S	t
0 - 450 mm (0 - 18 in)	100	91.8	35	25	65	640	41.2	R10	18	8
0 - 600 mm (0 - 24 in)						790				

( ): Inch/Metric type

Calipers

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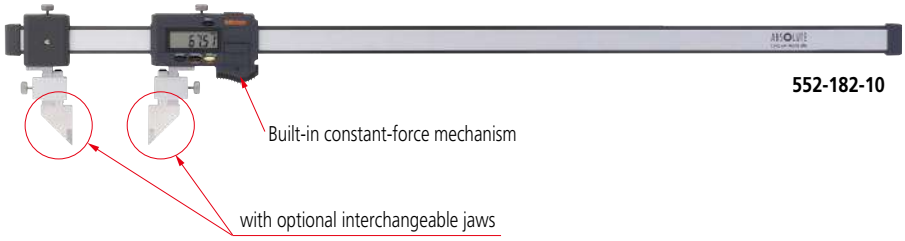
ABSOLUTE Coolant Proof Carbon Fiber Caliper SERIES 552 — with Interchangeable Jaws

- Digimatic Calipers employ CFRP (Carbon-Fiber Reinforced Plastics) in the beam and jaws. Leightweight and easy to handle. The range of applications can be expanded by using interchangeable jaws.
- Rated to IP66: can be used in adverse environments where the caliper is subject to splashing by cutting fluid or coolant. The digital display can reduce human error by preventing incorrect reading of measurement results.



SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*1	
			E_{MPE}	S_{MPE}
552-181-10	0 - 450	0.01	±0.04	
552-182-10	0 - 600			
552-183-10	0 - 1000		±0.05	
552-184-10	0 - 1500		±0.09	
552-185-10	0 - 2000		±0.12	

Inch / Metric

Code No.	Range	Resolution	Maximum permissible error*1	
			E_{MPE}	S_{MPE}
552-191-10	0 - 18 in/0 - 450 mm	0.0005 in/0.01 mm	±0.002 in/±0.04 mm	
552-192-10	0 - 24 in/0 - 600 mm			
552-193-10	0 - 40 in/0 - 1000 mm		±0.002 in/±0.05 mm	
552-194-10	0 - 60 in/0 - 1500 mm		±0.004 in/±0.09 mm	
552-195-10	0 - 80 in/0 - 2000 mm		±0.005 in/±0.12 mm	

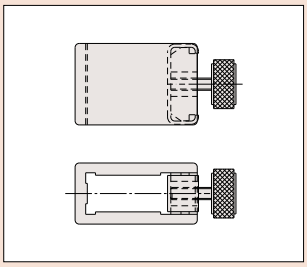
- Dust/Water protection level: IP66 (IEC 60529)*2
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5,000 hours in continuous use
- Response speed: Unlimited

*1 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*2 Rustproofing shall be applied after use if caliper was in contact with coolant.
Note1: The Maximum permissible error (MPE) values described above were measured using a dedicated outside measurement inspection tool.
Note2: A constant-force mechanism is used in the finger rest; however, this is only an auxiliary mechanism to avoid measurement error caused by excessive measuring force. To measure with good accuracy, use the minimum necessary measuring force for the caliper measuring faces to make sufficient contact with the workpiece. Refer to page 13-21 for details.

Functions

- Zero-setting
- Data hold: Pressing the HOLD switch displays "H" on the LCD display and holds (retains) the display of value. Moving the slider in this state does not change the displayed value. Pressing the switch again cancels the state, allowing you to start measurement again.
- Offsetting: Pressing the OFFSET switch adds an offset for inside measurement to the displayed value so that you can directly obtain an inside measurement value.
- Presetting: This function presets a desired value as the displayed value at the origin. When using optional jaws, presetting an offset of the jaws enables you to directly obtain the necessary measurement value.
- Data output: Measurement data can be output, allowing easy incorporation of this instrument into a statistical process control or measurement system.
- Low-power and low-voltage alert: When the battery voltage becomes low, "B" appears on the LCD, signalling the need for battery replacement before the calliper stops working.
- Counting value composition error: If a measurement error occurs due to dirt on the scale, etc., an error message appears on the display and measurement stops.
- Automatic power on/off, inch/mm reading (inch/mm models): LCD display turns off after 20 minutes inactivity but the ABS scale unit origin is stored. Moving the slider restores the display.

Standard Accessories (2 pcs.)



Jaw clamps: 05GZA033

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch

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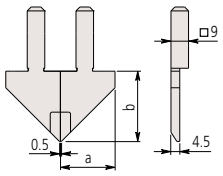
Optional accessories

Interchangeable jaws

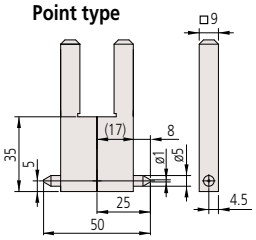
SPECIFICATIONS

Unit: mm

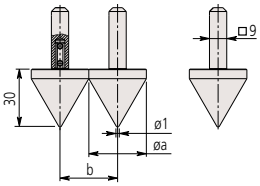
Standard type



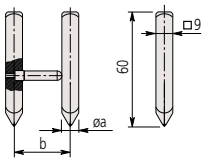
Point type



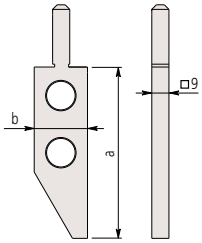
Centerline Type



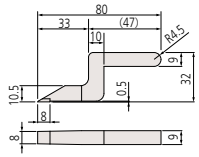
Scriber Type



Surface Plate Type



Scriber for height gages



Standard Type

Code No.	Components	a	b
07CZA056	Right (**07CAA044**), Left (**07CAA045**)	28 mm (1.1 in)	36 mm (1.2 in)

Note: 1 set

Point Type

Code No.	Components	a	b
07CZA058	**07CZA041**×2 pcs.	25 mm	50 mm
07CZA059	**07CZA048**×2 pcs.	1 in	2 in

Centerline Type

Code No.	Components	a	b
07CZA057	**07CZA039**×2 pcs.	30 mm	30 mm
07CZA060	**07CZA047**×2 pcs.	1.2 in	1.2 in

Scriber Type

Code No.	Components	a	b
07CZA055	Right (**07CZA042**), Left (**07CZA043**)	8 mm	30 mm
07CZA061	Right (**07CZA042**), Left (**07CZA049**)	0.31 in	1.2 in

Surface Plate Type

Code No.	a	b
07CZA044	90 mm (3.5 in)	28 mm (1.1 in)

Note: Note that the error arising from the combination of surface plates is outside the scope of accuracy guarantee.

Scriber for height gages

Code No.
07GZA000

Type	Applicable calipers	Range	Maximum permissible error* E_{MPE}	Maximum permissible error* S_{MPE}
Standard type	**552-181-10** (**552-191-10**)	0 - 450 mm (0 - 18 in)	±0.06 mm (±0.0025 in)	
	552-182-10 (**552-192-10**)	0 - 600 mm (0 - 24 in)		
	552-183-10 (**552-193-10**)	0 - 1000 mm (0 - 40 in)	±0.07 mm (±0.0030 in)	
	552-184-10 (**552-194-10**)	0 - 1500 mm (0 - 60 in)	±0.11 mm (±0.0045 in)	
	552-185-10 (**552-195-10**)	0 - 2000 mm (0 - 80 in)	±0.14 mm (±0.0055 in)	
Point type	**552-181-10** (**552-191-10**)	Inside: 50.1 - 500 mm (2.004 - 20 in)	—	±0.09 mm (±0.0035 in)
		Outside: 0 - 450 mm (0 - 18 in)	±0.09 mm (±0.0035 in)	—
	552-182-10 (**552-192-10**)	Inside: 50.1 - 650 mm (2.004 - 26 in)	—	±0.09 mm (±0.0035 in)
		Outside: 0 - 600 mm (0 - 24 in)	±0.09 mm (±0.0035 in)	—
	552-183-10 (**552-193-10**)	Inside: 50.1 - 1050 mm (2.004 - 42 in)	—	±0.10 mm (±0.0040 in)
		Outside: 0 - 1000 mm (0 - 40 in)	±0.10 mm (±0.0040 in)	—
	552-184-10 (**552-194-10**)	Inside: 50.1 - 1550 mm (2.004 - 62 in)	—	±0.14 mm (±0.0055 in)
		Outside: 0 - 1500 mm (0 - 60 in)	±0.14 mm (±0.0055 in)	—
	552-185-10 (**552-195-10**)	Inside: 50.1 - 2050 mm (2.004 - 82 in)	—	±0.17 mm (±0.0070 in)
		Outside: 0 - 2000 mm (0 - 80 in)	±0.17 mm (±0.0070 in)	—
Centerline type	**552-181-10** (**552-191-10**)	30.1 - 480 mm (1.204 - 19.2 in)		±0.08 mm (±0.0030 in)
	552-182-10 (**552-192-10**)	30.1 - 630 mm (1.204 - 25.2 in)		
	552-183-10 (**552-193-10**)	30.1 - 1030 mm (1.204 - 41.2 in)		±0.10 mm (±0.0040 in)
	552-184-10 (**552-194-10**)	30.1 - 1530 mm (1.204 - 61.2 in)		±0.13 mm (±0.0055 in)
	552-185-10 (**552-195-10**)	30.1 - 2030 mm (1.204 - 81.2 in)		±0.16 mm (±0.0065 in)
Scriber type	**552-181-10** (**552-191-10**)	30.1 - 480 mm (1.204 - 19.2 in)		±0.11 mm (±0.0045 in)
	552-182-10 (**552-192-10**)	30.1 - 630 mm (1.204 - 25.2 in)		
	552-183-10 (**552-193-10**)	30.1 - 1030 mm (1.204 - 41.2 in)		
	552-184-10 (**552-194-10**)	30.1 - 1530 mm (1.204 - 61.2 in)		±0.15 mm (±0.0060 in)
	552-185-10 (**552-195-10**)	30.1 - 2030 mm (1.204 - 81.2 in)		±0.18 mm (±0.0070 in)
Surface plate type + Scriber type for height gages	**552-181-10** (**552-191-10**)	0 - 450 mm (0 - 17.7 in)	±0.10 mm(±0.0040 in)	
	552-182-10 (**552-192-10**)	0 - 600 mm (0 - 23.7 in)		
	552-183-10 (**552-193-10**)	0 - 1000 mm (0 - 39.4 in)	±0.11 mm (±0.0045 in)	
	552-184-10 (**552-194-10**)	0 - 1500 mm (0 - 59.4 in)	±0.15 mm (±0.0060 in)	
	552-185-10 (**552-195-10**)	0 - 2000 mm (0 - 79.6 in)	±0.18 mm (±0.0070 in)	
Surface plate type + Point type	**552-181-10** (**552-191-10**)	Outside: 0 - 450 mm (0 - 18 in)	±0.12 mm (±0.0050 in)	—
	552-182-10 (**552-192-10**)	Outside: 0 - 600 mm (0 - 24 in)	±0.12 mm (±0.0050 in)	—
	552-183-10 (**552-193-10**)	Outside: 0 - 1000 mm (0 - 40 in)	±0.13 mm (±0.0055 in)	—
	552-184-10 (**552-194-10**)	Outside: 0 - 1500 mm (0 - 60 in)	±0.17 mm (±0.0070 in)	—
	552-185-10 (**552-195-10**)	Outside: 0 - 2000 mm (0 - 80 in)	±0.20 mm (±0.0080 in)	—
Surface plate type + Centerline type	**552-181-10** (**552-191-10**)	15.1 - 465 mm (0.6 - 18.6 in)		±0.11 mm (±0.0045 in)
	552-182-10 (**552-192-10**)	15.1 - 615 mm (0.6 - 24.6 in)		
	552-183-10 (**552-193-10**)	15.1 - 1015 mm (0.6 - 40.6 in)		±0.12 mm (±0.0050 in)
	552-184-10 (**552-194-10**)	15.1 - 1515 mm (0.6 - 60.6 in)		±0.16 mm (±0.0065 in)
	552-185-10 (**552-195-10**)	15.1 - 2015 mm (0.6 - 80.6 in)		±0.19 mm (±0.0075 in)

( ): Inch/Metric models

Note: The values described in the above table are MPE values when attached to a caliper.

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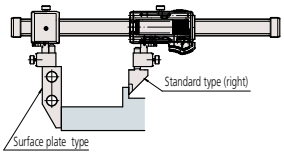
Optional accessories

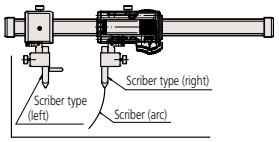
Interchangeable jaws

Typical applications

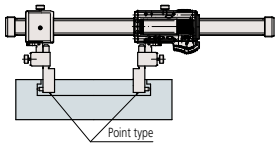
Surface plate type + Standard type



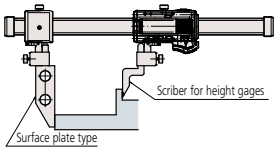
Scriber type



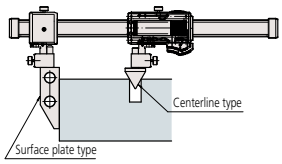
Point type



Surface plate type + Scriber for height gages



Surface plate type + Centerline type



The above combinations are examples only.
Contact us for advice on accuracy when using a contact point in a combination other than as shown above.

Calipers

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MeasurLink® ENABLED Data Management Software by Mitutoyo

U-WAVE fit

ABSOLUTE™

IP67

Dust- and Water-Protected

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Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)*1
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)*1
959149	C	Connection cable for **IT/DP/MUX** (1 m)*2
959150	C	Connection cable for **IT/DP/MUX** (2 m)*2
06AFM380A	A	USB Input Tool Direct (2 m)*1
06AFM380C	C	USB Input Tool Direct (2 m)*2
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)*1
02AZE140A	A	Connection cable for **U-WAVE-T***1 For foot switch
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm)*2
02AZE140C	C	Connection cable for **U-WAVE-T***2 For foot switch
264-620	IP67	**U-WAVE-TC***1
264-621	Buzzer	**U-WAVE-TC***1
264-624	IP67	**U-WAVE-TCB***1
264-625	Buzzer	**U-WAVE-TCB***1
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB***1

*1 For IP67 models (up to 300 mm)
*2 For **series 550-2XX** and **550-22X**.

ABSOLUTE Digimatic Caliper SERIES 550 — with Nib Style Jaws

- This model can measure both inside and outside dimensions with a specially shaped jaw.
- The digital display can reduce human error by preventing incorrect reading of measurement results. **550-3XX-20** is rated at IP67 and therefore can be reliably used at the manufacturing site.
- Data output function allows integration into statistical process control and measurement systems. (Refer to page 09-3.)
- ID measurement value: displayed value + (a compensation value displayed on the main unit). OFFSET switch allows to input a compensation value so that the measurement value can be read directly (**Code No. 550-301-20, 550-331-20, 550-311-20** and **550-341-20**). Preset function allows to set a desired starting point (**550-331-20** and **550-341-20**).

550-301-20

SPECIFICATIONS

Metric

Code No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2 E_{MPE}	Maximum permissible error (mm)*2 S_{MPE}	Remarks
550-301-20	0 - 200 (10.1 - 210)	0.01	±0.03	±0.03	IP67, with offset
550-331-20	0 - 300 (10.1 - 310)		±0.04	±0.04	IP67, with offset/preset function for easy inside measurement
550-203-10	0 - 450 (20.1 - 470)		±0.05	±0.05	—
550-205-10	0 - 600 (20.1 - 620)				—
550-207-10	0 - 1000 (20.1 - 1020)		±0.07	±0.07	—

Inch / Metric

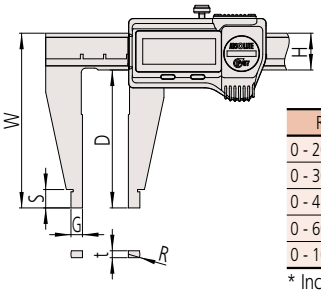
Code No.	Range*1	Resolution	Maximum permissible error*2 E_{MPE}	Maximum permissible error*2 S_{MPE}	Remarks
550-311-20	0 - 8 in/0 - 200 mm (0.404 - 8.4 in/10.26 - 210.16 mm)	0.0005 in/ 0.01 mm	±0.0015 in/ ±0.03 mm	±0.0015 in/ ±0.03 mm	IP67, with offset
550-341-20	0 - 12 in/0 - 300 mm (0.404 - 12.4 in/10.26 - 310.16 mm)		±0.002 in/ ±0.04 mm	±0.002 in/ ±0.04 mm	IP67, with offset/preset function for easy inside measurement
550-223-10	0 - 18 in/0 - 450 mm (0.504 - 18.5 in/12.8 - 462.7 mm)		±0.002 in/ ±0.05 mm	±0.002 in/ ±0.05 mm	—
550-225-10	0 - 24 in/0 - 600 mm (0.504 - 24.5 in/12.8 - 612.7 mm)				—
550-227-10	0 - 40 in/0 - 1000 mm (1.004 - 41 in/25.5 - 1025.4 mm)		±0.003 in/ ±0.07 mm	±0.003 in/ ±0.07 mm	—

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited

*1 ( ): Inside measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



Range (mm)	D	G	S	W	H	t	R
0 - 200 (0 - 8 in)*	60	5 (5.08)*	8	76	16	3	5 (5.08)*
0 - 300 (0 - 12 in)*	75		12	95	20	3.8	
0 - 450 (0 - 18 in)*	100	10 (6.35)*	18	125	25	6	10 (6.35)*
0 - 600 (0 - 24 in)*							
0 - 1000 (0 - 40 in)*	140	10 (12.7)*	24	172	32	8	10 (12.7)*

* Inch model

Calipers

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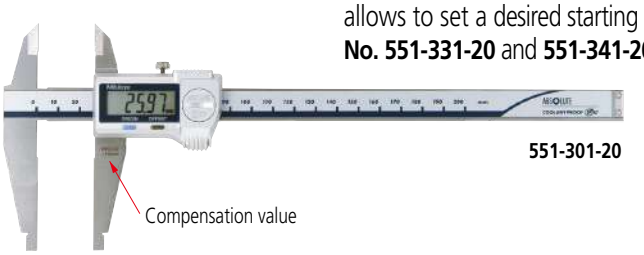
ABSOLUTE Digimatic Caliper
SERIES 551 — with Nib Style and Standard Jaws

- This model has a smaller jaw for outside measurements and a larger jaw for inside and outside measurements. Use the jaws that are suitable for your application. The jaw for outside measurement has sharp tips that are helpful for measuring thin parts.
- Incorporates Mitutoyo's ABSOLUTE measurement system. No need to reset the origin after switching on.
- The digital display can reduce human error by preventing incorrect reading of measurement results. **551-3XX-20** is rated at IP67 and therefore can be reliably used at the manufacturing site.
- ID measurement value: displayed value + (a compensation value displayed on the main unit). OFFSET switch allows to input a compensation value so that the measurement value can be read directly (**Code No. 551-301-20, 551-331-20, 551-311-20** and **551-341-20**). Preset function allows to set a desired starting point (**Code No. 551-331-20** and **551-341-20**).



551-301-20

SPECIFICATIONS

Metric

Code No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2		Remarks
			E_{MPE}	S_{MPE}	
551-301-20	0 - 200 (10.1 - 210)	0.01	±0.03	±0.03	IP67, with offset
551-331-20	0 - 300 (10.1 - 310)		±0.04	±0.04	IP67, with offset/preset function for easy inside measurement
551-204-10	0 - 500 (20.1 - 520)		±0.06	±0.06	—
551-206-10	0 - 750 (20.1 - 770)				
551-207-10	0 - 1000 (20.1 - 1020)		±0.07	±0.07	

Inch/Metric

Code No.	Range*1	Resolution	Maximum permissible error*2		Remarks
			E_{MPE}	S_{MPE}	
551-311-20	0 - 8 in/0 - 200 mm (0.404 - 8.4 in/10.26 - 210.16 mm)	0.0005 in/ 0.01 mm	±0.0015 in/ ±0.03 mm	±0.0015 in/ ±0.03 mm	IP67, with offset
551-341-20	0 - 12 in/0 - 300 mm (0.404 - 12.4 in/10.26 - 310.16 mm)		±0.002 in/ ±0.04 mm	±0.002 in/ ±0.04 mm	IP67, with offset/preset function for easy inside measurement
551-224-10	0 - 20 in/0 - 500 mm (0.504 - 20.5 in/12.8 - 512.7 mm)		±0.0025 in/ ±0.06 mm	±0.0025 in/ ±0.06 mm	—
551-226-10	0 - 30 in/0 - 750 mm (0.504 - 30.5 in/12.8 - 762.7 mm)				
551-227-10	0 - 40 in/0 - 1000 mm (1.004 - 40.1 in/25.5 - 1025.4 mm)		±0.003 in/ ±0.07 mm	±0.003 in/ ±0.07 mm	

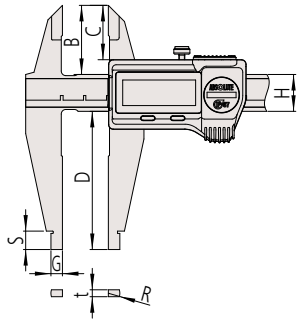
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Response speed: Unlimited

*1 ( ): Inside measurement

*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



Range (mm)	B	C	D	G	S	H	t	R
0 - 200 (0 - 8 in)*	30	23.6	60	5 (5.08)*	8	16	3	5 (5.08)*
0 - 300 (0 - 12 in)*	40	32.2	90		10	20	3.8	
0 - 500 (0 - 20 in)*	56	44.9	150	10 (6.35)*	18	25	6	10 (6.35)*
0 - 750 (0 - 30 in)*	56							
0 - 1000 (0 - 40 in)*	56	43.8		10 (12.7)*	20	32	8	10 (12.7)*

* Inch model

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IP67

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Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)*1
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)*1
959149	C	Connection cable for **IT/DP/MUX** (1 m)*2
959150	C	Connection cable for **IT/DP/MUX** (2 m)*2
06AFM380A	A	USB Input Tool Direct (2 m)*1
06AFM380C	C	USB Input Tool Direct (2 m)*2
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)*1
02AZE140A	A	Connection cable for **U-WAVE-T***1 For foot switch
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm)*2
02AZE140C	C	Connection cable for **U-WAVE-T***2 For foot switch
264-620	IP67	**U-WAVE-TC***1
264-621	Buzzer	**U-WAVE-TC***1
264-624	IP67	**U-WAVE-TCB***1
264-625	Buzzer	**U-WAVE-TCB***1
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB***1

*1 For IP67 models (up to 300 mm)

*2 For series **551-2XX** and **551-22X**.

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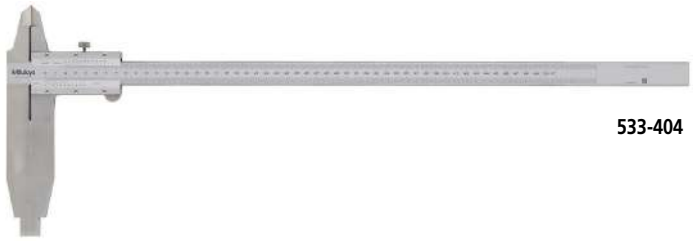
Vernier Caliper
SERIES 533 — with Nib Style and Standard Jaws

- Allows inside and outside measurements directly from the upper and lower Vernier scales.
- Main scale and Vernier scale with a satin chrome finish provides better readability.



533-404

SPECIFICATIONS

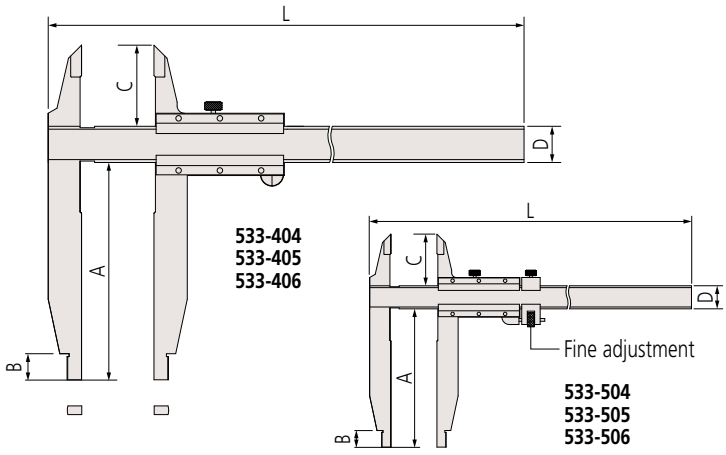
Metric

Code No.	Range (mm)*1	Resolution (mm)	Maximum permissible error (mm)*2		Remarks
			E_{MPE}	S_{MPE}	
533-404	0 - 500 (20.1 - 520)	0.05	±0.10	±0.10	—
533-405	0 - 750 (20.1 - 770)		±0.12	±0.12	
533-406	0 - 1000 (20.1 - 1020)		±0.15	±0.15	
533-504	0 - 500 (20.1 - 520)	0.02	±0.05	±0.05	with fine adjustment
533-505	0 - 750 (20.1 - 770)		±0.06	±0.06	
533-506	0 - 1000 (20.1 - 1020)		±0.07	±0.07	

*1 ( ): Inside measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



Range (mm)	A	B	C	D	L
0 - 500	150	18	56	25	680
0 - 750					963
0 - 1000		20		32	1230

Calipers

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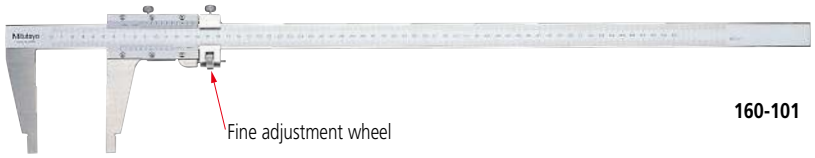
Vernier Caliper
SERIES 160 — with Nib Style Jaws and Fine Adjustment

- The jaws' measuring faces have a radius for accurate inside diameter (ID) measurement. Inside and outside measurements can be read directly from the upper and lower slider graduations respectively.
- With fine adjustment (**Code No. 160-127/128/101/104**).

160-131



160-101

SPECIFICATIONS

Metric with inside measurement Vernier scale

Code No.	Range (mm)*1	Minimum reading (mm)	Maximum permissible error (mm)*2		Remarks
			E_{MPE}	S_{MPE}	
160-130	0 (20.1) - 450	0.05	±0.10	±0.10	without fine adjustment
160-131	0 (20.1) - 600				
160-132	0 (20.1) - 1000		±0.15	±0.15	

*1 ( ): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

Metric with inside measurement Vernier scale

Code No.	Range (mm)*1	Minimum reading (mm)	Maximum permissible error (mm)*2		Remarks
			E_{MPE}	S_{MPE}	
160-127	0 (10.1) - 300	0.02	±0.04	±0.04	with fine adjustment
160-128	0 (20.1) - 450		±0.05	±0.05	
160-101	0 (20.1) - 600				
160-104	0 (20.1) - 1000		±0.07	±0.07	

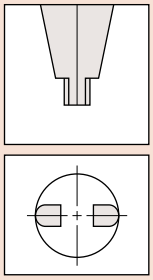
*1 ( ): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

Metric/Inch with metric/inch double scale

Code No.	Range*1	Minimum reading	Maximum permissible error*2		Remarks
			E_{MPE}	S_{MPE}	
160-150	0 - 300 mm/0 - 12 in (10.1 - 300 mm/0.398 - 12 in)	0.02 mm/ 0.001 in	±0.04 mm/ ±0.0015 in	±0.04 mm/ ±0.0015 in	+10 mm/0.394 in to reading in inside measurement
160-151	0 - 450 mm/0 - 18 in (20.1 - 450 mm/0.791 - 18 in)		±0.05 mm/ ±0.002 in	±0.05 mm/ ±0.002 in	+20 mm/0.787 in to reading in inside measurement
160-153	0 - 600 mm/0 - 24 in (20.1 - 600 mm/0.791 - 24 in)				
160-155	0 - 1000 mm/0 - 40 in (20.1 - 1000 mm/0.791 - 24 in)		±0.07 mm/ ±0.003 in	±0.07 mm/ ±0.003 in	

*1 ( ): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

Measurement example



Radiused jaws for accurate ID measurement

Measurement example

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Inch with inside measurement Vernier scale

Code No.	Range (in)*1	Minimum reading (in)	Maximum permissible error (in)*2		Remarks
			E_{MPE}	S_{MPE}	
160-124	0 (0.304) - 12	0.001	±0.0015	±0.0015	—
160-116	0 (0.504) - 18		±0.002	±0.002	
160-102	0 (0.504) - 24				
160-105	0 (1.004) - 40		±0.003	±0.003	

*1 ( ): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

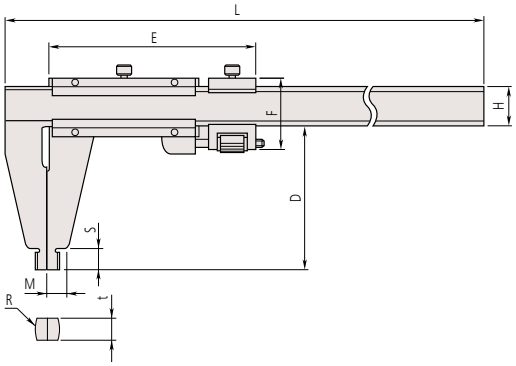
Inch/Metric with inch/metric double scale

Code No.	Range*1	Minimum reading	Maximum permissible error*2		Remarks
			E_{MPE}	S_{MPE}	
160-125	0 - 12 in/0 - 300 mm (0.304 - 12 in/7.72 - 300 mm)	0.001 in/ 0.02 mm	±0.0015 in/ ±0.04 mm	±0.0015 in/ ±0.04 mm	+0.3 in/7.62 mm to reading in inside measurement
160-119	0 - 18 in/0 - 450 mm (0.504 - 18 in/12.8 - 450 mm)		±0.002 in/ ±0.05 mm	±0.002 in/ ±0.05 mm	+0.5 in/12.7 mm to reading in inside measurement
160-103	0 - 24 in/0 - 600 mm (0.504 - 24 in/12.8 - 600 mm)				
160-106	0 - 40 in/0 - 1000 mm (1.004 - 40 in/25.5 - 1000 mm)		±0.003 in/ ±0.07 mm	±0.003 in/ ±0.07 mm	+1 in/25.4 mm to reading in inside measurement

*1 ( ): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



Range	D	E	F	H	L	M	R	S	t
0 - 300 mm/0 - 12 in	75	103	38	20	445	10	R5	12	3.8
0 - 450 mm*	100	89	—	25	630	14.8	R10	18	6
0 - 450 mm/0 - 18 in		112	51						
0 - 600 mm*		89	—		780				
0 - 600 mm/0 - 24 in		112	51						
0 - 1000 mm*	140	111	—	32	1240	17		24	8
0 - 1000 mm/0 - 40 in		150	62.5						

* Without fine adjustment

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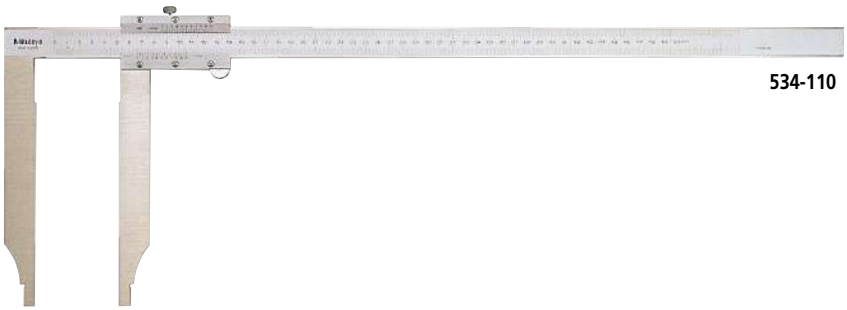
Mitutoyo

Long Jaw Vernier Caliper SERIES 534

- Long jaws for measuring hard-to-reach workpiece features. Suitable for measuring outside diameter of workpieces such as large pipes or spherical objects.
- Inside and outside measurements can be read directly from the upper and lower slider graduations respectively.



534-110

SPECIFICATIONS

Metric with inside measurement Vernier scale

Code No.	Range (mm)*1	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
			E_{MPE}	S_{MPE}	
534-109	0 (10.1) - 300	0.05	±0.07	±0.07	without fine adjustment
534-110	0 (20.1) - 500		±0.13	±0.13	

*1 ( ): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

Calipers

Metric/Inch with metric/inch double scale

Code No.	Range*1	Graduation	Maximum permissible error*2		Remarks
			E_{MPE}	S_{MPE}	
534-101	0 - 300 mm/0 - 12 in (10.1 - 300 mm/0.398 - 12 in)	0.05 mm/ 1/128 in	±0.07 mm/ ±0.5/128 in	±0.07 mm/ ±0.5/128 in	+10 mm/0.394 in to reading in inside measurement without fine adjustment
534-105	0 - 300 mm/0 -12 in (10.1 - 300 mm/0.398 - 12 in)	0.02 mm/ 0.001 in	±0.04 mm/ ±0.0015 in	±0.04 mm/ ±0.0015 in	
534-102	0 - 500 mm/0 - 20 in (20.1 - 500 mm/0.791 - 20 in)	0.05 mm/ 1/128 in	±0.13 mm/ ±0.5/128 in	±0.13 mm/ ±0.5/128 in	+20 mm/0.787 in to reading in inside measurement without fine adjustment
534-106		0.02 mm/ 0.001 in	±0.06 mm/ ±0.0025 in	±0.06 mm/ ±0.0025 in	
534-103	0 - 750 mm/0 - 30 in (20.1 - 750 mm/0.791 - 30 in)	0.05 mm/ 1/128 in	±0.16 mm/ ±1/128 in	±0.16 mm/ ±1/128 in	
534-107		0.02 mm/ 0.001 in	±0.08 mm/ ±0.003 in	±0.08 mm/ ±0.003 in	
534-104	0 - 1000 mm/0 - 40 in (20.1 - 1000 mm/0.791 - 40 in)	0.05 mm/ 1/128 in	±0.2 mm/ ±1/128 in	±0.2 mm/ ±1/128 in	
534-108		0.02 mm/ 0.001 in	±0.1 mm/ ±0.004 in	±0.1 mm/ ±0.004 in	

*1 ( ): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
Note: For external dimensions, refer to page 04-28.

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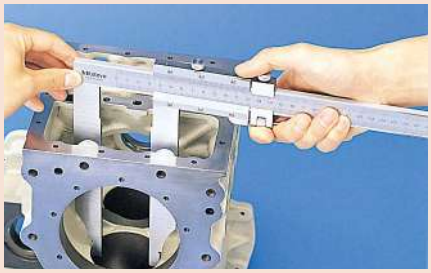
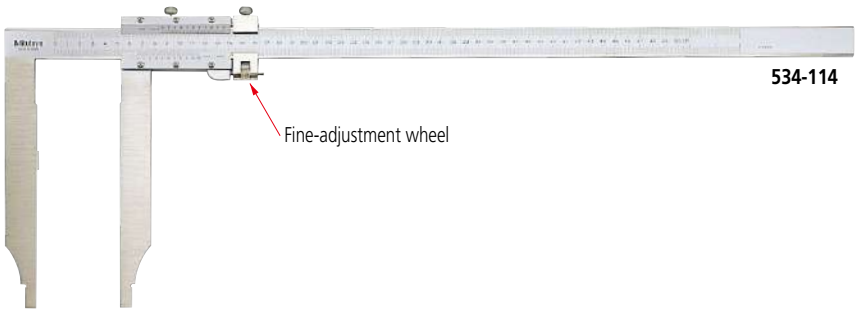
Long Jaw Vernier Caliper
SERIES 534

Measurement example



- Long jaws for measuring hard-to-reach workpiece features. Suitable for measuring outside diameter of workpieces such as large pipes or spherical objects.
- Inside and outside measurements can be read directly from the upper and lower slider graduations respectively.
- Fine adjustment for more accurate measurement.



SPECIFICATIONS

Metric with inside measurement Vernier scale

Code No.	Range (mm)*1	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
			E_{MPE}	S_{MPE}	
534-113	0 (10.1) - 300	0.02	±0.04	±0.04	with fine adjustment
534-114	0 (20.1) - 500		±0.06	±0.06	
534-115	0 (20.1) - 750		±0.08	±0.08	
534-116	0 (20.1) - 1000		±0.10	±0.10	

*1 ( ): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

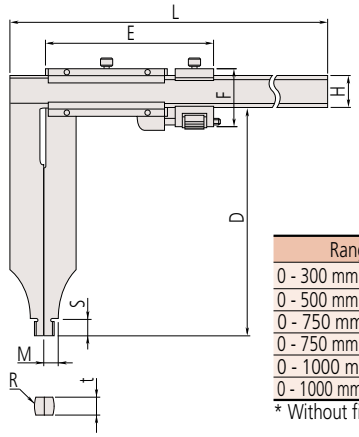
Inch with inside measurement Vernier scale

Code No.	Range (in)*1	Graduation (in)	Maximum permissible error (in)*2		Remarks
			E_{MPE}	S_{MPE}	
534-117	0 (0.304) - 12	0.001	±0.0015	±0.0015	with fine adjustment
534-118	0 (0.804) - 20		±0.0025	±0.0025	
534-119	0 (0.804) - 30		±0.003	±0.003	
534-120	0 (0.804) - 40		±0.004	±0.004	

*1 ( ): Minimum dimension in ID measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



Range	D	E	F	H	L	M	R	S	t
0 - 300 mm/0 - 12 in	90	103	38	20	445	7	R5	12	3.8
0 - 500 mm/0 - 20 in	200	112	51	25	682	12	R10	18.5	6
0 - 750 mm*		150	—	32	995				
0 - 750 mm/0 - 30 in			62.5						8
0 - 1000 mm*			—		1230				
0 - 1000 mm/0 - 40 in			62.5						

* Without fine adjustment

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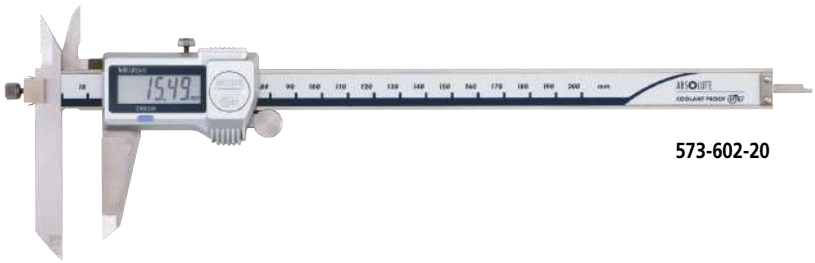
Mitutoyo

Offset Caliper
SERIES 573 — ABSOLUTE Digimatic Type

- The beam-mounted jaw can be adjusted to facilitate measurement of stepped sections.



573-602-20

SPECIFICATIONS

Metric Digimatic model

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
573-601-20	0 - 150	0.01	±0.02	±0.04
573-611-20*1	0 - 150			
573-602-20	0 - 200			
573-612-20*1	0 - 200			
573-604-20	0 - 300		±0.03	±0.05
573-614-20*1	0 - 300			

Inch/Metric Digimatic model

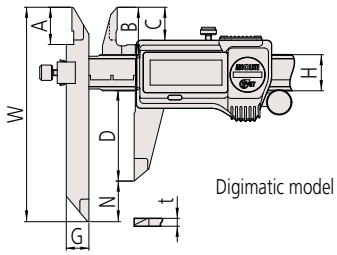
Code No.	Range	Resolution	Maximum permissible error*2	
			E_{MPE}	S_{MPE}
573-701-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm
573-702-20	0 - 8 in/0 - 200 mm			
573-704-20	0 - 12 in/0 - 300 mm		±0.0015 in/±0.03 mm	±0.0025 in/±0.05 mm

- Dust/Water protection level: IP67 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited

*1 Without thumb roller
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm



Digimatic model

Code No.	Model	Range (mm)	A	B	C	D	G	H	N	W	t
573-601-20	Digimatic model	0 - 150	16.5	21	14.6	40	10	16	(18)	95	3.5
573-602-20		0 - 200	20	24.5	18.1	50			(4.5)		
573-604-20		0 - 300	22	27.5	19.8	64	15	20	(23.5)	135	3.8

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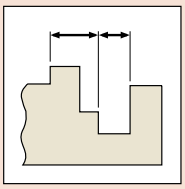
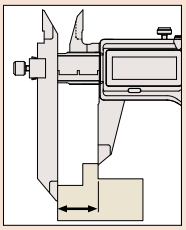
Measurement example





Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

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Offset Caliper
SERIES 536 — Vernier Type

- The beam-mounted jaw can be adjusted to facilitate measurement of stepped sections.

536-101

SPECIFICATIONS

Metric Analog model

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
536-101	0 - 150	0.05	±0.05	±0.07
536-102	0 - 200			
536-103	0 - 300		±0.08	±0.10

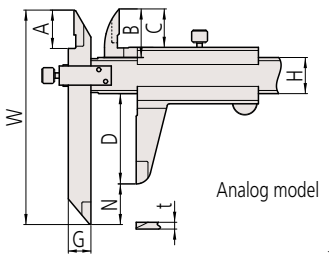
Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
536-221	0 - 150	0.05	±0.05	±0.07
536-222	0 - 200			
536-223	0 - 300		±0.08	±0.10

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



Analog model

Code No.	Model	Range (mm)	A	B	C	D	G	H	N	W	t
536-101	Analog model	0 - 150	17	21.5	17	40	10	16	(18)	95	3
536-102		0 - 200	20.5	25	20.5	50			(4)		
536-103		0 - 300	22	27.5	22	64	15	20	(23.5)	135	3.8

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Offset Centerline Caliper
SERIES 573 — ABSOLUTE Digimatic Type

- Specially designed for center-to-center hole diameter measurements on the same and offset planes. The beam-mounted jaw can be adjusted to facilitate the measurement of stepped sections.
- Direct reading of pitch measurement is available due to the offset-value setting function.

573-606-20

SPECIFICATIONS

Metric Digimatic model

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
573-605-20	10.1 - 160	0.01		±0.03
573-615-20*1	10.1 - 160			
573-606-20	10.1 - 210			
573-616-20*1	10.1 - 210			
573-608-20	10.1 - 310			±0.04
573-618-20*1	10.1 - 310			

Inch / Metric Digimatic model

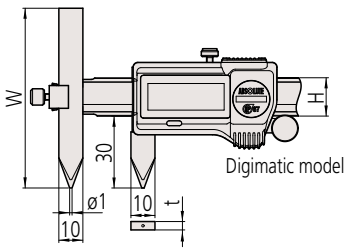
Code No.	Range	Resolution	Maximum permissible error*2	
			E_{MPE}	S_{MPE}
573-705-20	0.404 - 6.4 in/10.26 - 160.16 mm	0.0005 in/0.01 mm		±0.0015 in/±0.03 mm
573-706-20	0.404 - 8.4 in/10.26 - 210.16 mm			
573-708-20	0.404 - 12.4 in/10.26- 310.16 mm			±0.0015 in/±0.04 mm

- Dust/Water protection level: IP67 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited

*1 Without thumb roller
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm



Digimatic model

Range	H	W	t	Applicable hole
10.26 - 160.16 mm/0.404 - 6.4 in	16	75	3.5	ø1.5 - ø9.5 mm
10.26 - 210.16 mm/0.404 - 8.4 in				
10.26 - 310.16 mm/0.404 - 12.4 in	20	100	3.8	

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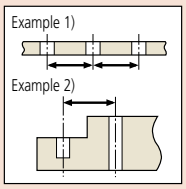
Measurement example



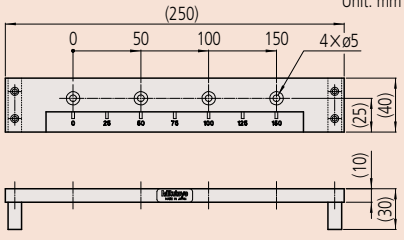
Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

Inspection equipment for offset caliper

05FAJ735

Unit: mm



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Offset Centerline Caliper
SERIES 536 — Vernier Type

- Specially designed for center-to-center hole diameter measurements on the same and offset planes. The beam-mounted jaw can be adjusted to facilitate the measurement of stepped sections.

536-105

SPECIFICATIONS

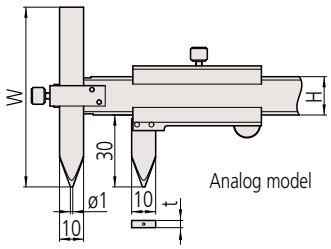
Metric Analog model

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
536-105	10.1 - 150	0.05		±0.05
536-106	10.1 - 200			
536-107	10.1 - 300			±0.08

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



Analog model

Range (mm)	H	W	t	Applicable hole
10 - 150	16	75	3	ø1.5 - ø9.5 mm
10 - 200				
10 - 300	20	100	3.8	

Calipers

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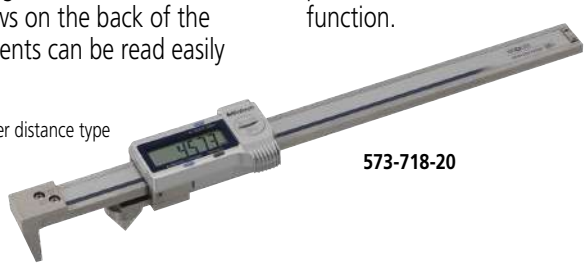
ABSOLUTE Back-Jaw Centerline Caliper
SERIES 573 — Center-to-Center & Edge-to-Center Types

- Specially designed to measure hole Center-to-Center and Edge-to-Center distances. Provided with jaws on the back of the slider, measurements can be read easily from above.
- Direct reading of pitch measurement is possible due to the offset-value setting function.

Edge-to-center distance type



573-718-20

SPECIFICATIONS

Metric

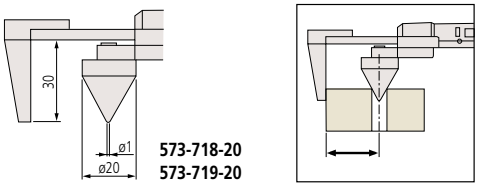
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
573-718-20*1	10.1 - 200	0.01		±0.10
573-719-20*1	10.1 - 300			±0.15

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited

*1 Applicable hole diameter: ø1.5 - ø19.5 mm
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



573-718-20
573-719-20

Center-to-center distance type

573-716-20

SPECIFICATIONS

Metric

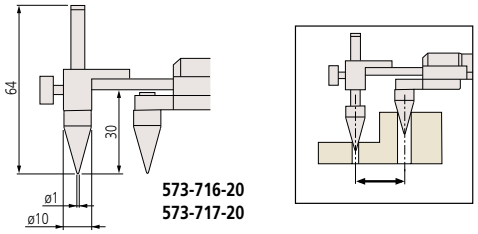
Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
573-716-20*1	10.1 - 200	0.01		±0.10
573-717-20*1	10.1 - 300			±0.15

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited

*1 Applicable hole diameter: ø1.5 - ø19.5 mm
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



573-716-20
573-717-20

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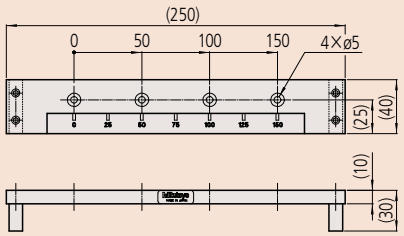
Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch

Inspection equipment for center-to-center type*

05FAJ735

Unit: mm



* Inspection equipment for Edge-to-center type is available by special order.

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U-WAVE fit

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Applicable models: **series 573**

IP67

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Measurement example

Optional Accessories (for series 573)

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

Point Caliper
SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Types

- Narrow-tip jaws fit into very small grooves and tracks, making many previously difficult outside measurements far easier to obtain.

573-621-20

SPECIFICATIONS

Metric Digimatic model

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
573-621-20	0 - 150	0.01	±0.02	±0.04
573-625-20	0 - 150			
573-622-20*1	0 - 150			
573-626-20*1	0 - 150			

Inch/Metric Digimatic model

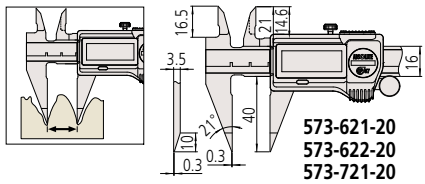
Code No.	Range	Resolution	Maximum permissible error*2	
			E_{MPE}	S_{MPE}
573-721-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm
573-725-20				

- Dust/Water protection level: IP67 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited
- With depth bar

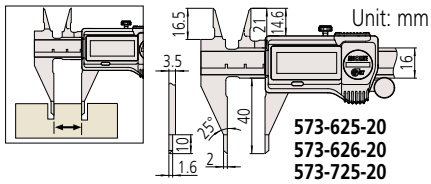
*1 Without thumb roller
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm



573-621-20
573-622-20
573-721-20



573-625-20
573-626-20
573-725-20

536-121

SPECIFICATIONS

Metric Analog model

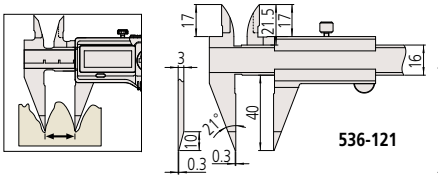
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
536-121	0 - 150	0.05	±0.05	±0.07

- With depth bar

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



536-121

Calipers

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Mitutoyo

Blade Type Caliper
SERIES 573 — ABSOLUTE Digimatic Type

- The thin blade-type jaws fit into very small grooves and make previously difficult outside measurements far easier to obtain.
- The outside measuring faces are carbide tipped.

573-634-20

SPECIFICATIONS

Metric Digimatic model

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
573-634-20	0 - 150	0.01	±0.02	±0.04
573-635-20*1	0 - 150			

Inch / Metric Digimatic model

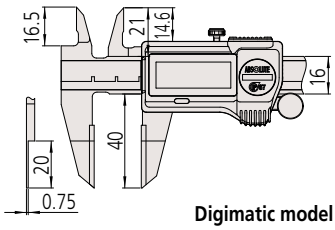
Code No.	Range	Resolution	Maximum permissible error*2	
			E_{MPE}	S_{MPE}
573-734-20	0 - 6 in/0 - 150 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm

- Dust/Water protection level: IP67 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited

*1 Without thumb roller
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm



Digimatic model

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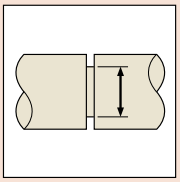
Measurement example



Optional Accessories (for series 573)

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

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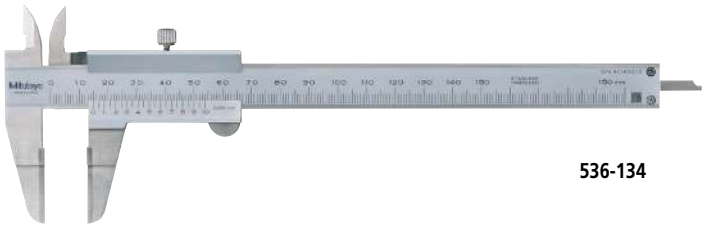
Blade Type Caliper
SERIES 536 — Vernier Type

- The thin blade-type jaws fit into very small grooves and make previously difficult outside measurements far easier to obtain.
- The outside measuring faces are carbide tipped.



536-134

SPECIFICATIONS

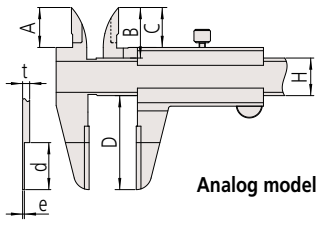
Metric Analog model

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
536-134	0 - 150	0.05	±0.05	±0.07
536-135	0 - 200			
536-136	0 - 300		±0.08	±0.10

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



Analog model

Range (mm)	A	B	C	D	d	e	H	t
0 - 150	17	21.5	17	40	20	0.75	16	3
0 - 200	20.5	25	20.5	50	25			
0 - 300	22	27.5	22	64	30	1	20	3.8

Calipers

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

ABSOLUTE Inside Caliper
SERIES 573 — Knife-edge/Inside Groove/Point Jaw Type

- Specially designed for inside measurements. Select the right model for your workpiece shape.

Knife-edge type

573-642-20

Inside groove type

573-645-20

Compensation value

Point jaw type

573-646-20

Compensation value

SPECIFICATIONS

Metric Digimatic model

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*3 E_{MPE}	Maximum permissible error (mm)*3 S_{MPE}	Remarks
573-642-20	10 - 200	0.01		±0.05	Knife-edge type, Measurable min.
573-643-20*1	10 - 200				Knife-edge type, Measurable min.
573-645-20*2	10.1 - 160				Inside groove type, Measurable min.
573-647-20*1	10.1 - 160				Inside groove type, Measurable min.
573-646-20*2	20.1 - 170			±0.03	Point jaw type, Measurable min.
573-648-20*1	20.1 - 170				Point jaw type, Measurable min.

Inch/Metric Digimatic model

Code No.	Range	Resolution	Maximum permissible error*3 E_{MPE}	Maximum permissible error*3 S_{MPE}	Remarks
573-742-20	0.4 - 8 in/ 10 - 200 mm	0.0005 in/ 0.01 mm		±0.002 in/ ±0.05 mm	Knife-edge type, Measurable min.
573-745-20*2	0.404 - 6.4 in/ 10.26 - 160.16 mm				Inside groove type, Measurable min.
573-746-20*2	0.804 - 6.8 in/ 20.42 - 170.32 mm			±0.0015 in/ ±0.03 mm	Point jaw type, Measurable min.

- Dust/Water protection level: IP67 (IEC 60529)*4
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited

*1 Without thumb roller
*2 Includes the offsetting function, which indicates the actual measurement value.
*3 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*4 Rustproofing shall be applied after use if caliper was in contact with coolant.

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Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

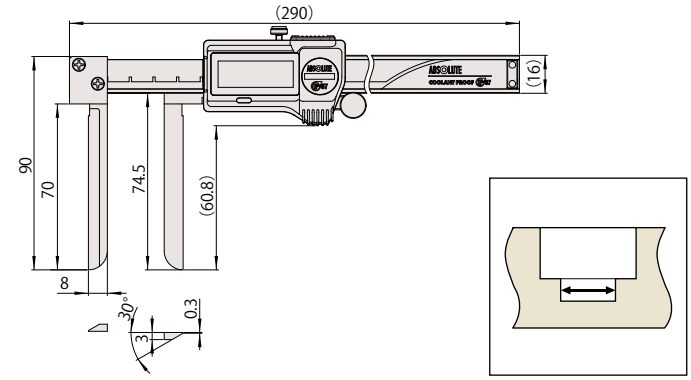
Note: **U-WAVE-TC/TCB** cannot be used with Knife-edge Type (**573-642-20**, **573-643-20** and **573-742-20**).

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

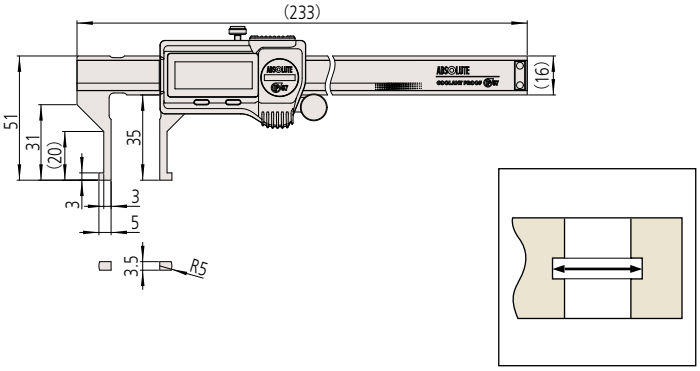
DIMENSIONS

Unit: mm

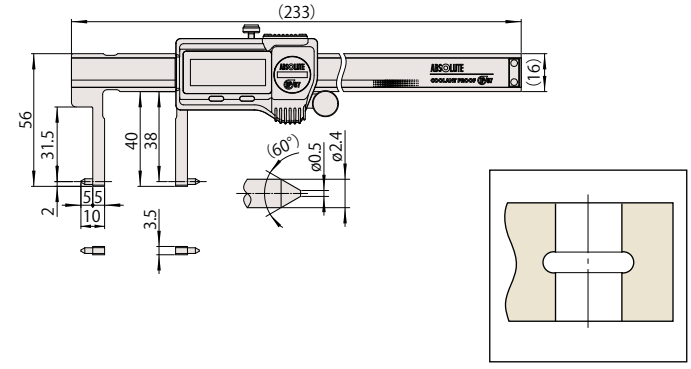
Knife-edge type: 573-642-20, 573-643-20, 573-742-20



Inside groove type: 573-645-20, 573-647-20, 573-745-20



Point jaw type: 573-646-20, 573-648-20, 573-746-20



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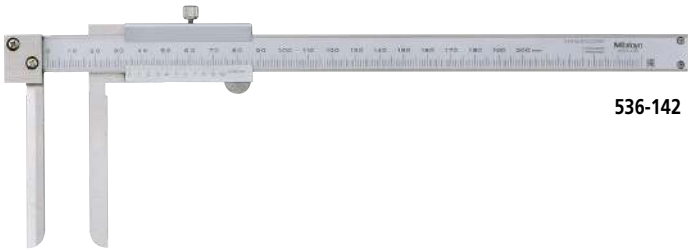
ABSOLUTE Inside Caliper
SERIES 536 — Knife-edge/Inside Groove/Point Jaw Type

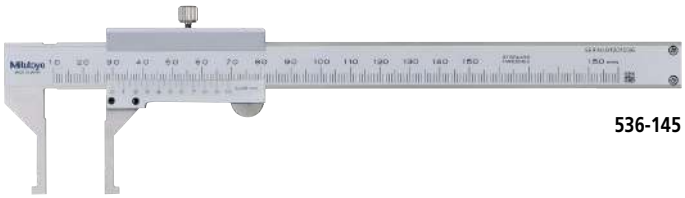
- Specially designed for inside measurement. Select the right model for your workpiece shape.

Knife-edge type



536-142

Inside groove type



536-145

Point jaw type

536-146

SPECIFICATIONS

Metric Analog model

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Remarks
			E_{MPE}	S_{MPE}	
536-142	10 - 200	0.05		±0.12	Knife-edge type, Measurable min.
536-145	10.1 - 150			±0.05	Inside groove type, Measurable min.
536-146	20.1 - 150				Point jaw type, Measurable min.
536-147	30.1 - 300			±0.08	Point jaw type, Measurable min.
536-148	70.1 - 450			±0.10	Point jaw type, Measurable min.
536-149	70.1 - 600			±0.12	Point jaw type, Measurable min.

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

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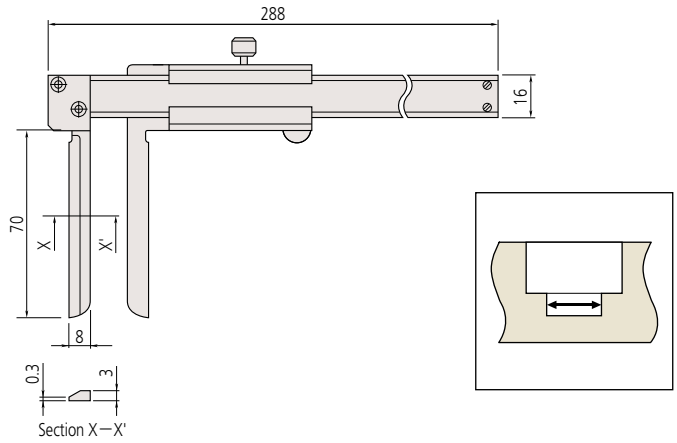
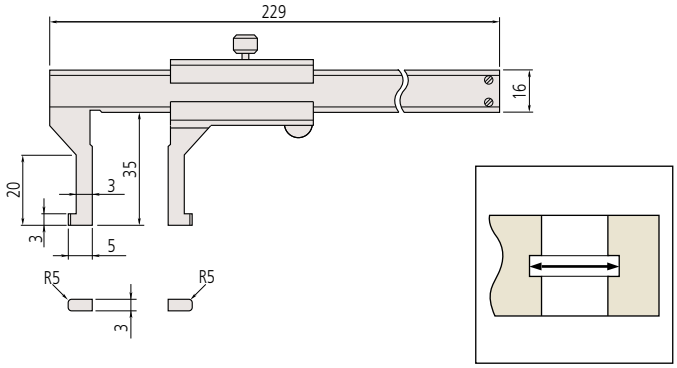
DIMENSIONS

Knife-edge type: 536-142

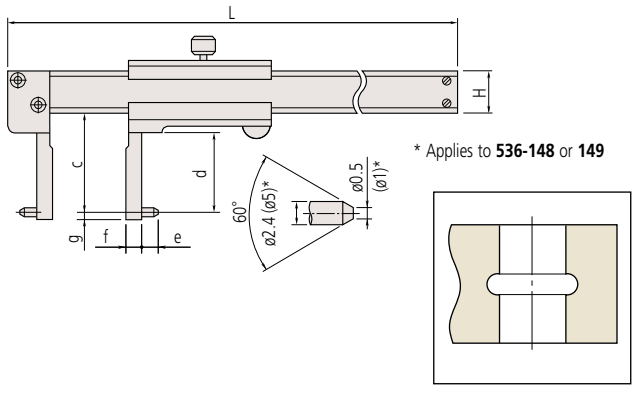
Unit: mm



Inside groove type: 536-145



Point jaw type: 536-146, 147, 148, 149



* Applies to **536-148** or **149**

Range (mm)	c	d	e	f	g	H	L
150	38	31	5	5	2	16	229
300	98	89		10		20	403
450	145	136	10	25	5	25	610
600							750

Note: Models with a measuring range of more than 300 mm have slightly different appearance. For details, contact our Customer Support Center.

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Neck Caliper
SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Types

- Can measure wall thickness, inside bores, and recesses.

573-651-20

SPECIFICATIONS

Metric Digimatic model

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*3	
			E_{MPE}	S_{MPE}
573-651-20	0 - 150	0.01	±0.03	
573-652-20*1	0 - 150			
573-653-20*2	0 - 150			
573-654-20*1*2	0 - 150			

Inch / Metric Digimatic model

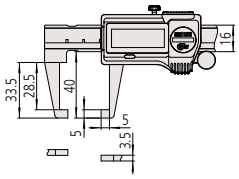
Code No.	Range	Resolution	Maximum permissible error*3	
			E_{MPE}	S_{MPE}
573-751-20	0 - 6 in/ 0 - 150 mm	0.0005 in/ 0.01 mm	±0.0015 in/ ±0.03 mm	
573-752-20*1	0 - 6 in/ 0 - 150 mm			

- Dust/Water protection level: IP67 (IEC 60529)*4
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited

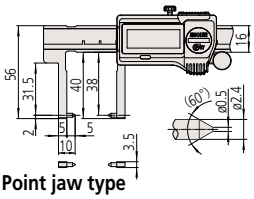
*1 Point jaw type
*2 Without thumb roller
*3 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*4 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

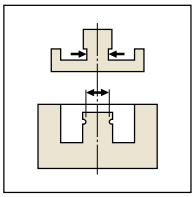
Unit: mm



573-651-20, 573-653-20*, 573-751-20
* Without thumb roller
Jaw thickness: 3.5 mm



Point jaw type
573-652-20, 573-654-20*, 573-752-20
* Without thumb roller



Point jaw type

536-152

SPECIFICATIONS

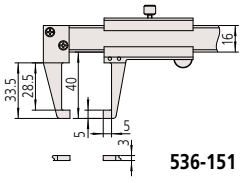
Metric Analog model

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*1	
			E_{MPE}	S_{MPE}
536-151	0 - 150	0.05	±0.05	
536-152*2				

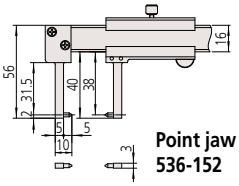
*1 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*2 Point jaw type

DIMENSIONS

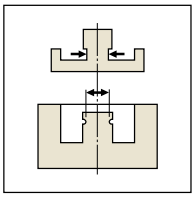
Unit: mm



536-151



Point jaw type
536-152



Jaw thickness: 3 mm

MeasurLink® ENABLED
Data Management Software by Mitutoyo

U-WAVE fit

ABSOLUTE™

Applicable models: **series 573**

IP67

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Measurement example

Optional Accessories (for series 573)

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

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MeasurLink® ENABLED Data Management Software by Mitutoyo

U-WAVE fit

ABSOLUTE™

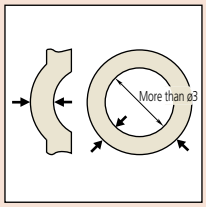
Applicable models: **series 573**

IP67

Dust- and Water-Protected

TÜVRheinland CERTIFIED www.tuv.com ID 0000045042

Measurement example



Optional Accessories (for series 573)

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

Tube Thickness Caliper
SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Types

- The beam-mounted jaw is a round bar that facilitates measurements of tube wall thickness.
- Data output function allows integration into statistical process control and measurement systems. (Refer to page 09-3.)

573-661-20

SPECIFICATIONS

Metric Digimatic model

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*2	
			E_{MPE}	S_{MPE}
573-661-20	0 - 150	0.01	±0.05	
573-662-20*1	0 - 150			

Inch / Metric Digimatic model

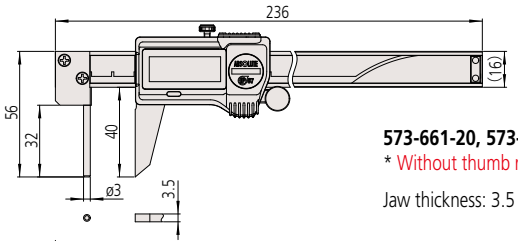
Code No.	Range	Resolution	Maximum permissible error*2	
			E_{MPE}	S_{MPE}
573-761-20	0 - 6 in/ 0 - 150 mm	0.0005 in/ 0.01 mm	±0.002 in/ ±0.05 mm	

- Dust/Water protection level: IP67 (IEC 60529)*3
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years under normal use
- Position detection method: ABSOLUTE electromagnetic induction linear encoder
- Response speed: Unlimited

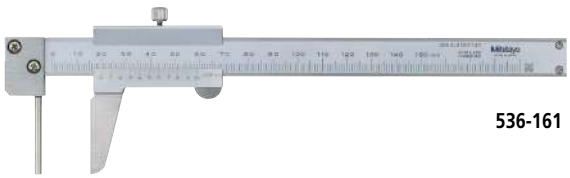
*1 Without thumb roller
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
*3 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm



573-661-20, 573-662-20*, 573-761-20
* Without thumb roller
Jaw thickness: 3.5 mm



536-161

SPECIFICATIONS

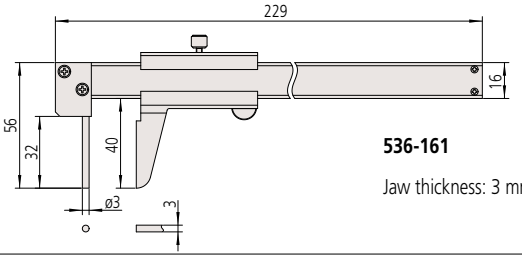
Metric Analog model

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
536-161	0 - 150	0.05	±0.05	

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

Unit: mm



536-161
Jaw thickness: 3 mm

Hook Type Vernier Caliper SERIES 536

- Can measure width of grooves and lands inside bores and recesses.
- **536-172** is equipped with a fine-adjustment wheel to enable precise feed and adjustment.

536-171

Inside-groove type

536-172

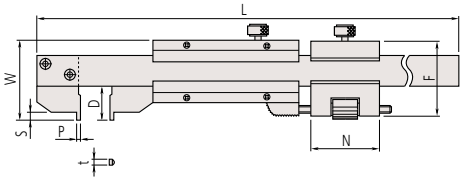
SPECIFICATIONS

Metric

Code No.	Range (mm)*1	Graduation (mm)	Maximum permissible error (mm)*2		Remarks
			E_{MPE}	S_{MPE}	
536-171	0 - 200 (10.1 - 200)	0.02	±0.03	±0.03	—
536-172	0 - 200 (2.1 - 200)				with fine adjustment

*1 ( ): Dimension in inside measurement
*2 The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

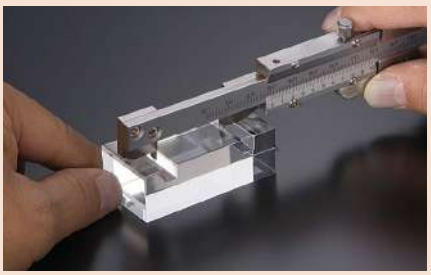


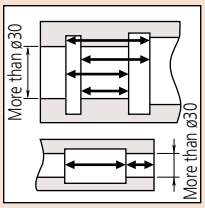
Unit: mm

Code No.	D	F	L	N	P	S	t	W
536-171*1	12	—	320	—	5	4	3.5	28
536-172*2		28.5		20	1			

*1 Inside measuring face is R5.
*2 Inside measuring face is flat.

Measurement example





Swivel Vernier Caliper SERIES 536 — Moving Jaw Type

- The moving jaw can be rotated to measure sectioned shafts.
- Can measure outside and inside dimensions, depth, and steps.

536-212

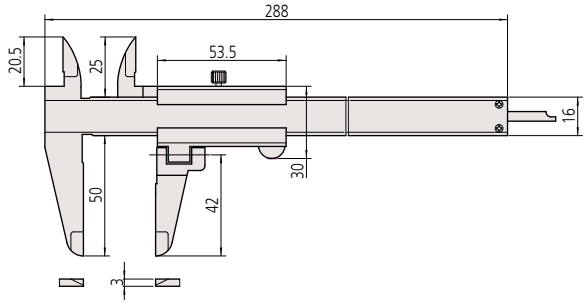
SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error (mm)*		Remarks
			E_{MPE}	S_{MPE}	
536-212	0 - 200	0.05	±0.05	±0.07	with depth bar

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS



Unit: mm

Measurement example

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MeasurLink® ENABLED
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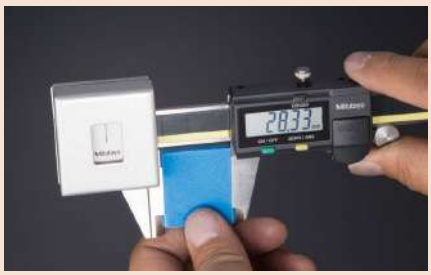
ABSOLUTE™

ABSOLUTE Low Force Caliper SERIES 573

- Due to the low measuring force, this caliper is ideal for measuring elastic workpieces such as plastic and rubber parts.
- Easily allows fine feeding by using the thumb roller.
- Measuring force: 0.5 N to 1.0 N

573-191-30

Measurement example



Technical Explanation

Measurement procedure

A consistently low measuring force can be guaranteed by only taking measurements when the pointer is between the two fiducial lines.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
959149	C	Connection cable for **IT/DP/MUX** (1 m)
959150	C	Connection cable for **IT/DP/MUX** (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm)
02AZE140C	C	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF300	Buzzer	Connecting unit for **U-WAVE-TC/TCB**

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
573-191-30	0 - 180	0.01	±0.05	

Inch/Metric

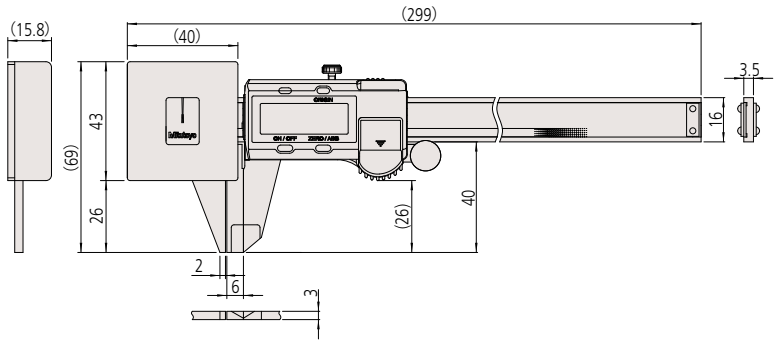
Code No.	Range	Resolution	Maximum permissible error*	
			E_{MPE}	S_{MPE}
573-291-30	0 - 7 in/0 - 180 mm	0.0005 in/0.01 mm	±0.002 in/±0.05 mm	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic inductive linear encoder
- Response speed: Unlimited

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.
Note: Dedicated for outside measurement (depth bar is not fitted).

DIMENSIONS

Unit: mm



Calipers

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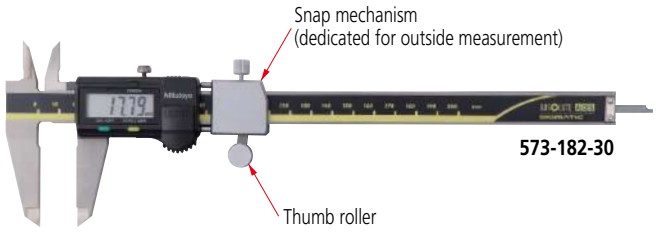
ABSOLUTE™

ABSOLUTE Snap Caliper SERIES 573

- Features a 'snap action' movement control of the slider via a spring-loaded mechanism attached to a movable clamp on the beam.
- Enables quick and efficient repetitive Go/No-Go inspection of a specific dimension on mass-produced parts by just moving a lever.
- The slider can be retracted by up to 2 mm from the measuring position.
- Measuring force: 7 to 14 N



SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (mm)*	
			E_{MPE}	S_{MPE}
573-181-30	0 - 100	0.01	±0.02	±0.04
573-182-30	0 - 150			

Inch/Metric

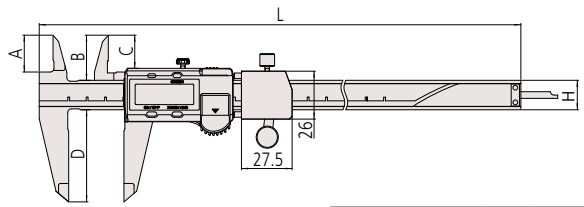
Code No.	Range	Resolution	Maximum permissible error*	
			E_{MPE}	S_{MPE}
573-281-30	0 - 4 in/0 - 100 mm	0.0005 in/0.01 mm	±0.001 in/±0.02 mm	±0.002 in/±0.04 mm
573-282-30	0 - 6 in/0 - 150 mm			

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic inductive linear encoder
- Response speed: Unlimited

* The Partial Surface Contact Error (E_{MPE}) and Shift Error (S_{MPE}) are terms defined by ISO 13385-1:2019.

DIMENSIONS

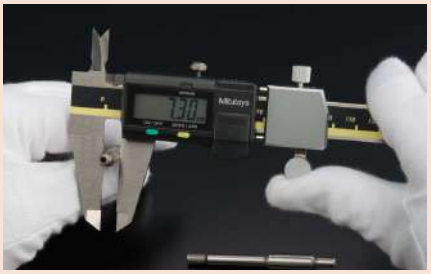
Unit: mm



Thickness of outer jaw: 3.5 mm

Range	A	B	C	D	H	L
0 - 100 mm/0 - 4 in	16.5	21	14.5	40	16	233
0 - 150 mm/0 - 6 in	20	24.5	18	50		290

Measurement example



Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
959149	C	Connection cable for **IT/DP/MUX** (1 m)
959150	C	Connection cable for **IT/DP/MUX** (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm)
02AZE140C	C	Connection cable for **U-WAVE-T** For foot switch

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05

Height Gages

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

PROPRIETARY INSPECTION CERTIFICATE

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off.
The origin is set once - thereafter the live position is displayed when the power is turned on.

Linear Height

QM-Height

ABSOLUTE Digimatic Height Gage

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Mitutoyo

Linear Height
SERIES 518 — High-performance 2D Measurement System

- This is a precision height gage featuring high accuracy and outstanding ease of use. It is useful not only in height measurement but also in a wide range of applications such as inspection of moulds and precision parts.
- Easy operation using keypad and touch screen navigation allows intuitive operation that is suitable even for beginners.
- The built-in scale is dirt-resistant and can be reliably used on shop floors.
- Various interfaces are available, including connection to a printer, a PC, and our wired or wireless communication system.
- Pneumatic full/semi-floating suspension system allows adjustment of air-cushion height.
- It is easily expandable to support various types of optional probes to meet your different measurement needs.

518-361-11

SPECIFICATIONS

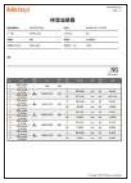
Model		LH-600F	LH-600FG
Code No.	mm	518-360-11	518-361-11
	inch/mm	518-360-13	518-361-13
Power grip		Without power grip	With power grip
Measuring range (Stroke)		0 to 977 mm (600 mm) 0 to 38 in (24 in)	
Resolution		0.0001/0.001/0.01/0.1 mm (selectable) 0.000001/0.00001/0.0001/0.001 in (selectable)	
Accuracy	Indication accuracy*1	± (1.1 + 0.6L/600) µm, L= Arbitrary measuring height (mm)	
	Repeatability*1	Plane: 0.4 µm (2σ), Hole: 0.9 µm (2σ)	
	Perpendicularity (forward and backward)*2	5 µm	
	Straightness (forward and backward)*2	4 µm	
Driving method (speed)		Motor-driven (5, 10, 15, 20, 25, 30, 40 mm/s: 7 steps)/Manual	
Scale unit		Photoelectric incrermental encoder STVC-20Z	
Measuring force		1 N (automatic constant-force function)	
Main unit moving mode		Full-floating (moving)/Semi-floating (measuring) Air bearing (built-in compressor)	
Display unit		8.4 inch touch-screen, LCD	
Adjustment of display unit		Stepless tilt adjustment: 0 to 40° Stepless swivel adustment: -30 to 180°	
Preventive maintenance		Scale status notification, calibration schedule notification	
Probe diameter compensation		Semi-automatic compensation using the probe diameter calibration block (standard accessory) Compensation by inputting the probe diameeter	
Power source		AC adapter 100-240 V±10% 50/60 Hz/Battery (NiMH)	
Battery operation time*3		Battery powered (standard): 4 hours*4, Powered by 2 batteries: 8 hours	
Battery charging time*5		Approx. 3.5 hours (can be used while charging)	
Dimensions (W×D×H)		238×492×996 mm	
Mass		26.1 kg	26.6 kg
Operating temperature/humidity ranges		5 to 40 °C/20 to 80% RH (non-condensing)	
Data output		Digimatic D1/D2/S1 (bi-directional communication)	

• Use in an environment that is as close as possible to 20 ˚C, and subject to minimal temperature change over time.
*1: Indication accuracy and repeatability represent the values obtained when the standard ø5 stepped prove is used.
*2: Guaranteed when using the Lever Head (**519-521**) and Mu-Checker (**519-561**).
*3: 25% operation of vertical movement by suspension and motor
*4: One battery pack (**12AAF712**) is provided as standard.
*5: When ambient temperature is 30 °C or higher, the battery may not charge sufficiently.

LH Communication-Tool V1.0 software for creating inspection reports and configuring system settings

You can easily create and save inspection reports and configure device parameters.

* Available at Mitutoyo website for free download.
* To connect to a PC, use a USB cable (type A-B).



PROPRIETARY INSPECTION CERTIFICATE

Adjustable to easy-to-see angle

Measurement guidance

Intuitive operation thanks to guidance

Home screen
Measurement menu display is easy to understand visually. The guidance makes it easy for first-time users to operate the system.

2D measurement - Pre-placement -
This function allows the user to register the hole position of the workpiece before measurement.

Perpendicular/straightness measurement - Graph creation -
You can check the measurement results of perpendicularity and straightness in real time during measurement.

Part program measurement
You can easily create, execute, edit, and even display the results of part programs.

Product catalog E12012

Video

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Optional products for outputting measurement data

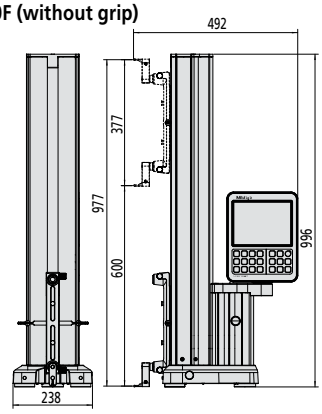
Code No.	Product name
12AAY481	Receipt printer (for Japan)*1
12AAY482	Receipt printer (for North America)*1
12AAY483	Receipt printer (for EU countries, excluding the UK)*1
12AAY484	Receipt printer (for the UK)*1
12AAN052	Printer paper for receipt printer (set of 10)
12AAY485	Printer mounting attachment
12AAN146	Connection cable for printer
—	(USB memory device)*2
12BAF812	USB cable (type A - type B) (2 m)
543-700B	Digimatic indicator (**ID-C0512NXB**)
543-701B	Digimatic indicator (**ID-C0512MNXB**)
519-521	Lever head probe **MLH-521**
519-561	Mu-checker **M-561**
936937	Digimatic cable (1 m)
965014	Digimatic cable (2 m)
264-505	Digimatic mini processor (**DP-1VA**)
264-020	Input tool (**IT-020U**)
06AGQ001F	Input tool (**USB-ITN-SF**)
06AGL011	Bidirectional digimatic S1 cable, Flat and straight (1 m)
06AGL021	Bidirectional digimatic S1 cable, Flat and straight (2 m)
12AAJ088	Foot switch
02AZD810D	**U-WAVE-R**
02AZD730G	**U-WAVE-T** (IP67 type)
02AZD880G	**U-WAVE-T** (Buzzer type)
12AAY486	**U-WAVE T** mounting bracket
02AZG011	Bidirectional Digimatic S1 cable for **U-WAVE-T** (160 mm)
264-626	**U-WAVE-TMB** (IP67 type)
264-627	**U-WAVE-TMB** (Buzzer type)

*1 A small printer (optionally battery-powered) that can be mounted on the main unit.
It includes a printer cable and mounting bracket.
*2 USB memory devices should be formatted with FAT16/32. NTFS and exFAT are not supported.

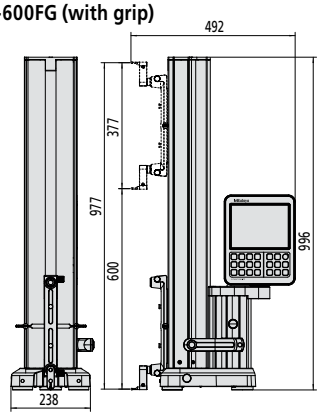
DIMENSIONS

Unit: mm

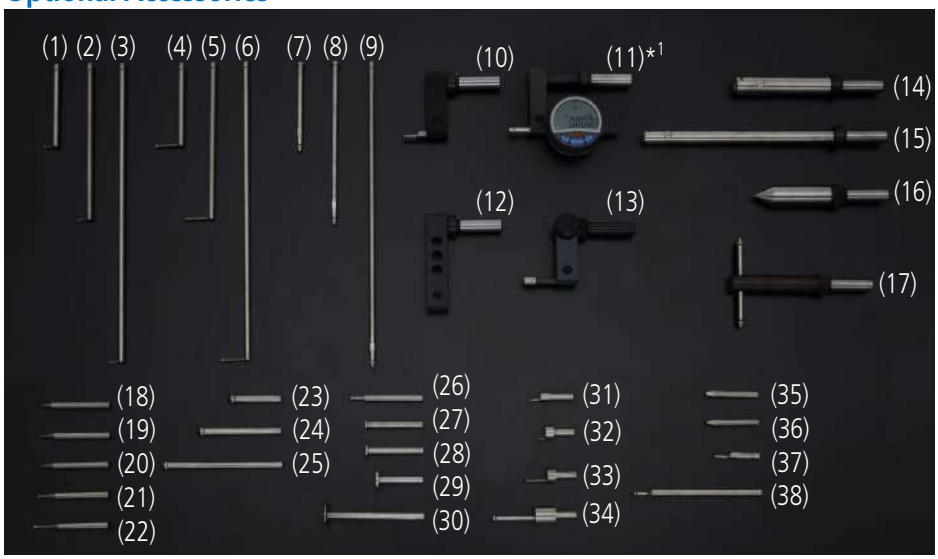
LH-600F (without grip)



LH-600FG (with grip)



Optional Accessories



No.	Code No.	Item
(1)	**12AAY602**	Depth stylus 70 ø2 ball
(2)	**12AAY603**	Depth stylus 150 ø2 ball
(3)	**12AAY604**	Depth stylus 300 ø2 ball
(4)	**12AAY605**	Depth stylus 70 ø4 ball
(5)	**12AAY606**	Depth stylus 150 ø4 ball
(6)	**12AAY607**	Depth stylus 300 ø4 ball
(7)	**12AAY599**	Depth stylus 70
(8)	**12AAY600**	Depth stylus 150
(9)	**12AAY601**	Depth stylus 300
(10)	**12AAY343**	ø5 stepped probe (standard accessory)
(11)	**12AAA792** **12AAA837**	Dial indicator holder (mm type)*1 Dial indicator holder (inch type)*1
(12)	**12AAA793**	Probe extension holder
(13)	**12AAB136**	ø10 mm cylindrical probe
(14)	**12AAY595**	Extension holder 100
(15)	**12AAY596**	Extension holder 200
(16)	**12AAC073**	Tapered probe (ø20)
(17)	**12AAC072**	Depth probe
(18)	**12AAF666**	ø1 mm ball probe (coaxial type)
(19)	**957261**	ø2 mm ball probe (coaxial type)

No.	Code No.	Item
(20)	**12AAF667**	ø2 mm ball probe (coaxial type) Ruby ball
(21)	**957262**	ø3 mm ball probe (coaxial type)
(22)	**957263**	ø4 mm ball probe (coaxial type)
(23)	**12AAB552**	ø10 mm ball probe (coaxial type)
(24)	**12AAF668**	ø10 mm ball probe (coaxial type) L: 82 mm
(25)	**12AAF669**	ø10 mm ball probe (coaxial type) L: 120 mm
(26)	**12AAF670**	ø5 mm disk probe
(27)	**12AAF671**	ø10 mm disk probe
(28)	**957264**	ø14 mm disk probe
(29)	**957265**	ø20 mm disk probe
(30)	**12AAY598**	ø25 disk stylus
(31)	**12AAF672**	ø1 mm ball offset probe
(32)	**12AAF673**	ø2 ball stylus (eccentric type)
(33)	**12AAA788**	ø4 mm ball offset probe
(34)	**12AAA789**	ø6 mm ball offset probe
(35)	**226118**	M3 CMM stylus adapter*2
(36)	**226117**	M2 CMM stylus adapter*2
(37)	**05HAA394**	ø5 ball stylus*3
(38)	**12AAY597**	ø5 ball stylus L130
	12AAF712	Additional battery pack

*1 A dial indicator is not included.
*2 For enabling CMM stylus to be used.
*3 The stylus is attached to ø5 stepped probe (**12AAY343**) and provided as standard.
Note 1: A gauge block may be required for zero-setting depending on the probe and contact point.
Note 2: Refer to the **E12012** catalog for more details.

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MeasurLink ENABLED
Data Management Software by Mitutoyo

PROPRIETARY INSPECTION CERTIFICATE

QM-Height
SERIES 518 — High-performance Height Gage

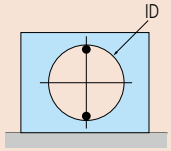
- This highly precise height gage is useful not only in height measurements but also in a wide range of applications such as measurement of steps, inside and outside diameters, and runouts.
- Easy-to-view, simple control panel enables most measurements to be made with a single keystroke.
  SPC (Digimatic) and RS-232C data output allow easy data management with a PC.
- Pneumatic floating models, which feature an air-suspension mechanism, can move smoothly on a surface plate (accuracy cannot be guaranteed for measurement while the unit is air-suspended).
- It features a long continuous operating time of approximately 1,200 hours with four AA alkaline batteries.
  (Four commercially available NiMH/HR6 rechargeable batteries can also be used.)

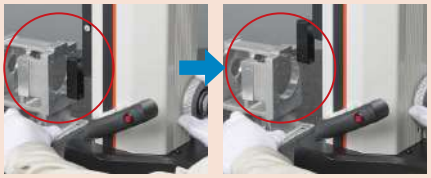
518-246

Measurement example

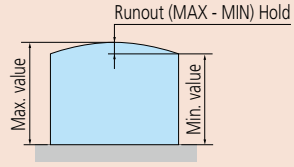
- Height measurement

- ID measurement





- Runout measurement



SPECIFICATIONS

Code No.	Metric / Inch/Metric	518-240 / 518-241	518-242 / 518-243	518-244 / 518-245	518-246 / 518-247
Measuring range (stroke)		0 to 465 mm (350 mm/14 in)	0 to 715 mm (600 mm/24 in)	0 to 465 mm (350 mm/14 in)	0 to 715 mm (600 mm/24 in)
Resolution	Metric	0.001 mm/0.005 mm (Selectable)			
	Inch/Metric	0.001/0.005 mm 0.00005/0.0001/0.0002 in (Selectable)			
Accuracy	Indication accuracy*1	± (2.4 + 2.1L/600) µm			
	Repeatability*1	2 σ ≤ 1.8 µm			
Perpendicularity*2		7 µm	12 µm	7 µm	12 µm
Guiding method		Roller bearing			
Drive method		Manual (wheel)			
Measurement principle		Electromagnetic induction absolute encoder			
Measuring force		1.5±0.5 N			
Data output ports		Digimatic/USB*3			
Air-floating system		Not included		Included (for positioning only)*4	
Power source		Alkaline AA/LR6 batteries×4 (standard accessories)/AC adapter (optional accessory)*5/ Supports NiMH (HR6) rechargeable batteries×4			
Battery life guidelines*6		Approx. 1,200 hours (without using the air-floating system)			
		Approx. 90 hours (when using the air-floating system)			
Mass		25 kg	29 kg	26 kg	30 kg
Dimensions (W×D×H)		Stroke 350 mm type: 280×273×784 mm Stroke 600 mm type: 280×273×1016 mm			
Operating temperature (recommended)		0 to 40 °C (10 to 30 °C)			
Operating humidity		20 to 80% RH (non-condensing)			
Storage temperature		-10 to 50 °C			
Storage humidity		5 to 90% RH (non-condensing)			

- Standard Accessories: **05HZA148** ø5 mm stepped probe, **12AAA715** Probe diameter calibration block, Alkaline batteries×4 (AA/LR6) (For operational checks)

*1 Indication accuracy and repeatability represent the values obtained when the standard ø5 stepped probe is used. It should be used in an environment as close to 20 °C as possible, with minimal temperature changes. In the case of diameter, minimum (maximum) value, circle pitch or difference measurement, measuring errors may be larger than the accuracy ratings listed in the table due to variations in measuring force during a scanning measurement, which differs from height measurement.
*2 Indicates the value obtained from the measurement of a straight surface placed perpendicular to the the base reference surface using the Lever Head (**519-521**) and Mu-checker (**519-551**).
*3 Requires special communication driver. Consult your local Mitutoyo Sales Office for details.
These can be downloaded from the Mitutoyo web site. **https://www.mitutoyo.co.jp/eng/contact/products/usb/index.html**
*4 When using a model with the air-floating system, it is advisable to use a JIS 1 class, or higher, surface plate. Using on surfaces with scratches or unevenness may prevent the system operating to the specified performance.
*5 The AC adapter cannot be used to recharge rechargeable batteries.
*6 Battery life depends on the operating conditions. In particular, it is more economical to use the optional AC adapter to power the instrument if the application requires prolonged use of the air-floating system.

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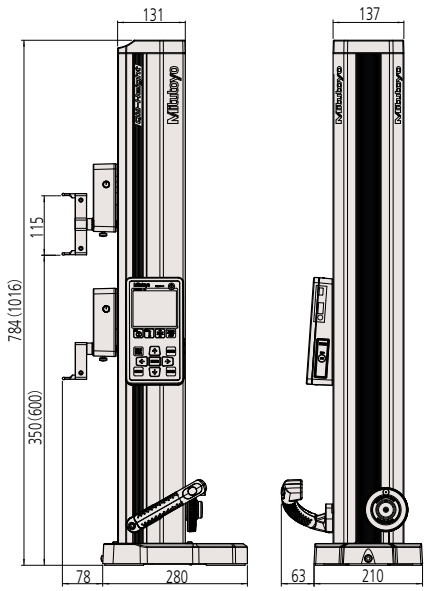
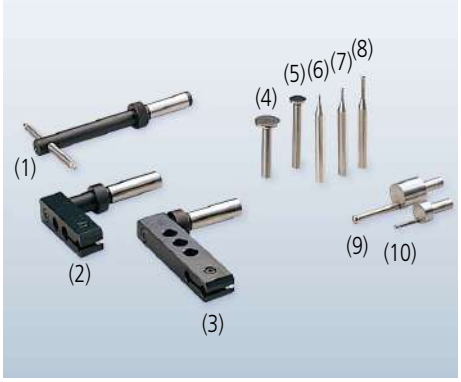
DIMENSIONS

Unit: mm



( ): 600 mm stroke type

Optional Accessories



Optional accessories that enable centralized data management

Code No.	Item name
Small printer equipped with Data Logger	
264-505	**DP-1VA LOGGER**
936937	Digimatic connection cable (1 m)
965014	Digimatic connection cable (2 m)
06AFZ050	USB cable (A-microB)
Measurement Data Input Unit	
06AFM380D	USB Input Tool Direct **USB-ITN-D**
Measurement data wireless communication system	
02AZD730G	**U-WAVE-T** (Transmission unit) (IP67 type)
02AZD880G	**U-WAVE-T** (Transmission unit) (Buzzer type)
02AZD790D	**U-WAVE-T** dedicated cable (Standard use)
02AZE140D	**U-WAVE-T** dedicated cable (For foot switch)
02AZD810D	**U-WAVE-R**
02AZE990	**U-WAVE** mounting bracket
Measurement data collection software for Excel **USB-IT PAK V2.1/V3.0**	
Measurement data network system **MeasurLink®**	

Contact points for a wide range of measurements

Item	Code No.	Description
	Depth probe	
(1)	**12AAC072**	Depth probe
	Special holder	
(2)	**12AAA792**	Holder for dial indicator
(3)	**12AAA793**	Holder (Long)
	Interchangeable contact points for ø5 mm stepped probe	
(4)	**957265**	ø20 mm disk
(5)	**957264**	ø14 mm disk
(6)	**957261**	ø2 mm ball (coaxial type)
(7)	**957262**	ø3 mm ball (coaxial type)
(8)	**957263**	ø4 mm ball (coaxial type)
(9)	**12AAA789**	ø6 mm ball (eccentric type)
(10)	**12AAA788**	ø4 mm ball (eccentric type)
	AC Adapter	
	06AGZ369JA	AD620JA for Japan/U.S.
	06AGZ369D	AD620D for the EU
	06AGZ369E	AD620E for the UK
	06AGZ369K	AD620K for Korea
	06AGZ369DC	AD620DC for China
	Other	
	05HZA173	Scriber*

* Used for measurements, cannot be used for scribing.
Note: A gauge block may be required for zero-setting depending on the probe or contact point to be used.

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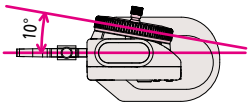
Mitutoyo

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Digimatic Height Gage
SERIES 192 — Multi-function Type with SPC Data Output

- Double-column structure ensures stable measurements.
- Ergonomic base fits comfortably in the hand.
- Inclined handle improves slider ergonomics.
- Bidirectional touch-trigger probe is available as an optional accessory.
- Provided with a long scriber (150 mm).



192-663-10

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error E_{MPE} (mm)*	Response speed (mm/s)	Height (mm)	Mass (kg)
192-663-10	0 - 300	0.01/0.005 (selectable)	±0.02	Approx. 500	510	5.7
192-664-10	0 - 600		±0.04		802	8.3
192-665-10	0 - 1000		±0.06		1228	15.7

Inch/Metric

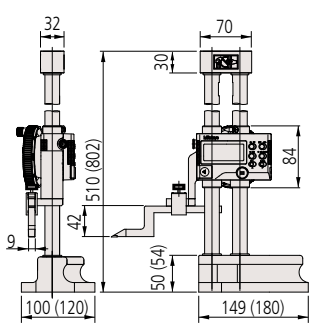
Code No.	Range (in)	Resolution	Maximum permissible error E_{MPE} (in)*	Response speed (mm/s)	Height (mm)	Mass (kg)
192-670-10	0 - 12	0.01 mm/0.005 mm (selectable)	±0.001	Approx. 500	510	5.7
192-671-10	0 - 18		±0.0015		649	7.5
192-672-10	0 - 24	0.0005 in/0.0002 in (selectable)	±0.0015		802	8.3
192-673-10	0 - 40		±0.0025		1228	15.7

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 3,500 hours in continuous use

* Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

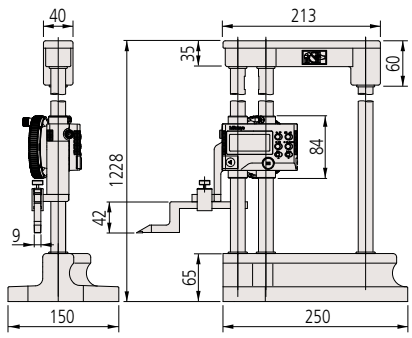
DIMENSIONS

192-663-10, 192-664-10
( ): **192-664-10**



192-665-10

Unit: mm



Functions (Refer to page 05-8)

Standard Accessories

Code No.	Description	Models
905200	Scriber	**192-663-10** **192-664-10** **192-665-10**
905201	Scriber	**192-670-10** **192-671-10** **192-672-10** **192-673-10**
05GZA033	Scriber clamp box	**192-663-10** **192-664-10** **192-665-10**
901385	Scriber clamp box	**192-670-10** **192-671-10** **192-672-10** **192-673-10**

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
905338	F	Connection cable for **IT/DP/MUX** (1 m)
905409	F	Connection cable for **IT/DP/MUX** (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790F	F	Connection cable for **U-WAVE-T** (160 mm)
02AZE140F	F	Connection cable for **U-WAVE-T** For foot switch

- **Bidirectional touch-trigger probe**: **192-007** (mm), **192-008** (inch)
  Improves accuracy in step, internal thickness, and outside width measurement by minimizing reproducibility error. A bidirectional touch-trigger probe is available as an optional accessory for **192-663-10**, **192-664-10**, **192-665-10**, **192-670-10**, **192-671-10**, **192-672-10** and **192-673-10**.

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Digimatic Height Gage
SERIES 192 — Multi-function Type with SPC Data Output

- Double-column structure ensures stable measurements.
- Ergonomic base fits comfortably in the hand.
- Cannot be used with bidirectional touch-trigger probe.

192-613-10

Functions

- Origin-setting (ABS measurement mode):
  Any arbitrary value can be stored as the origin point.
- Zero-setting (INC measurement mode):
  Displayed value can be set to zero at any arbitrary position of the slider.
- Origin restoration:
  Previously set origin is restored when switching back to ABS mode.
- Presetting (ABS INC measurement mode):
  Displayed value can be set to any arbitrary value, including negative values.
- Measuring direction
  Measuring direction can be switched at the press of a button.
- Data hold
  Display value can be held. Reverts to ABS or INC mode when cancelled.
- Alarm: Error message is displayed when overflow or overspeed of displayed value arises and measurement is stopped.
- Data output:
  Allows integration into statistical process control and measurement systems. (Refer to page 09-3.)
- Fine and coarse height adjustment through knob and wheel combination.
  Slider height adjustment wheel allows fine and coarse height adjustment.
- Probe-tip diameter compensation: An adjustment is applied to the raw measurement data to compensate for the effect of the size of the spherical contact point used by the bidirectional touch-trigger probe.
- Presetting (2 positions): With two preset functions, two reference heights can be used relative to a surface plate.

Standard Accessories

Code No.	Description	Models
07GZA000	Scriber	**192-613-10** **192-614-10** **192-615-10**
900258	Scriber	**192-630-10** **192-631-10** **192-632-10** **192-633-10**
05GZA033	Scriber clamp box	**192-613-10** **192-614-10** **192-615-10**
901385	Scriber clamp box	**192-630-10** **192-631-10** **192-632-10** **192-633-10**

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
905338	F	Connection cable for **IT/DP/MUX** (1 m)
905409	F	Connection cable for **IT/DP/MUX** (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE990	—	**U-WAVE-T** mounting bracket
02AZD790F	F	Connection cable for **U-WAVE-T** (160 mm)
02AZE140F	F	Connection cable for **U-WAVE-T** For foot switch

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error E_{MPE} (mm)*	Response speed (mm/s)	Height (mm)	Mass (kg)
192-613-10	0 - 300	0.01/0.005 (selectable)	±0.02	Approx. 500	475	4.7
192-614-10	0 - 600		±0.05		802	8.3
192-615-10	0 - 1000		±0.07		1228	15.7

Inch / Metric

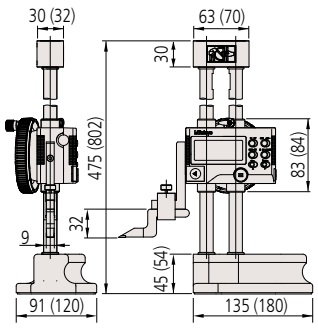
Code No.	Range (in)	Resolution	Maximum permissible error E_{MPE} (in)*	Response speed (mm/s)	Height (mm)	Mass (kg)
192-630-10	0 - 12	0.01 mm/0.005 mm (selectable)	±0.001	Approx. 500	475	4.7
192-631-10	0 - 18		±0.002		649	7.5
192-632-10	0 - 24	0.0005 in/0.0002 in (selectable)	±0.002		802	8.3
192-633-10	0 - 40		±0.003		1228	15.7

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 3,500 hours in continuous use

* Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

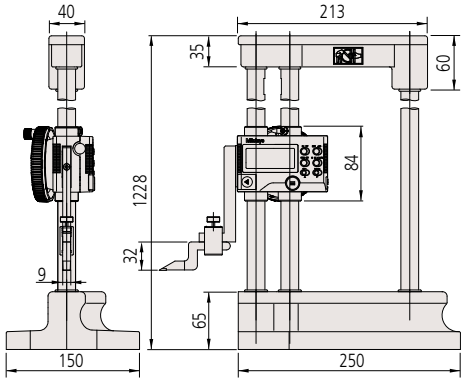
DIMENSIONS

192-613-10, 192-614-10
( ): **192-614-10**



192-615-10

Unit: mm



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MeasurLink® ENABLED Data Management Software by Mitutoyo

ABSOLUTE™

ABSOLUTE Digimatic Height Gage SERIES 570 — with Ergonomic Base

- New standard model which features a prismatic column and offers excellent rigidity and accuracy.
- Allows smooth elevation by the slider adjustment wheel.
- **U-WAVE-T/TC/TCB** (wireless data transmitter) can be installed on the back of the display unit.

570-402

Equipped with **U-WAVE-T/TC/TCB**

Note: When attaching the **U-WAVE**, use commercially available double-sided tape, etc.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error E_{MPE} (mm)*	Response speed	Mass (kg)
570-402	0 - 300	0.01	±0.03	Unlimited	4.6
570-404	0 - 600		±0.05		6.4

Inch / Metric

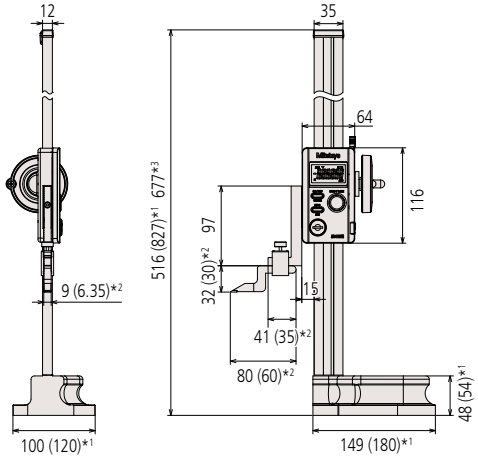
Code No.	Range	Resolution	Maximum permissible error E_{MPE}*	Response speed	Mass (kg)
570-412	0 to 12 in/0 to 300 mm	0.0005 in/ 0.01 mm	±0.0015 in/±0.03 mm	Unlimited	4.6
570-413	0 to 18 in/0 to 450 mm		±0.0020 in/±0.05 mm		5.9
570-414	0 to 24 in/0 to 600 mm				6.4

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5 years

* Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

DIMENSIONS

Unit: mm



*1 0 to 450 mm, 0 to 600 mm
*2 Inch model
*3 0 to 450 mm

Measurement example

Functions

- Origin-setting:
  Any convenient reference surface, such as a surface plate, etc., can be stored as the ABSOLUTE origin point.
- ABSOLUTE measurement:
  After power is turned ON, measurement can be started without zero-setting if origin-setting was previously performed. ABSOLUTE origin position can be changed by ORIGIN button.
- Incremental measurement: Allows origin setting at any arbitrary position. In this case, the origin point is not stored after turning off the power.
- Data hold
  Display value can be held.
- Data output:
  Allows integration into statistical process control and measurement systems. (Refer to page 09-3.)
- Low-voltage alert:
  Low-voltage alert: If the battery voltage becomes low, a "B" appears in the display to alert the user before measurement is no longer possible so that the battery can be changed in good time.

Standard Accessories

Code No.	Description	Models
07ZA000	Scriber	**570-402** **570-404**
900258	Scriber	**570-412** **570-413** **570-414**
05GZA033	Scriber clamp box	**570-402** **570-404**
901385	Scriber clamp box	**570-412** **570-413** **570-414**

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
905338	F	Connection cable for **IT/DP/MUX** (1 m)
905409	F	Connection cable for **IT/DP/MUX** (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZD790F	F	Connection cable for **U-WAVE-T** (160 mm)
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
902053	—	Clamp (with dovetail groove)*
953638	—	Holding bar*

* For mounting test indicators, etc. (Refer to pages 07-84 and 07-85 for details.)

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ABSOLUTE™

ABSOLUTE Digimatic Height Gage SERIES 570 — Standard Model

- Simple design is easy to use.
- Scriber is provided as a standard accessory.
- When a dial indicator or dial test indicator is used with **570-227** and **244**, the dedicated holding bar (**953639**, overall length 50 mm) is recommended for use. However, MPE (Maximum permissible error) may be larger because the measurement point is further from the beam.

570-227

Functions

- Zero-setting
- +/- directional measurement
- Data hold
- Data output
- Presetting
- inch/mm reading (inch/mm models)
- Preset value memory
- Origin restoration
- Low battery voltage alert
- Counting value composition error alert

Standard Accessories

Code No.	Description	Models
900173	Scriber	**570-227** **570-244**
905200	Scriber	**570-230** **570-248**
901338	Scriber clamp box	**570-227** **570-244**
05GZA033	Scriber clamp box	**570-230** **570-248**

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790F	F	Connection cable for **U-WAVE-T** (160 mm)
02AZE140F	F	Connection cable for **U-WAVE-T** For foot switch

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Fine feed (mm)	Maximum permissible error E_{MPE} (mm)*	Height (mm)	Mass (kg)
570-227	0 - 200	0.01	4	±0.03	355	1.4
570-230	0 - 1000		6	±0.07	1260	16.8

Inch/Metric

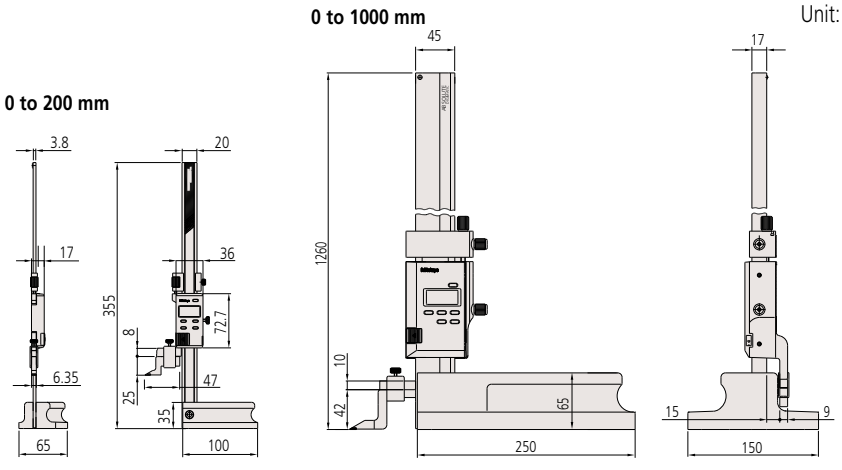
Code No.	Range (in)	Resolution	Fine feed (in)	Maximum permissible error E_{MPE} (in)*	Height (mm)	Mass (kg)
570-244	0 - 8	0.0005 in/0.01 mm	0.16	±0.002	355	1.4
570-248	0 - 40		0.24	±0.003	1260	16.8

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 5,000 hours under normal use

* Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

DIMENSIONS

Unit: mm



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Mitutoyo

Vernier Height Gage
SERIES 514, 506 — Standard Height Gage with Adjustable Main Scale

- Standard Vernier height gage. Fits comfortably in the hand and moves easily on the surface plate.
- Scriber is provided as a standard accessory.
- When installing a dial indicator or dial test indicator on **506-207**, ensure that the overall system can keep a good weight balance to ensure reliable measurement.
- The main scale slides and clamps within the column for quick and convenient zero-setting. (only for the **514** Series)

514-102

506-207

Standard Accessories

Code No.	Description	Models
900173	Scriber	**506-207** **506-208**
07GZA000	Scriber	**514-102** **514-103** **514-104** **514-105** **514-106** **514-107**
905200	Scriber	**514-108** **514-109**
06AGR304	Scriber clamp box	**506-207** **506-208**
05GZA033	Scriber clamp box	**514-102** **514-103** **514-104** **514-105** **514-106** **514-107** **514-108** **514-109**

SPECIFICATIONS

Metric

Code No.	Range (mm)	Minimum reading (mm)	Scale adjustment (mm)	Fine feed (mm)	Maximum permissible error E_{MPE} (mm)*	Height (mm)	Mass (kg)
506-207	0 - 200	0.02	—	4	±0.03	341	1.4
514-102	0 - 300		15		±0.04	525	3.1
514-104	0 - 450				±0.05	675	3.4
514-106	0 - 600			7		870	7.4
514-108	0 - 1000		25	6	±0.07	1340	20

Inch / Metric

Code No.	Range (in)	Minimum reading	Scale adjustment (in)	Fine feed (in)	Maximum permissible error E_{MPE} (in)*	Height (mm)	Mass (kg)
506-208	0 - 8	0.001 in/0.02 mm	—	0.16	±0.001	341	1.4
514-103	0 - 12		0.6		±0.002	525	3.1
514-105	0 - 18					675	3.4
514-107	0 - 24			0.27		870	7.4
514-109	0 - 40		1	0.24	±0.003	1340	20

- Reading magnifier (optional): **514-102**, **104**, **106**: **07GZA003**, **514-108**: **07GZA015**

* Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

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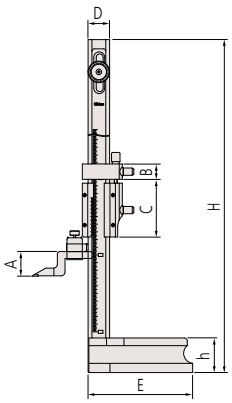
DIMENSIONS

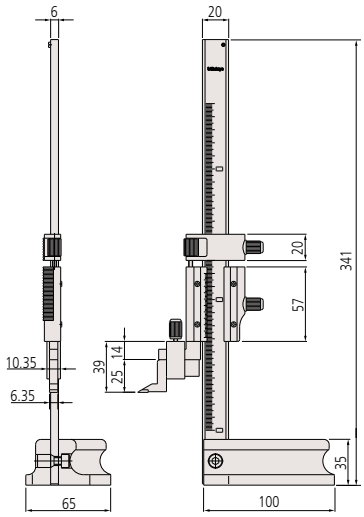
Unit: mm

0 to 300 to 0 to 1000 mm



Range (mm)	A	B	C	D	E	H	h
0 - 300	32	20	70	28	135	525	45
0 - 450						675	
0 - 600		24	85	35	180	870	54
0 - 1000	42	30	110	45	250	1340	65

0 to 200 mm



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Mitutoyo

Dial Height Gage
SERIES 192 — with Mechanical Counter

- Easy and error-free reading with both up and down digital counters as well as a dial.
- The counters and dial can be re-zeroed at any scriber position.
- Provided with a feed wheel for easy coarse feeding.
- Carbide-tipped scriber is provided.

192-130

Standard Accessories

Code No.	Description	Models
07ZA000	Scriber	**192-130** **192-131** **192-132** **192-133**
900258	Scriber	**192-150** **192-151** **192-152** **192-153**
05GZA300	Scriber clamp box	**192-130** **192-131** **192-132** **192-133**
901385	Scriber clamp box	**192-150** **192-151** **192-152** **192-153**

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error E_{MPE} (mm)*	Height (mm)	Mass (kg)
192-130	0 - 300	0.01	±0.03	470	4.2
192-131	0 - 450		±0.05	648	9.2
192-132	0 - 600			798	9.8
192-133	0 - 1000		±0.07	1220	17.0

Inch

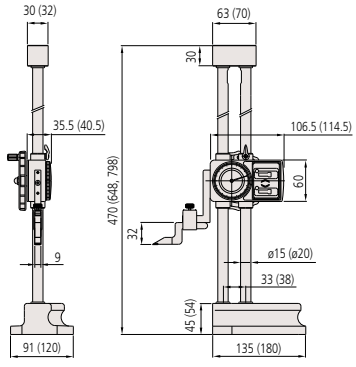
Code No.	Range (in)	Graduation (in)	Maximum permissible error E_{MPE} (in)*	Height (mm)	Mass (kg)
192-150	0 - 12	0.001	±0.0015	470	4.2
192-151	0 - 18		±0.002	648	9.2
192-152	0 - 24			798	9.8
192-153	0 - 40		±0.003	1220	17.0

* Maximum permissible error, E_{MPE} is the term (notation) used in JIS B 7517: 2018, revised based on ISO/TR 14253-6: 2012.

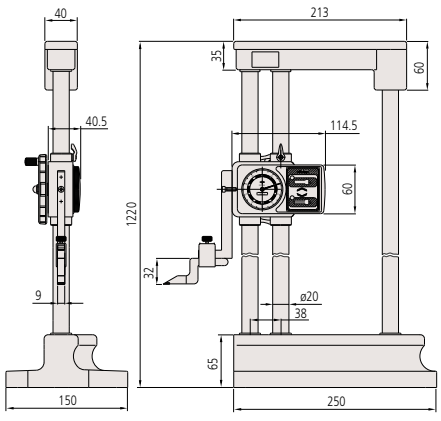
DIMENSIONS

Unit: mm

0 to 300 mm (0 to 450 mm, 0 to 600 mm)



0 to 1000 mm



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Height Gage
Optional Accessories for Height Gages

SPECIFICATIONS (Scriber)

Metric

Code No.	Applicable Height Gages
07GZA000	192 Series Digimatic Height Gages (**192-613-10, 192-614-10, 192-615-10**)
	570 Series Digimatic Height Gages (**570-302, 570-304**)
	192 Series Dial Height Gages (**192-130, 192-131, 192-132, 192-133**)
	514 Series Vernier Height Gages (**514-102, 514-104, 514-106, 514-103, 514-105, 514-107**)
	570 Series Digimatic Height Gages (**570-402/404**)
900168	514 Series Vernier Height Gages (**514-160/172**)
905200	192 Series Digimatic Height Gages (**192-663-10, 192-664-10, 192-665-10**)
	570 Series Digimatic Height Gage (**570-230**)
	514 Series Vernier Height Gages (**514-108, 514-109**)
900390	514 Series Vernier Height Gage (**514-170**)

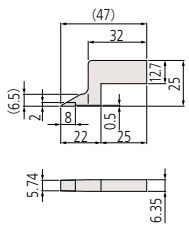
Inch

Code No.	Applicable Height Gages
900173	570 Series Digimatic Height Gages (**570-227, 570-244**)
	506 Series Vernier Height Gages (**506-201/207/204, 506-208**)
900258	192 Series Digimatic Height Gages (**192-630-10, 192-631-10, 192-632-10, 192-633-10**)
	570 Series Digimatic Height Gages (**570-412, 570-413, 570-414**)
	574 Series Heightmatic (**574-212-1, 574-211-1, 574-210-1**)
905201	192 Series Digimatic Height Gages (**192-670-10, 192-671-10, 192-672-10, 192-673-10**)
	570 Series Digimatic Height Gage (**570-248**)

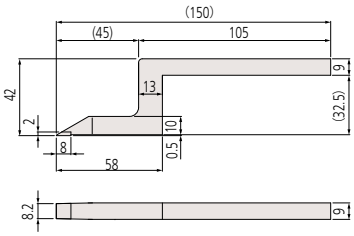
DIMENSIONS (Scriber)

Unit: mm

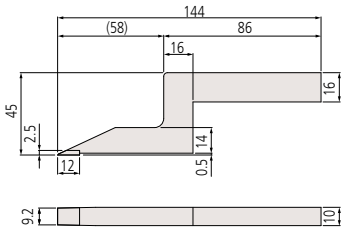
900173



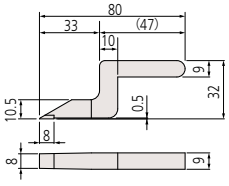
905200



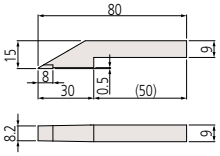
900390



07GZA000



900168



Values in parenthesis are reference dimensions.

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Height Gage
Optional Accessories for Height Gages

Dial Test Indicators

• For information about the attachment of dial test indicators, refer to page 07-84.

Contact Sensor

900872

- This is a convenient sensor to be attached to both the workpiece*1 and the height gage*2, giving a lamp display when the scriber touches the workpiece.
  *1 Conductive workpieces only.
  *2 Attach to a conductive part.
- Magnet is incorporated.
- Battery (PR44, 2 pcs. required) is not included.
- Use it on a precision black granite surface plate. (Refer to page 01-51)

Center Probe

951144

- Allows quick measurement of center-to-center distance between holes.
- Measurable hole diameters: 1 to 38 mm
- Mounting bar section: 9×9 mm

Depth Gage Attachment

900764

- Attaches to a height gage for measuring groove and hole depth.
- Minimum hole diameter: 5.5 mm
- Maximum distance from the bottom of the holding bar to the contact point: 80 mm (metric type), 2.95 in (inch type)
- Dial indicator contact points are usable. (Refer to pages 07-63 and 07-64.)
- Mounting bar section: 9×9 mm
- Holding bar length: 100 mm

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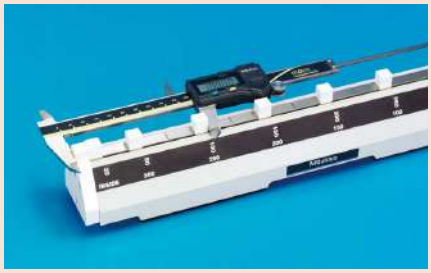
CERA Caliper Checker
SERIES 515

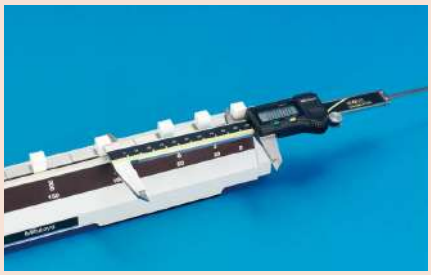
- Designed to inspect calipers.
- Can also stand perpendicular to a surface for height gage inspection.

515-555

Typical applications



Checking accuracy of caliper (outside measurement)



Checking accuracy of caliper (inside measurement)

Checking accuracy of height gage

Optional Accessories

- **602162**: Wooden case for **300 mm**, **12 inch** model
- **602164**: Wooden case for **600 mm** model

SPECIFICATIONS

Metric

Code No.	Range (mm)	Block pitch accuracy*		Parallelism of blocks*		Mass (kg)
		20 - 300 mm	350 - 600 mm	20 - 300 mm	350 - 600 mm	
515-555	0 - 300	±5.0 µm	—	2.0 µm	—	4
515-556-2	0 - 600		±7.0 µm		4.0 µm	8.5

Inch

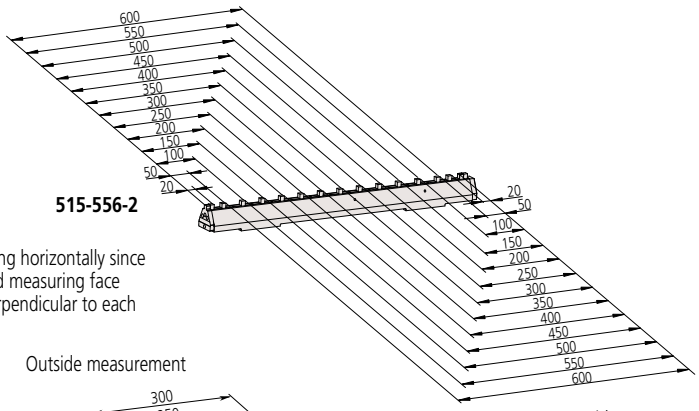
Code No.	Range (in)	Block pitch accuracy*	Parallelism of blocks*	Mass (kg)
		1 - 12 in	1 - 12 in	
515-565	0 - 12	±0.0002 in	0.00008 in	4

* The block accuracy and the parallelism of blocks are based on the following:
- Outside caliper and height gage: lower end reference plane
- Inside caliper: inside reference plane

DIMENSIONS

Unit: mm

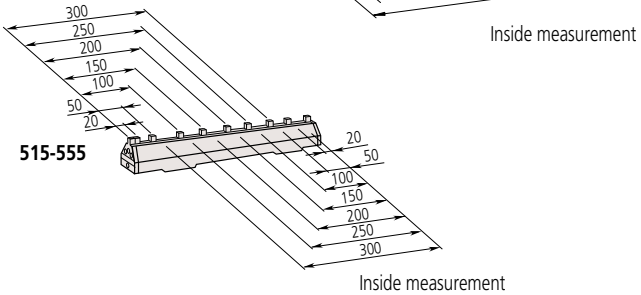
Outside measurement



515-556-2

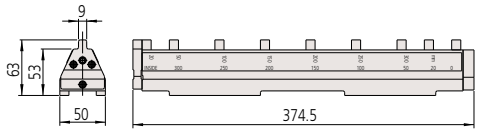
- Be careful when using horizontally since the bottom face and measuring face are not precisely perpendicular to each other.

Outside measurement



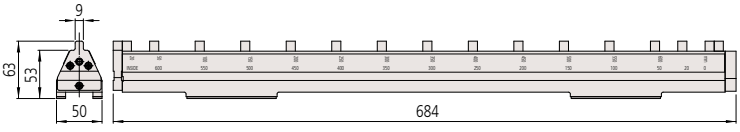
Inside measurement

515-555



Inside measurement

515-556-2



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06

Depth Gages

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

U-WAVE fit

Measurement Data Wireless Communication System

Bluetooth® communication enables wireless transfer of measurement data from Digimatic micrometers and callipers to PCs, smartphones, tablets and such other devices.

IP67

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level.
(Refer to page 3)

TÜVRheinland CERTIFIED
Dust- and Water-Protected
www.tuv.com
ID 0000040191

TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

PROPRIETARY INSPECTION CERTIFICATE

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off.
The origin is set once - thereafter the live position is displayed when the power is turned on.

Depth Micrometer

ABSOLUTE Digimatic Depth Gage

Dial Depth Gage

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Depth Micrometer

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MeasurLink® ENABLED
Data Management Software by Mitutoyo

U-WAVE fit

Depth Micrometer
SERIES 329, 129 — Interchangeable Rod Type

- Interchangeable rods provide a wide measuring range.
- Data output function allows integration into statistical process control and measurement systems. (Refer to page 09-3.)

329-250-30

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Base (mm)	Spindle feed error (µm)	Flatness of reference surface (base) (µm)	Flatness of measuring face (rod) (µm)	Parallelism between reference face and measuring rod face (µm)	Zero point error of rods (µm)	No. of rods
Digimatic (LCD)									
329-250-30	0 - 150	0.001	101.6x16	3	2	0.3	7	±4	6
329-251-30	0 - 300						10	±6	12

Inch / Metric

Code No.	Range (in)	Resolution	Base (in)	Spindle feed error	Flatness of reference surface(base) (in)	Flatness of measuring face (rod) (in)	Parallelism between reference face and measuring rod face (in)	Zero point error of rods (in)	No. of rods
Digimatic (LCD)									
329-350-30	0 - 6	0.00005 in/ 0.001 mm	4x0.63	0.00015 in/ 3 µm	0.00008	0.000012	0.00035	±0.0002	6
329-351-30	0 - 12	0.0001 in/ 0.001 mm					0.0005	±0.0003	12

Metric

Code No.	Range (mm)	Graduation (mm)	Base (mm)	Spindle feed error (µm)	Flatness of reference surface (base) (µm)	Flatness of measuring face (rod) (µm)	Parallelism between reference face and measuring rod face (µm)	Zero point error of rods (µm)	No. of rods
Analog									
129-154	0 - 25	0.01	63.5x16	3	1.3	0.3	5	±3	1
129-155			101.6x16		2				
129-109	0 - 50		63.5x16		1.3				2
129-113			101.6x16		2				
129-110	0 - 75		63.5x16		1.3		6		3
129-114			101.6x16		2				
129-111	0 - 100		63.5x16		1.3			±4	4
129-115			101.6x16		2				
129-112	0 - 150		63.5x16		1.3		7		6
129-116			101.6x16		2				
129-152	0 - 300		63.5x16		1.3		10	±6	12
129-153			101.6x16		2				

Inch

Code No.	Range (in)	Graduation (in)	Base (in)	Spindle feed error (in)	Flatness of reference surface(base) (in)	Flatness of measuring face (rod) (in)	Parallelism between reference face and measuring rod face (in)	Zero point error of rods (in)	No. of rods
Analog									
129-129	0 - 2	0.001	4x0.63	0.00015	0.00008	0.000012	0.00025	±0.00015	2
129-126	0 - 3		2.5x0.63		0.00005		0.00030		3
129-130			4x0.63		0.00008				
129-127	0 - 4		2.5x0.63		0.00005			±0.00020	4
129-131			4x0.63		0.00008				
129-128	0 - 6		2.5x0.63		0.00005		0.00035		6
129-132			4x0.63		0.00008				
129-149	0 - 12		2.5x0.63		0.00005		0.00050	±0.00030	12
129-150			4x0.63		0.00008				
129-331	0 - 4		2.4x0.63		0.00005		0.00030	±0.00020	4
129-332	0 - 6						0.00035		6

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life*: Approx. 2.4 years under normal use

* Digimatic models

- Position detection method: Electromagnetic induction ABSOLUTE encoder
- Standard Accessories: **301336** Spanner, **04GAA274** Spanner, **202863** Hex-Spanner

Functions of series 329

Origin point setting (ABS measurement system):
Resets the ABS origin at the current spindle position to the minimum value of the measuring range and switches to ABS mode.

Zero-setting (INC measurement system):
A brief press on the ZERO/ABS button sets display to zero at the current spindle position and switches to the incremental (INC) measuring mode. A longer press resets to the ABS measuring mode.

Hold:
Pressing the HOLD button freezes the current value in the display. This function is useful for preserving a measurement in situations of poor visibility where the instrument must be moved away from the workpiece before the reading can be recorded.

Data output:
Models equipped with this function have an output port for transferring measurement data to a Statistical Process Control (SPC) system.

Auto power ON / OFF:
The reading on the LCD disappears after this instrument is idle for about 20 minutes, but the reading and measurement mode are retained. Turning the spindle causes the reading to reappear.

Error alarm:
In case of an overflow on the LCD or a computing error, an error message appears on the LCD, and the measuring function stops. This prevents an instrument from giving an erroneous reading. Also, when the battery voltage drops to a certain level, the low-battery-voltage alarm annunciator appears well before the micrometer becomes unusable.

Function lock:
This function allows the PRESET (origin point setting) function and the ZERO (zero-setting) function to be locked to prevent these points being reset accidentally.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM**

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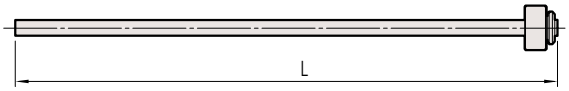
Depth Micrometer
SERIES 329, 129 — Interchangeable Rod Type

Interchangeable rod (Optional Accessories)

(Check and adjust the origin point before measurement)

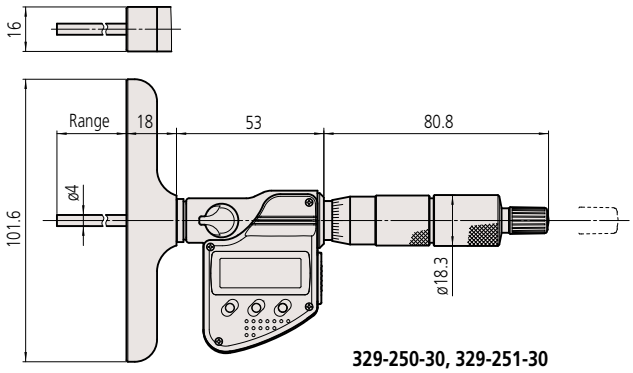


Range (mm)		0 - 25	25 - 50	50 - 75	75 - 100	100 - 125	125 - 150	150 - 175	175 - 200	200 - 225	225 - 250	250 - 275	275 - 300
Analog models	**Code No.**	**983501**	**983503**	**983505**	**983507**	**983509**	**983511**	**983525**	**983527**	**983529**	**983531**	**983533**	**983535**
	L (mm)	104	129	154	179	204	229	254	279	304	329	354	379
Digimatic models	**Code No.**	**983505**	**983507**	**983509**	**983511**	**983525**	**983527**	**983529**	**983531**	**983533**	**983535**	**981781**	**981782**
	L (mm)	154	179	204	229	254	279	304	329	354	379	404	429

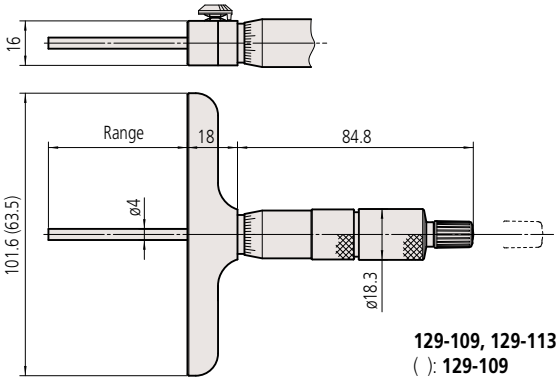
Range (in)		0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12
Analog models	**Code No.**	**983502**	**983504**	**983506**	**983508**	**983510**	**983512**	**983526**	**983528**	**983530**	**983532**	**983534**	**983536**
	L (mm)	104.3	129.7	155.1	180.5	205.9	231.3	256.7	282.1	307.5	332.9	358.3	383.7
Digimatic models	**Code No.**	**983506**	**983508**	**983510**	**983512**	**983526**	**983528**	**983530**	**983532**	**983534**	**983536**	**981783**	**981784**
	L (mm)	155.1	180.5	205.9	231.3	256.7	282.1	307.5	332.9	358.3	383.7	409.1	434.5

DIMENSIONS

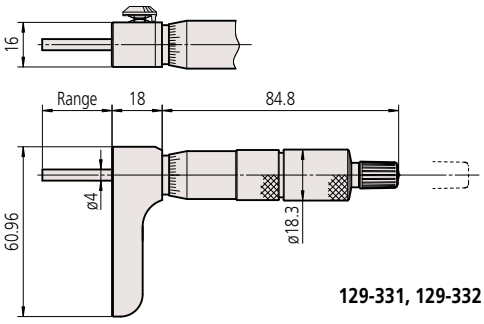
Unit: mm



329-250-30, 329-251-30



129-109, 129-113
( ): **129-109**



129-331, 129-332

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Depth Micrometer
SERIES 128

- Measuring rod diameter: ø4 mm.
- With measuring rod clamp.
  Note: The clamp is unseen in the picture.
- Carbide-tipped measuring rod model is available.
- With ratchet stop for constant measuring force.

128-101

128-102

Measurement example

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Flatness of reference surface (base) (µm)	Flatness of measuring face (rod) (µm)	Parallelism between reference face and measuring rod face (µm)	Base (mm)
128-101	0 - 25	0.01	±3	1.3	0.3	within 5	63.5x16
128-103*							
128-102				2			101.6x16
128-104*							

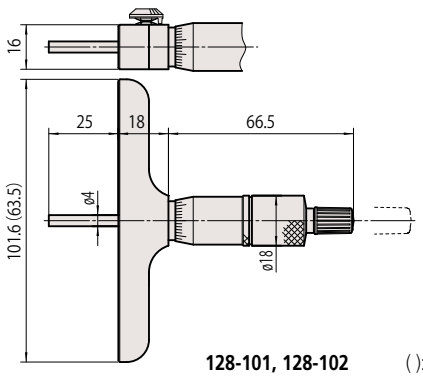
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Flatness of reference surface (base) (in)	Flatness of measuring face (rod) (in)	Parallelism between reference face and measuring rod face (in)	Base (in)
128-105	0 - 1	0.001	±0.00015	0.000052	0.000012	within 0.00025	2.5x0.63
128-106				0.00008			4x0.63

• Standard Accessories: **301336** Spanner
* With carbide-tipped measuring rod

DIMENSIONS

Unit: mm



128-101, 128-102 ( ): **128-101**

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Depth Micro Checker
SERIES 515

Measurement example

- The Depth Micro Checker is designed to efficiently check the zero point of a depth micrometer.

515-570

515-571

SPECIFICATIONS

Metric

Code No.	Range (mm)	Block pitch accuracy	Anvil block accuracy (µm)
515-570	0 - 150	±(1 + L/150) µm, L=Length to check (mm)	±0.5
515-571	0 - 300		

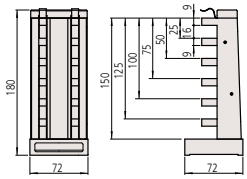
Inch

Code No.	Range (in)	Block pitch accuracy	Anvil block accuracy (µin)
515-575	0 - 6	±(40 + L/0.15) µin, L=Length to check (in)	±20

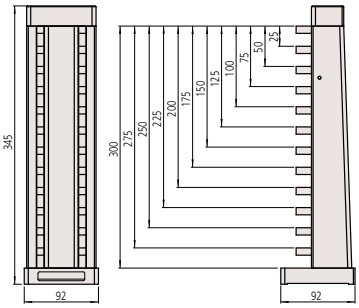
DIMENSIONS

Unit: mm

515-570



515-571



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ABSOLUTE Digimatic Depth Gage SERIES 571

- Enables stable depth measurement with a resolution of 0.01 mm.
- Coolant proof type IP67 rated.
- Data output function allows integration into statistical process control and measurement systems.(Refer to page 09-3.)
- Optional longer extension bases are available.

571-252-20

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Base (W×T) (mm)	Maximum permissible error E_{MPE} (mm)*1
571-251-20	0 - 150	0.01	100×6	±0.02
571-252-20	0 - 200			
571-253-20	0 - 300		100×6.3	±0.03

Inch / Metric

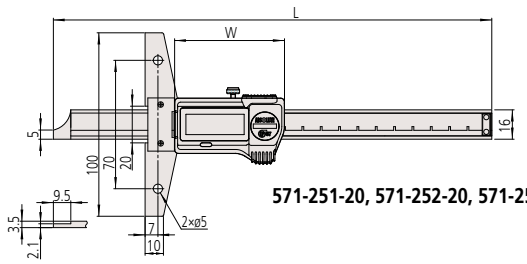
Code No.	Range (in)	Resolution	Base (W×T) (in)	Maximum permissible error E_{MPE} (in)*1
571-261-20	0 - 6	0.0005 in/ 0.01mm	3.93×0.23	±0.001 in/±0.02 mm
571-262-20	0 - 8			
571-263-20	0 - 12		3.93×0.25	±0.0015 in/±0.03 mm

- Dust/Water protection level: IP67*2
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic inductive linear encoder
- Battery life: Approx. 5 years
- Response speed: Unlimited

*1 Maximum permissible error, E_{MPE}, is the term defined by ISO 13385-2:2011.
*2 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm



571-251-20, 571-252-20, 571-253-20

Range (mm)	L	W	Base thickness
0 - 150	239	59.2	6
0 - 200	289		
0 - 300	403	71	6.3

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IP67

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Measurement example

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable (1 m)
05CZA625	A	Connection cable (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
02AZE140C	C	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**
02AZF300	—	Connecting unit for **U-WAVE-TC**

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ABSOLUTE Digimatic Depth Gage SERIES 571

- Enables stable depth measurement with a resolution of 0.01 mm.
- Data output function allows integration into statistical process control and measurement systems.(Refer to page 09-3.)
- Optional longer extension bases are available.

571-201-30

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
959149	C	Connection cable (1 m)
959150	C	Connection cable (2 m)
06AFM380C	C	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
02AZD790C	C	Connection cable for **U-WAVE-T** (160 mm)
02AZE140C	C	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC***
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB***
02AZF300	—	Connecting unit for **U-WAVE-TC/TCB** (For models with a range up to 300 mm/12 in)
959143	—	Data hold unit

* Cannot be used with **571-20X-10** and **571-21X-10**.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Battery life	Base (W×T) (mm)	Maximum permissible error E_{MPE} (mm)*1
571-201-30	0 - 150	0.01	Approx. 5 years	100×6	±0.02
571-202-30	0 - 200				
571-203-30	0 - 300			100×6.3	±0.03
571-204-10*2	0 - 450		Approx. 3 years	250×10	±0.05
571-205-10*2	0 - 600				
571-206-10*2	0 - 750				±0.06
571-207-10*2	0 - 1000				±0.07

Inch / Metric

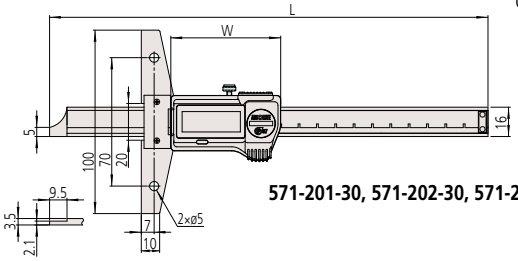
Code No.	Range (in)	Resolution	Battery life	Base (W×T) (in)	Maximum permissible error E_{MPE} (in)*1
571-211-30	0 - 6	0.0005 in/ 0.01mm	Approx. 5 years	3.93×0.23	±0.001 in/±0.02 mm
571-212-30	0 - 8				
571-213-30	0 - 12			3.93×0.25	±0.0015 in/±0.03 mm
571-214-10*2	0 - 18		Approx. 3 years	9.8×0.39	±0.002 in/±0.05 mm
571-215-10*2	0 - 24				
571-216-10*2	0 - 30				±0.0025 in/±0.06 mm
571-217-10*2	0 - 40				±0.0025 in/±0.07 mm

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: Electrostatic capacity absolute sensor
- Response speed: Unlimited

*1 Maximum permissible error, E_{MPE}, is the term defined by ISO 13385-2:2011.
*2 Cannot be used with **U-WAVE-TC**

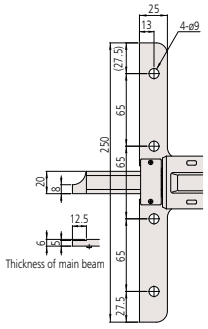
DIMENSIONS

Unit: mm



571-201-30, 571-202-30, 571-203-30

Range (mm)	L	W	Base thickness
0 - 150	239	59.2	6
0 - 200	289		
0 - 300	403	71	6.3
0 - 450	635	94	10
0 - 600	785		
0 - 750	935		
0 - 1000	1200		



571-204-10, 571-205-10, 571-206-10, 571-207-10

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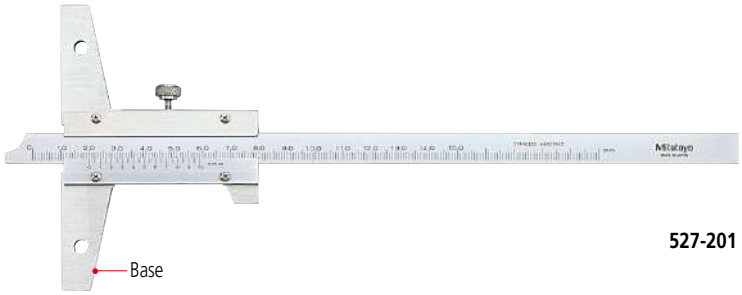
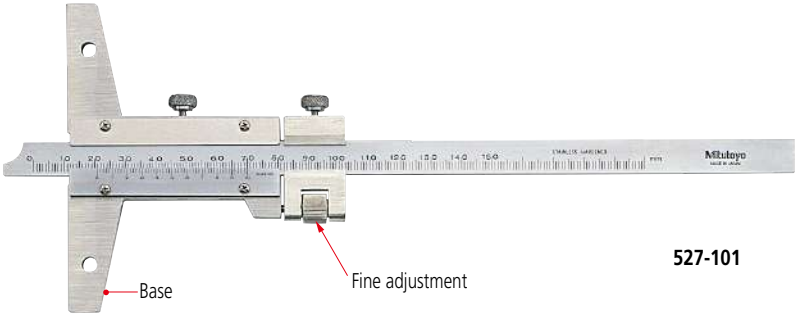
Vernier Depth Gage SERIES 527

- Standard Vernier gage for depth measurement.
- Optional longer extension bases are available.



527-201



527-101

SPECIFICATIONS

Metric

Code No.	Range (mm)	Minimum reading (mm)	Base (W×T) (mm)	Maximum permissible error E_{MPE} (mm)*	Remarks
527-201	0 - 150	0.05	100×6.5	±0.05	—
527-202	0 - 200				
527-203	0 - 300			±0.08	
527-204	0 - 600		250×10	±0.10	
527-205	0 - 1000			±0.15	

Metric

Code No.	Range (mm)	Minimum reading (mm)	Base (W×T) (mm)	Maximum permissible error E_{MPE} (mm)*	Remarks
527-101	0 - 150	0.02	100×6.5	±0.03	with fine adjsutment
527-102	0 - 200				
527-103	0 - 300			±0.04	
527-104	0 - 600		250×10	±0.05	
527-105	0 - 1000			±0.07	

Metric

Code No.	Range (mm)	Minimum reading (mm)	Base (W×T) (mm)	Maximum permissible error E_{MPE} (mm)*	Remarks
527-121	0 - 150	0.02	100×6.5	±0.03	—
527-122	0 - 200				
527-123	0 - 300				

Inch

Code No.	Range (in)	Minimam reading (in)	Base (W×T) (in)	Maximum permissible error E_{MPE} (in)*	Remarks
527-111	0 - 6	0.001	3.93×0.25	±0.001	with fine adjustment
527-112	0 - 8				
527-113	0 - 12		9.8×0.39	±0.0015	
527-114	0 - 24			±0.002	
527-115	0 - 40			±0.003	

* Maximum permissible error, E_{MPE}, is the term defined by ISO 13385-2:2011.

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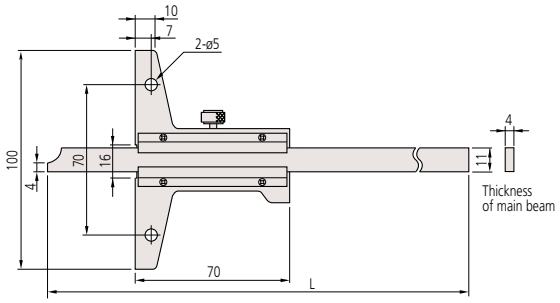
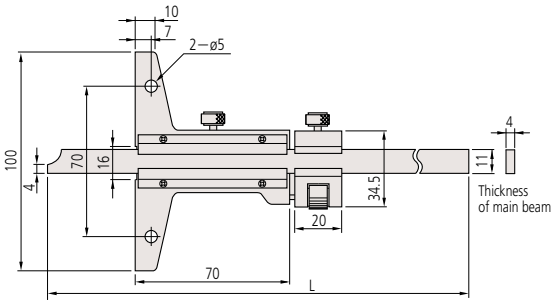
DIMENSIONS

Unit: mm



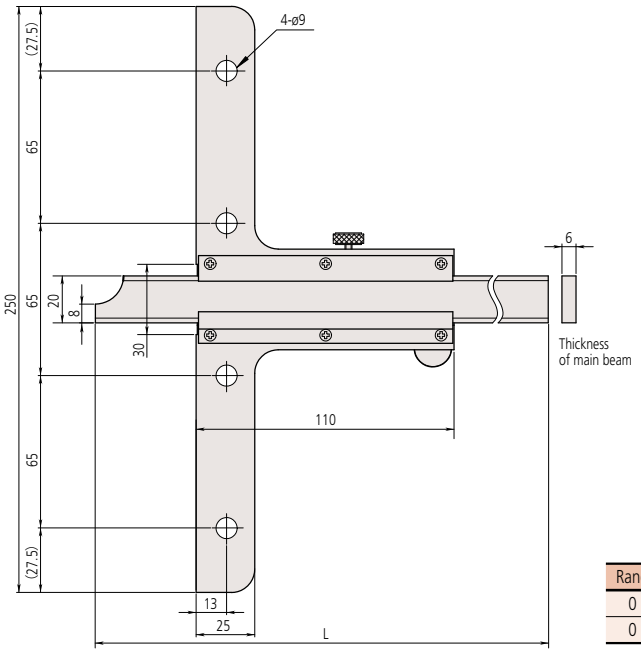
Range (mm)	L
0 - 150	260
0 - 200	310
0 - 300	410

527-201, 527-202, 527-203



Range (mm)	L
0 - 150	260
0 - 200	310
0 - 300	410

527-101, 527-102, 527-103



Range (mm)	L
0 - 600	800
0 - 1000	1200

527-204, 527-205, 527-104, 527-105

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Mitutoyo

Depth Gage
SERIES 571 — Hook-end Type

- The end of the main scale is hook-shaped to allow depth and thickness measurements of a projected portion or lip in a hole, in addition to standard depth measurement.
- Direct reading of depth measurement is available due to the offset-value setting function.
- Coolant proof type IP67 rated.
- Optional longer extension bases are available.

571-254-20

SPECIFICATIONS

Metric

Code No.	Range (mm): L1 (L2 and L3)	Resolution (mm)	Base (W×T) (mm)	Maximum permissible error E_{MPE} (mm)*1
571-254-20	10.1 - 160 (0 - 150)	0.01	100×6	±0.03
571-255-20	10.1 - 210 (0 - 200)			

Inch / Metric

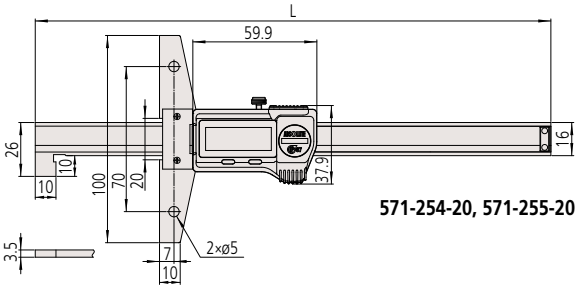
Code No.	Range: L1 (L2 and L3)	Resolution	Base (W×T) (mm)	Maximum permissible error E_{MPE}*1
571-264-20	0.4 in - 6.4 in (0 - 6 in)	0.0005 in/0.01 mm	100×6	±0.0015 in/±0.03 mm
571-265-20	0.4 in - 8.4 in (0 - 8 in)			

- Dust/Water protection level: IP67*2
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic inductive linear encoder
- Battery life: Approx. 5 years
- Response speed: Unlimited

*1 Maximum permissible error, E_{MPE}, is the term defined by ISO 13385-2:2011.
*2 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm



571-254-20, 571-255-20

Range (mm)	L
0 - 150	249
0 - 200	299

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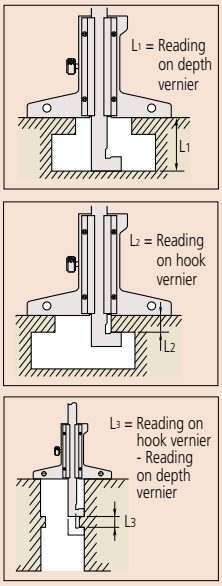
Typical applications



Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable (1 m)
05CZA625	A	Connection cable (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

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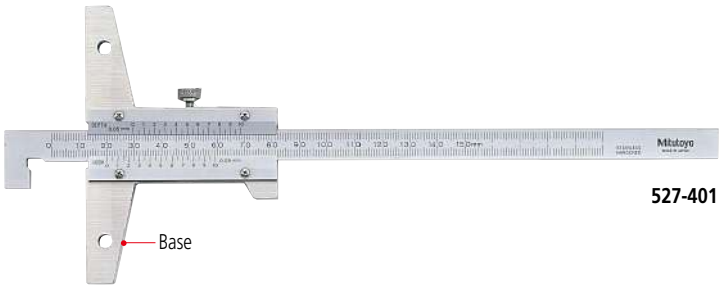
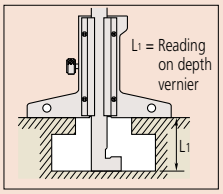
Depth Gage
SERIES 527 — Hook-end Type

- The end of the main scale is hook-shaped to allow depth and thickness measurements of a projected portion or lip in a hole, in addition to standard depth measurement.
- Depth can be directly measured with the upper Vernier of the slider and thickness with the lower Vernier.
- Optional longer extension bases are available. (Refer to page 06-15.)

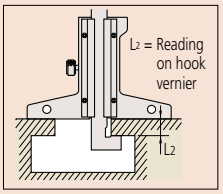


527-401

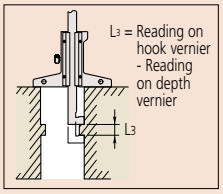
Typical applications



Vernier



Vernier



Vernier (both instances)

SPECIFICATIONS

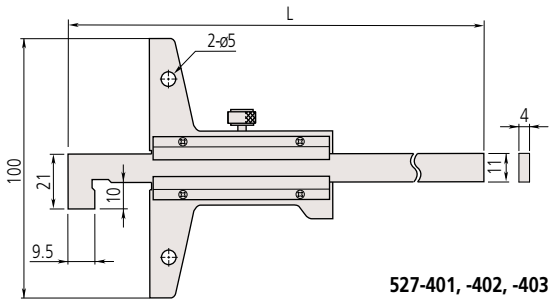
Metric

Code No.	Range (mm): L_1 (L_2 and L_3)	Resolution/Graduation (mm)	Base (W×T) (mm)	Maximum permissible error E_{MPE} (mm)*
527-401	10 - 150 (0 - 150)	0.05	100×6.5	±0.05
527-402	10 - 200 (0 - 200)			
527-403	10 - 300 (0 - 300)			±0.08
527-411	10 - 150 (0 - 150)	0.02		±0.03
527-412	10 - 200 (0 - 200)			
527-413	10 - 300 (0 - 300)			±0.04

* Maximum permissible error, E_{MPE}, is the term defined by ISO 13385-2:2011.

DIMENSIONS

Unit: mm



527-401, -402, -403

Range (mm)	L
0 - 150	260
0 - 200	310
0 - 300	410

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Depth Gage
SERIES 571 — Pin-end Type

- ABSOLUTE Point-Type Digimatic Depth Gage is suitable for measuring inside narrow holes.
- Optional longer extension bases are available.
- Data output function allows integration into statistical process control and measurement systems.(Refer to page 09-3.)
- Coolant proof type IP67 rated.

571-302-20

SPECIFICATIONS

Metric

Code No.	Range (mm): L1 (L2 and L3)	Resolution (mm)	Base (W×T) (mm)	Maximum permissible error E_{MPE} (mm)*1
571-301-20	0 - 150	0.01	100×6	±0.02
571-302-20	0 - 200			

Inch / Metric

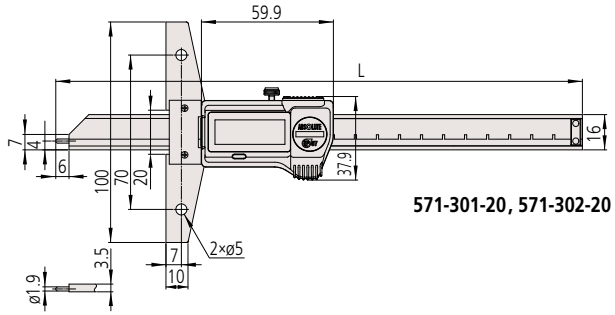
Code No.	Range: L1 (L2 and L3)	Resolution	Base (W×T) (mm)	Maximum permissible error E_{MPE}*1
571-311-20	0 - 150 mm/0 - 6 in	0.0005 in/0.01 mm	100×6	±0.001 in/±0.02 mm
571-312-20	0 - 200 mm/0 - 8 in			

- Dust/Water protection level: IP67*2
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic inductive linear encoder
- Battery life: Approx. 5 years
- Response speed: Unlimited

*1 Maximum permissible error, E_{MPE}, is the term defined by ISO 13385-2:2011.
*2 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm



571-301-20, 571-302-20

Range (mm)	L
0 - 150	239
0 - 200	289

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Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

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Mini Depth Gage
SERIES 571

- Digital display with 0.01 mm resolution.
- Enables measurement of tread depth.
- ABSOLUTE Digimatic Depth Gage.
- Data output function allows integration into statistical process control and measurement systems.(Refer to page 09-3.)
- Coolant proof type IP67 rated.

Measurement example

571-100-20

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA624	A	Connection cable for **IT/DP/MUX** (1 m)
05CZA625	A	Connection cable for **IT/DP/MUX** (2 m)
06AFM380A	A	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZE200	—	**U-WAVE-T** mounting bracket
02AZD790A	A	Connection cable for **U-WAVE-T** (160 mm)
02AZE140A	A	Connection cable for **U-WAVE-T** For foot switch
264-620	IP67	**U-WAVE-TC**
264-621	Buzzer	**U-WAVE-TC**
264-624	IP67	**U-WAVE-TCB**
264-625	Buzzer	**U-WAVE-TCB**
02AZF310	IP67	Connecting unit for **U-WAVE-TC/TCB**

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Base (mm)	Maximum permissible error E_{MPE} (mm)*1
571-100-20	0 - 25	0.01	60 (thickness 6.65)	±0.02

Inch/Metric

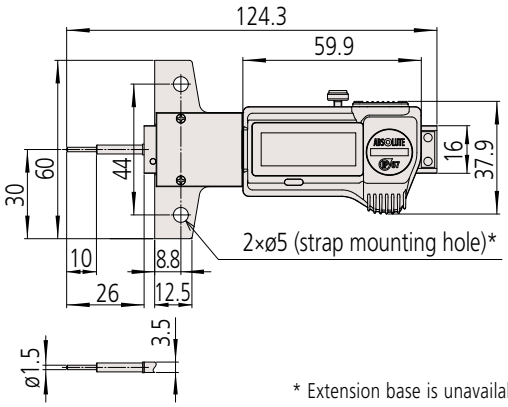
Code No.	Range (in)	Resolution (in)	Base (in)	Maximum permissible error E_{MPE} (in)*1
571-200-20	0 - 1	0.0005	2.36	±0.001

- Dust/Water protection level: IP67*2
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: ABSOLUTE electromagnetic inductive linear encoder
- Battery life: Approx. 5 years under normal use.
- Response speed: Unlimited

*1 Maximum permissible error, E_{MPE}, is the term defined by ISO 13385-2:2011.
*2 Rustproofing shall be applied after use if caliper was in contact with coolant.

DIMENSIONS

Unit: mm



* Extension base is unavailable.

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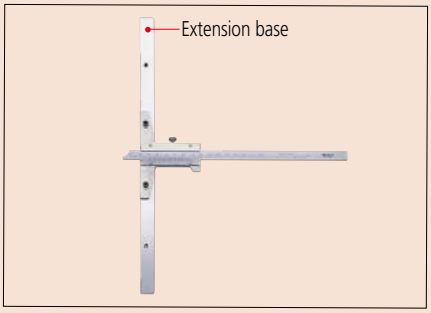
Extension Bases
Optional Accessory for Depth Gage

- Attaches to the base (reference face) plate of a depth gage to extend its span.
- These Extension Bases can be attached to 300 mm or less range models.
- For over 300 mm range models, special-size extensions are available as shown on the left.

900372

Example of attaching the extension base



Special size / specifications

Extension bases, to size of specifications other than standard, available by special order. Please consult your local Mitutoyo Sales Office.

Example of special size

Measuring range of depth gage	L (mm)
300 mm or less	400
	500
	600
450 mm or more	400
	500
	600
	700
	800

SPECIFICATIONS

Metric

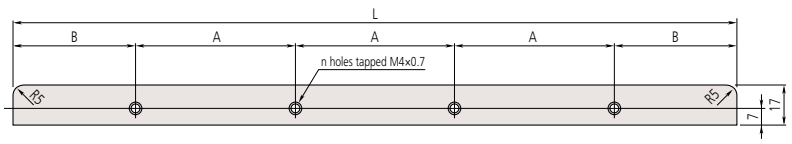
Code No.	Size L (mm)	Thickness (mm)	Material	n
900370	180	8	SUS	2
900371	260			5
900372	320			4

Inch

Code No.	Size L (in)	Thickness (in)	Material	n
900367	7	0.3	SUS	2
900368	10			5
900369	12			4

DIMENSIONS

Unit: mm



Code No.	A	B	L	n
900370	70	55	180	2
900371	35	60	260	5
900372	70	55	320	4

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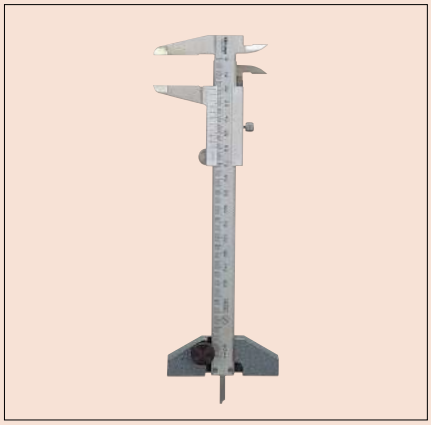
Depth Gage Attachment
Optional Accessory for Calipers

Example of attaching the depth gage attachment



- Attaching this depth gage attachment to the depth measurement face of the caliper makes depth measurement accurate and secure.

050084-10

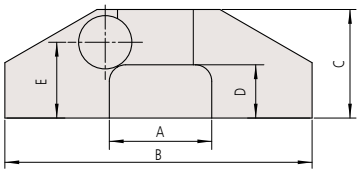
SPECIFICATIONS

Metric

Code No.	Size (mm)	Applicable measuring range of caliper
050083-10	75	100 mm, 150 mm, 200 mm, 4 in, 6 in and 8 in
050084-10	100	100 mm, 150 mm, 200 mm, 4 in, 6 in and 8 in
050085-10	125	300 mm (12 in)

DIMENSIONS

Unit: mm



Size (mm)	A	B	C	D	E	T
75	25	75	26.5	13	18.5	12
100		100				
125	30	125	28.5		20	14

T: Base thickness

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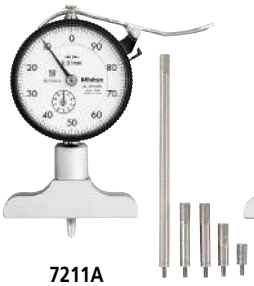
Dial Depth Gage
SERIES 7

- Optimal for hole, narrow groove and step measurement.



7211A

7214A

7222A

7224A

7231A

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Stroke (mm)	Accuracy (µm)	Measuring force (N)	Base			
						W (mm)	T (mm)	Flatness (µm)	Mounting position of a dial indicator
7210A	0 - 10	0.01	10	±15	1.4	40	16	5	1
7211A	0 - 200					63.5			
7212A						101.6			
7213A	0 - 210		30	±30	2.5	63.5			
7214A						101.6			
7220A	0 - 200		10	±15	1.4	100	18		2
7221A						150			3
7222A	0 - 10					ø16			1
7223A						ø25			
7224A						ø40			
7231A	0 - 200		5			63.5	16		

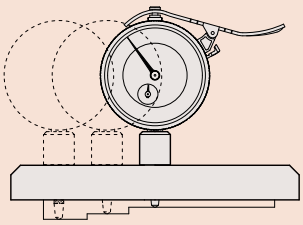
Code No.	Contact point*1	Extension rod*2	Indicator*3 (dial indicator)
7210A	Provided with a needle point (**137413**)	—	**2902AB** for Depth Gage
7211A	Provided with a carbide-tipped ball point (**21JAA224**)	5 pcs. (10, 20, 30, 30, 100 mm)	**2902AB** for Depth Gage
7212A			
7213A	Provided with a carbide-tipped ball point (**21JAA225**)	3 pcs. (30, 60, 90 mm)	**2952AB** for Depth Gage
7214A			
7220A	Provided with a carbide-tipped ball point (**21JAA224**)	5 pcs. (10, 20, 30, 30, 100 mm)	**2902AB** for Depth Gage
7221A			
7222A	Provided with a needle point (**137413**)	—	**2902AB** for Depth Gage
7223A	Provided with a carbide-tipped ball point (**21JAA224**: 17 mm)		
7224A			
7231A		5 pcs. (10, 20, 30, 30, 100 mm) Interchangeable contact point (**21JAA226**)	**1162A** for Depth Gage (Back plunger type)

*1 Caution should be exercised when exchanging a contact point of a Depth Gage (Dial/Digimatic Indicator):
- If a different size contact point is mounted, displacement of the contact point from the base contact surface will be changed and as a result, measurement range may not be maintained.
- A contact point cannot be mounted to a Depth Gage if its diameter is too large for the hole diameter of the base.
- Parallelism adjustment with the bottom face of the base is required when mounting a flat contact point such as the flat/needle or carbide-tipped contact point.

*2 Caution should be exercised when using an extension rod:
- If the total length of the extension rod exceeds 110 mm (4.5 in) use the instrument in a vertical position (contact point downward).
- Use a master gage (such as gauge blocks) to perform zero-setting when the extension rod is mounted. (Master gage is an optional accessory.)

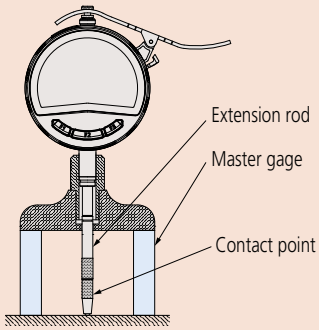
*3 Caution should be exercised when indicators are used on a Depth Gage:
- When the indicator is exchanged and a longer extension rod is connected, the contact-point may deflect significantly with an adverse effect on measuring accuracy.
- **Code No.543-710B/543-712B** for Depth Gage has a measuring force less than 1.5 N. (Refer to page 06-19.)

Typical application



7220A and **7221A** allow the mounting position of a dial indicator to be varied.

When using an extension rod



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SPECIFICATIONS

Inch

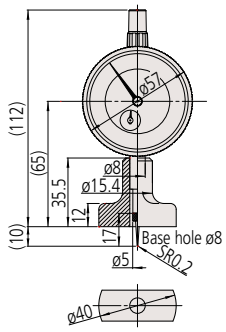
Code No.	Range (in)	Graduation (in)	Stroke (in)	Accuracy (in)	Measuring force (N)	Base W (in)	Base T (in)	Base Flatness (in)	Base Mounting position of a dial indicator
7217A	0 - 8	0.001	1	±0.002	2.0	2.5	0.63	0.0002	1
7218A						4			
7237A			0.2		1.4	2.5			
7238A						4			

Code No.	Contact point*	Extension rod*	Indicator* (dial indicator)
7217A	Provided with a carbide-tipped ball point (**21JZA242**: 0.7 in)	3 pcs. (1 in, 2 in, 4 in)	**2904AB** for Depth Gage
7218A			
7237A		4 pcs. (0.5 in, 1 in, 2 in, 4 in) Interchangeable contact point (**21JZA243**: 0.9 in)	**1168A** for Depth Gage (Back plunger type)
7238A			

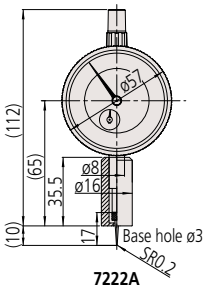
* Refer to corresponding notes on page 06-17.

DIMENSIONS

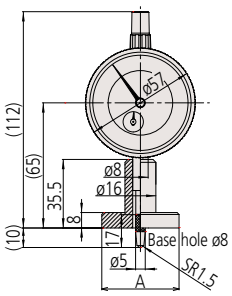
Unit: mm



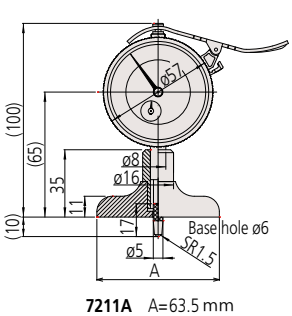
7210A



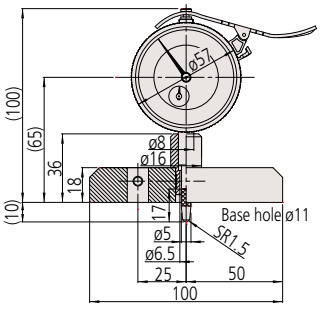
7222A



7223A A=ø25 mm
7224A A=ø40 mm

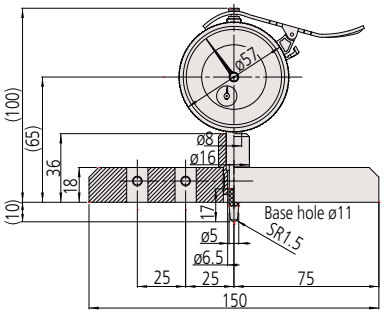


7213A, 7217A A=63.5 mm
7214A, 7218A A=101.6 mm

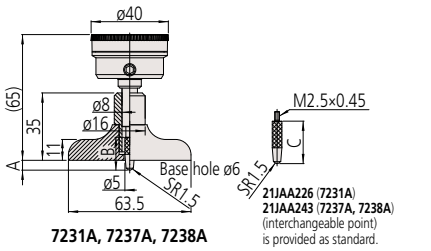


7220A

7211A A=63.5 mm
7212A A=101.6 mm



7221A



7231A, 7237A, 7238A

21JAA226 (**7231A**)
21JAA243 (**7237A, 7238A**)
(interchangeable point)
is provided as standard.

Code No.	A	B	C
7231A	(5)	17	22
7237A, 7238A	0.21 in	0.7 in	0.9 in

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MeasurLink® ENABLED
Data Management Software by Mitutoyo

ABSOLUTE™

ABSOLUTE Digimatic Depth Gage SERIES 547

- Easy-to-read digital display effectively prevents misreading.
- An analog bar indicator on the LCD is convenient for observing subtle movements such as the approach to tolerance.
- Data output function allows integration into statistical process control and measurement systems.(Refer to page 09-3.)

547-211A

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Stroke (mm)	Accuracy (µm)	Measuring force (N)	Base W (mm)	Base T (mm)	Base flatness (µm)
547-211A	0 - 200	0.01	12.7	±20	1.5 or less	63.5	16	5
547-212A						101.6		
547-251A		0.0005 (0.001/0.01 mm selectable)		±5		63.5		2
547-252A						101.6		

Code No.	Contact point*	Extension rod*	Indicator*
547-211A	Provided with a carbide-tipped ball point (**21JAA224**)	5 pcs. (10, 20, 30, 30, 100 mm)	**543-710B**
547-212A			
547-251A			**543-700B**
547-252A			

Inch / Metric

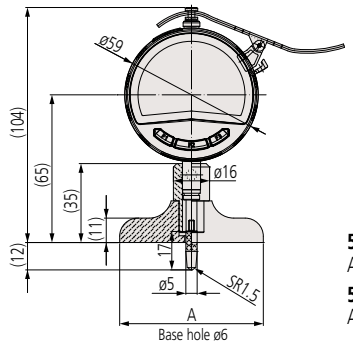
Code No.	Range (in)	Resolution	Stroke (in)	Accuracy (in)	Measuring force (N)	Base W (in)	Base T (in)	Base flatness (in)
547-217A	0 - 8	0.0005 in/0.01 mm	0.5	±0.001	1.5 or less	2.5	0.63	0.0002
547-218A						4		
547-257A		0.00002 in (0.00005/0.0001/0.0005 in 0.0005/0.001/0.01 mm selectable)		±0.0002		2.5		0.00008
547-258A						4		

Code No.	Contact point*	Extension rod*	Indicator*
547-217A	Provided with a carbide-tipped ball point (**21JZA242**)	4 pcs. (0.5 in, 1 in, 2 in, 4 in)	**543-712B**
547-218A			
547-257A			**543-702B**
547-258A			

* Refer to corresponding notes on page 06-17.

DIMENSIONS

Unit: mm



547-211A、547-251A
A=63.5 mm

547-212A、547-252A
A=101.6 mm

Functions

- Peak detection (MAX/MIN)
- Runout range measurement (MAX - MIN)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching
  (For 0.0005 mm or 0.00002 inch resolution type)
- Simple calculation: f(x) =Ax
- Function Lock
- Calibration schedule warning
- Auto power OFF
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery/voltage alarm display
- Error alarm display

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
06AGL011	SF	Connection cable (1 m)
06AGL021	SF	Connection cable (2 m)
06AGQ001F	SF	USB Input Tool Direct* (2 m)
02AZG011	SF	Connection cable for **U-WAVE-T** (160 mm)
02AZG021	SF	Connection cable for **U-WAVE-T** (160 mm) For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
02AZD810D	—	**U-WAVE-R**
02AZF670	—	**U-WAVE-TM** mounting bracket For Digimatic Indicator
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF700	—	Connecting unit for **U-WAVE-TM/TMB** (for **ID-C/ID-F** Series 12.7 mm/0.5 inch type only)

* One **06AGQ001F** is necessary for each Digimatic indicator.

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07

Indicators

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

IP66

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level.
(Refer to page 3)

TÜVRheinland CERTIFIED
Dust- and Water-Protected
www.tuv.com ID 0000040191

TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

PROPRIETARY INSPECTION CERTIFICATE

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off.
The origin is set once - thereafter the live position is displayed when the power is turned on.

DIGIMATIC S1

DIGIMATIC S1

Mitutoyo's proprietary bidirectional serial communication protocol enables a connected PC to execute measurement data output, setting and control of a measuring instrument, and capture of information of a specific measuring instrument.

ABSOLUTE Digimatic Indicator
ID-CNX
(Digimatic S1 supported)

Dial Indicator
Standard Type, 0.01 mm Graduation

Dial Test Indicator

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Precautions for use

Origin setting of Digimatic Indicators

Repeatability in the range of 0.2 mm from the lowest rest point is not guaranteed for Digimatic indicators. When setting the origin or presetting a specific value, be sure to lift the spindle at least 0.2 mm from the lowest rest point.

Mitutoyo

MeasurLink® ENABLED Data Management Software by Mitutoyo

ABSOLUTE™

PROPRIETARY INSPECTION CERTIFICATE

DIGIMATIC S1

High-performance ABS Digimatic Indicator ID-FNX (Digimatic S1 supported) SERIES 543 — with Back-lit LCD Screen

- **ID-F** Series is a next-generation indicator with various new functions, supporting bidirectional communication. With the addition of the appropriate data cable and software, remote zero setting and gage setting can all be implemented from a connected PC, thereby improving your work efficiency.
- This series adopts an external power supply to operate a bright backlit display. The display color helps you make tolerance judgment at a glance.

Green indication for GO judgment

Red indication for ±NG judgment

- The next calibration due date can be set with an alarm to improve instrument management.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.

* Refer to "Precautions for use" on page 07-2.

Functions

- Peak detection (MAX/MIN)
- Runout range measurement (MAX - MIN)

Note: Peak detection
1) Sampling rate:
Resolution 0.0005 mm 50 readings/s
Resolution 0.001 mm, 0.01 mm 500 readings/s
2) Capturing speed:
Resolution 0.0005 mm 50 µm/s
Resolution 0.001 mm, 0.01 mm 500 µm/s

- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching
- Simple calculation f(x) =Ax
- Analog resolution selection
- Data hold (when not connected to an external device)
- Function Lock
- Calibration schedule warning
- Data output
- Display rotation (330°)
- Error alarm display

SPECIFICATIONS

Metric ISO/JIS Type

Code No.*3	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Power source	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-855	12.7	0.0005/ 0.001/0.01 (selectable)	0.0025	0.0025	0.002	0.002	1.5 or less	AC adapter (5.9 V)	180
543-855B (flat back)									170
543-851	25.4						1.8 or less		240
543-853	50.8		0.004	0.004			2.3 or less		330
543-857			0.003	0.003					

Inch/Metric ASME/ANSI/AGD Type

Code No.*3	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Power source	Mass (g)
			Overall*2	Hysteresis	Repeatability	Measuring force (N)		
543-856	0.5 in/ 12.7 mm	0.00002/ 0.00005/ 0.0001/ 0.0005/ 0.001 in, 0.005/ 0.001/ 0.01 mm (selectable)	±0.00010	0.00008	0.00008	1.5 or less	AC adapter (5.9 V)	200
543-856B (flat back)								170
543-852	1 in/ 25.4 mm					1.8 or less		240
543-854	2 in/ 50.8 mm		±0.00016			2.3 or less		330
543-858			±0.00012					

- Display: 7-digit display, sign, and analog bar with 2-color backlight
- Response speed: Unlimited

*1 These values apply to normal measurements at 20 °C.
*2 Overall magnification and linearity
*3 To denote your AC power cable add the following suffixes to the code No.: **A** for UL/CSA and PSE, **D** for CEE, **DC** for CCC, **E** for BS, **K** for KC, **No suffix** is required for JIS/100 V.

Product catalog E12049

Video

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Optional Accessories

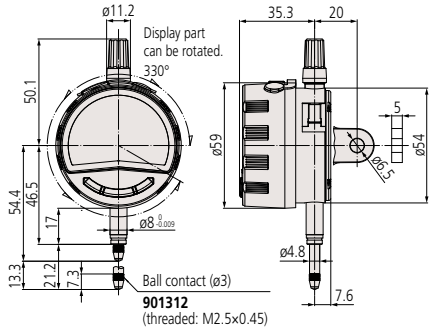
Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
06AGL011	SF	Connection cable (1 m)
06AGL021	SF	Connection cable (2 m)
06AGQ001F	SF	USB Input Tool Direct (2 m)
02AZG011	SF	Connection cable for **U-WAVE-T** (160 mm)
02AZG021	SF	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
02AZD810D	—	**U-WAVE-R**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF700	—	Connecting unit for **U-WAVE-TM/TMB** (for **ID-F/ID-C** Series 12.7 mm/0.5 inch type only)
02AZF670	—	**U-WAVE-TM/TMB** mounting bracket: for Digimatic Indicators

- Lifting
  Lifting lever:
  21EZA198 (12.7 mm/0.5 inch type)
  Lifting cable:
  21JZA295 Stroke 12.7 mm: 12.7 mm/0.5 inch type
  With auto-stop function:
  21JZA301 (overall length 300 mm) 12.7 mm/0.5 inch type
  Lifting knob:
  21EZA105 (12.7 mm/0.5 inch type)
  21EZA197 (25.4 mm/1 inch type)
  21EZA200 (50.8 mm/2 inch type)
  Lifting lever: **21EAA426**
  (supplied with 25.4 mm and 50.8 mm models as standard.)
- Auxiliary spindle spring:
  02ACA571 (25.4 mm/1 inch type)
  02ACA773 (50.8 mm/2 inch type)
- Measurement data collection software
  USB-ITPAK V3.0: **06AGR543**
- Contact points for Mitutoyo's Digimatic indicators (optional)
  Refer to pages 07-63 to 07-68 for details.
- Interchangeable back covers (optional)
  Refer to pages 07-69 to 07-70 for details.
- Measuring stands (optional)
  Refer to pages 07-97 to 07-103 for details.

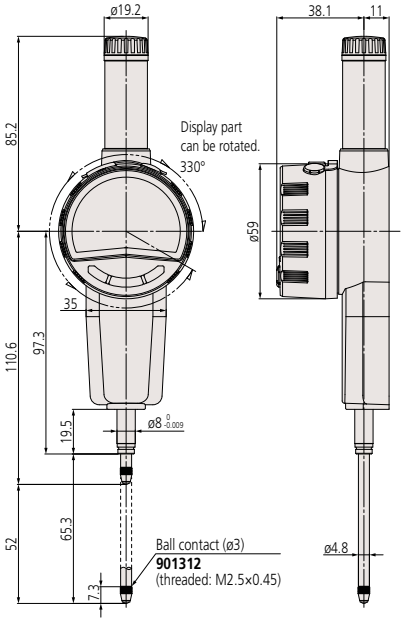
DIMENSIONS

ISO/JIS Type — Unit: mm

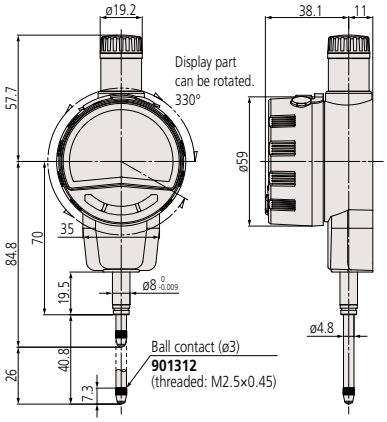
543-855



543-853, 543-857

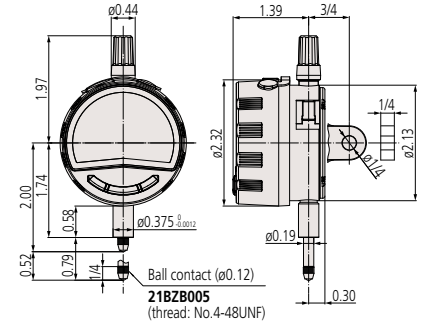


543-851

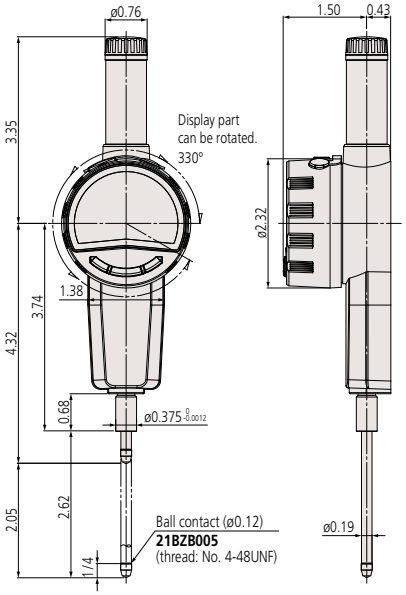


ASME/ANSI/AGD Type — Unit: in

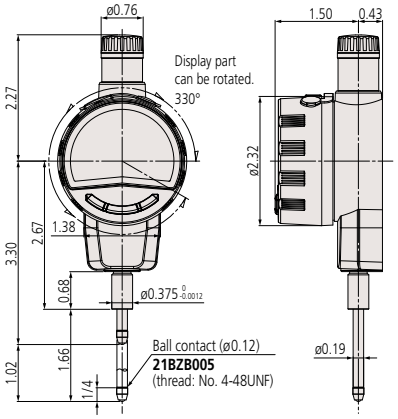
543-856



543-854, 543-858



543-852



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ABSOLUTE Digimatic Indicator ID-CNX (Digimatic S1 supported) SERIES 543 — Standard Type

- **ID-C** Series is a next-generation indicator with many new functions, supporting bidirectional communication. With the addition of the appropriate data cable and software, remote zero setting and gage setting can all be implemented from a connected PC, thereby improving your work efficiency.
- The digital display and analog bar indications help you to intuitively read the approach to the origin and tolerance values.
- The next calibration due date can be set with an alarm to improve instrument management.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page 09-3)

* Refer to "Precautions for use" on page 07-2.

Measuring range 12.7 mm
543-700B

Measuring range 25.4 mm
543-720B

SPECIFICATIONS

Metric ISO/JIS Type

Code No. w/lug	Code No. Flat back	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm) Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Maximum permissible limit (MPL) Measuring force (N)	Mass (g) w/lug	Mass (g) Flat back
543-700	**543-700B**	12.7	0.0005/0.001/0.01 (selectable)	0.003	0.003	0.002	0.002	1.5 or less	175	165
543-705*2	**543-705B***2							0.4 to 0.7	170	160
—	**543-720B**	25.4						1.8 or less	—	195
—	**543-730B**	50.8		0.005	0.005			2.3 or less	—	260
543-710	**543-710B**	12.7	0.01	0.02	0.02	0.02	0.01	0.9 or less	170	160
543-715*2	**543-715B***2							0.2 to 0.5	165	155
—	**543-725B**	25.4						1.8 or less	—	190
—	**543-735B**	50.8		0.04	0.04			2.3 or less	—	245

Inch/Metric ISO/JIS Type

Code No. w/lug	Code No. Flat back	Range	Resolution	Maximum permissible error (MPE)*3 (mm) Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Maximum permissible limit (MPL) Measuring force (N)	Mass (g) w/lug	Mass (g) Flat back
543-701	**543-701B**	0.5 in/12.7 mm	0.00002/0.00005/0.0001/0.0005 in, 0.0005/0.001/0.01 mm (selectable)	0.003	0.003	0.002	0.002	1.5 or less	175	165
543-706*2	**543-706B***2							0.4 to 0.7	170	160
—	**543-721B**	1 in/25.4 mm						1.8 or less	—	195
—	**543-731B**	2 in/50.8 mm		0.005	0.005			2.3 or less	—	260
543-711	**543-711B**	0.5 in/12.7 mm	0.0005 in/0.01 mm	0.02	0.02	0.02	0.01	0.9 or less	170	160
543-716*2	**543-716B***2							0.2 to 0.5	165	155
—	**543-726B**	1 in/25.4 mm						1.8 or less	—	190
—	**543-736B**	2 in/50.8 mm		0.04	0.04			2.3 or less	—	245

Inch/Metric ASME/ANSI/AGD Type

Code No. w/lug	Code No. Flat back	Range	Resolution	Maximum permissible error (MPE)*3 (in) Overall*4	Hysteresis	Repeatability	Maximum permissible limit (MPL) Measuring force (N)	Mass (g) w/lug	Mass (g) Flat back
543-702	**543-702B**	0.5 in/12.7 mm	0.00002/0.00005/0.0001/0.0005 in, 0.0005/0.001/0.01 mm (selectable)	±0.00012	0.00008	0.00008	1.5 or less	195	165
543-707*2	**543-707B***2						0.4 to 0.7	190	160
—	**543-722B**	1 in/25.4 mm					1.8 or less	—	195
—	**543-732B**	2 in/50.8 mm		±0.00020			2.3 or less	—	260
543-712	**543-712B**	0.5 in/12.7 mm	0.0005 in/0.01 mm	±0.0010	0.0010	0.0005	0.9 or less	190	160
543-717*2	**543-717B***2						0.2 to 0.5	185	155
—	**543-727B**	1 in/25.4 mm					1.8 or less	—	190
—	**543-737B**	2 in/50.8 mm		±0.0015			2.3 or less	—	245

- Display: 7-digit display, sign, and analog bar
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Battery life: Approx. 2,700 hours of continuous use. Approx. 2.5 years under normal use. (Depends on use of the indicator. The above values are reference values.)
- Response speed: Unlimited (except for scanning measurement)

*1 These values apply to normal measurements at 20 °C (Resolution: 0.0005 mm, Calculation coefficient: A=1)
*2 Low measuring force *3 These values apply to normal measurements at 20 °C. *4 Overall magnification and linearity

MeasurLink® ENABLED Data Management Software by Mitutoyo

ABSOLUTE™

DIGIMATIC S1

Functions

- Peak detection (MAX/MIN)
- Runout range measurement (MAX - MIN)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For 0.0005 mm or 0.00002 inch resolution type)
- Simple calculation: f(x) =Ax
- Function Lock
- Calibration schedule warning
- Auto power OFF
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery/voltage alarm display
- Error alarm display

Example of ID-CNX installed on optional bore gage

Note: Direction setting, etc. is necessary when **ID-CNX** is used with a bore gage. Refer to the operation manual for details.

Spindle orientation for measurement

- Standard models with measuring range 12.7 mm: Usable in all orientations.
- Models with measuring range 25.4 or 50.8 mm: Usable between the contact point pointing downward and spindle in horizontal orientation. To use the contact point pointing upward, the auxiliary spindle spring (optional) is required.
- Low measuring force model: See "Setting measuring force on low measuring force models" below.

Setting measuring force on low measuring force models

The measuring force of models with low measuring force can be set by combining standard accessory springs and weights.

• 543-715(B)/716(B)/717(B)

Spindle orientation	Spring	Weight (approximately 0.1 N)	Maximum measuring force (N)
Pointing vertically downward	Yes	Yes	0.5 or less
	Yes	No	0.4 or less
	No	Yes	0.3 or less
	No	No	0.2 or less
Horizontal	Yes	No	0.3 or less

Note: Operation using configurations other than shown above is not guaranteed.

• 543-705(B)/706(B)/707(B)

Spindle orientation	Spring	Weight (approximately 0.1 N)	Maximum measuring force (N)
Pointing vertically downward	Yes	Yes	0.7 or less
	Yes	No	0.6 or less
	No	Yes	0.4 or less
	No	No	Not guaranteed

Note: Operation using configurations other than shown above is not guaranteed.

Product catalog E12049

Video

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
06AGL011	SF	Connection cable (1 m)
06AGL021	SF	Connection cable (2 m)
06AGQ001F	SF	USB Input Tool Direct (2 m)
02AZG011	SF	Connection cable for **U-WAVE-T** (160 mm)
02AZG021	SF	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
02AZD810D	—	**U-WAVE-R**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF700	—	Connecting unit for **U-WAVE-TM**/**TMB** (for **ID-F**/**ID-C** Series 12.7 mm/0.5 inch type only)
02AZF670	—	**U-WAVE-TM**/**TMB** mounting bracket: for Digimatic Indicators

Connecting unit fitted to an indicator (12.7 mm type)

Typical application of **U-WAVE-TM**/**TMB** mounting bracket (with **543-725B**)

- Lifting
  Lifting lever:
  21EZA198 (12.7 mm/0.5 inch type)
  Lifting cable:
  21JZA295 Stroke 12.7 mm: 12.7 mm/0.5 inch type
  (This cannot be used on low measuring force model.)
  With auto-stop function:
  21JZA301 (overall length 300 mm) 12.7 mm/0.5 inch type
  (This cannot be used on low measuring force model.)
  Lifting knob:
  21EZA105 (12.7 mm/0.5 inch type)
  (This cannot be used on low measuring force model.)
  21EZA197 (25.4 mm/1 inch type)
  21EZA200 (50.8 mm/2 inch type)
  Lifting lever: **21EAA426**
  (supplied with 25.4 mm and 50.8 mm models as standard.)
- Auxiliary spindle spring:
  02ACA571 (25.4 mm/1 inch type*)
  02ACA773 (50.8 mm/2 inch type*)

*Required when orienting the indicator upside down.

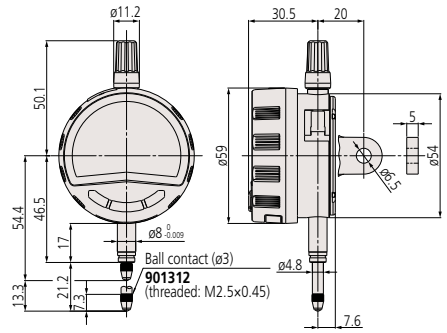
- Measurement data collection software
  USB-ITPAK V3.0: **06AGR543**
- Contact points for Mitutoyo's Digimatic indicators (optional)
  Refer to pages 07-63 to 07-68 for details.
- Interchangeable back covers (optional)
  Refer to pages 07-69 to 07-70 for details.
- Measuring stands (optional)
  Refer to pages 07-97 to 07-103 for details.

DIMENSIONS

12.7 mm range models

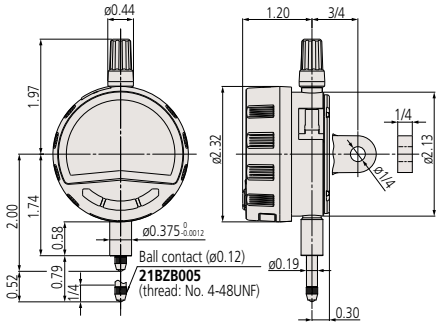
Unit: mm

ISO/JIS Type



Unit: in

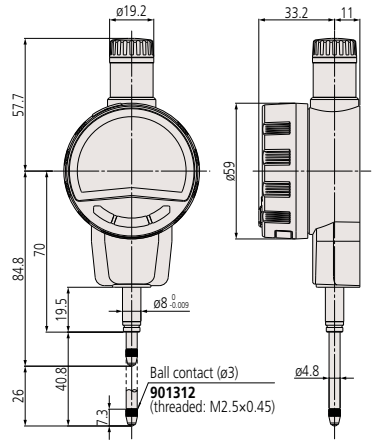
ASME/ANSI/AGD Type



25.4 mm range models

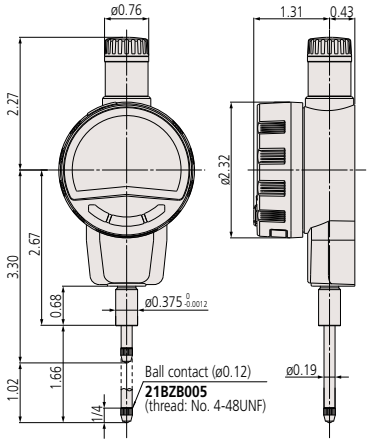
Unit: mm

ISO/JIS Type



Unit: in

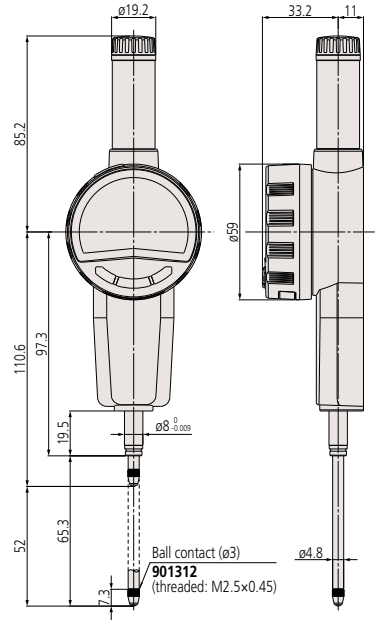
ASME/ANSI/AGD Type



50.8 mm range models

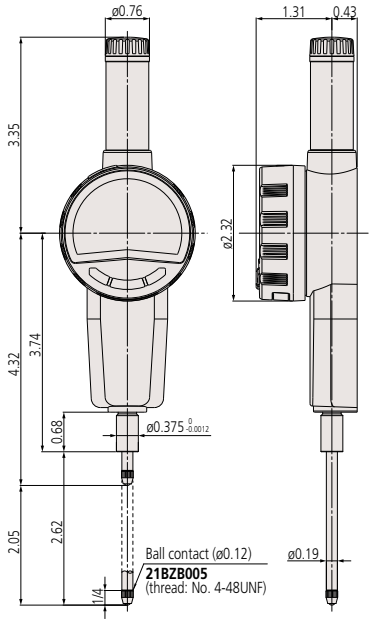
Unit: mm

ISO/JIS Type



Unit: in

ASME/ANSI/AGD Type



Note: Products with a code No. suffixed "**B**" have a plain back, and other models have a center-lug back. Refer to pages 07-69 to 07-70 for details of the backs.

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ABSOLUTE Digimatic Indicator ID-N/B SERIES 543 — with Dust/Water Protection Conforming to IP66

- Slim body design (body width: only 35 mm). Rated to IP66: Can be used confidently even in adverse environments.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Back plunger design (**ID-B**) is widely used for dial indicators. A 5 mm-stroke plunger with a higher degree of accuracy has been implemented by adopting a direct reading scale for plunger displacement.
- Tolerance judgment can be performed by setting upper and lower tolerance limits.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page 09-3)

* Refer to "Precautions for use" on page 07-2.

543-575 543-585

SPECIFICATIONS

Metric ISO/JIS Type

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Remarks
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	
543-570	12.7	0.01	0.02	0.02	0.02	0.01	2.5 or less	Slim type
543-580	5.08						2.0 or less	Back Plunger type
543-575	12.7	0.001/0.01 (selectable)	0.003/0.01	0.003/0.01	0.002	0.002	2.5 or less	Slim type
543-585	5.08						2.0 or less	Back Plunger type

Inch/Metric ASME/ANSI/AGD Type

Code No.	Range (in)	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Remarks
			Overall*2	Hysteresis	Repeatability	Measuring force (N)	
543-571	0.5	0.0005 in/ 0.01 mm	±0.0010	0.0010	0.0005	2.5 or less	Slim type
543-581	0.2					2.0 or less	Back Plunger type
543-576	0.5	0.00005/ 0.0005 in, 0.001/ 0.01 mm (selectable)	±0.00010	0.00010	0.00010	2.5 or less	Slim type
543-586	0.2					2.0 or less	Back Plunger type

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)

*1 These values apply to normal measurements at 20 °C.
*2 Overall magnification and linearity

Bifurcated connection cable with zero-setting terminal (optional)

21EAA210 (1 m), **21EAA211** (2 m)
Two of the wires inside the cable are separated for zero setting without touching the SET switch on the main body.
Use these wires in combination with commercially available switches. Zero setting is performed by briefly connecting these two wires together (less than a second), and ABS preset & recall by connecting for a second or more.

SPC cable

Bifurcated connection cable with zero-setting terminal

MeasurLink® ENABLED Data Management Software by Mitutoyo

ABSOLUTE™

IP66

PROPRIETARY INSPECTION CERTIFICATE

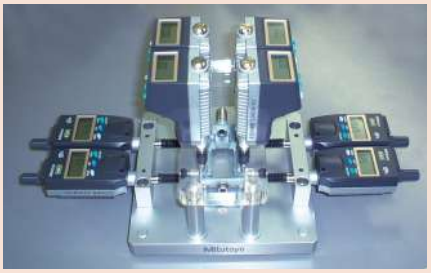
TÜVRheinland CERTIFIED Dust- and Water-Protected www.tuv.com ID 0000007161

Applicable models:
543-57X

TÜVRheinland CERTIFIED Dust- and Water-Protected www.tuv.com ID 0000007162

Applicable models:
543-58X

Typical application



Functions

- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Display readout reversal
- Resolution switching (For 0.001 mm or 0.00005 in resolution type)
- Data output
- Display value holding (when no external device is connected)
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
21EAA194	G	Connection cable (1 m)
21EAA190	G	Connection cable (2 m)
06AFM380G	G	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZD790G	G	Connection cable for **U-WAVE-T** (160 mm)
02AZE140G	G	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
02AZD810D	—	**U-WAVE-R**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF675	—	**U-WAVE-TM/TMB** mounting bracket: for **ID-N** (Slim Type)*

* Cannot be used with **ID-B** (Back Plunger Type) since it may apply stress to the cable.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Typical application

Rated to IP66 water-and dust-proofing standard, and oil resistance improved.

Optional Accessories

- Lug
  21EZA145 (ISO/JIS type)
  21EZA146 (ASME/ANSI/AGD type)
- Contact points for Mitutoyo's Digimatic indicators (optional)
  Refer to pages 07-63 to 07-68 for details.
- Lifting knob (only for **ID-N**)
  21EZA105 (ISO/JIS type)
  21EZA150 (ASME/ANSI/AGD type)
  Spindle can be manually lifted. Remove the spindle cap for **ID-N** and attach the lifting knob to the spindle. Note that water resistance is not maintained in this configuration.

Typical application using the lifting knob

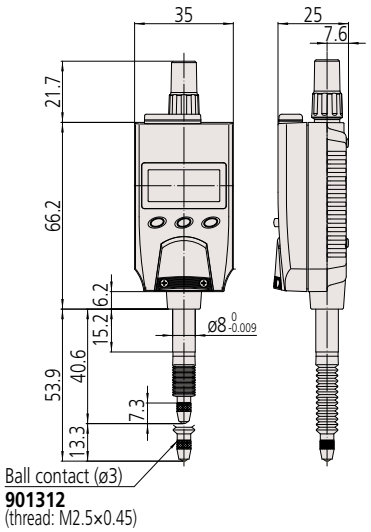
- Rubber boot
  For oil resistance (NBR) **21EAA423** (for **ID-N**)
  21AAB562 (for **ID-B**)
  For durability (silicone) **238774** (for **ID-N**)
  21EAA212 (for **ID-B**)

DIMENSIONS

Slim Type
ID-N

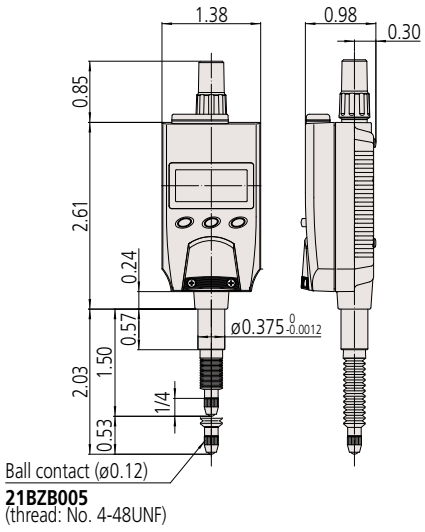
Unit: mm

ISO/JIS Type



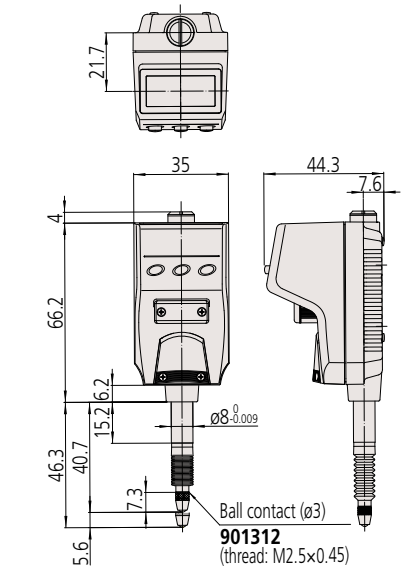
Unit: in

ASME/ANSI/AGD Type

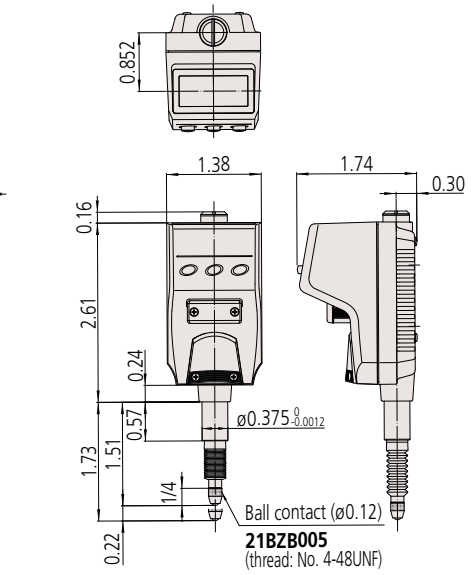


Back plunger Type
ID-B

ISO/JIS Type



ASME/ANSI/AGD Type



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ABSOLUTE Digimatic Indicator ID-SX2 SERIES 543

- A standard model of indicator that is reliable and easy to use with basic functions.
- This model consumes less power than other advanced models and can operate longer without frequent battery replacement.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page 09-3)

* Refer to "Precautions for use" on page 07-2.

543-781-10

MeasurLink ENABLED Data Management Software by Mitutoyo

ABSOLUTE™

IP53

PROPRIETARY INSPECTION CERTIFICATE

Applicable models:
See **SPECIFICATIONS**

Functions

- Origin set (Zero-setting)
- Measuring direction switching
- Data output
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct* (2 m)
02AZD790F	F	Connection cable for **U-WAVE-T** (160 mm)
02AZE140F	F	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
02AZD810D	—	**U-WAVE-R**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF670	—	**U-WAVE-TM/TMB** mounting bracket: for Digimatic Indicators

* Please separately purchase **USB-ITPAK** since there is no data output switch on the measurement instrument. (Refer to pages 09-15 to 09-17 for details.)

- Lifting
  Lifting lever **21EZA198**
  Lifting knob **21EZA105**
  Lifting cable **21JZA295**
  With auto-stop function:
  21JZA301 (overall length 300 mm)
- Contact points for Mitutoyo's Digimatic indicators (optional)
  Refer to pages 07-63 to 07-68 for details.
- Interchangeable back covers (optional)
  Refer to pages 07-69 to 07-70 for details.
- Measuring stands (optional)
  Refer to pages 07-97 to 07-103 for details.

SPECIFICATIONS

Metric ISO/JIS Type

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm) Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Maximum permissible limit (MPL) Measuring force (N)	Back type	Battery life*2	Mass (g)	Dust/Water protection level*3
543-790-10	12.7	0.001	0.003	0.003	0.002	0.002	1.5 or less	With lug	Approx. 18,000 hours (Continuous use) Approx. 5 years (Normal use)	150	IP42
543-790B-10								Flat		140	
543-794-10							2.5 or less	With lug		155	IP53
543-794B-10								Flat		155	
543-781-10		0.01	0.02	0.02	0.02	0.01	1.5 or less	With lug	Approx. 20,000 hours (Continuous use) Approx. 5 years (Normal use)	150	IP42
543-781B-10								Flat		140	

Inch/Metric ISO/JIS Type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (mm) Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Maximum permissible limit (MPL) Measuring force (N)	Back type	Battery life*2	Mass (g)	Dust/Water protection level*3
543-791-10	0.5 in/ 12.7 mm	0.00005 in/ 0.001 mm	0.003	0.003	0.002	0.002	1.5 or less	With lug	Approx. 18,000 hours (Continuous use) Approx. 5 years (Normal use)	150	IP42
543-791B-10								Flat		140	
543-795-10							2.5 or less	With lug		155	IP53
543-795B-10								Flat		155	
543-782-10		0.0005 in/ 0.01 mm	0.02	0.02	0.02	0.01	1.5 or less	With lug	Approx. 20,000 hours (Continuous use) Approx. 5 years (Normal use)	150	IP42
543-782B-10								Flat		140	

Inch/Metric ASME/ANSI/AGD Type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (in) Overall*4	Hysteresis	Repeatability	Maximum permissible limit (MPL) Measuring force (N)	Back type	Battery life*2	Mass (g)	Dust/Water protection level*3
543-792-10	0.5 in/ 12.7 mm	0.00005 in/ 0.001 mm	±0.00010	0.00010	0.00010	1.5 or less	With lug	Approx. 18,000 hours (Continuous use) Approx. 5 years (Normal use)	165	IP42
543-792B-10							Flat		140	
543-793-10		0.0001 in/ 0.001 mm					With lug		165	
543-793B-10							Flat		140	
543-796-10		0.00005 in/ 0.001 mm				2.5 or less	With lug		155	IP53
543-796B-10							Flat		155	
543-783-10		0.0005 in/ 0.01 mm	±0.0010	0.0010	0.0005	1.5 or less	With lug	Approx. 20,000 hours (Continuous use) Approx. 5 years (Normal use)	165	IP42
543-783B-10							Flat		140	

- Display: 6-digit display, sign
- Usable orientation: All
- Position detection method: ABSOLUTE electrostatic linear encoder
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Response speed: Unlimited (except for scanning measurement)

*1 These values apply to normal measurements at 20 °C.
*2 The battery life varies, depending on the number of times a Digimatic indicator is used as well as the way it is used. The values listed above are approximations.
*3 This is only valid when the data socket cover is in place. Does not apply if the cover is removed, a lifting accessory is attached, or a connection cable is attached.
*4 Overall magnification and linearity

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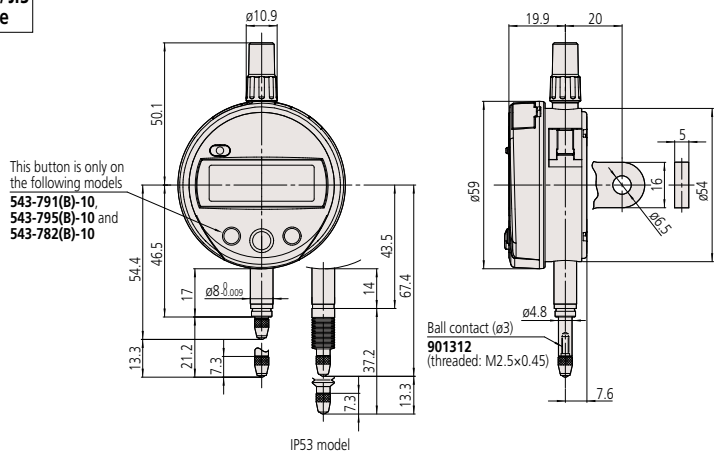
DIMENSIONS

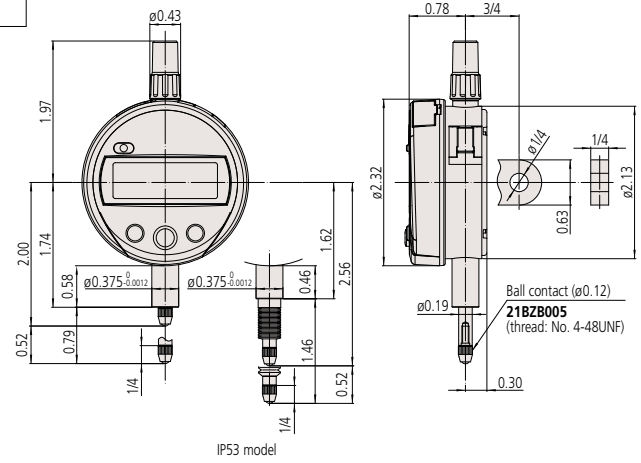
ISO / JIS Type

Unit: mm



ASME / ANSI / AGD Type

Unit: in



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MeasurLink® ENABLED Data Management Software by Mitutoyo

ABSOLUTE™

PROPRIETARY INSPECTION CERTIFICATE

ABSOLUTE Digimatic Indicator ID-U SERIES 575 — Slim and Economical Design

- Cost-effective and user-friendly type with basic functions.
- Battery life: approx. 20,000 hours in continuous use.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page 09-3)

* Refer to "Precautions for use" on page 07-2.

575-121

Function

- Origin set (Zero-setting)
- Measuring direction switching
- Data output
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct* (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZD790F	F	Connection cable for **U-WAVE-T** (160 mm)
02AZE140F	F	Connection cable for **U-WAVE-T** For foot switch
02AZD810D	—	**U-WAVE-R**
02AZE200	—	**U-WAVE-T** mounting bracket

* Please separately purchase **USB-ITPAK** since there is no data output switch on the measurement instrument. (Refer to pages 09-15 to 09-17 for details.)

- Spindle lifting cable (stroke: 10 mm): **21JZA295**
- With auto-stop function: **21JZA301** (overall length 300 mm)
- Contact points for Mitutoyo's Digimatic indicators (optional) Refer to pages 07-63 to 07-68 for details.
- Measuring stands (optional) Refer to pages 07-97 to 07-103 for details.

SPECIFICATIONS

Metric ISO/JIS Type

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)
575-121	25.4	0.01	0.02	0.02	0.02	0.01	1.8 or less

Inch/Metric ISO/JIS Type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)
575-122	1 in/ 25.4 mm	0.0005 in/ 0.01 mm	0.02	0.02	0.02	0.01	1.8 or less

Inch/Metric ASME/ANSI/AGD type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)
			Overall*2	Hysteresis	Repeatability	Measuring force (N)
575-123	1 in/ 25.4 mm	0.0005 in/ 0.01 mm	±0.0010	0.0010	0.0005	1.8 or less

- Display: 5-digit display, sign
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 20,000 hours of continuous use. Approx. 5 years under normal use.
  Note: It varies depending on use frequency and method. Please take the values as rough indications.
- Lifting lever: **21EAA426** (standard accessory)

*1 These values apply to normal measurements at 20 °C.
*2 Overall magnification and linearity

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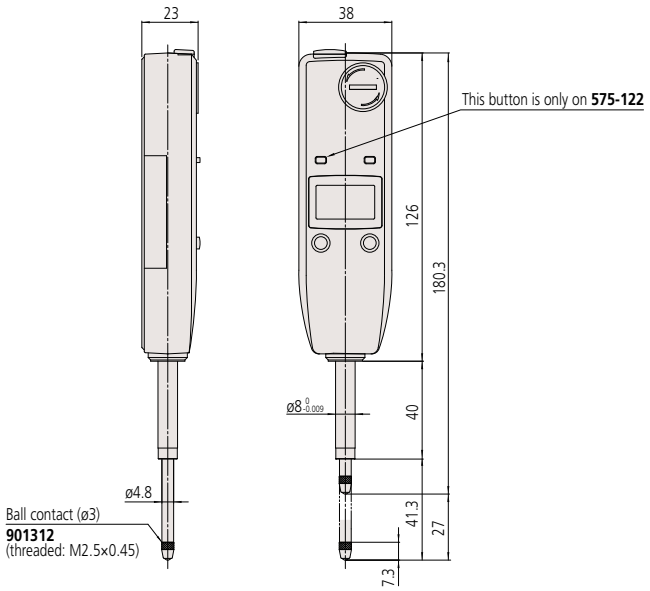
DIMENSIONS

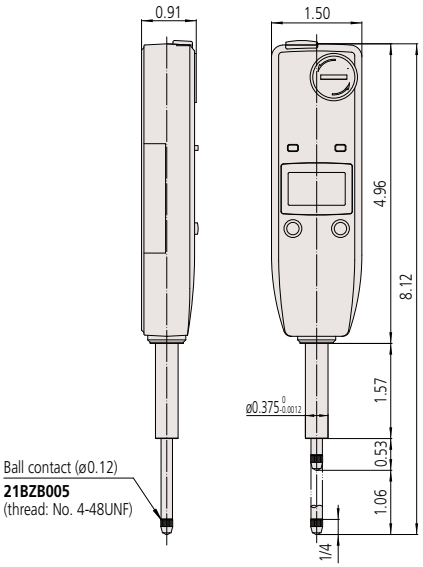
ISO / JIS Type

Unit: mm



ASME / ANSI / AGD Type

Unit: in



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ABSOLUTE™

PROPRIETARY INSPECTION CERTIFICATE

ABSOLUTE Digimatic Indicator ID-CAX SERIES 543 — Peak-Value Hold Type

- The Peak Hold-Type Digimatic Indicator. GO/NG judgment is performed by setting the upper and lower tolerances for max., min. and runout values.*1
- Five buttons, status icons, and clear button indications allow easy operation and various functions.
- Wide display and new analog bar graph are standard on all models.
- The ABS (ABSOLUTE) scale restores the last origin position*2 automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.
- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to page 09-3)
- By using the parameter setup kit (optional) and the dedicated software, the functions and the parameters can be configured using a computer.

*1 Tolerance judgment results cannot be output.
*2 Refer to "Precautions for use" on page 07-2.

543-300-10

SPECIFICATIONS

Metric ISO/JIS Type

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Battery life (normal use)*2	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-300-10	12.7	0.001/0.01 (selectable)	0.003	0.003	0.003	0.002	1.5 or less	Approx. 1 year	180
543-300B-10 (flat back)									170

Inch/Metric ISO/JIS Type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Battery life (normal use)*2	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-301-10	0.5 in/ 12.7 mm	0.00005/ 0.0001/ 0.0005 in, 0.001/ 0.01 mm (selectable)	0.003	0.003	0.003	0.002	1.5 or less	Approx. 1 year	180
543-301B-10 (flat back)									170

Inch/Metric ASME/ANSI/AGD type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Battery life (normal use)*2	Mass (g)
			Overall*3	Hysteresis	Repeatability	Measuring force (N)		
543-302-10	0.5 in/ 12.7 mm	0.00005/ 0.0001/ 0.0005 in, 0.001/ 0.01 mm (selectable)	±0.00010	0.00010	0.00010	1.5 or less	Approx. 1 year	195
543-302B-10 (flat back)								170

- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)

*1 These values apply to normal measurements at 20 °C.
*2 Applies only if not connected to a data processor. Battery life depends on use of the indicator. Use the above value as a guide only.
*3 Overall magnification and linearity

Functions

- Peak detection (MAX/MIN)
- Runout (MAX - MIN) Hold

Note: Peak detection
1) Sampling rate: 50 readings/s
2) Capturing speed: 50 µm/s (max.)

- Zeroset (INC system)
- Preset function (ABS system)
- Measuring direction switching
- Tolerance judgment (3 pairs of ABS, INC memory function)
- Resolution selection
- Simple calculation f(x) =Ax
- Analog bar resolution selection
- Key lock
- in/mm conversion (inch/mm type)
- Display hold (when no external device is connected)
- Data output
- External PC setting input
- Display rotation (330°)
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD790F	F	Connection cable for **U-WAVE-T** (160 mm)
02AZE140F	F	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
02AZD810D	—	**U-WAVE-R**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF670	—	**U-WAVE-TM/TMB** mounting bracket: for Digimatic Indicators

- Lifting
  Lifting lever **21EZA198**
  Lifting knob **21EZA105**
- Parameter setup kit: **21EZA313**

Note: Parameter setting software (can be downloaded for free from the Mitutoyo website) is also required.

Parameter setup kit

Parameter setting software

- Contact points for Mitutoyo's Digimatic indicators (optional)
  Refer to pages 07-63 to 07-68 for details.
- Interchangeable back covers (optional)
  Refer to pages 07-69 to 07-70 for details.
- Measuring stands (optional)
  Refer to pages 07-97 to 07-103 for details.

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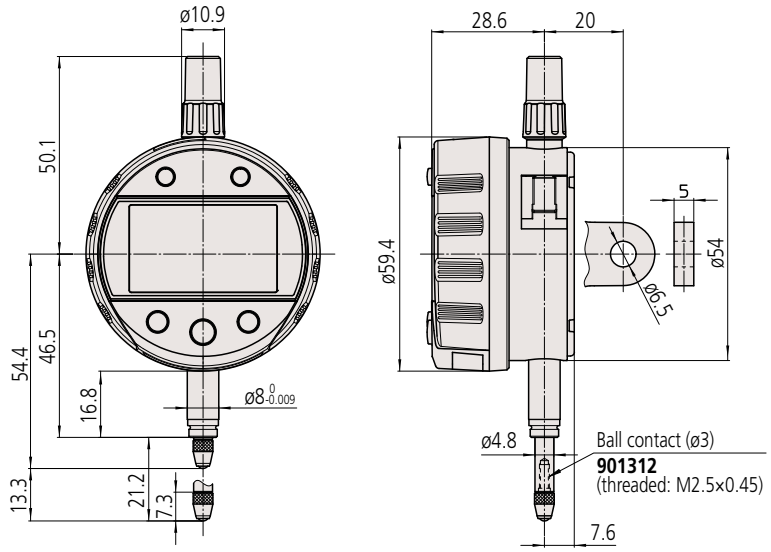
DIMENSIONS

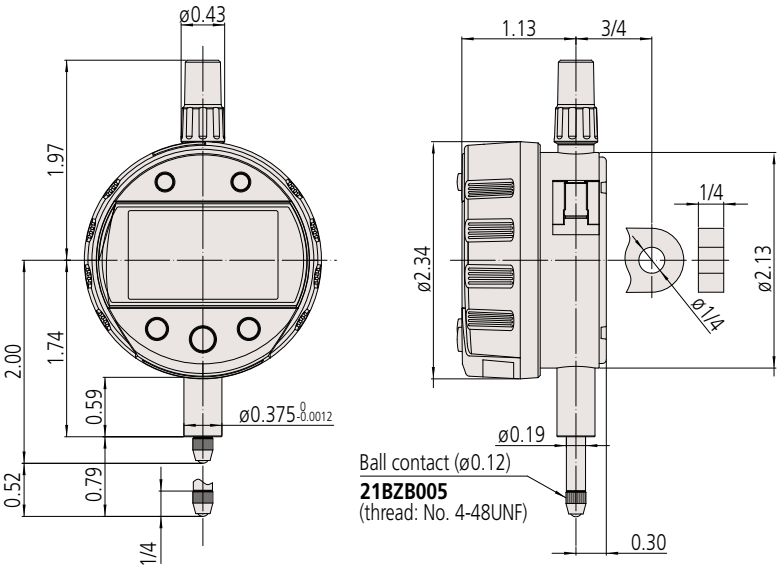
ISO / JIS Type

Unit: mm



ASME / ANSI / AGD Type

Unit: in



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ABSOLUTE™

PROPRIETARY INSPECTION CERTIFICATE

ABSOLUTE Digimatic Indicator ID-CGX SERIES 543 — Bore Gage Type

- Dedicated to inside diameter measurement with minimum-value holding and tolerance judgment functions*.
  Use together with a Mitutoyo bore gage (refer to pages 08-31 to 08-48 for details).
- Five buttons, status icons, and clear button indications allow easy operation and various functions.
- Wide display and analog bar graph are standard on all models.
- Up to three sets of master values and upper/lower tolerance values can be stored to simplify the master setting.
- By using the parameter setup kit (optional) and the dedicated software, the functions and the parameters can be configured using a computer.

* Tolerance judgment results cannot be output.

543-310B-10

SPECIFICATIONS

Metric ISO/JIS Type

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Battery life (normal use)*2	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-310B-10	12.7	0.001/0.01 (selectable)	0.003	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170

Inch/Metric ISO/JIS Type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Battery life (normal use)*2	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-311B-10	0.5 in/ 12.7 mm	0.00005/ 0.0001/ 0.0005 in, 0.001/ 0.01 mm (selectable)	0.003	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170

Inch/Metric ASME/ANSI/AGD type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Battery life (normal use)*2	Mass (g)
			Overall*3	Hysteresis	Repeatability	Measuring force (N)		
543-312B-10	0.5 in/ 12.7 mm	0.00005/ 0.0001/ 0.0005 in, 0.001/ 0.01 mm (selectable)	±0.00010	0.00010	0.00010	1.5 or less	Approx. 1 year	170

- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)

*1 These values apply to normal measurements at 20 °C.
*2 Applies only if not connected to a data processor. Battery life depends on use of the indicator. Use the above value as a guide only.
*3 Overall magnification and linearity
Note: Flat-back type only.

Example of use with a bore gage (sold separately)

Functions

- Minimum value detection

Note: Peak detection
1) Sampling rate: 50 readings/s
2) Capturing speed: 50 µm/s (max.)

- Preset (3 Preset values can be stored)
- Tolerance judgment (3 sets of upper and lower limits can be stored)
- Resolution selection
- Analog bar resolution selection
- Key lock
- Display hold (when no external device is connected)
- Data saving/calling (when no external device is connected)
- Data output
- External PC setting input
- Display rotation (330°)
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Refer to page 07-13.

- Parameter setup kit (optional)
  Refer to page 07-13 for details.

The ABSOLUTE Digimatic Bore Gage

ABSOLUTE Digimatic Bore Gages, which integrate the display with a bore gage measuring unit, are also available. Refer to pages 08-49 and 08-50 for details.

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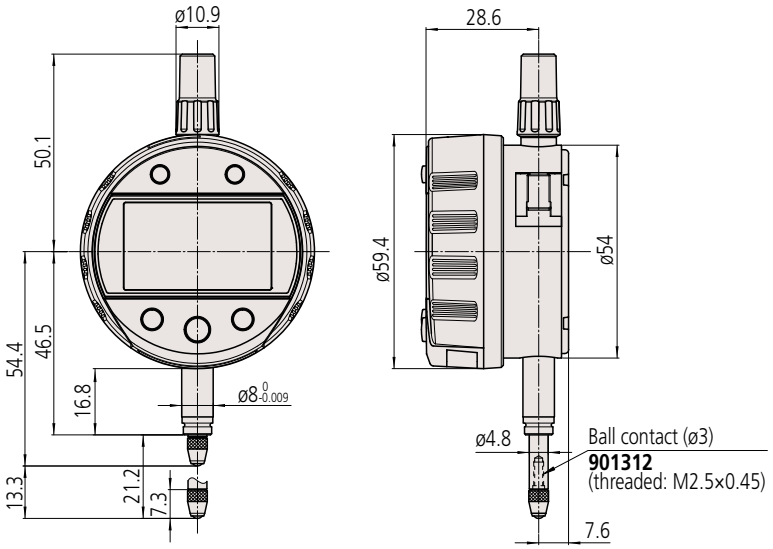
DIMENSIONS

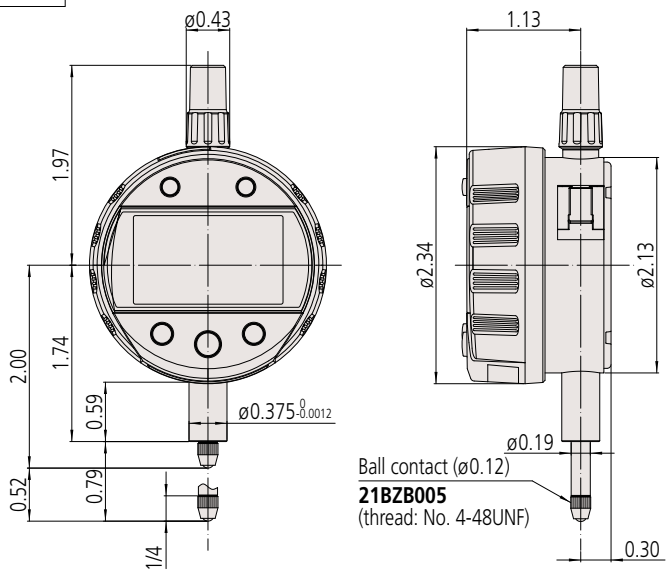
ISO / JIS Type

Unit: mm



ASME / ANSI / AGD Type

Unit: in



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PROPRIETARY INSPECTION CERTIFICATE

ABSOLUTE Digimatic Indicator ID-CRX SERIES 543 — Calculation Type

- This expandable indicator incorporates an internal calculation function that operates from plunger displacement. Using dedicated fixtures and setting the calculation coefficients, you can read your measurements directly without the need for conversions.
- By using the parameter setup kit (optional) and the dedicated software, the functions and the parameters can be configured using a computer.
- Five buttons, status icons, and clear button indications allow easy operation and various functions.

543-342B-10

SPECIFICATIONS

Metric ISO/JIS Type

Code No.	Range (mm)	Resolution (selectable)	Maximum permissible error (MPE)*1*2 (mm)				Maximum permissible limit (MPL)	Battery life (normal use)*4	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-340B-10	12.7	12 steps*4	0.003	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170
543-590B-10	25.4						1.8 or less*3		190
543-595B-10	50.8		0.006	0.006			2.3 or less*3		260

Inch/Metric ISO/JIS Type

Code No.	Range	Resolution (selectable)	Maximum permissible error (MPE)*1*2 (mm)				Maximum permissible limit (MPL)	Battery life (normal use)*4	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)		
543-341B-10	0.5 in/ 12.7 mm	12 steps*4	0.003	0.003	0.003	0.002	1.5 or less	Approx. 1 year	170
543-591B-10	1 in/ 25.4 mm						1.8 or less*3		190
543-596B-10	2 in/ 50.8 mm		0.006	0.006			2.3 or less*3		260

Inch/Metric ASME/ANSI/AGD type

Code No.	Range	Resolution (selectable)	Maximum permissible error (MPE)*1*2 (in)			Maximum permissible limit (MPL)	Battery life (normal use)*4	Mass (g)
			Overall*5	Hysteresis	Repeatability	Measuring force (N)		
543-342B-10	0.5 in/ 12.7 mm	12 steps*4	±0.00010	0.00010	0.00010	1.5 or less	Approx. 1 year	170
543-592B-10	1 in/ 25.4 mm					1.8 or less*3		190
543-597B-10	2 in/ 50.8 mm		±0.00025			2.3 or less*3		260

- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)

*1 These values apply to normal measurements at 20 °C.
*2 Valid for resolution set to 0.001 mm/0.00005 in and coefficients A=1, B=0 and C=0.
*3 Applies for a spindle orientation between the spindle pointing vertically downward to the spindle horizontal.
*4 Applies only if not connected to a data processor. Battery life depends on use of the indicator. Use the above value as a guide only.
*5 Overall magnification and linearity
Note: Flat-back type only.

Typical application

Functions

- Calculation f (x') =Ax'+B+Cx'$^{-1}$ (x'=x+offset)
- Peak detection (MAX/MIN)
- Runout (MAX - MIN) Hold

Note: Peak detection
1) Sampling rate: 10 readings/s
2) Capturing speed: 10 µm/s (max.)
Settings can be changed to:
1) Sampling rate: 50 readings/s
2) Capturing speed: 50 µm/s (max.)

- Zero-setting (INC system)
- Preset (ABS system)
- Tolerance judgment (3 pairs of ABS, INC memory function)
- Analog bar resolution selectable
- Key lock
- Display hold (when no external device is connected)
- Data output
- External PC setting input
- Display rotation (330°)
- Low battery voltage alarm display
- Error alarm display
- Resolution switching*

Resolution (mm)		
0.0002	0.005	0.1
0.0005	0.01	0.2
0.001	0.02	0.5
0.002	0.05	1

Resolution (in)		
0.00001	0.0002	0.005
0.00002	0.0005	0.01
0.00005	0.001	0.02
0.0001	0.002	0.05

* Since the calculation resolution is one micrometer (0.001 mm), using sub-micrometer resolution settings may result in the 4th-place digit being unreliable, particularly when B is set to a very low value and C=0. It does not change at all with certain combinations of calculation coefficient (for example, A=1, B=C=0). The 3rd-place digit representing micrometers (if displayed) is always reliable.

Optional Accessories

Refer to page 07-13.

- Lifting
  Lifting lever **21EZA198** (12.7 mm/0.5 inch type)
  Lifting knob **21EZA105** (12.7 mm/0.5 inch type)
  21EZA197 (25.4 mm/1 inch type)
  21EZA200 (50.8 mm/2 inch type)
- Parameter setup kit (optional)
  Refer to page 07-13 for details.

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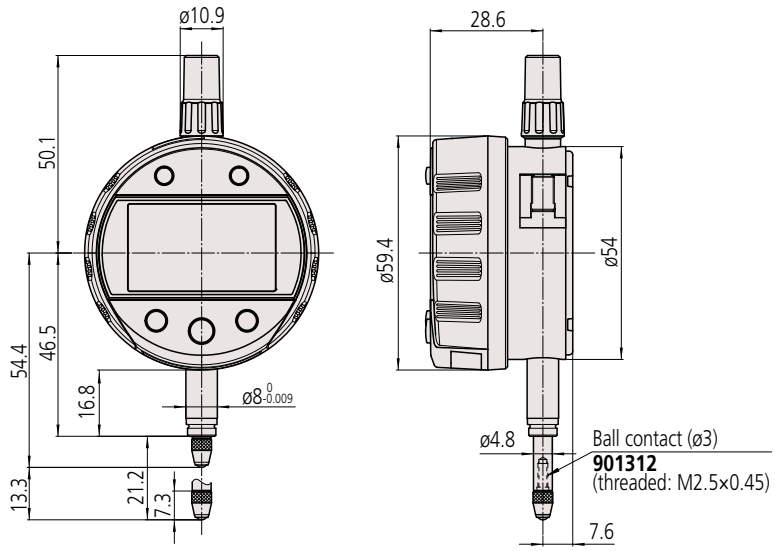
DIMENSIONS

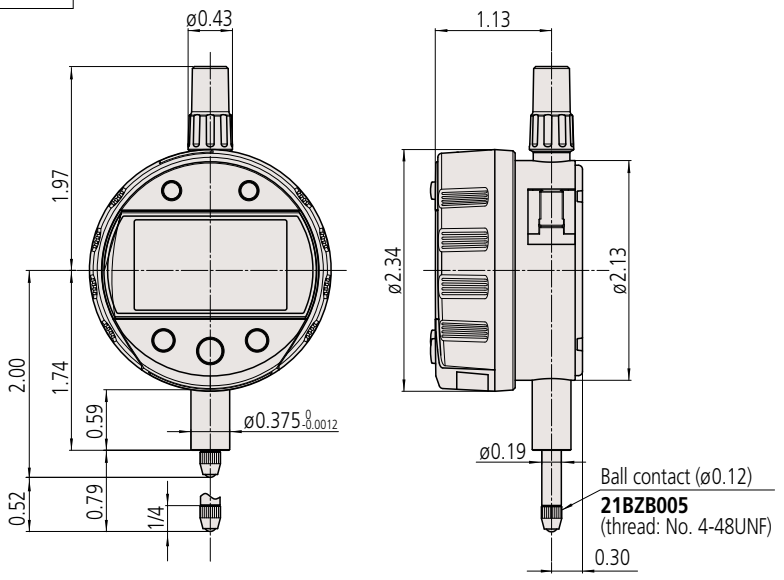
ISO / JIS Type

Unit: mm

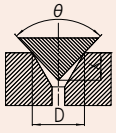
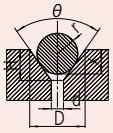
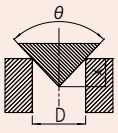
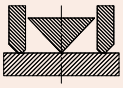
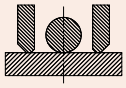
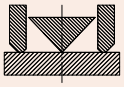


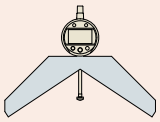
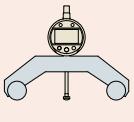
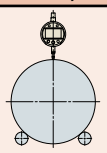
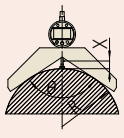
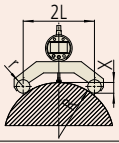
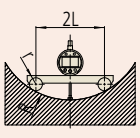
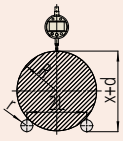
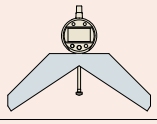
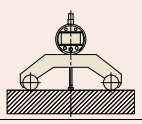
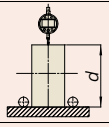
ASME / ANSI / AGD Type

Unit: in



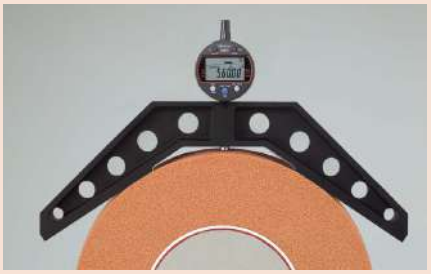
Examples of measuring various features

Item		D=Countersink diameter/Groove width; H=Countersink depth/Groove depth			
Fixture type*1					
Contact point		Cone	Ball		Cone
Measuring method x: Spindle displacement					
Calculation		D=Ax	D=Ax+B	H=Ax+B	D=Ax
Coefficient values	A	$-2tan\frac{\theta}{2}$	$-2tan\frac{\theta}{2}$	-1	$-2tan\frac{\theta}{2}$
	B	0	$2r\left(\frac{1}{\cos\frac{\theta}{2}}-tan\frac{\theta}{2}\right)$	$r\left(\frac{1}{\sin\frac{\theta}{2}}-1\right)-\frac{d}{2tan\frac{\theta}{2}}$	0
	C	0	0	0	0
Origin offset value (function ON/OFF)	d	0 (OFF)	0 (OFF)	0 (OFF)	0 (OFF)
ORIGIN-set position (x=0 position)					
Displayed measurement value at ORIGIN-set position (Value displayed when x=0)		0	Value of coefficient B	0	0

Item		R=Outside radius of round object		R=Inside radius of round object	R=Outside radius of round object
Fixture type*1					
Contact point		—			
Measuring method x: Spindle displacement					
Calculation		R=Ax	R=Ax+B+Cx^{-1}		R=A(x+d)+B+C(x+d)$^{-1}$
Coefficient values	A	$-\frac{sin\frac{\theta}{2}}{1-sin\frac{\theta}{2}}$	$\frac{1}{2}$	$-\frac{1}{2}$	$\frac{1}{2}$
	B	0	$-r$	r	$-r$
	C	0	$\frac{L^2}{2}$	$-\frac{L^2}{2}$	$\frac{L^2}{2}$
Origin offset value (function ON/OFF)	d	0 (OFF)	0 (OFF)	0 (OFF)	d (ON)
ORIGIN-set position (x=0 position)					
Displayed measurement value at ORIGIN-set position (Value displayed when x=0)		0	Err 30*2 (Overflow error of Display value)		Depends on value of d

*1 A dedicated fixture for a workpiece can be made to order.
*2 The error is cleared when the measured value returns to the displayable range as a result of moving the spindle.

Typical applications



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ABSOLUTE™ PROPRIETARY INSPECTION CERTIFICATE

IP54

Functions

- Signal output
  (–NG/OK/+NG, N-ch open drain, logical invert is available)
- Remote control (peak start preset/zero-set)
- Peak detection (MAX/MIN)
- Runout range measurement (MAX - MIN)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment (3 pairs of ABS, INC memory function)
- Resolution switching
- Simple calculation: f(x) =Ax
- Key lock
- Calibration mode (Signal output in Digimatic code format)
- Error alarm display

Optional Accessories

- Lifting*
  Lifting lever **21EZA198**
  Lifting knob **21EZA105**

* Dust-water protection is not guaranteed.

- Digimatic power supply unit: **21EZA345**
  To denote your AC power cable add the following suffixes to the code No.: **A** for UL/CSA, **D** for CEE, **DC** for CCC, **E** for KC. **No suffix** is required for JIS/100VAC.
  Used in the calibration mode when executing automatic inspection using i-Checker **IC2000**.
  In such a case, purchase connection cable **21EAA194** (1 m), or **21EAA190** (2 m).

Note: It can't be used as a power source when using in the normal mode.

- Contact points for Mitutoyo's Digimatic indicators (optional)
  Refer to pages 07-63 to 07-68 for details.
- Interchangeable back covers (optional)
  Refer to pages 07-69 to 07-70 for details.

Output signals and display

Wire	– NG	OK	+ NG	ABS data composition error
Orange (– NG)	Low	High	High	High
Green (OK)	High	Low	High	High
Brown (+ NG)	High	High	Low	High
LED	Red	Green	Red	Red flashing
Display	◀	○	▶	"x.xxE" indication

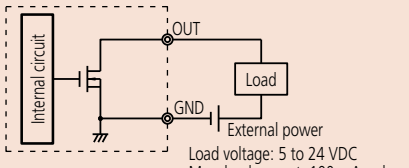
Note: Logical invert is available.

I/O Specifications

Wire	Signal	I/O	Description
Black	– V (GND)	—	Connected to minus (-) terminal
Red	+ V	—	Power supply (5 to 24 VDC)
Orange	– NG	O	Tolerance judgment result output: Only the terminal corresponding to a judgment result is set to the low level.
Green	OK	O	
Brown	+ NG	O	
Yellow	PRESET_RECALL ZERO	I	External input terminal: If the relevant terminal is set to the low level, its signal becomes true.
Blue	PEAK_START	I	
Shield	FG	—	Connected to GND (Earth)

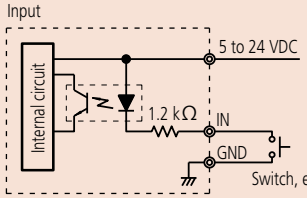
Note: Measurement data cannot be output.

Output



Load voltage: 5 to 24 VDC
Max. load current: 100 mA or less

Input



Input current: Max. 20 mA

ABSOLUTE Digimatic Indicator ID-CJX
SERIES 543 — Signal Output Function Type

- Enables the GO/NG judgment result to be output to external equipment. Output is enabled by directly connecting to an external device such as a sequencer, contributing to automation of measurement processes. It also supports logical invert of signal output.
- The GO/NG judgment result is also indicated by the green/red LED and the signs on display.
- A peak detection function is equipped for measuring and judging peak values such as runout.
- The ABS (ABSOLUTE) scale restores the last origin position* automatically when the indicator is turned on, and realizes high reliability by eliminating over-speed errors.

* Refer to "Precautions for use" on page 07-2.

543-350-10

SPECIFICATIONS

Metric ISO/JIS Type

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	
543-350-10	12.7	0.001/0.01 (selectable)	0.003	0.003	0.003	0.002	2.5 or less	295
543-350B-10 (flat back)								285

Inch/Metric ISO/JIS Type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	
543-351-10	0.5 in/ 12.7 mm	0.00005/ 0.0001/ 0.0005 in, 0.001/ 0.01 mm (selectable)	0.003	0.003	0.003	0.002	2.5 or less	295
543-351B-10 (flat back)								285

Inch/Metric ASME/ANSI/AGD type

Code No.	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Mass (g)
			Overall*2	Hysteresis	Repeatability	Measuring force (N)	
543-352-10	0.5 in/ 12.7 mm	0.00005/ 0.0001/ 0.0005 in, 0.001/ 0.01 mm (selectable)	±0.00010	0.00010	0.00010	2.5 or less	295
543-352B-10 (flat back)							285

*1 These values apply to normal measurements at 20 °C.
*2 Overall magnification and linearity
Note 1: Display readout does not rotate.
Note 2: MAX/MIN holding: sample rate is 100 readings/s; max. rate of change of reading is 100 µm/s or less.
Note 3: Standard contact point: **901312** (ISO/JIS type), **21BZB005** (ANSI/AGD type)

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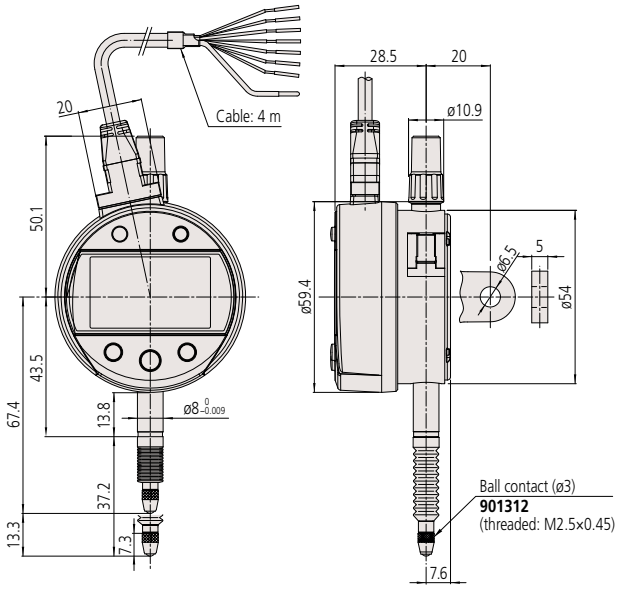
ABSOLUTE Digimatic Indicator ID-CJX
SERIES 543 — Signal Output Function Type

DIMENSIONS

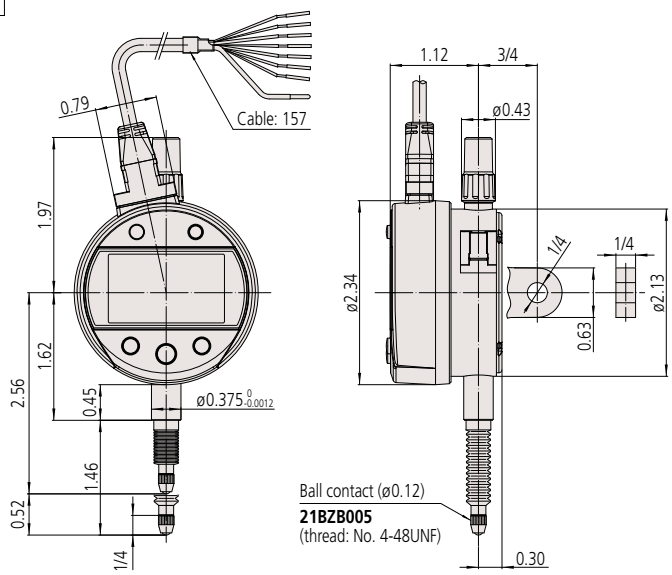
ISO / JIS Type

Unit: mm



ASME / ANSI / AGD Type

Unit: in



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Data Management Software by Mitutoyo

PROPRIETARY INSPECTION CERTIFICATE

Digimatic Indicator ID-H
SERIES 543 — High Accuracy and High Functionality Type

- This digital indicator offers the excellent accuracy, functionality and high resolution expected with top-of-the-line indicators.
- Take advantage of its high accuracy backed up by 0.5 µm resolution, remote control functionality via a handheld controller (or an RS-232C interface) and easy runout measurements with the well-established analog bar display.
- The maximum, minimum, or runout value (MAX - MIN) can be measured.
- An advanced, remote control system can be implemented with the built-in RS-232C interface and a PC.
- With the optional remote controller, operations such as zero-setting and presetting can be made without touching the indicator body, thereby enabling more stable and high accuracy measurement.

Remote controller (optional)

543-563

Application example using comparator stand

Comparator stand
215-505-10

Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
936937	D	Connection cable (1 m)
965014	D	Connection cable (2 m)
06AFM380D	D	USB Input Tool Direct (2 m)
02AZD730G	IP67	**U-WAVE-T**
02AZD880G	Buzzer	**U-WAVE-T**
02AZD790D	D	Connection cable for **U-WAVE-T** (160 mm)
02AZE140D	D	Connection cable for **U-WAVE-T** For foot switch
02AZD810D	—	**U-WAVE-R**
02AZE200	—	**U-WAVE-T** mounting bracket

- Remote controller: **21EZA099**
- Lifting cable: **21JZA295** (stroke 30 mm)
- With auto-stop function:
  21JZA301 (overall length 300 mm)
- Lifting knob: **21EZA101**

- RS-232C Connection cable (2 m): **21EAA131**
- Lug-on-center back:
  101040 (ISO/JIS type)
  101306 (ASME/ANSI/AGD type)
- Contact points for Mitutoyo's Digimatic indicators (optional)
  Refer to pages 07-63 to 07-68 for details.
- Granite comparator stands (optional)
  Refer to page 07-101 for details.
- Comparator stands (optional)
  Refer to page 07-102 for details.

SPECIFICATIONS

Metric ISO/JIS Type

Code No.*2	Range (mm)	Resolution (mm)	Maximum permissible error (MPE)*1 (mm)				Maximum permissible limit (MPL)	Mass (g)
			Partial measuring range P_{MPE}	Total measuring range E_{MPE}	Hysteresis H_{MPE}	Repeatability R_{MPE}	Measuring force (N)	
543-561	30.48	0.0005/ 0.001 (selectable)	0.0015	0.0015	0.0015	0.001	2.0 or less	290
543-563	60.96		0.0025	0.0025	0.0025		2.5 or less	305

Inch/Metric ASME/ANSI/AGD Type

Code No.*2	Range	Resolution	Maximum permissible error (MPE)*1 (in)			Maximum permissible limit (MPL)	Mass (g)
			Overall*3	Hysteresis	Repeatability	Measuring force (N)	
543-562	1.2 in/ 30.48 mm	0.00002/ 0.00005/ 0.0001 in, 0.0005/ 0.001 mm (selectable)	±0.00006	0.00006	0.00004	2.0 or less	300
543-564	2.4 in/ 60.96 mm		±0.00010	0.00010		2.5 or less	

- Display: 7-digit display, sign, and analog bar with 2-color backlight
- Power source: 5.9 V DC (via AC adapter) **06AGZ369***
  * To denote your AC power cable add the following suffixes to the code No.: **JA** for UL/CSA and PSE, **D** for CEE, **DC** for CCC, **E** for BS, **K** for KC
- Position detection method: Photoelectric-type reflection linear encoder
- Response speed: Approx. 1000 mm/s
- Lifting lever: **21EAA426** (standard accessory)

*1 These values apply to normal measurements at 20 °C.
*2 To denote your AC power cable add the following suffixes to the code No.: **A** for UL/CSA, **D** for CEE, **DC** for CCC, **E** for BS, **K** for KC, **No suffix** is required for JIS/100 V
*3 Overall magnification and linearity
Note 1: The indicator can output SPC (Digimatic) data consisting of up to 6 digits in full. If the data consists of 7 digits the first digit is not output (example: 123.4565 mm is output as 23.4565 mm).
Note 2: Regarding origin setting, refer to "Precautions for use" on page 07-2.
Note 3: The orientation for use can be from vertical (contact point pointing downward) to horizontal (spindle in horizontal orientation).

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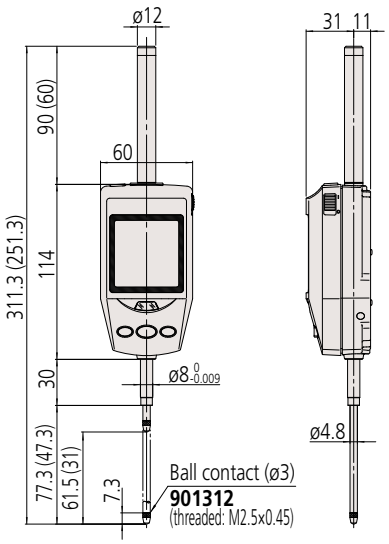
Digimatic Indicator ID-H
SERIES 543 — High Accuracy and High Functionality Type

DIMENSIONS

ISO / JIS Type

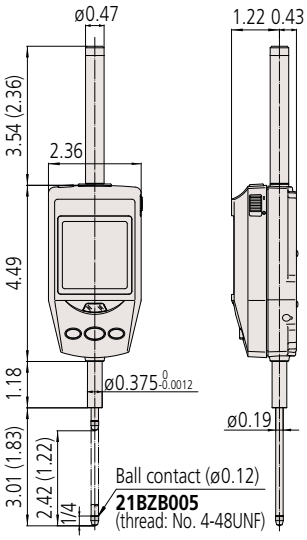
Unit: mm



Note: ( ) = **543-561**

ASME / ANSI / AGD Type

Unit: in



Note: ( ) = **543-562**

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EC Counter
SERIES 542 — Low-cost, Modular Type Display Unit

Functions
- Preset
- Tolerance judgment (3 steps)

- The counter can be connected to a gage that has a data output function, such as a Digimatic indicator or linear gage.
- 3 sets of limiting values can be displayed and output.
- Compact size (DIN 96×48 mm)

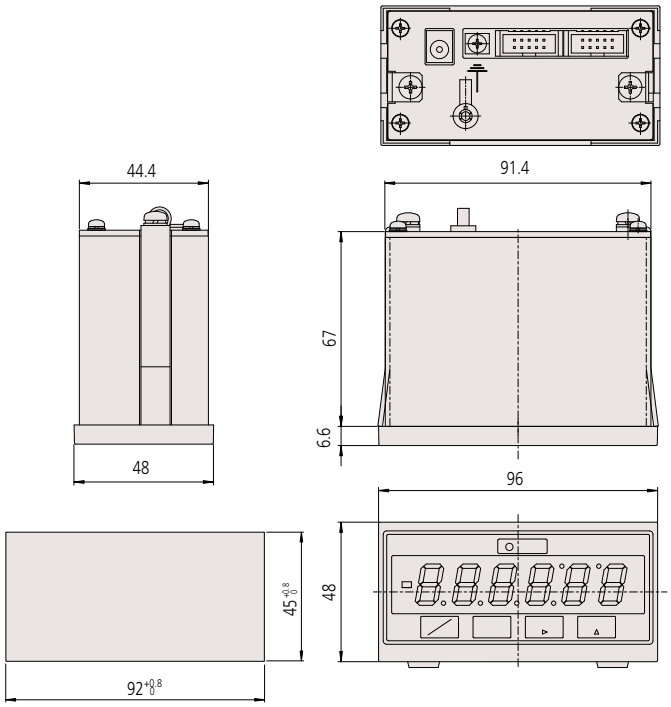
542-007

SPECIFICATIONS

Code No.		542-007*
Resolution ( ) indicates maximum display range		0.01 mm (±9999.99)/0.0005 in (±99.9995 in)/0.001 in (±999.999 in) 0.001 mm (±9999.999)/0.00005 in (±9.99995 in)/0.0001 in (±99.999 in) [automatic setting by gage]
Tolerance judgment display		LED display (3 steps: Amber, Green, Red)
External output (switching type)	Tolerance judgment output	–NG, OK, +NG (open-collector)
	Data output	Digimatic output
Control input		External PRESET, external HOLD
Operating temperature		0 to 40 °C (RH 20 to 80%, no condensation)
Storage temperature		–10 to 50 °C (RH 20 to 80%, no condensation)
External dimensions		96 (W) ×48 (H) ×84.6 (D) mm
Power Source		AC adapter: **12BAR954** AC cable: **12BAK729** (Japan), **12BAK730** (U.S.), **12BAK731** (EU), **12BAK734** (UK), **12BAK732** (China), **12BAK733** (Korea)
Standard Accessories		AC adapter, AC cable, rubber feet
Mass		500 g

DIMENSIONS

Unit: mm



Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

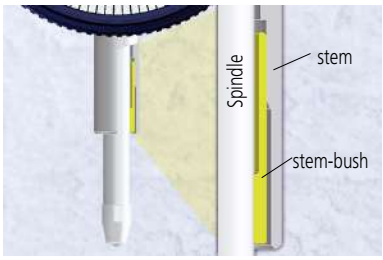
Mitutoyo

Dial Indicators

Mitutoyo dial indicators have long been used by many of our customers. In full recognition of their needs, we have devoted ourselves to the research and development necessary to produce high-quality and high-accuracy dial indicators. Due to the recent re-acknowledgement of the importance of measurement technologies, the demands on dial indicators are many and varied: installation in measuring jigs, mounting in countless types of precision equipment, etc. We offer numerous models with various types of dial faces, measuring ranges, graduation styles and environmental resistance ratings. The stems, which ensure the fixture reliability, and the spindles, which are the basis of accuracy, have excellent resistance against harsh use thanks to the hardened stainless steel construction. 0.01 mm resolution dial indicators have a main gear made of stainless steel with high resistance to wear and deformation. 0.001 mm graduation dial indicators employ a sector gear made of a special alloy in order to further increase the resistance to wear.
Many models employ an O-ring to ensure airtightness between the outer frame and the bezel in order to prevent water or oil penetration from the front.
Mitutoyo's dial indicators are manufactured and inspected according to JIS B 7503:2017. (Inspection orientation: vertical)
Important factors in choosing a dial indicator: the size (bezel diameter), resolution (graduation) and measuring range. Use the table on the right to help choose a suitable model for your application.

FEATURES: A Series (SERIES 2, 3, 4)

- No through screw-holes on the frame for high oil- and dust-resistance. The bezel clamp (optional) can be attached either to the right or left side.
- Improved impact- and oil-resistant materials are employed in the bezel. Easier reading is due to the improved shape of the crystal face.

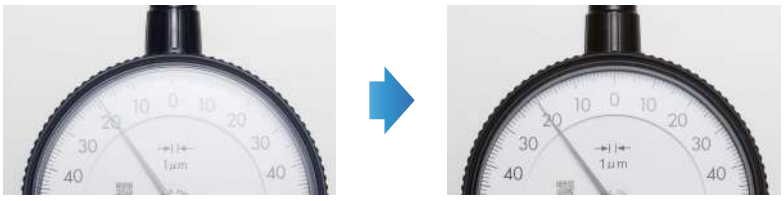


- Revolutionary stem-bush design for trouble-free stem clamping (longer clamping range; maximum tightening torque at the clamping point with M5 screw: 150 N•cm).

- The spindle lifting lever (optional: **21EZA198**) can be attached to either the right or left side providing high operability and smooth movement. This lever can be easily installed and removed.

- The optional limit hands (1) can be moved without interfering with the optional bezel clamp (2).

- Application of anti-stain and anti-reflective coating improves scale visibility.



<Conventional model> <New model>

Parts of a dial indicator

Feature icons

Icon	Feature description
	Continuous scale
	Balanced scale
	Reverse reading type, Suitable for depth and step measurement.
	One revolution type for easy and error-free reading
	Double scale spacing type, easy-on-the-eyes
	Shockproof
	Waterproof (IP63)
	Waterproof (IP64)
	With damper at top rest point
	With damper at lowest rest point
	Jeweled bearing
	Peak retaining
	Dustproof
	With coaxial revolution counter
	Back Plunger
	Adjustable hand

Note: Mitutoyo produces ASME-compatible products. Contact us for details.

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SERIES 2 — Standard Type, 0.01 mm Graduation

- This model is the most popular Mitutoyo indicator with excellent accuracy and durability. Standard 0.01 mm graduation dial indicators have a bezel with an outside diameter of 57 mm.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.

2046A

SPECIFICATIONS

Metric

ISO/JIS type

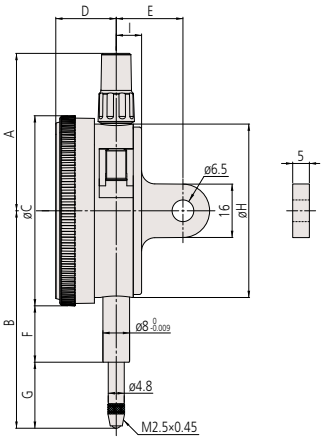
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm)						Dial reading	Measuring force (N)
				Indication error				Hysteresis	Repeat-ability		
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2046A	**2046AB**	0.01	10 (1)	5	9	10	13	3	3	±0-100	1.4 or less
2046A-09	**2046AB-09**	0.01	10 (1)	5	9	10	15	3	3	±0-100	1.4 or less
2047A	**2047AB**	0.01	10 (1)	5	9	10	13	3	3	0-50-0	1.4 or less
2902A	**2902AB**	0.01	10 (1)	5	9	10	13	3	3	100-0	1.4 or less
2310A-10	**2310AB-10**	0.01	10 (1)	5	9	10	15	3	3	±0-100	1.4 or less
2044A	**2044AB**	0.01	5 (1)	5	9	10	12	3	3	±0-100	1.4 or less
2044A-09	**2044AB-09**	0.01	5 (1)	5	9	10	12	3	3	±0-100	1.4 or less
2045A	**2045AB**	0.01	5 (1)	5	9	10	12	3	3	0-50-0	1.4 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

ISO/JIS Type

Unit: mm



Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2046A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	144	135
2046A-09	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	146	137
2047A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	144	135
2902A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	144	135
2310A-10	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	146	137
2044A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2044A-09	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	147	138
2045A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136

Note: Refer to pages 07-63 to 07-68 for details of contact points.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Standard Type, 0.01 mm Graduation

Continuous scale

Graduation: 0.01 mm,
Measuring range: 10 mm

2046A
With damper at top rest point

2046A-09
Shockproof

Balanced scale

Graduation: 0.01 mm,
Measuring range: 10 mm

2047A
With damper at top rest point

Reverse reading type. Suitable for depth and step measurement.

Graduation: 0.01 mm,
Measuring range: 10 mm

2902A
With damper at top rest point

Continuous scale

Graduation: 0.01 mm,
Measuring range: 10 mm

2310A-10
With coaxial revolution counter
Jeweled bearing

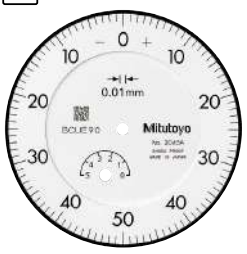
Continuous scale

Graduation: 0.01 mm,
Measuring range: 5 mm

2044A
With damper at top rest point

2044A-09
With damper at top rest point
Shockproof

Balanced scale



Graduation: 0.01 mm,
Measuring range: 5 mm

2045A
With damper at top rest point

FEATURES

Metric

ISO/JIS type

Code No. w/lug	Code No. Flat-back								
2046A	2046AB	✔			✔		✔		
2046A-09	2046AB-09	✔			✔				
2047A	2047AB		✔				✔		
2902A	2902AB			✔			✔		
2310A-10	2310AB-10	✔						✔	✔
2044A	2044AB	✔					✔		
2044A-09	2044AB-09	✔			✔				
2045A	2045AB		✔				✔		

Optional Accessories

• Limit hand (2 pcs.): **21AZB195**

• Bezel clamp: **21AZB148**

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SERIES 2 — Standard Type, 0.001 mm & 0.005 mm Graduation

- Standard 0.001 mm and 0.005 mm graduation dial indicators have a bezel with an outside diameter of 57 mm. These indicators provide excellent accuracy and durability.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The indicator uses jeweled bearings, providing excellent indication sensitivity and durability.

2109A-10

SPECIFICATIONS

Metric

ISO/JIS type

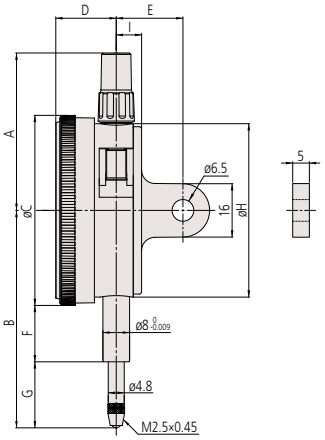
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm)						Dial reading	Measuring force (N)
				Indication error				Hysteresis	Repeat-ability		
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2109A-10	**2109AB-10**	0.001	1 (0.2)	2	3	4	5	2	0.5	0-100-0	1.5 or less
2110A-10	**2110AB-10**	0.001	1 (0.1)	2	3	4	5	2	0.5	±0-100	1.8 or less
2113A-10	**2113AB-10**	0.001	2 (0.2)	2	4	5	7	2	0.5	0-100-0	1.5 or less
2118A-10	**2118AB-10**	0.001	5 (0.2)	3.5	5	6	10	3	1	0-100-100	1.5 or less
2119A-10	**2119AB-10**	0.001	5 (0.2)	3.5	5	6	10	3	1	0-100-0	1.5 or less
2124A-10	**2124AB-10**	0.005	5 (0.5)	5	8	9	12	3	3	±0-50	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

ISO/JIS Type

Unit: mm



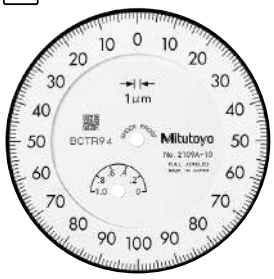
Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2109A-10	47.2	60.5	57	18.1	20	16.9	15.1	52	7.6	148	139
2110A-10	47.2	66.5	57	18.1	20	16.9	21.1	52	7.6	149	140
2113A-10	47.2	61	57	18.1	20	16.9	15.6	52	7.6	148	139
2118A-10	47.2	60.7	57	18.1	20	16.9	15.3	52	7.6	146	137
2119A-10	47.2	60.7	57	18.1	20	16.9	15.3	52	7.6	146	137
2124A-10	47.2	60.7	57	18.1	20	16.9	15.3	52	7.6	146	137

Note: Refer to pages 07-63 to 07-68 for details of contact points.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Standard Type, 0.001 mm & 0.005 mm Graduation

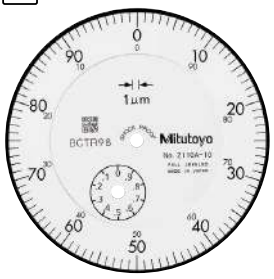
Balanced scale



Graduation: 0.001 mm,
Measuring range: 1 mm

2109A-10
Shockproof
Jeweled bearing

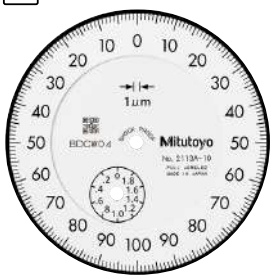
Continuous scale



Graduation: 0.001 mm,
Measuring range: 1 mm

2110A-10
Double scale spacing
Shockproof
Jeweled bearing

Balanced scale



Graduation: 0.001 mm,
Measuring range: 2 mm

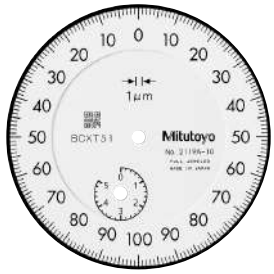
2113A-10
Shockproof
Jeweled bearing

Continuous scale

Graduation: 0.001 mm,
Measuring range: 5 mm

2118A-10
Jeweled bearing

Balanced scale



Graduation: 0.001 mm,
Measuring range: 5 mm

2119A-10
Jeweled bearing

Continuous scale

Graduation: 0.005 mm,
Measuring range: 5 mm

2124A-10
Jeweled bearing

FEATURES

Metric

ISO/JIS type

Code No.							
w/lug	Flat-back						
2109A-10	2109AB-10		✔	✔		✔	
2110A-10	2110AB-10	✔		✔		✔	✔
2113A-10	2113AB-10		✔	✔		✔	
2118A-10	2118AB-10	✔				✔	
2119A-10	2119AB-10		✔			✔	
2124A-10	2124AB-10	✔				✔	

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
Refer to page 07-27 for details.

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SERIES 2 — Water-proof Type, 0.01 mm & 0.001 mm Graduation

- Standard 0.01 mm and 0.001 mm graduation dial indicators have a highly water-resistant bezel with an outside diameter of 57 mm.
- O-rings and rubber bellows are used to prevent water and oil penetration.
- Excellent in accuracy and durability.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.

2046A-60

SPECIFICATIONS

Metric

ISO/JIS type

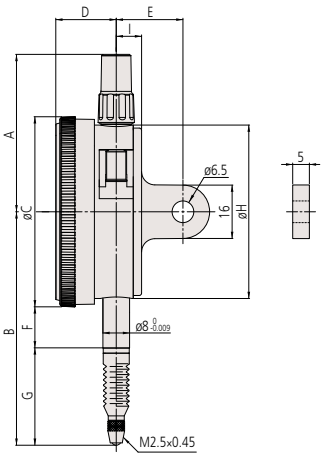
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm)						Dial reading	Measuring force (N)
				Indication error				Hysteresis	Repeat-ability		
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2046A-60	**2046AB-60**	0.01	10 (1)	5	9	10	13	3	3	±0-100	2.5 or less
2044A-60	**2044AB-60**	0.01	5 (1)	5	9	10	12	3	3	±0-100	2.5 or less
2109A-70	**2109AB-70**	0.001	1 (0.2)	2	3	4	5	2	0.5	0-100-0	2.0 or less
2110A-70	**2110AB-70**	0.001	1 (0.1)	2	3	4	5	2	0.5	±0-100	2.0 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

ISO/JIS Type

Unit: mm



Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2046A-60	47.2	74.7	57	18.1	20	12.3	33.9	52	7.6	147	138
2044A-60	47.2	70	57	18.1	20	12.3	29.2	52	7.6	147	138
2109A-70	47.2	65.3	57	18.1	20	12.3	24.5	52	7.6	149	140
2110A-70	47.2	67.5	57	18.1	20	12.3	26.7	52	7.6	150	141

Note: Refer to pages 07-63 to 07-68 for details of contact points.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Water-proof Type, 0.01 mm & 0.001 mm Graduation

Continuous scale

Graduation: 0.01 mm,
Measuring range: 10 mm

2046A-60
- Waterproof
- With damper at top rest point

Continuous scale

Graduation: 0.01 mm,
Measuring range: 5 mm

2044A-60
- Waterproof
- With damper at top rest point

Balanced scale

Graduation: 0.001 mm,
Measuring range: 1 mm

2109A-70
- Waterproof
- Shockproof
- Jeweled bearing

Continuous scale

Graduation: 0.001 mm,
Measuring range: 1 mm

2110A-70
- Waterproof
- Double scale spacing
- Shockproof
- Jeweled bearing

FEATURES

Metric

ISO/JIS type

Code No.								
w/lug	Flat-back							
2046A-60	2046AB-60	✔			✔	✔		
2044A-60	2044AB-60	✔			✔	✔		
2109A-70	2109AB-70		✔	✔	✔		✔	
2110A-70	2110AB-70	✔		✔	✔		✔	✔

Optional Accessories

- Limit hand (2 pcs.): **21AZB195**

- Bezel clamp: **21AZB148** (for metric type)
  21RZA065 (for inch type)

21AZB148

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Standard Type, Inch Reading

SPECIFICATIONS

Inch

ANSI/AGD type

Code No.		Graduation (in)	Range (range/rev) (in)	Accuracy (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
w/lug	Flat-back			First 1 Rev/2.5 Rev/10 Rev	Retrace			
2414A	**2414AB**	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	±0-100	1.8 or less
2415A	**2415AB**	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	0-50-0	1.8 or less
2914A	**2914AB**	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	100-0	1.8 or less
2506A	**2506AB**	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	±0-50	1.8 or less
2507A	**2507AB**	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-25-0	1.8 or less
2514A	**2514AB**	0.0005	0.5 (0.05)	±0.0005/±0.0005/±0.0015	0.00016	±0.0001	±0-50	1.8 or less
2922A	**2922AB**	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-25-0	1.8 or less
2356A-10	**2356AB-10**	0.0001	0.25 (0.01)	±0.0002/±0.0002/±0.0003/±0.0004 (First 20rev)/±0.0005 (Over 20rev)	0.0001	±0.00003	0-10	2.0 or less
2358A-10	**2358AB-10**	0.0001	0.5 (0.01)	±0.0002/±0.0002/±0.0003/±0.0004 (First 20rev)/±0.0008 (Over 20rev)	0.00015	±0.00003	0-10	2.0 or less
2802A-10	**2802AB-10**	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-10	2.0 or less
2803A-10	**2803AB-10**	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-5-0	2.0 or less
2804A-10	**2804AB-10**	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	0-10	2.0 or less
2805A-10	**2805AB-10**	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	0-5-0	2.0 or less
2905A-10	**2905AB-10**	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	10-0	2.0 or less
2923A-10	**2923AB-10**	0.0001	0.05 (0.01)	±0.0001/±0.0001/±0.0002	0.0001	±0.00003	0-5-0	2.0 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

FEATURES

Inch

Code No.								
w/lug	Flat-back							
2414A	**2414AB**				✔		✔
2415A	**2415AB**					✔	✔
2914A	**2914AB**		✔				✔
2506A	**2506AB**				✔		✔
2507A	**2507AB**					✔	✔
2514A	**2514AB**				✔		✔
2922A	**2922AB**					✔	✔
2356A-10	**2356AB-10**			✔	✔		✔
2358A-10	**2358AB-10**			✔	✔		✔
2802A-10	**2802AB-10**	✔		✔	✔		
2803A-10	**2803AB-10**	✔		✔		✔	
2804A-10	**2804AB-10**	✔		✔	✔		
2805A-10	**2805AB-10**	✔		✔		✔	
2905A-10	**2905AB-10**	✔	✔	✔			
2923A-10	**2923AB-10**	✔		✔		✔	

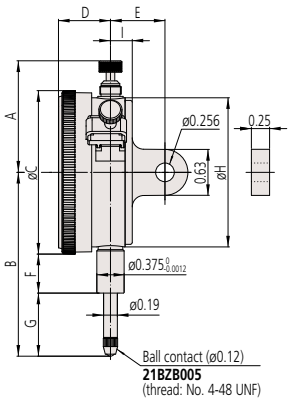
Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Standard Type, Inch Reading

DIMENSIONS

ANSI / AGD Type

Unit: in



Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2414A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2415A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2914A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2506A	1.86	2.14	2.24	0.71	3/4	0.54	0.48	2.05	0.30	164	139
2507A	1.86	2.14	2.24	0.71	3/4	0.54	0.48	2.05	0.30	164	139
2514A	1.53	2.52	2.24	0.71	3/4	0.54	0.87	2.05	0.30	164	139
2922A	1.86	2.14	2.24	0.71	3/4	0.54	0.48	2.05	0.30	164	139
2356A-10	1.86	2.25	2.24	0.71	3/4	0.54	0.59	2.05	0.30	163	138
2358A-10	1.53	2.50	2.24	0.71	3/4	0.54	0.85	2.05	0.30	164	139
2802A-10	1.86	2.02	2.24	0.71	3/4	0.54	0.37	2.05	0.30	164	139
2803A-10	1.86	2.02	2.24	0.71	3/4	0.54	0.37	2.05	0.30	164	139
2804A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	166	141
2805A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	166	141
2905A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	164	139
2923A-10	1.86	2.04	2.24	0.71	3/4	0.54	0.38	2.05	0.30	164	139

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Standard One Revolution Type for Error-free Reading

One revolution type Back Plunger dial gages are also available. (Refer to pages 07-59 to 07-62 for details.)

2990A-10

- The one revolution dial indicator prevents the possibility of reading errors.
- Mitutoyo's unique shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.

2900A-10

SPECIFICATIONS

Metric

ISO/JIS type ANSI/AGD type

Code No. w/lug	Code No. Flat-back	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm) Indication error 1/10 Rev	1/2 Rev	1 Rev	Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
2928A	**2928AB**	0.1	4 (5)	20	—	—	40	20	20	2-0-2	1.4 or less
2929A	**2929AB**	0.01	0.8 (1)	5	—	—	8	3	3	40-0-40	1.4 or less
2929A-62	**2929AB-62**	0.01	0.8 (1)	5	—	—	8	3	3	40-0-40	2.0 or less
2959A	**2959AB**	0.01	1.6 (2)	5	—	—	10	3	3	80-0-80	1.4 or less
2900A-10	**2900AB-10**	0.001	0.08 (0.1)	2	—	—	3	2	0.5	40-0-40	1.5 or less
2900A-72	**2900AB-72**	0.001	0.08 (0.1)	2	—	—	3	2	0.5	40-0-40	2.0 or less
2901A-10	**2901AB-10**	0.001	0.16 (0.2)	2	—	—	4	2	0.5	80-0-80	1.5 or less

Inch

Code No. w/lug	Code No. Flat-back	Graduation (in)	Range (range/rev) (in)	Accuracy (in) First 1 Rev/2.5 Rev/10 Rev	Retrace	Repeat-ability (in)	Dial reading	Measuring force (N)
2909A-62	**2909AB-62**	0.0005	0.04/0.05	±0.0005/—/—	0.00016	±0.0001	20-0-20	2.5 or less
2910A-10	**2910AB-10**	0.0001	0.008/0.01	±0.0001/—/—	0.0001	±0.00003	4-0-4	1.8 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your local Mitutoyo Sales Office for more information.

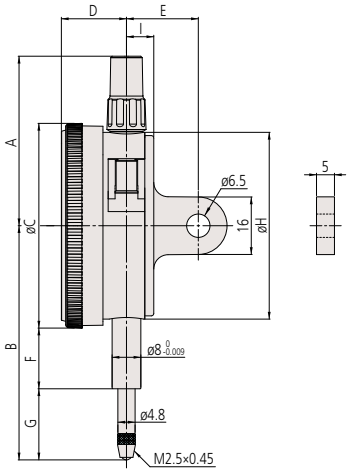
Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Standard One Revolution Type for Error-free Reading

DIMENSIONS

ISO / JIS Type

Unit: mm

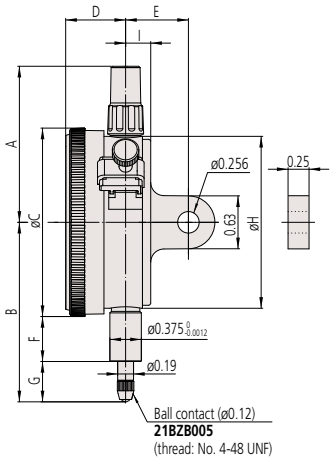


Code No.	A	B	C	D	E	F	G	H	I	Mass (g) w/lug	Mass (g) Flat-back
2928A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2929A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2929A-62	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2959A	47.2	65.2	57	18.1	20	16.9	19.8	52	7.6	145	136
2900A-10	47.2	66	57	18.1	20	16.9	20.6	52	7.6	149	140
2900A-72	47.2	66	57	18.1	20	16.9	20.6	52	7.6	149	140
2901A-10	47.2	66.1	57	18.1	20	16.9	20.7	52	7.6	149	140

Note: Refer to pages 07-63 to 07-68 for details of contact points.

ANSI / AGD Type

Unit: in



Code No.	A	B	C	D	E	F	G	H	I	Mass (g) w/lug	Mass (g) Flat-back
2909A-62	1.86	2.04	2.24	0.71	3/4	0.54	0.39	2.05	0.30	163	138
2910A-10	1.86	2.02	2.24	0.71	3/4	0.54	0.36	2.05	0.30	164	139

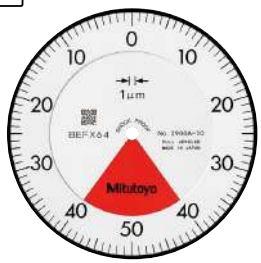
Note: Refer to pages 07-63 to 07-68 for details of contact points.

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
  Refer to page 07-31 for details.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Balanced scale

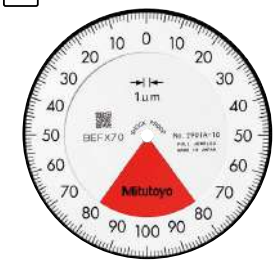


Graduation: 0.001 mm, Measuring range: 0.08 mm

2900A-10
- One revolution
- Shockproof
- Jeweled bearing

2900A-72
- One revolution
- Shockproof
- Dustproof
- Jeweled bearing

Balanced scale



Graduation: 0.001 mm, Measuring range: 0.16 mm

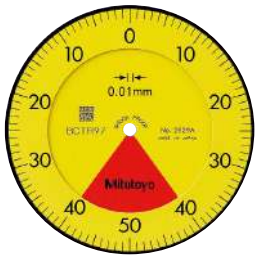
2901A-10
- One revolution
- Shockproof
- Jeweled bearing

Balanced scale

Graduation: 0.1 mm, Measuring range: 4 mm

2928A
- One revolution
- Shockproof

Balanced scale



Graduation: 0.01 mm, Measuring range: 0.8 mm

2929A
- One revolution
- Shockproof

2929A-62
- One revolution
- Shockproof
- Dustproof

Balanced scale

Graduation: 0.01 mm, Measuring range: 1.6 mm

2959A
- One revolution
- Shockproof

FEATURES

Metric ISO/JIS type ANSI/AGD type

Code No. w/lug	Code No. Flat-back						
2928A	2928AB	✔	✔	✔			
2929A	2929AB	✔	✔	✔			
2929A-62	2929AB-62	✔	✔	✔		✔	
2959A	2959AB	✔	✔	✔			
2900A-10	2900AB-10	✔	✔	✔			✔
2900A-72	2900AB-72	✔	✔	✔		✔	✔
2901A-10	2901AB-10	✔	✔	✔			✔

Inch

Code No. w/lug	Code No. Flat-back						
2909A-62	2909AB-62	✔	✔	✔		✔	
2910A-10	2910AB-10	✔	✔	✔			✔

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

IP64

SERIES 2 — Standard One Revolution Type for Error-free Reading, Water-proof Type

- The one revolution dial indicator with improved water resistance prevents the possibility of reading errors.
- Mitutoyo's unique shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- It is highly durable thanks to a hardened stainless-steel stem and spindle, carbide probe, and a large gear made of wear- and deformation-resistant materials.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.

2929A-60

SPECIFICATIONS

Metric

ISO/JIS type ANSI/AGD type

Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
				Indication error				Hysteresis	Repeat-ability		
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2929A-60	**2929AB-60**	0.01	0.8 (1)	5	—	—	8	3	3	40-0-40	2.0 or less
2900A-70	**2900AB-70**	0.001	0.08 (0.1)	2	—	—	3	2	0.5	40-0-40	2.0 or less

Inch

Code No.		Graduation (in)	Range (range/rev) (in)	Accuracy (in)		Repeat-ability (in)	Dial reading	Measuring force (N)
w/lug	Flat-back			First 1 Rev/2.5 Rev/10 Rev	Retrace			
2910A-72	**2910AB-72**	0.0001	0.008/0.01	±0.0001/—/—	0.0001	±0.00003	4-0-4	2.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your local Mitutoyo Sales Office for more information.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

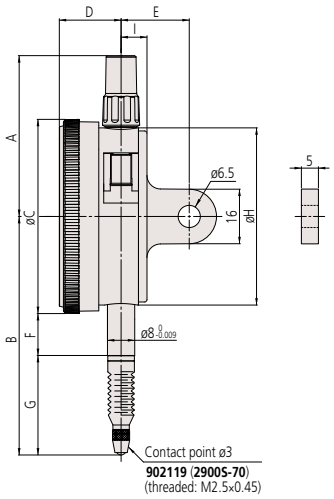
Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
  Refer to page 07-31 for details.

DIMENSIONS

ISO / JIS Type

Unit: mm

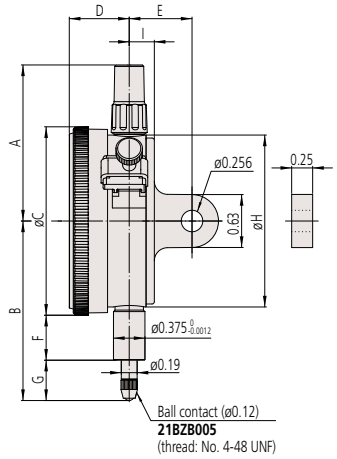


Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2929A-60	47.2	70	57	18.1	20	12.3	29.2	52	7.6	146	137
2900A-70	47.2	67	57	18.1	20	12.3	26.2	52	7.6	150	141

Note: Refer to pages 07-63 to 07-68 for details of contact points.

ANSI / AGD Type

Unit: in



Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2910A-72	1.86	2.02	2.24	0.71	3/4	0.54	0.36	2.05	0.30	150	141

Note: Refer to pages 07-63 to 07-68 for details of contact points.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Standard One Revolution Type for Error-free Reading, Water-proof Type

Balanced scale

Graduation: 0.001 mm,
Measuring range: 0.08 mm

2900A-70

- One revolution
- Shockproof
- Waterproof
- Jeweled bearing

Balanced scale

Graduation: 0.01 mm,
Measuring range: 0.8 mm

2929A-60

- One revolution
- Shockproof
- Waterproof

FEATURES

Metric

ISO/JIS type ANSI/AGD type

Code No. w/lug	Code No. Flat-back						
2929A-60	2929AB-60	✔	✔	✔	✔		
2900A-70	2900AB-70	✔	✔	✔	✔		✔

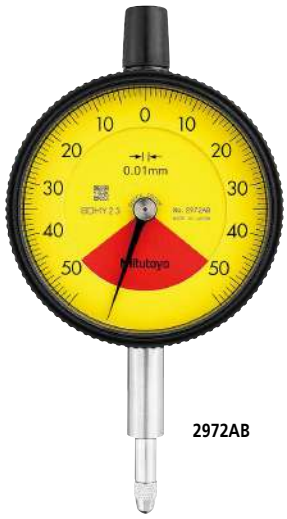
Inch

Code No. w/lug	Code No. Flat-back						
2910A-72	2910AB-72	✔	✔	✔		✔	✔

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Standard One Revolution Type for Error-free Reading, Lightweight Type

- The one revolution dial indicator (lightweight type) prevents the possibility of reading errors.
- Mitutoyo's unique shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- Lightweight type (70 g).
- It is highly durable thanks to a hardened stainless-steel stem and spindle, carbide probe, and a large gear made of wear- and deformation-resistant materials.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.



2972AB

SPECIFICATIONS

ISO/JIS type ANSI/AGD type

Metric

Code No. w/lug	Code No. Flat-back	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm) Indication error 1/10 Rev	1/2 Rev	1 Rev	Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
—	**2971AB**	0.01	0.5 (0.7)	5	—	—	8	3	3	25-0-25	1.4 or less
—	**2972AB**	0.01	1 (1.4)	5	—	—	8	3	3	50-0-50	1.4 or less
—	**2973AB**	0.02	1.6 (2)	8	—	—	16	6	5	80-0-80	1.4 or less

Inch

Code No. w/lug	Code No. Flat-back	Graduation (in)	Range (range/rev) (in)	Accuracy (in) First 1 Rev/2.5 Rev/10 Rev	Accuracy (in) Retrace	Repeat-ability (in)	Dial reading	Measuring force (N)
—	**2976AB**	0.0005	0.02 (0.028)	±0.0005/—/—	0.00016	±0.0001	10-0-10	1.4 or less
—	**2977AB**	0.0005	0.04 (0.055)	±0.0005/—/—	0.00016	±0.0001	20-0-20	1.4 or less
—	**2978AB**	0.001	0.06 (0.079)	±0.001/—/—	0.0002	±0.0002	30-0-30	1.4 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your local Mitutoyo Sales Office for more information.

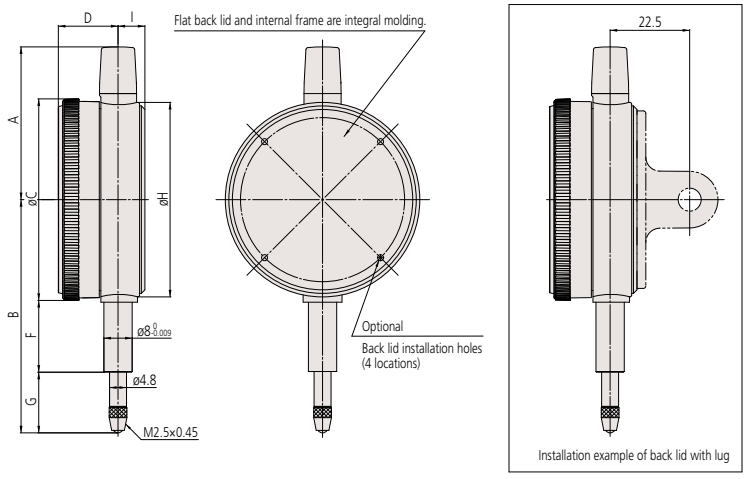
Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Standard One Revolution Type for Error-free Reading, Lightweight Type

DIMENSIONS

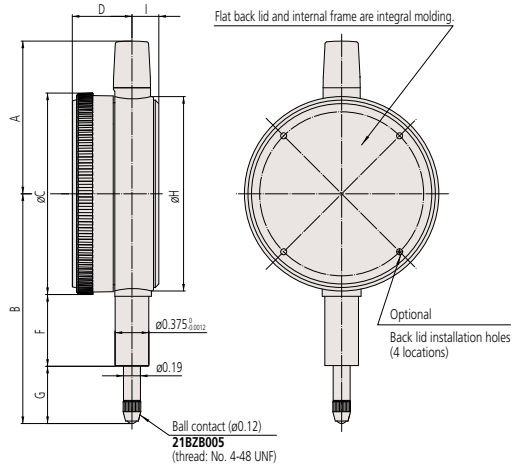
ISO / JIS Type

Unit: mm



ANSI / AGD Type

Unit: in



Note 1: When installing an optional back (refer to pages 07-69 to 07-70 for details) 4 retaining screws must also be obtained (**546666**: Self-tapping screw only for plastic).
Do not apply a tightening torque of more than 20 N•cm in order to avoid stripping the screw threads.
Note 2: An optional lifting lever, release or bezel clamp cannot be installed.

Metric

Code No.	A	B	C	D	F	G	H	I	Mass (g)
2971AB	43.2	65.6	57	16.9	20.3	16.8	55	7.6	70
2972AB	43.2	66	57	16.9	20.3	17.2	55	7.6	
2973AB	43.2	66.3	57	16.9	20.3	17.5	55	7.6	

Inch

Code No.	A	B	C	D	F	G	H	I	Mass (g)
2976AB	1.70	2.55	2.24	0.67	0.80	0.63	2.17	0.30	70
2977AB	1.70	2.56	2.24	0.67	0.80	0.64	2.17	0.30	
2978AB	1.70	2.57	2.24	0.67	0.80	0.65	2.17	0.30	

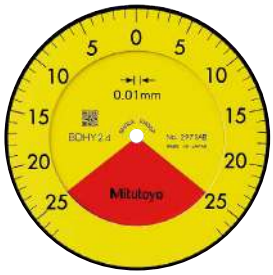
Note: Refer to pages 07-63 to 07-68 for details of contact points.

Optional Accessory

• Limit hand (2 pcs.): **21AZB195**

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Balanced scale



Graduation: 0.01 mm,
Measuring range: 0.5 mm

2971AB

- One revolution
- Shockproof
- Dustproof

Balanced scale

Graduation: 0.01 mm,
Measuring range: 1 mm

2972AB

- One revolution
- Shockproof
- Dustproof

Balanced scale

Graduation: 0.02 mm,
Measuring range: 1.6 mm

2973AB

- One revolution
- Shockproof
- Dustproof

FEATURES

Metric ISO/JIS type ANSI/AGD type

Code No.					
w/lug	Flat-back				
—	**2971AB**	✔	✔	✔	✔
—	**2972AB**	✔	✔	✔	✔
—	**2973AB**	✔	✔	✔	✔

Inch

Code No.					
w/lug	Flat-back				
—	**2976AB**	✔	✔	✔	✔
—	**2977AB**	✔	✔	✔	✔
—	**2978AB**	✔	✔	✔	✔

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 2 — Long Stroke Type

- Long stroke dial indicators with measuring range of 20 mm or more have a ø57 mm bezel.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The lifting lever (optional) cannot be used with models that are water-proof or which have a measurement range of 30 mm.

SPECIFICATIONS

Metric

ISO/JIS type ANSI/AGD type

Code No. w/lug	Code No. Flat-back	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm) Indication error 1/10 Rev	1/2 Rev	1 Rev	Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
2050A	**2050AB**	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
2050A-60*	**2050AB-60***	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.5 or less
2050A-19	**2050AB-19**	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
2320A-10	**2320AB-10**	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
2052A	**2052AB**	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
2052A-19	**2052AB-19**	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
2330A-10	**2330AB-10**	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
2952A	**2952AB**	0.01	30 (1)	10	12	15	25	7	5	100-0	2.5 or less

* **2050A-60** and **2050AB-60** are water-proof types that use a rubber bellows to cover the spindle.
Note that the outer diameter of the bellows (ø9.5) is larger than that of the stem (ø8).

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Inch

Code No. w/lug	Code No. Flat-back	Graduation (in)	Range (range/rev) (in)	Accuracy (in) First 1 Rev/2.5 Rev/10 Rev	Retrace	Repeat-ability (in)	Dial reading	Measuring force (N)
2416A	**2416AB**	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	±0-100	1.8 or less
2416A-06	**2416AB-06**	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	±0-100	1.8 or less
2416A-10	**2416AB-10**	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	±0-100	1.8 or less
2417A	**2417AB**	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	0-50-0	1.8 or less
2424A-19	**2424AB-19**	0.001	2 (0.1)	±0.001/±0.001/±0.002/±0.003 (First 20 Rev)	0.00033	±0.0002	±0-100	2.5 or less
2776A	**2776AB**	0.0005	1 (0.05)	±0.0005/±0.0005/±0.0015/±0.002 (First 20 Rev)	0.0002	±0.0001	±0-50	2.5 or less
2904A	**2904AB**	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	100-0	1.8 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Optional Accessories

• Limit hand (2 pcs.): **21AZB195**

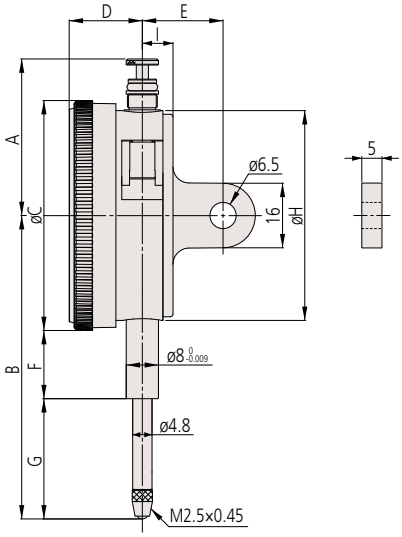
• Bezel clamp: **21AZB148** (for metric type)
21RZA065 (for inch type)
21RZA067 (for **2424A(B)-19**)

21AZB148

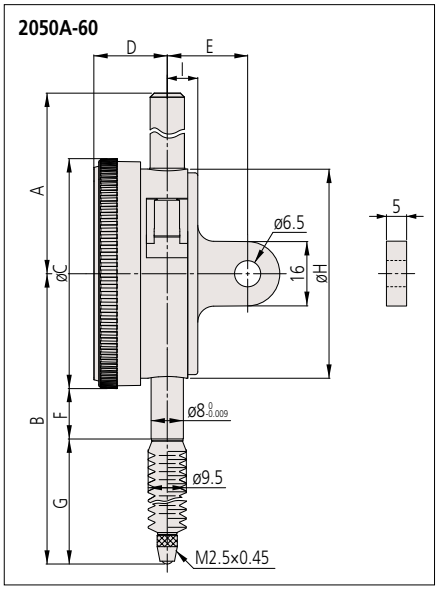
DIMENSIONS

ISO / JIS Type

Unit: mm



2050A-60



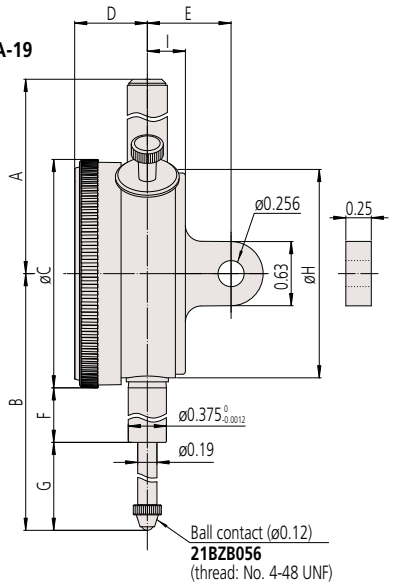
Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2050A	38.5	75.2	57	18.1	20	16.9	29.8	52	7.6	149	140
2050A-60	58.2	87.2	57	18.1	20	12.3	46.4	52	7.6	155	146
2050A-19	38.5	75.2	57	18.1	20	16.9	29.8	52	7.6	149	140
2320A-10	38.5	75.2	57	18.1	20	16.9	29.8	52	7.6	150	141
2052A	38.5	88.7	57	18.1	20	16.9	43.3	52	7.6	152	143
2052A-19	38.5	88.7	57	18.1	20	16.9	43.3	52	7.6	152	143
2330A-10	38.5	88.7	57	18.1	20	16.9	43.3	52	7.6	153	144
2952A	38.5	88.7	57	18.1	20	16.9	43.3	52	7.6	152	143

Note: Refer to pages 07-63 to 07-68 for details of contact points.

ANSI / AGD Type

2424A-19

Unit: in



Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2416A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2416A-06	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2416A-10	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2417A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2424A-19	4.67	5.61	2.24	0.71	5/6	2.14	2.35	2.05	0.37	248	239
2776A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139
2904A	1.53	3.02	2.24	0.71	3/4	0.54	1.37	2.05	0.30	164	139

Note: Refer to pages 07-63 to 07-68 for details of contact points.

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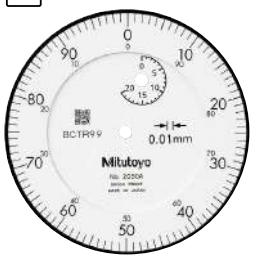
SERIES 2 — Long Stroke Type

Continuous scale



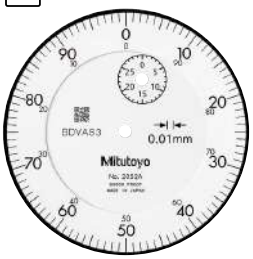
Graduation: 0.01 mm,
Measuring range: 20 mm

2050A
- With damper at lowest rest point

2050A-19
- Shockproof
- Jeweled bearing
- With damper at lowest rest point

2050A-60
- Waterproof

Continuous scale

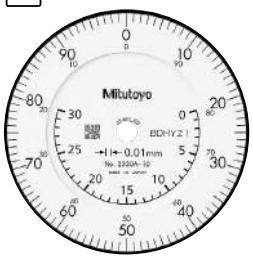


Graduation: 0.01 mm,
Measuring range: 30 mm

2052A
- With damper at lowest rest point

2052A-19
- Shockproof
- Jeweled bearing
- With damper at lowest rest point

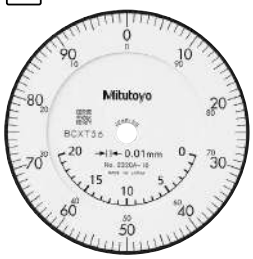
Continuous scale



Graduation: 0.01 mm,
Measuring range: 30 mm

2330A-10
- With coaxial revolution counter
- With damper at lowest rest point
- Jeweled bearing

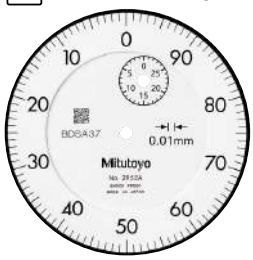
Continuous scale



Graduation: 0.01 mm,
Measuring range: 20 mm

2320A-10
- With coaxial revolution counter
- With damper at lowest rest point
- Jeweled bearing

Reverse reading



Graduation: 0.01 mm,
Measuring range: 30 mm

2952A
- With damper at lowest rest point

FEATURES

Metric — ISO/JIS type / ANSI/AGD type

Code No. w/lug	Code No. Flat-back								
2050A	2050AB	✔					✔		
2050A-60	2050AB-60	✔				✔			
2050A-19	2050AB-19	✔			✔		✔	✔	
2320A-10	2320AB-10	✔					✔	✔	✔
2052A	2052AB	✔					✔		
2052A-19	2052AB-19	✔			✔		✔	✔	
2330A-10	2330AB-10	✔					✔	✔	✔
2952A	2952AB			✔			✔		

Inch

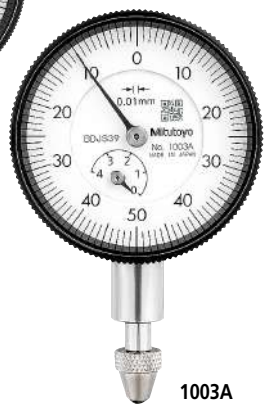
Code No. w/lug	Code No. Flat-back							
2416A	2416AB	✔						
2416A-06	2416AB-06	✔						
2416A-10	2416AB-10	✔				✔		
2417A	2417AB		✔					
2424A-19	2424AB-19	✔		✔		✔		✔
2776A	2776AB	✔						
2904A	2904AB				✔			

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 1 — Compact Type, Extra Small Diameter

- These compact, space-saving dial indicators make it easy to incorporate into gaging jigs.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.

1911A-10



1003A

SPECIFICATIONS

Metric

ISO/JIS type ANSI/AGD type

Code No. w/lug	Code No. Flat-back	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm) Indication error 1/10 Rev	1/2 Rev	1 Rev	Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
1911A-10	**1911AB-10**	0.01	2.5 (1)	8	9	10	12	4	3	0-50-0	1.8 or less
1913A-10	**1913AB-10**	0.002	0.5 (0.2)	2.5	4	5	6	2.5	1	0-100-0	1.8 or less
1003A	**1003AB**	0.01	4 (1)	8	10	11	13	4	3	0-50-0	1.4 or less

Inch

Code No. w/lug	Code No. Flat-back	Graduation (in)	Range (range/rev) (in)	Accuracy (in) First 1 Rev/2.5 Rev/10 Rev	Retrace	Repeat-ability (in)	Dial reading	Measuring force (N)
1921A-10	**1921AB-10**	0.001	0.1 (0.04)	±0.001/±0.001/—	0.0002	±0.0002	0-20-0	1.8 or less
1923A-10	**1923AB-10**	0.0005	0.05 (0.02)	±0.0005/±0.005/—	0.00016	±0.0001	0-10-0	1.8 or less
1925A-10	**1925AB-10**	0.0001	0.025 (0.01)	±0.0002/±0.0002/—	0.0001	±0.00003	0-5-0	1.8 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

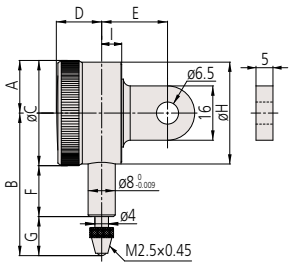
Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 1 — Compact Type, Extra Small Diameter

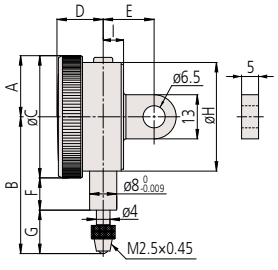
DIMENSIONS

ISO/JIS Type Unit: mm

1911A-10/1913A-10

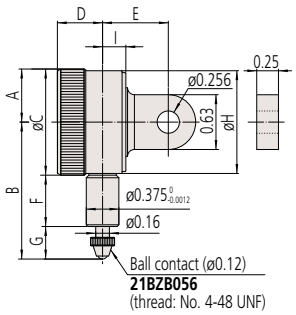


1003A



ANSI/AGD Type Unit: in

1921A-10/1923A-10/1925A-10



Metric Unit: mm

Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
1911A-10	15.5	42	31	12.7	19.4	15.1	11.5	30	6	55	51
1913A-10	15.5	39.5	31	12.7	19.4	15.1	8.9	30	6	55	51
1003A	18	40.3	36	13.5	15	9.5	12.8	32	6	51	48

Inch Unit: in

Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
1921A-10	0.61	1.58	1.22	0.5	3/4	0.59	0.37	1.18	0.27	55	51
1923A-10	0.61	1.51	1.22	0.5	3/4	0.59	0.31	1.18	0.27	55	51
1925A-10	0.61	1.48	1.22	0.5	3/4	0.59	0.28	1.18	0.27	55	51

Note 1: Limit hands, bezel clamps and lifting levers cannot be installed.
Note 2: The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. When replacing it with an optional contact point with a connector not exceeding ø7 mm in outside diameter, insert a washer (with ø7 mm outside diameter, ø3 mm inside diameter, and approximately 0.5 mm thickness) above the contact point.
Note 3: Being fixed by only two retaining screws, the back cannot be rotated by 90° to change the orientation of the lug.

Balanced scale

Graduation: 0.01 mm,
Measuring range: 2.5 mm

1911A-10
Jeweled bearing

Balanced scale

Graduation: 0.002 mm,
Measuring range: 0.5 mm

1913A-10
Jeweled bearing

Balanced scale

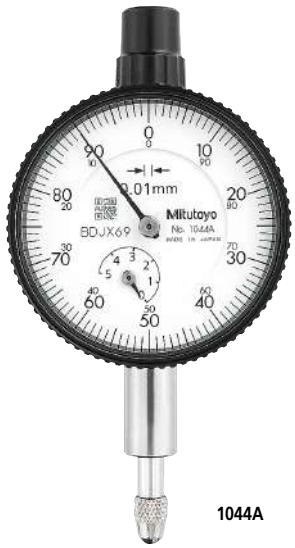
Graduation: 0.01 mm,
Measuring range: 4 mm

1003A

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 1 — Compact Type, Small Diameter

- Compact dial indicators ideal for restricted-space applications in gaging jigs.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.



1044A

SPECIFICATIONS

Metric

ISO/JIS type ANSI/AGD type

Code No. w/lug	Code No. Flat-back	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm) Indication error 1/10 Rev	1/2 Rev	1 Rev	Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
1013A-10	**1013AB-10**	0.002	1 (0.2)	2.5	4	5	6	2.5	1	0-100-0	1.5 or less
1040A	**1040AB**	0.01	3.5 (0.5)	8	10	11	13	4	3	±0-50	1.4 or less
1041A	**1041AB**	0.01	3.5 (0.5)	8	10	11	13	4	3	0-25-0	1.4 or less
1044A	**1044AB**	0.01	5 (1)	8	10	11	13	4	3	±0-100	1.4 or less
1044A-15	**1044AB-15**	0.01	5 (1)	8	10	11	13	4	3	±0-100	0.4 or less*
1044A-60	**1044AB-60**	0.01	5 (1)	8	10	11	13	4	3	±0-100	2.0 or less
1045A	**1045AB**	0.01	5 (1)	8	10	11	13	4	3	0-50-0	1.4 or less
1109A-10	**1109AB-10**	0.001	1 (0.2)	2.5	3.5	4.5	5	2	1	0-100-0	1.5 or less
1124A	**1124AB**	0.005	3.5 (0.5)	6	9	10	12	3.5	3	±0-50	1.4 or less

* For low measuring force type, use in the vertical orientation.
Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

Inch

Code No. w/lug	Code No. Flat-back	Graduation (in)	Range (range/rev) (in)	Accuracy (in) First 1 Rev/2.5 Rev/10 Rev	Retrace	Repeat-ability (in)	Dial reading	Measuring force (N)
1410A	**1410AB**	0.001	0.25 (0.1)	±0.001/±0.001/—	0.0002	±0.0002	0-100	1.4 or less
1411A	**1411AB**	0.001	0.25 (0.1)	±0.001/±0.001/—	0.0002	±0.0002	0-50-0	1.4 or less
1410A-10	**1410AB-10**	0.001	0.25 (0.1)	±0.001/±0.001/—	0.0002	±0.0002	0-100	1.4 or less
1780A	**1780AB**	0.001	0.125 (0.05)	±0.001/±0.001/—	0.0002	±0.0002	0-50	1.4 or less
1781A	**1781AB**	0.001	0.125 (0.05)	±0.001/±0.001/—	0.0002	±0.0002	0-25-0	1.4 or less
1506A	**1506AB**	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-50	1.4 or less
1507A	**1507AB**	0.0005	0.125 (0.05)	±0.0005/±0.0005/—	0.00016	±0.0001	0-25-0	1.4 or less
1670A	**1670AB**	0.0005	0.1 (0.04)	±0.0005/±0.0005/—	0.00016	±0.0001	0-40	1.4 or less
1671A	**1671AB**	0.0005	0.1 (0.04)	±0.0005/±0.0005/—	0.00016	±0.0001	0-20-0	1.4 or less
1802A-10	**1802AB-10**	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-10	1.5 or less
1803A-10	**1803AB-10**	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-5-0	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

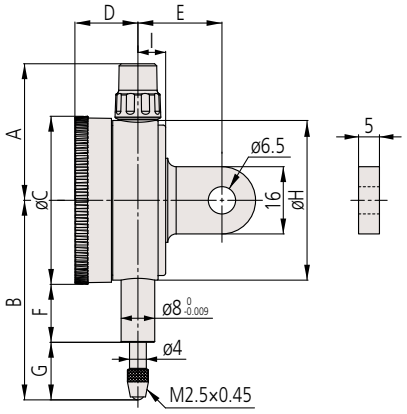
Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SERIES 1 — Compact Type, Small Diameter

DIMENSIONS

ISO / JIS Type

Unit: mm

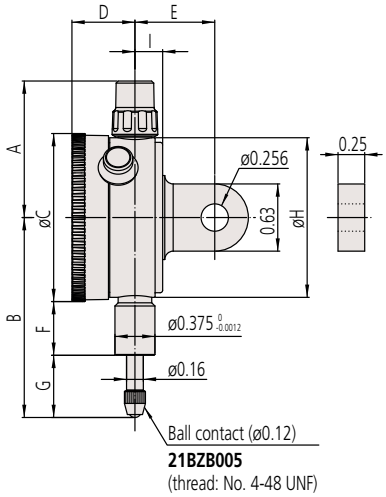


Code No.	A	B	C	D	E	F	G	H	I
1013A-10	32.5	49	40	15	20	13.8	15.2	38	6.6
1040A	32.5	46	40	15	20	13.8	12.2	38	6.6
1041A	32.5	46	40	15	20	13.8	12.2	38	6.6
1044A	32.5	47.5	40	15	20	13.8	13.7	38	6.6
1044A-15*	32.5	47.5	40	15	20	13.8	13.7	38	6.6
1044A-60	32.5	57	40	15	20	12.2	24.8	38	6.6
1045A	32.5	47.5	40	15	20	13.8	13.7	38	6.6
1109A-10	32.5	49	40	15	20	13.8	15.2	38	6.6
1124A	32.5	46	40	15	20	13.8	12.2	38	6.6

* Use in the vertical orientation (contact point downward) for the low measuring force model.
Note: Refer to pages 07-63 to 07-68 for details of contact points.

ANSI / AGD Type

Unit: in



Code No.	A	B	C	D	E	F	G	H	I
1410A	1.28	1.87	1.57	0.59	3/4	0.50	0.58	1.50	0.26
1411A	1.28	1.87	1.57	0.59	3/4	0.50	0.58	1.50	0.26
1410A-10	1.28	1.87	1.57	0.59	3/4	0.50	0.58	1.50	0.26
1780A	1.28	1.74	1.57	0.59	3/4	0.50	0.44	1.50	0.26
1781A	1.28	1.74	1.57	0.59	3/4	0.50	0.44	1.50	0.26
1506A	1.28	1.74	1.57	0.59	3/4	0.50	0.44	1.50	0.26
1507A	1.28	1.74	1.57	0.59	3/4	0.50	0.44	1.50	0.26
1670A	1.28	1.71	1.57	0.59	3/4	0.50	0.42	1.50	0.26
1671A	1.28	1.71	1.57	0.59	3/4	0.50	0.42	1.50	0.26
1802A-10	1.28	1.63	1.57	0.59	3/4	0.50	0.33	1.50	0.26
1803A-10	1.28	1.63	1.57	0.59	3/4	0.49	0.33	1.50	0.26

Note: Refer to pages 07-63 to 07-68 for details of contact points.

Optional Accessories

• Limit hand (2 pcs.): **21AAB363**

• Bezel clamp: **21RZA149**

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

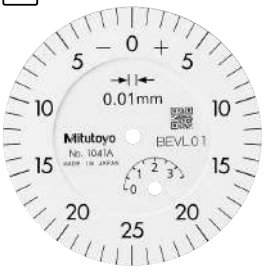
Continuous scale

Graduation: 0.01 mm, Measuring range: 3.5 mm

1040A

Double scale spacing

Balanced scale



Graduation: 0.01 mm, Measuring range: 3.5 mm

1041A

Double scale spacing

Continuous scale

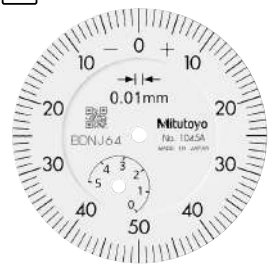
Graduation: 0.01 mm, Measuring range: 5 mm

1044A

1044A-15

Jeweled bearing

Balanced scale



Graduation: 0.01 mm, Measuring range: 5 mm

1045A

Balanced scale

Graduation: 0.001 mm, Measuring range: 1 mm

1109A-10

Shockproof

Jeweled bearing

Balanced scale

Graduation: 0.002 mm, Measuring range: 1 mm

1013A-10

Shockproof

Jeweled bearing

Continuous scale

Graduation: 0.005 mm, Measuring range: 3.5 mm

1124A

Continuous scale

Graduation: 0.01 mm, Measuring range: 5 mm

1044A-60

Waterproof

FEATURES

Metric — ISO/JIS type — ANSI/AGD type

Code No. w/lug	Code No. Flat-back						
1013A-10	1013AB-10		✔		✔	✔	
1040A	1040AB	✔		✔			
1041A	1041AB		✔	✔			
1044A	1044AB	✔					
1044A-15	1044AB-15	✔				✔	
1044A-60	1044AB-60	✔					✔
1045A	1045AB		✔				
1109A-10	1109AB-10		✔		✔	✔	
1124A	1124AB	✔					

Inch

Code No. w/lug	Code No. Flat-back				
1410A	1410AB	✔			
1411A	1411AB		✔		
1410A-10	1410AB-10	✔		✔	
1780A	1780AB	✔			
1781A	1781AB		✔		
1506A	1506AB	✔			
1507A	1507AB		✔		
1670A	1670AB	✔			
1671A	1671AB		✔		
1802A-10	1802AB-10	✔		✔	✔
1803A-10	1803AB-10		✔	✔	✔

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PROPRIETARY INSPECTION CERTIFICATE

SERIES 1 — Compact One Revolution Type for Error-free Reading

- The one revolution dial indicator (compact type) prevents the possibility of reading errors.
- Mitutoyo's unique shock-proof mechanism is incorporated, providing improved resistance to shock due to sudden spindle retraction caused by impact.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.

1929A

One revolution type Back Plunger dial gages are also available. (Refer to pages 07-59 to 07-62 for details.)

2990A-10

SPECIFICATIONS

Metric

ISO/JIS type ANSI/AGD type

Code No. w/lug	Code No. Flat-back	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm) Indication error 1/10 Rev	1/2 Rev	1 Rev	Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
1929A	**1929AB**	0.01	1 (1.4)	7	—	—	11	4	3	50-0-50	1.4 or less
1929A-62	**1929AB-62**	0.01	1 (1.4)	7	—	—	11	4	3	50-0-50	1.4 or less
1900A-10	**1900AB-10**	0.001	0.1 (0.14)	2.5	—	—	5	2	1	50-0-50	1.5 or less
1900A-72	**1900AB-72**	0.001	0.1 (0.14)	2.5	—	—	5	2	1	50-0-50	1.5 or less

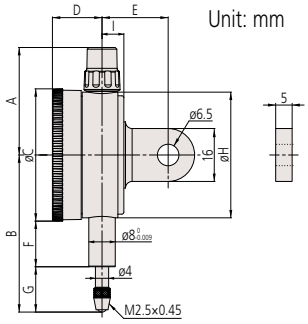
Inch

Code No. w/lug	Code No. Flat-back	Graduation (in)	Range (range/rev) (in)	Accuracy (in) First 1 Rev/2.5 Rev/10 Rev	Retrace	Repeat-ability (in)	Dial reading	Measuring force (N)
1909A-62	**1909AB-62**	0.0005	0.04 (0.056)	±0.0005/—/—	0.00016	±0.0001	20-0-20	1.4 or less
1910A-72	**1910AB-72**	0.0001	0.006 (0.008)	±0.0001/—/—	0.0001	±0.00003	3-0-3	1.5 or less

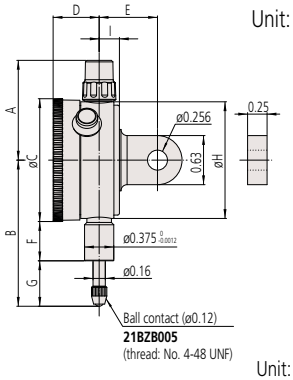
Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

ISO/JIS Type Unit: mm



ANSI/AGD Type Unit: in



Metric Unit: mm

Code No.	A	B	C	D	E	F	G	H	I	Mass (g) w/lug	Mass (g) Flat-back
1929A	32.5	47.5	40	15	20	13.8	13.7	38	6.6	90	70
1929A-62	32.5	47.5	40	15	20	13.8	13.7	38	6.6	90	70
1900A-10	32.5	53.5	40	15	20	13.8	19.7	38	6.6	95	75
1900A-72	32.5	53.5	40	15	20	13.8	19.7	38	6.6	95	75

Inch Unit: in

Code No.	A	B	C	D	E	F	G	H	I	Mass (g) w/lug	Mass (g) Flat-back
1909A-62	1.28	1.64	1.57	0.59	0.75	0.50	0.35	1.50	0.26	90	70
1910A-72	1.28	1.61	1.57	0.59	0.75	0.50	0.31	1.50	0.26	90	70

Note: Refer to pages 07-63 to 07-68 for details of contact points.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your local Mitutoyo Sales Office for more information.

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Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
  Refer to page 07-49 for details.

Balanced scale

Graduation: 0.001 mm,
Measuring range: 0.1 mm

1900A-10
- One revolution
- Shockproof
- Jeweled bearing

1900A-72
- One revolution
- Shockproof
- Dustproof
- Jeweled bearing

Balanced scale

Graduation: 0.01 mm,
Measuring range: 1 mm

1929A
- One revolution
- Shockproof

1929A-62
- One revolution
- Shockproof
- Dustproof

FEATURES

Metric ☐ ISO/JIS type ☐ ANSI/AGD type

Code No. w/lug	Code No. Flat-back					
1929A	1929AB	✔	✔			✔
1929A-62	1929AB-62	✔	✔		✔	✔
1900A-10	1900AB-10	✔	✔	✔		✔
1900A-72	1900AB-72	✔	✔	✔	✔	✔

Inch

Code No. w/lug	Code No. Flat-back					
1909A-62	1909AB-62	✔	✔		✔	✔
1910A-72	1910AB-72	✔	✔	✔	✔	✔

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SERIES 3, 4 — Long Stroke Type, Large Diameter

- Dial indicators with a large-diameter dial face for easy reading.
- The indicator is highly durable thanks to its oil- and water-tight design, quenched hardened stainless-steel, carbide contact point, and a grand gear made of wear- and deformation-resistant material.
- Application of an anti-reflective and hard surface coating improves scale visibility along with scratch and chemical resistance.

3109A-10

4046A

3058A-19

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
Refer to page 07-31 for details.

SPECIFICATIONS

Metric

ISO/JIS type ANSI/AGD type

Code No. w/lug	Code No. Flat-back	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm) Indication error 1/10 Rev	1/2 Rev	1 Rev	Measuring range	Hysteresis	Repeat-ability	Dial reading	Measuring force (N)
3046A	3046AB	0.01	10 (1)	5	9	10	15	3	3	±0-100	1.4 or less
3047A	3047AB	0.01	10 (1)	5	9	10	15	3	3	0-50-0	1.4 or less
3050A	3050AB	0.01	20 (1)	8	10	15	20	5	4	±0-100	2.0 or less
3052A-19	3052AB-19	0.01	30 (1)	10	12	15	25	7	5	±0-100	2.5 or less
3058A-19	3058AB-19	0.01	50 (1)	10	12	15	30	8	5	±0-100	3.0 or less
3060A-19*1	3060AB-19*1	0.01	80 (1)	12	17	20	45	9	5	±0-100	3.0 or less
3062A-19*1	3062AB-19*1	0.01	100 (1)	12	17	20	50	9	5	±0-100	3.5 or less
3109A-10	3109AB-10	0.001	1 (0.2)	2	3.5	4	5	2	0.5	0-100-0	1.5 or less
4046A	4046AB	0.01	10 (1)	5	9	10	15	3	3	±0-100	1.4 or less

Inch

Code No. w/lug	Code No. Flat-back	Graduation (in)	Range (range/rev) (in)	Accuracy*2 (in) First 1 Rev/2.5 Rev/10 Rev	Retrace	Repeat-ability (in)	Dial reading	Measuring force (N)
3414A	3414AB	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	±0-100	1.8 or less
3415A	3415AB	0.001	0.5 (0.1)	±0.001/±0.001/±0.001	0.0002	±0.0002	0-50-0	1.8 or less
3416A	3416AB	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	±0-100	1.8 or less
3417A	3417AB	0.001	1 (0.1)	±0.001/±0.001/±0.002	0.0002	±0.0002	0-50-0	1.8 or less
3424A-19	3424AB-19	0.001	2 (0.1)	±0.001/±0.001/±0.002 /±0.003 (20 Rev)	0.00033	±0.0002	±0-100	3.0 or less
3426A-19*1	3426AB-19*1	0.001	3 (0.1)	±0.001/±0.001/±0.002/±0.003 (20 Rev)/±0.005 (Over 20 Rev)	0.00033	±0.0002	±0-100	3.0 or less
3428A-19*1	3428AB-19*1	0.001	4 (0.1)	±0.001/±0.001/±0.002/±0.003 (20 Rev)/±0.005 (Over 20 Rev)	0.00033	±0.0002	±0-100	3.5 or less
3802A-10	3802AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	±0.00003	0-10	2.0 or less
3803A-10	3803AB-10	0.0001	0.025 (0.01)	±0.0001/±0.0001/—	0.0001	0±.00003	0-5-0	2.0 or less
4887A-19*1	4887AB-19*1	0.001	3 (0.1)	±0.001/±0.001/±0.002/±0.003 (20 Rev)/±0.005 (Over 20 Rev)	0.00033	±0.0002	±0-100	3.0 or less

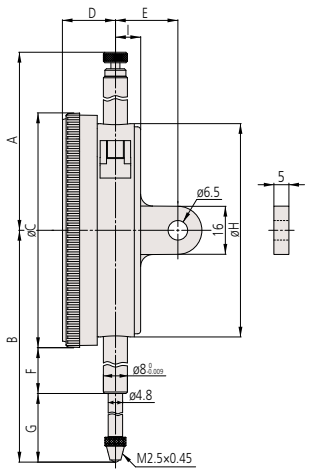
*1 Use in a vertical orientation (contact point downward) for the long stroke model.
*2 Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

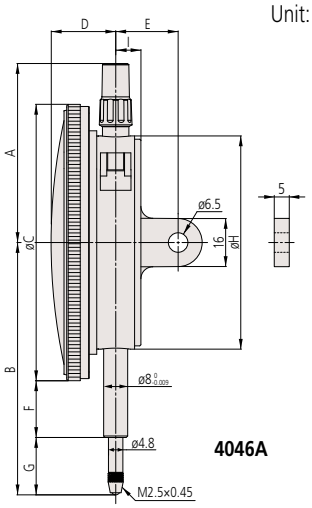
Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

DIMENSIONS

ISO / JIS Type

Unit: mm





Code No.	A	B	C	D	E	F	G	H	I
3046A	59.6	75.5	78	17.7	21	15.9	20.6	71	9
3047A	59.6	75.5	78	17.7	21	15.9	20.6	71	9
3050A	52.6	94	78	17.7	21	25.9	29.1	71	9
3052A-19*	72.9	104.3	78	17.7	21	25.9	39.4	71	9
3058A-19*	81.9	142.3	78	17.7	21	43.9	59.4	71	9
3060A-19*	120.9	202.3	78	17.7	21	73.9	89.4	71	9
3062A-19*	141.9	243.3	78	17.7	21	94.9	109.4	71	9
3109A-10	59.6	79	78	17.7	21	25.9	14.1	71	9
4046A	59.6	84	92	21.5	21	18.9	19.1	71	9

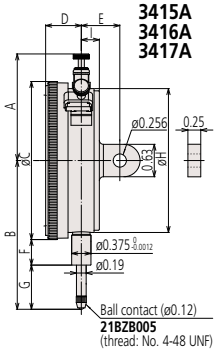
* The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. When replacing it with an optional contact point with a connector not exceeding ø7 mm in outside diameter, insert a washer (with ø7 mm outside diameter, ø3 mm inside diameter, and approximately 0.5 mm thickness) above the contact point.

Note: Refer to pages 07-63 to 07-68 for details of contact points.

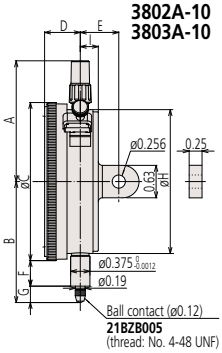
ANSI / AGD Type

Unit: in

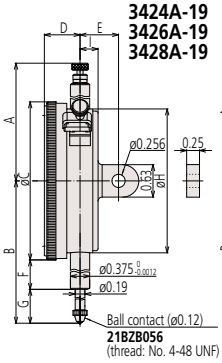
3414A
3415A
3416A
3417A



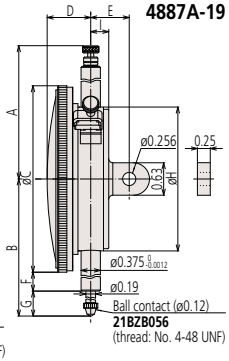
3802A-10
3803A-10



3424A-19
3426A-19
3428A-19



4887A-19



Code No.	A	B	C	D	E	F	G	H	I
3414A	2.07	2.89	3.07	0.70	3/4	0.50	0.86	2.80	0.35
3415A	2.07	2.89	3.07	0.70	3/4	0.50	0.86	2.80	0.35
3416A	2.07	3.39	3.07	0.70	3/4	0.50	1.36	2.80	0.35
3417A	2.07	3.39	3.07	0.70	3/4	0.50	1.36	2.80	0.35
3424A-19*	3.31	5.88	3.07	0.70	3/4	1.99	2.35	2.80	0.35
3426A-19*	4.84	7.80	3.07	0.70	3/4	2.91	3.35	2.80	0.35
3428A-19*	5.67	9.63	3.07	0.70	3/4	3.74	4.35	2.80	0.35
3802A-10	2.41	2.35	3.07	0.70	3/4	0.50	0.32	2.80	0.35
3803A-10	2.41	2.35	3.07	0.70	3/4	0.50	0.32	2.80	0.35
4887A-19*	4.84	7.80	3.62	0.85	3/4	2.63	3.35	2.80	0.35

* The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. When replacing it with an optional contact point with a connector not exceeding ø7 mm in outside diameter, insert a washer (with ø7 mm outside diameter, ø3 mm inside diameter, and approximately 0.5 mm thickness) above the contact point.

Note: Refer to pages 07-63 to 07-68 for details of contact points.

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SERIES 3, 4 — Long Stroke Type, Large Diameter

Continuous scale

Graduation: 0.01 mm,
Measuring range: 10 mm **3046A**

Balanced scale

Graduation: 0.01 mm,
Measuring range: 10 mm **3047A**

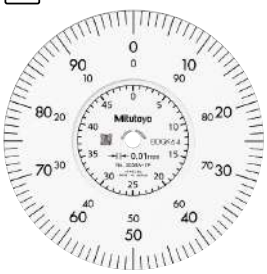
Continuous scale

Graduation: 0.01 mm,
Measuring range: 20 mm **3050A**

Continuous scale

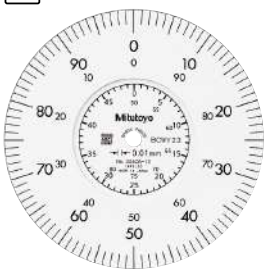
Graduation: 0.01 mm,
Measuring range: 30 mm **3052A-19**

Continuous scale



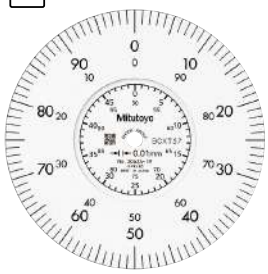
Graduation: 0.01 mm,
Measuring range: 50 mm **3058A-19**

Continuous scale



Graduation: 0.01 mm,
Measuring range: 80 mm **3060A-19**

Continuous scale

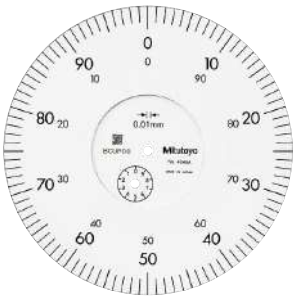


Graduation: 0.01 mm,
Measuring range: 100 mm **3062A-19**

Balanced scale

Graduation: 0.001 mm,
Measuring range: 1 mm **3109A-10**

Continuous scale



Graduation: 0.01 mm,
Measuring range: 10 mm **4046A**

FEATURES

Metric ISO/JIS type

Code No. w/lug	Code No. Flat-back						
3046A	3046AB	✔					
3047A	3047AB		✔				
3050A	3050AB	✔			✔		
3052A-19	3052AB-19	✔		✔		✔	✔
3058A-19	3058AB-19	✔		✔		✔	✔
3060A-19	3060AB-19	✔		✔		✔	✔
3062A-19	3062AB-19	✔		✔		✔	✔
3109A-10	3109AB-10		✔	✔		✔	
4046A	4046AB	✔					

Inch ANSI/AGD type

Code No. w/lug	Code No. Flat-back					
3414A	3414AB	✔				
3415A	3415AB		✔			
3416A	3416AB	✔				
3417A	3417AB		✔			
3424A-19	3424AB-19	✔		✔	✔	✔
3426A-19	3426AB-19	✔		✔	✔	✔
3428A-19	3428AB-19	✔		✔	✔	✔
3802A-10	3802AB-10	✔		✔	✔	
3803A-10	3803AB-10		✔	✔	✔	
4887A-19	4887AB-19	✔		✔	✔	✔

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ANSI/AGD Type Metric Dial Indicators with ø3/8 inch Stem and #4-48UNF-Thread Contact Point Compatible Type

Optional Accessories

- Backs (See pages 07-69 to 07-70)
- Contact points (See pages 07-63 to 07-68)

SPECIFICATIONS

Metric SERIES **1** ☐ ANSI/AGD type

Code No. w/lug	Code No. Flat-back	Graduation (mm)	Range (range/rev) (mm)	Accuracy (µm) First 1 Rev/2.5 Rev/10 Rev	Accuracy (µm) Retrace	Repeatability (µm)	Dial reading	Measuring force (N)
1230A-01	**1230AB-01**	0.01	2.5 (1)	±10/±10/—	3	±2	0-100	1.4 or less
1231A-01	**1231AB-01**	0.01	2.5 (1)	±10/±10/—	3	±2	0-50-0	1.4 or less
1044A-01	**1044AB-01**	0.01	5 (1)	±10/±10/±13	3	±3	±0-100	1.4 or less
1045A-01	**1045AB-01**	0.01	5 (1)	±10/±10/±13	3	±3	0-50-0	1.4 or less
1010A-11	**1010AB-11**	0.002	0.5 (0.2)	±2/±2/—	2	±1	0-20	1.5 or less
1011A-11	**1011AB-11**	0.002	0.5 (0.2)	±2/±2/—	2	±1	0-10-0	1.5 or less

Metric SERIES **2**

Code No. w/lug	Code No. Flat-back	Graduation (mm)	Range (range/rev) (mm)	Accuracy (µm) First 1 Rev/2.5 Rev/10 Rev	Accuracy (µm) Retrace	Repeatability (µm)	Dial reading	Measuring force (N)
2231A-01	**2231AB-01**	0.01	2.5 (1)	±10/±10/—	3	±3	0-50-0	1.4 or less
2046A-01	**2046AB-01**	0.01	10 (1)	±10/±10/±13	3	±3	±0-100	1.4 or less
2046A-11	**2046AB-11**	0.01	10 (1)	±10/±10/±13	3	±3	±0-100	1.4 or less
2047A-01	**2047AB-01**	0.01	10 (1)	±10/±10/±13	3	±3	0-50-0	1.4 or less
2047A-11	**2047AB-11**	0.01	10 (1)	±10/±10/±13	3	±3	0-50-0	1.4 or less
2902A-01	**2902AB-01**	0.01	10 (1)	±10/±10/±13	3	±3	100-0	1.4 or less
2050A-01	**2050AB-01**	0.01	20 (1)	±10/±10/±15/±20 (20 Rev)	4	±3	±0-100	2.0 or less
2056A-01	**2056AB-01**	0.01	25 (1)	±10/±10/±15/±20 (20 Rev)/ ±25 (Over 20 Rev)	4	±3	±0-100	2.5 or less
2109A-11	**2109AB-11**	0.001	1 (0.2)	±3/±3/±4	2	±0.3	0-10-0	1.5 or less
2119A-11	**2119AB-11**	0.001	5 (0.2)	±7/±7/±8/±10 (20 Rev)/ ±10 (Over 20 Rev)	2.5	±0.3	0-10-0	1.5 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

FEATURES

Metric ☐ ANSI/AGD type

Code No. w/lug	Code No. Flat-back								
1230A-01	**1230AB-01**								
1231A-01	**1231AB-01**								
1044A-01	**1044AB-01**								
1045A-01	**1045AB-01**								
1010A-11	**1010AB-11**				✔			✔	
1011A-11	**1011AB-11**				✔			✔	

Metric

Code No. w/lug	Code No. Flat-back									
2231A-01	**2231AB-01**									
2046A-01	**2046AB-01**									
2046A-11	**2046AB-11**				✔					
2047A-01	**2047AB-01**									
2047A-11	**2047AB-11**				✔					
2902A-01	**2902AB-01**									✔
2050A-01	**2050AB-01**									
2056A-01	**2056AB-01**									
2109A-11	**2109AB-11**				✔			✔		
2119A-11	**2119AB-11**				✔					

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PROPRIETARY INSPECTION CERTIFICATE

SERIES 2 — Special Dial Indicators

Adjustable hand dial indicator

- The hand position can be adjusted independently of the vertical movement of the spindle by rotating the top knob.

2048A-10

Optional Accessories

- Limit hand (2 pcs.), Bezel clamp
Refer to page 07-27 for details.

SPECIFICATIONS

Metric

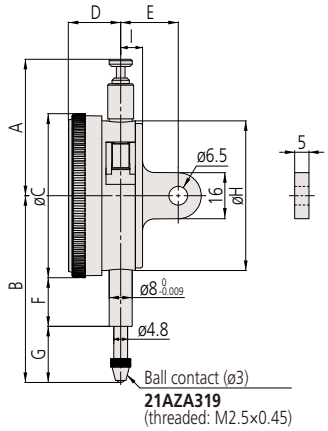
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm)						Dial reading	Measuring force (N)
				Indication error				Hysteresis	Repeat-ability		
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2048A-10	**2048AB-10**	0.01	10 (1)	5	9	10	15	3	3	±0-100	1.4 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

ISO/JIS Type

Unit: mm



Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2048A-10	47.4	64.9	57	18.1	20	16.9	19.5	52	7.6	144	135

Note: The shoulder on a contact point (standard accessory) acts as a stop to prevent spindle overrun that may otherwise damage the indicator. When replacing it with an optional contact point with a connector not exceeding ø7 mm in outside diameter, insert a washer (with ø7 mm outside diameter, ø3 mm inside diameter, and approximately 0.5 mm thickness) above the contact point.

Continuous scale

Graduation: 0.01 mm,
Measuring range: 10 mm

2048A-10

With coaxial revolution counter

Adjustable hand

Jeweled bearing

FEATURES

Metric

Code No.						
w/lug	Flat-back					
2048A-10	**2048AB-10**	✔	✔		✔	✔

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SERIES 2 — Special Dial Indicators

Optional Accessories
• Limit hand (2 pcs.), Bezel clamp
Refer to page 07-27 for details.

• A mechanism holds the pointer and the spindle at the position of maximum depression and hence displays the maximum value.

Note: Clearance of peak hold: Push the nut in the direction of the arrow indicated in the dimensional drawing for **2046A-80**.

2046A-80

SPECIFICATIONS

Metric

ISO/JIS type

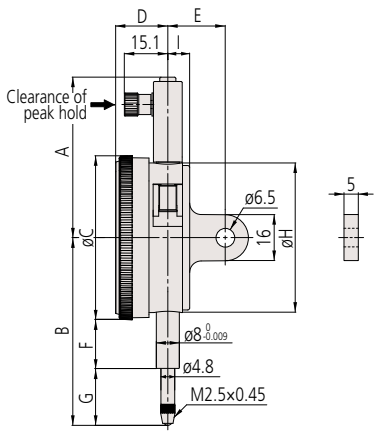
Code No.		Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (μm)						Dial reading	Measuring force (N)
				Indication error				Hysteresis	Repeat-ability		
w/lug	Flat-back			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2046A-80	**2046AB-80**	0.01	10 (1)	5	9	10	15	—	—	±0-100	5.0 or less

Note: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.

DIMENSIONS

ISO/JIS Type

Unit: mm



Code No.	A	B	C	D	E	F	G	H	I	Mass (g)	
										w/lug	Flat-back
2046A-80	55.8	65.2	57	18.1	20	16.9	19.8	52	7.6	158	149

Continuous scale

Graduation: 0.01 mm,
Measuring range: 10 mm

2046A-80

Peak retaining

FEATURES

Metric

Code No.					
w/lug	Flat-back				
2046A-80	**2046AB-80**	✔		✔	

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Back Plunger Type Dial Indicators SERIES 2

- The one revolution dial indicator (back plunger type) prevents the possibility of reading errors.
- Back plunger type dial indicators are suitable for mounting onto levelling machine tool tables or inspection jigs, and for use in situations where standard dial indicators are difficult to read.
- Mitutoyo's unique shockproof mechanism provides excellent durability and shock resistance.
- Model **2990A-10** provides 0.001 mm graduation.
- The red dead zone in the middle of the dial face is separated from the bezel and doesn't cover the graduations. Therefore, users can always see the range where accuracy is not guaranteed even if the bezel is rotated.

2960A

Holding bar (optional)

Code No.	øD (mm)	L (mm)
21AAA166	ø6	42
136567	ø6	81
124625	ø6.35	81
21AAA167	ø6.35	42
21AAA168	ø8	42
136568	ø8	81

Note: øD and L: detail shown in drawing below.

Optional Accessory

- Limit hand (2 pcs.)
  Refer to page 07-41 for details.

SPECIFICATIONS

Metric ISO/JIS type ANSI/AGD type

Code No.	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm)						Dial reading	Measuring force (N)
			Indication error				Hysteresis	Repeat-ability		
			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
2960A	0.01	1 (1.27)	8	—	—	14	4	3	50-0-50	1.4 or less
2990A-10	0.001	0.1 (0.14)	2.5	—	—	5	2	1	50-0-50	1.5 or less

Inch

Code No.	Graduation (in)	Range (range/rev) (in)	Accuracy (in)		Repeatbility (in)	Dial reading	Measuring force (N)
			First 1 Rev/2.5 Rev/10 Rev	Retrace			
2961A	0.0005	0.04 (0.05)	±0.0005/—/—	0.00016	±0.0001	20-0-20	1.4 or less
2991A-10	0.0001	0.008 (0.01)	±0.0002/—/—	0.0001	±0.00005	4-0-4	1.5 or less

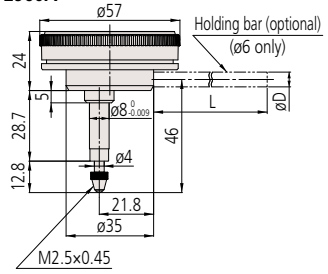
Note 1: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.
Note 2: The bezel clamp cannot be used.

DIMENSIONS

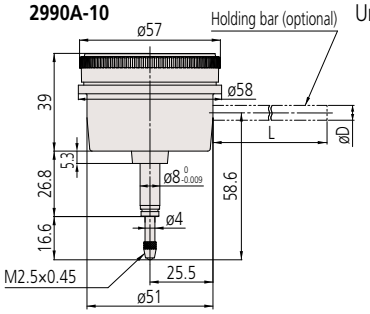
Unit: mm

ISO/JIS Type

2960A



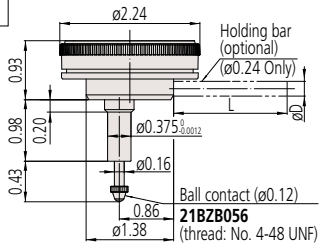
2990A-10



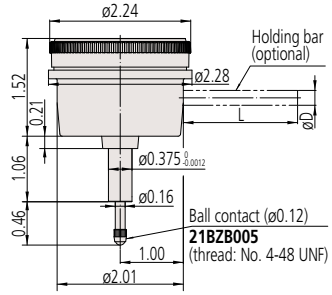
Unit: in

ANSI/AGD Type

2961A



2991A-10



Note 1: The shoulder on a contact point (standard accessory) for **2960A** and **2961A** acts as a stop to prevent spindle overrun that may otherwise damage the indicator. When replacing it with an optional contact point with a connector not exceeding ø7 mm in outside diameter, insert a washer (with ø7 mm outside diameter, ø3 mm inside diameter, and approximately 0.5 mm thickness) above the contact point.
Note 2: Refer to pages 07-63 to 07-68 for details of contact points.

Special specifications

Upon request, we can manufacture custom types with changed graduation numbers, graduation lines, dead zones, etc. Please contact your local Mitutoyo Sales Office for more information.

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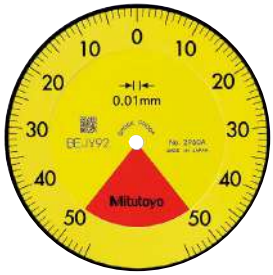
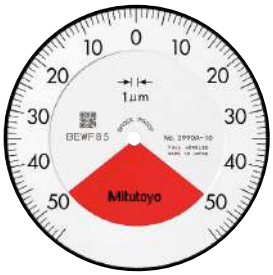
Balanced scale



Graduation: 0.01 mm,
Measuring range: 1 mm

2960A
- One revolution
- Shockproof
- Back Plunger

Balanced scale



Graduation: 0.001 mm,
Measuring range: 1 mm

2990A-10
- One revolution
- Shockproof
- Back Plunger
- Jeweled bearing

FEATURES

Metric — ISO/JIS type — ANSI/AGD type

Code No.					
2960A	✔	✔	✔		✔
2990A-10	✔	✔	✔	✔	✔

Inch

Code No.					
2961A	✔	✔	✔		✔
2991A-10	✔	✔	✔	✔	✔

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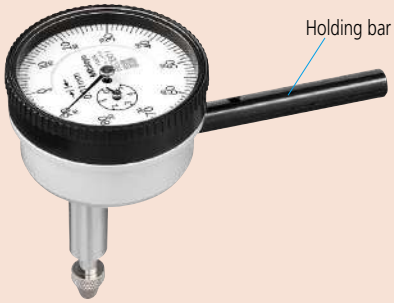
Back Plunger Type Dial Indicators SERIES 1

- Back plunger type dial indicators are suitable for mounting onto levelling machine tool tables or inspection jigs, and for use in situations where standard dial indicators are difficult to read.
- Models **1960A** and **1961A**, which use Mitutoyo's proprietary shock-proofing mechanism, have excellent durability and shock resistance.

1160A



SPECIFICATIONS

Metric

ISO/JIS type ANSI/AGD type

Code No.	Graduation (mm)	Range (range/rev) (mm)	Maximum permissible error (MPE) (µm)						Dial reading	Measuring force (N)
			Indication error				Hysteresis	Repeat-ability		
			1/10 Rev	1/2 Rev	1 Rev	Measuring range				
1960A	0.01	1 (1.27)	8	—	—	14	4	3	50-0-50	1.4 or less
1160A	0.01	5 (1)	8	12	14	16	4	3	±0-100	1.4 or less
1162A	0.01	5 (1)	8	12	14	16	4	3	100-0	1.4 or less

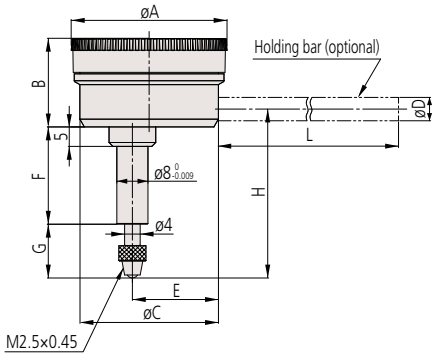
Inch

Code No.	Graduation (in)	Range (range/rev) (in)	Accuracy (in)		Repeatbility (in)	Dial reading	Measuring force (N)
			First 1 Rev/2.5 Rev/10 Rev	Retrace			
1961A	0.001	0.04 (0.05)	±0.001/—/—	0.0002	±0.0002	20-0-20	1.4 or less
1166A	0.001	0.2 (0.05)	±0.001/±0.001/±0.001	0.00033	±0.0002	±0-50	1.4 or less
1167A	0.001	0.2 (0.05)	±0.001/±0.001/±0.001	0.00033	±0.0002	0-25-0	1.4 or less
1168A	0.001	0.2 (0.05)	±0.001/±0.001/±0.001	0.00033	±0.0002	50-0	1.4 or less

Note 1: Completed products inspection is performed in the vertical orientation (contact point downward) and the stated accuracy is guaranteed.
Note 2: The bezel clamp cannot be used.

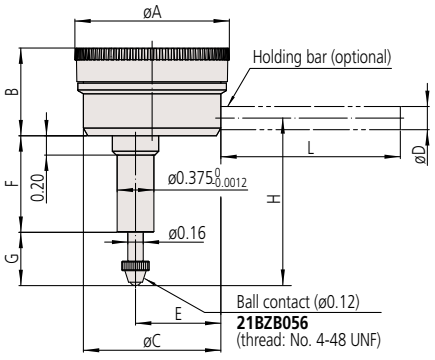
DIMENSIONS

ISO/JIS Type Unit: mm



Code No.	A	B	C	E	F	G	H	Mass (g) (Bar excluded)
1160A	40	22.7	35	21.8	25	13.8	43.3	80
1162A	40	22.7	35	21.8	25	13.8	43.3	80
1960A	40	22.7	35	21.8	28.7	12.8	46	80

ANSI/AGD Type Unit: in



Code No.	A	B	C	E	F	G	H	Mass (g) (Bar excluded)
1166A	1.57	0.89	1.38	7/8	0.98	0.51	1.67	80
1167A	1.57	0.89	1.38	7/8	0.98	0.51	1.67	80
1168A	1.57	0.89	1.38	7/8	0.98	0.51	1.67	80
1961A	1.57	0.89	1.38	7/8	0.98	0.43	1.59	80

Note 1: Contact point (standard accessory) for all products in this page has a role as a top dead point stopper. When replacing it with an optional contact point with a connector not exceeding ø7 mm in outside diameter, insert a washer (with ø7 mm outside diameter, ø3 mm inside diameter, and approximately 0.5 mm thickness) above the contact point.
Note 2: Refer to pages 07-63 to 07-68 for details of contact points.

Holding bar (optional)

Code No.	øD (mm)	L (mm)
21AAA166	ø6	42
136567	ø6	81
124625	ø6.35	81
21AAA167	ø6.35	42
21AAA168	ø8	42
136568	ø8	81

Note: øD and L: detail shown in drawing below.

Optional Accessories

- Limit hand (2 pcs.): **21AAB363**

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Continuous scale

Graduation: 0.01 mm,
Measuring range: 5 mm

1160A
Back Plunger

Reverse reading

Graduation: 0.01 mm,
Measuring range: 5 mm

1162A
Back Plunger

Balanced scale

Graduation: 0.01 mm,
Measuring range: 1 mm

1960A
One revolution
Shockproof
Back Plunger

FEATURES

Metric

ISO/JIS type ANSI/AGD type

Code No.						
1960A		✔	✔	✔		✔
1160A	✔					✔
1162A					✔	✔

Inch

Code No.						
1961A		✔	✔	✔		✔
1166A	✔					✔
1167A		✔				✔
1168A					✔	✔

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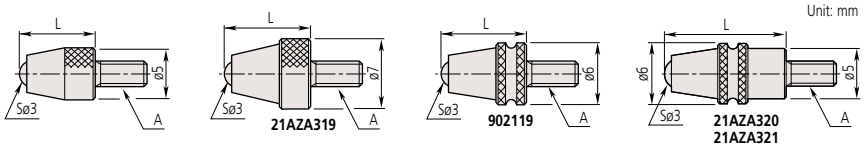
Optional Accessories for Digimatic and Dial Indicators and Linear Gages

Contact points, extension rod

- The thread of all contact points is M2.5 (P=0.45)×5 mm.
- After replacement, it must be tightened firmly to prevent looseness during use (recommended tightening torque: 50 N·cm).
- Carbide and ruby contact points are highly resistant to wear.

Standard contact point

Unit: mm



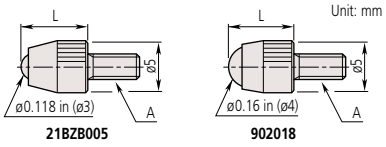
Note: Contact points for water-proof indicators are equipped with a groove to locate the rubber boot.

A: M2.5×0.45

Material / L (mm)	Carbide		Ruby	Plastic
	Without groove	With groove (water-proof type)	Without groove	Without groove
7.3	**901312**	—	**120047**	**901994**
8.3	**21AZA319**	**902119**	—	—
12.1	—	**21AZA320**	—	—
14	**21JAA225**	—	—	—
15	**120049**	—	**120051**	—
17	**21JAA224**	—	—	—
19.3	—	**21AZA321**	—	—
20	**137391**	—	**137392**	—
22	**21JAA226**	—	—	—
25	**120053**	—	**120055**	—
30	**21AAA252**	—	**21AAA253**	—

901312

Unit: mm



902119

A: 4-48UNF

Material / L (in)	Carbide	Plastic
1/4	**21BZB005**	**902018**

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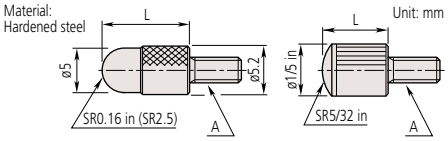
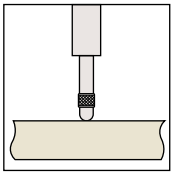
Shell Type Point

Contact point with a large radius.
Optimal for use on flat surfaces.

101118





A: M2.5×0.45

Code No.	L (mm)
101386	5
101118	10
137393	15
101387	20
101388	25
21AAA254	30

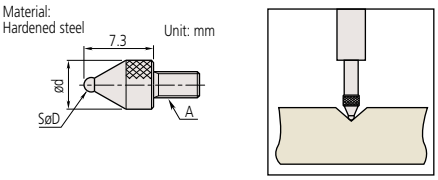
A: 4-48UNF

Code No.	L (in)
193697	3/32
101184	5/32
21AAA031	1/4
21AAA032	3/8
101185	1/2
21AAA033	5/8
101186	3/4
21AAA034	7/8
101187	1
21AAA035	1 1/4
21AAA036	1 1/2
21AAA037	1 3/4
21AAA038	2
21AAA039	2 1/4
21AAA040	2 1/2
21AAA041	2 3/4
21AAA042	3

Ball point

Optimal for workpieces with deep indentations.

101122



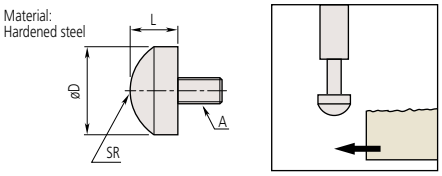
A: M2.5×0.45

Code No.	SøD (mm)	ød (mm)	Spherical tip material
21AAA349	1	5	Carbide
21AAA350	1.5	5	
101122	1.8	5	Hardened steel
21AAA351	2.5	5	Carbide
21AAA352	4	5	

Spherical Point

A large radius makes this contact point optimal for use where the workpiece needs to slide from the side.

101119



A: M2.5×0.45

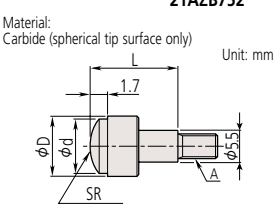
Code No.	øD (mm)	L (mm)	SR (mm)
111460	5.5	3	5
125258	7.9	5	5
101119	10	5	7

A: 4-48UNF

Code No.	øD (in)	L (in)	SR (in)
101205	1/2	1/8	0.35
101204	3/8	3/32	0.28

Spherical Point (Carbide)

21AZB752



A: M2.5×0.45

Code No.	øD	ød	L	SR
21AZB751	5.2	4.3	5	5
21AZB752	7.5	6.5	10	7
21AZB753	10.5	9.5	10	10

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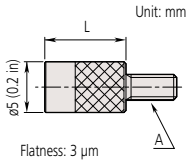
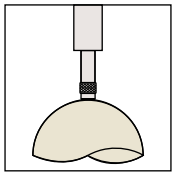
Flat Point

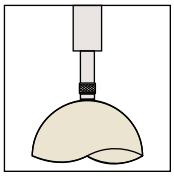
131365

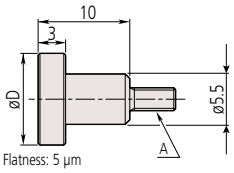


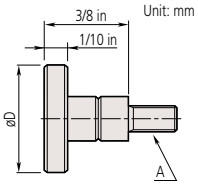


Material: Hardened steel

101117







A: M2.5×0.45

Code No.	L
131365	8
21AAB715	10

A: 4-48UNF

Code No.	L (in)
133017	5/16
21AAA043	1/2
21AAA044	3/4
21AAA045	1

A: M2.5×0.45

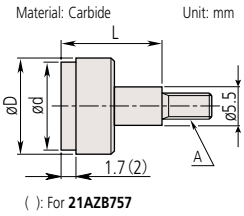
Code No.	øD
101117	10
21AAB711	15
21AAB712	20
21AAB713	25
21AAB714	30

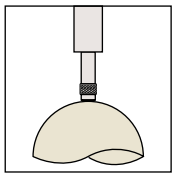
A: 4-48UNF

Code No.	øD (in)
101188	1/2
101189	3/8

Flat Point (Carbide)

21AZB758



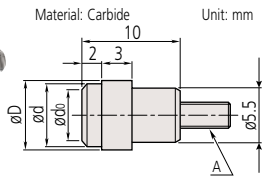


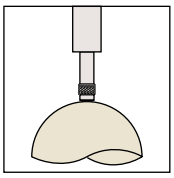
A: M2.5×0.45

Code No.	øD	ød	L
21AZB756	5.2	4.3*1	5
21AZB757	7	6.5*1	10
21AZB758	10.5	9.5*1	10
21AZB760	17	15*2	10
21AZB761	22	20*2	10
21AZB762	27	25*2	10
21AZB763	32	30*2	10

Flatness: *1: 3 µm, *2: 5 µm

21AZB754



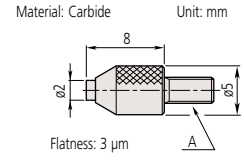


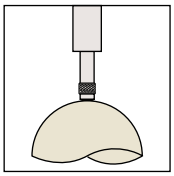
A: M2.5×0.45

Code No.	ød0	ød	øD
21AZB754	3	6.4	7
21AZB755	4.5	8	9

Flatness: 3 µm

21AZB759





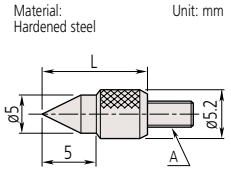
A: M2.5×0.45

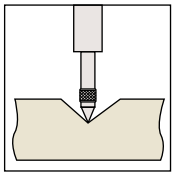
Code No.
21AZB759

Conical Point

Used for positioning the measurement point.
Since it can damage a workpiece easily, it is not suitable for use on soft materials.

101120





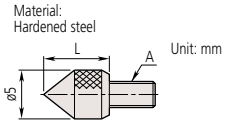
A: M2.5×0.45

Code No.	Tip angle	L
101120	60°	10

A: 4-48UNF

Code No.	Tip angle	L (in)
101190	60°	1/2

101385



A: M2.5×0.45

Code No.	Tip angle	L
101385	90°	5

A: 4-48UNF

Code No.	Tip angle	L (in)
101191	90°	1/4

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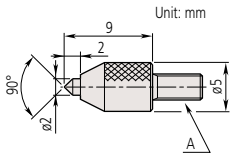
Conical Point (Carbide)

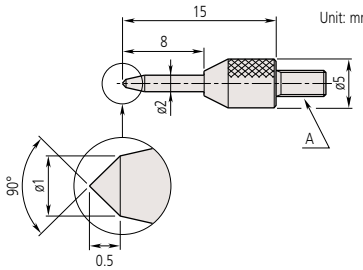
21AZB764



A: M2.5×0.45

Code No.
21AZB764

21AZB765



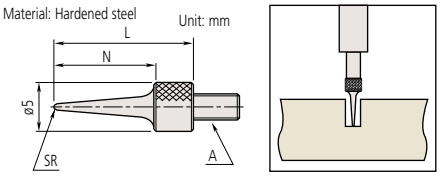
A: M2.5×0.45

Code No.
21AZB765

Needle Point

Suitable for probing the bottom of a groove or hole.

101121



A: M2.5×0.45

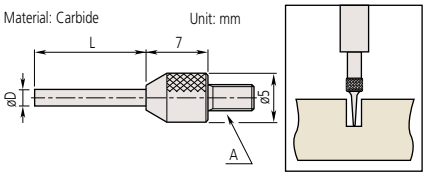
Code No.	N	L	SR
101121	11	15	0.4
137413	13	17	0.2
21AAA255	21	25	0.4
21AAA256	31	35	0.4

A: 4-48UNF

Code No.	L (in)	SR (in)
21AAA030	0.6	0.016
21AAA046	1	0.016
21AAA047	1 1/2	0.016
21AAA048	2	0.016

Needle Point (Carbide)

137257



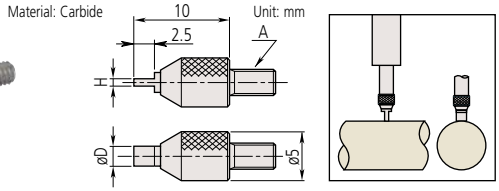
A: M2.5×0.45

Code No.	øD	L
120066	0.45	3
21AAA329	0.45	5
120065	1	3
21AAA330	1	5
21AAA331	1	8
21AAA332	1	10
21AAA333	1	20
21AAA334	1	40
21AAA335	1.5	5
21AAA336	1.5	10
120064	1.5	13
21AAA337	1.5	20
21AAA338	1.5	40
137257	2	8
21AAA257	2	18
21AAA258	2	28
21AAA339	2	40

Blade Point (Carbide)

Suitable for measuring cylinders.

21AZB768



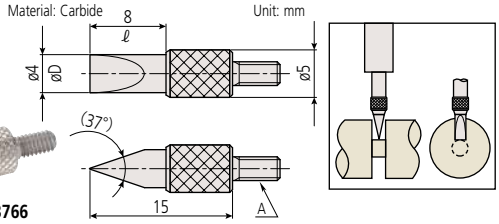
A: M2.5×0.45

Code No.	H	øD
21AZB767	0.4	2
21AZB768	0.6	2
21AZB769	1	4

Knife Edge Point (Carbide)

Suitable for measuring narrow groove diameter, etc.

21AZB766



A: M2.5×0.45

Code No.
21AZB766

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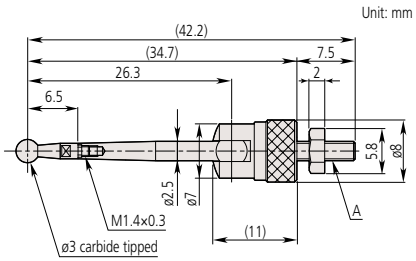
Optional Accessories for Digimatic and Dial Indicators and Linear Gages

Lever Point

Suitable for use* on perpendicular faces, such as those within mold cavities. Lever can be adjusted to the required angle.

* Perform measurement in the same posture and conditions as for the reference setting so that variation due to lever deflection is reduced. Gently bring the contact point into touch with the workpiece. Use a dial indicator with as small a measuring force as possible.

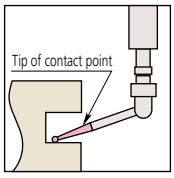


A: M2.5×0.45

Code No.
900391

A: 4-48UNF

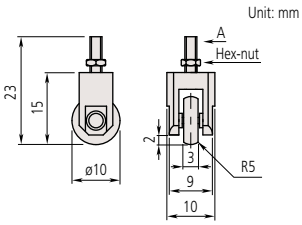
Code No.
900393



The tip of contact point is interchangeable.
Interchangeable contact points (optional)
ø1 mm contact point: **102824**
ø2 mm contact point: **102825**
ø3 mm contact point: **102826** (provided as standard)

Roller Point

Suitable for use on a moving workpiece surface, or where the workpiece needs to slide from the side.



A: M2.5×0.45

Code No.
901954

A: 4-48UNF

Code No.
901991

Roller material: Hardened steel
Roller runout: 10 µm or better
Note 1: For a different roller diameter, contact your local Mitutoyo sales office.
Note 2: High-accuracy roller with 5 µm runout is also available. (Special order item)

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Interchangeable Contact Point Set

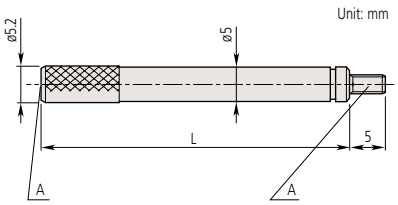
This set consists of six types of popular contact points for extending the use of an indicator to many applications.

Set code No. **7822**

M2.5×0.45

Code No.	Contact points included
131365	Flat Point (ø5 mm)
101117	Flat Point (ø10 mm)
101121	Needle Point
101119	Spherical Point
101118	Shell Type Point (R2.5×10)
101387	Shell Type Point (R2.5×20)

Extension Rod

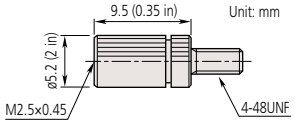


A: M2.5×0.45

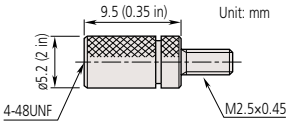
Code No.	L
303611	10
21AAA259A	15
303612	20
21AAA259B	25
303613	30
21AAA259C	35
21AAA259D	40
21AAA259E	45
21AAA259F	50
21AAA259G	55
304146	60
21AAA259H	65
21AAA259J	70
21AAA259L	75
21AAA259M	80
304147	90
303614	100

A: 4-48UNF

Code No.	L (in)
139167	1/2
301655	1
301657	2
301659	4



Code No.
21AAA011



Code No.
21AAA012

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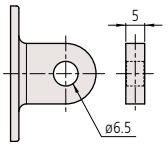
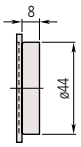
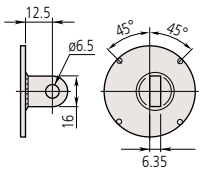
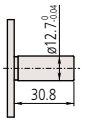
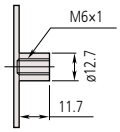
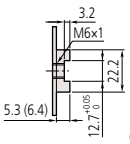
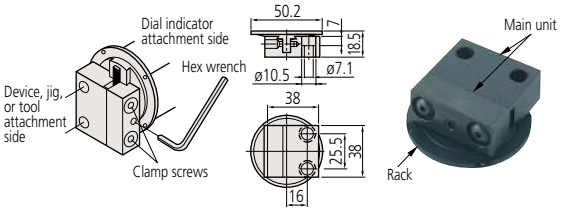
Interchangeable Back Covers
Optional Accessories for Digimatic and Dial Indicators

Various back covers

- A wide variety of indicator back cover types is available for Mitutoyo Digimatic and dial indicators.
- Most lugged back covers can be rotated by 90° because they have four retaining screws. However, **190561** and **137905** (for compact dial indicators) are only equipped with two retaining screws, therefore the lug orientation cannot be changed.

Description		
Lug-on-Center Back Clamped by securing the lug section.	 Unit: mm	
Flat Back Cannot be clamped by means of the back cover.	Unit: mm	
Magnetic Back (Magnetic force: 10 N) Can be easily attached to the flat surfaces of iron plates or machine tools with a magnet.	 Unit: mm	
Back with Offset Lug One side of the lug section is on the center line.	 Unit: mm	
Back with Post Used by clamping the ø12.7 pillar section.	 Unit: mm	
Back with Screw Mount Clamped with a screw with its thread as a guide.	 Unit: mm	
Adjustable Back Can be slid with the groove as a guide. Clamped with a screw.	 Unit: mm	
Back with Adjustable Bracket Can be attached to a device, jig, or tool and easily fine-tuned vertically with a hex wrench. (Travel range: Approx. 20 mm) Attachment procedure 1. Attach only the back cover with rack to the dial indicator. 2. Attach the main unit to a device, jig, or tool with M6 hexagon socket head cap screws. 3. Insert the back cover with rack into the main unit. 4. Use the supplied hex wrench (3/32") to fine-tune and fix with clamp screws.	 Unit: mm	

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Selection table for various back covers

- If the back cover of water-proof model is replaced, the water resistance will not be guaranteed.
- When mounting a back cover to lightweight type Series (**297*AB**), separately prepare 4 fixing screws (**546666** Self-tapping screw only for plastic). Do not apply a tightening torque of more than 20 N·cm in order to avoid stripping the screw threads.

Dial Indicators

Metric

	Bezel diameter	31 mm	36 mm	40 mm	40 mm (W/D proof models)	55.6/57 mm	55.6 mm (W/D proof models)	57 mm (W/D proof models)	78/92 mm
Back Covers	Lug-on-Center Back	**190561**	**137905**	**101210**	**101210**	**101040**		**21AZB230**	**100691**
	Flat Back	**191559**	**137906**	**101211**	**136872**	**101039**	**192910**	**21AZB231**	**100836**
	Magnetic Back	—				**900928**			**900929**
	Back with Offset Lug	—				**101167**			—
	Back with Post	—		**193172**		**101169**			—
	Back with Screw Mount	—		**193173** (M6×1)		**136023** (M6×1)			—
	Adjustable Back	—		**136025** (M6×1)		**136026** (M6×1)			—
	Back with Adjustable Bracket	—				**901963**			—

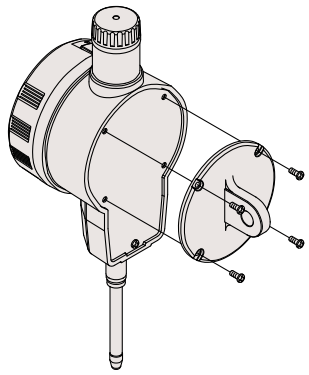
Inch

	Bezel diameter	1.22 in	1.57 in	1.57 in (W/D proof models)	2.19/2.24 in	2.19 in (W/D proof models)	2.24 in (W/D proof models)	3.07/3.62 in
Back Covers	Lug-on-Center Back	**190139**	**101307**	**101307**	**101306**		**21BZB104**	**100797**
	Flat Back	**191559**	**101211**	**136872**	**101039**	**192910**	**21AZB231**	**100836**
	Magnetic Back	—			**900928**			**900929**
	Back with Offset Lug	—			**101167**			—
	Back with Post	—	**193172**		**101169**			—
	Back with Screw Mount	—			**101170** (#1/4-28UNF)			—
	Adjustable Back	—	**129721** (#1/4-20UNC)		**101168** (#1/4-20UNC)			—
	Back with Adjustable Bracket	—			**901963**			—

Digimatic Indicators

	Series/model	•**ID-FNX** Series (12.7 mm models) •**ID-CNX** Series (12.7 mm models) •**ID-CAX** Series •**ID-SX** Series		•**ID-FNX** Series (25.4, 50.8 mm models)* •**ID-CNX** Series (25.4, 50.8 mm models)*		•**ID-CJX** Series •**ID-SPX** Series	
	Type	ISO/JIS	ASME/ANSI/AGD	ISO/JIS	ASME/ANSI/AGD	ISO/JIS	ASME/ANSI/AGD
Back Covers	Lug-on-Center Back	**101040**	**101306**	**101040**	**101306**	**21AZB230**	**21BZB104**
	Flat Back	**101039**		—		**21AZB231**	
	Magnetic Back	**900928**					
	Back with Offset Lug	**101167**					
	Back with Post	**101169**					
	Back with Screw Mount	**136023** (M6×1)	**101170** (#1/4-28UNF)	**136023** (M6×1)	**101170** (#1/4-28UNF)	**136023** (M6×1)	**101170** (#1/4-28UNF)
	Adjustable Back	**136026** (M6×1)	**101168** (#1/4-20UNC)	**136026** (M6×1)	**101168** (#1/4-20UNC)	**136026** (M6×1)	**101168** (#1/4-20UNC)
	Back with Adjustable Bracket	**901963**					

* For the **ID-CNX**, **ID-FNX** Series (25.4, 50.8 mm/1, 2 inch models), attach the back covers as shown below.



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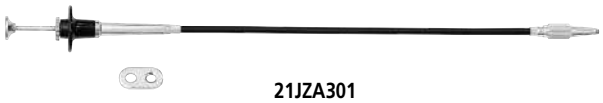
Spindle Lifting Lever and Cable
Optional Accessories for Digimatic and Dial Indicators

Spindle Lifting Cable

- The spindle can be moved up and down using the lifting lever or the lifting cable.
- Attaching the dial indicator to a stand improves measurement accuracy and efficiency.

Lifting cable
Stroke: 10 mm



21JZA301

21JZA295

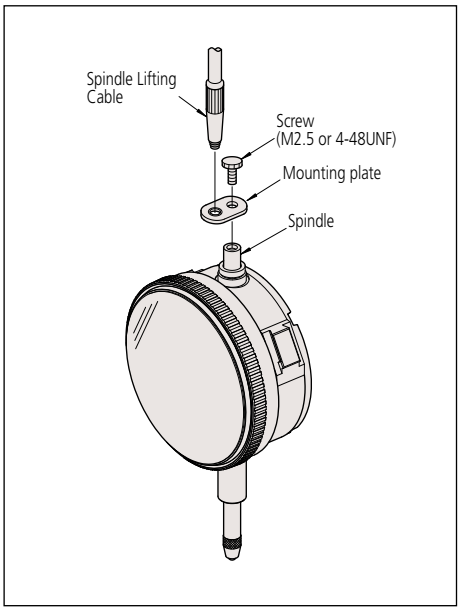
21JZA301: with auto-stop function (300 mm)
21JZA295: without auto-stop function (500 mm)

Note 1: This accessory is not applicable to dial indicators with a range of 20 mm or more, special models (**2048A(B)-10, 2046A(B)-80**), certain models of 1 series (**1911A(B)-10**, **1913A(B)-10**, **1921A(B)-10**, **1923A(B)-10**, **1925A(B)-10**, **2971AB**, **2972AB**, **2973AB**, **2976AB**, **2977AB**, **2978AB**), back plunger type and water-proof type.
Note 2: The lifting cable is attached to the spindle. Therefore, its weight is added to the measuring force. (Approximately 0.3 N max.)

Spindle Lifting Lever

21EAA426
Suitable for 4.8 mm spindle diameter.

Typical application



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Spindle Lifting Lever (A type)

902100[*1]
Use for A type SERIES **1** dial indicators.

21EZA198[*2]
Use for A type SERIES **2**, **3**, and **4** dial indicators (up to 10 mm/0.4 in).

21AZB149: Lever
101171: Stop screw

21AZB150[*2]
Use for A type SERIES **2** and **3** dial indicators (from 10 mm/0.4 in up to 20 mm/0.8 in).

Spindle Lifting Lever (S type)

902100[*1]
Use for S type SERIES **1** dial indicators.

21AZB149[*2]
Use for S type SERIES **2**, **3**, and **4** dial indicators (up to 10 mm/0.4 in).

21AZB150[*2]
Use for S type SERIES **2** and **3** dial indicators (from 10 mm/0.4 in up to 20 mm/0.8 in).

Spindle Lifting Lever (for ID-SS, ID-SX, ID-CX, ID-CNX)

21EZA198[*1*3]

21AZB149: Lever
101171: Stop screw

*1 Before use, replace the stop screw with the standard accessory.
*2 Use the stop screw already fixed to the dial indicator body.
*3 Stop screw is for mm model.

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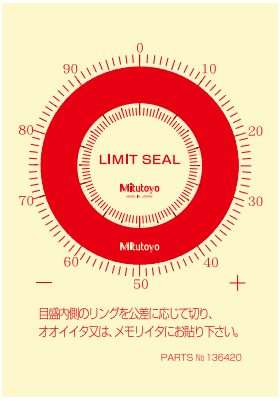
Limit Stickers

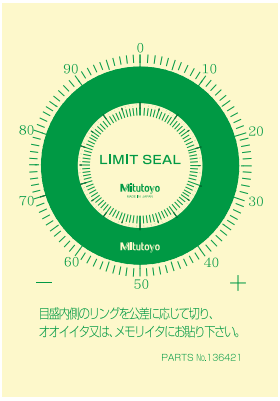
- Place limit stickers on a SERIES **2** indicator dial face or crystal to indicate tolerance limits. Stickers are available in: red, green, and yellow.

Red



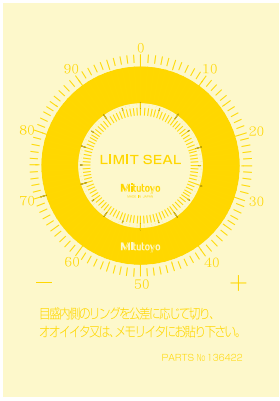
136420
(10 sheets/set)

Green



136421
(10 sheets/set)

Yellow



136422
(10 sheets/set)

Color-coded Spindle Caps

- 9 color-coded spindle caps are available for compact/standard dial indicators with a range of 10 mm or less.

Color	Code No.	
	Standard	Water-proof
Black	**21AAB675**	**21AAB676**
White	**21AAB675W**	**21AAB676W**
Red	**21AAB675R**	**21AAB676R**
Green	**21AAB675G**	**21AAB676G**
Blue	**21AAB675B**	**21AAB676B**
Yellow	**21AAB675Y**	**21AAB676Y**
Orange	**21AAB675D**	**21AAB676D**
Pink	**21AAB675P**	**21AAB676P**
Navy	**21AAB675S**	**21AAB676S**

Note: This accessory is not applicable to **1003A(B)**, **1911A(B)-10**, **1913A(B)-10**, **1921A(B)-10**, **1923A(B)-10**, **1925A(B)-10**, **2971AB**, **2972AB**, **2973AB**, **2976AB**, **2977AB**, and **2978AB**.

Note: When attaching to small dial indicators, the measuring range height will be 8 mm taller.

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Dial Indicator Repair Tools
Optional Accessories for Dial Indicators

Replacing bezels and graduation plates

A bezel and graduation plate must be swaged together so that the graduation plate always rotates with the bezel. Assemblies comprised of a swaged bezel and graduation plate are available for some models.

Code No. of dial indicators	Code No. of swaged assemblies
2046A	**21AZB650**
2109A-10	**21AZB693**

Special repairing technique is necessary for repair work. Note that we cannot guarantee accuracy if critical parts are disassembled.
We recommend that you use our repair service to operate the instrument with peace of mind.

Pointer removing tip (ø0.8) (**126630**)

Pointer removing tool (**126628**)

Pointer removing tip (ø0.5) (**126630B**)

Pointer removing tip (ø1.6) (**126630C**)

Adjustable nut (**100699**)

Pinion rest (**129735**)

Pin rest (**129731**)

Spindle rest (**129730**)

Reamer for pointer (ø0.5: 1/20 taper) (**21JAA273**)

Punch (**129733**)

Reamer (ø0.6: 1/50 taper) (**193702**)

Bearing adjuster (**129734**)

Reamer (ø1: 1/50 taper) (**129736**)

Pin remover (**129732**)

Typical applications

Remove the long hand
Select an appropriate pointer removing tip for the diameter of the hole of the long hand, and attach it to the pointer removing tool using the adjustable nut.
Push the pivot with the pointer removing tool to remove the long hand.

Remove or replace a pin
Place the spindle on the V-groove of the spindle rest. Remove the pin using the pin remover and a commercially available hammer.
To press-fit the pin, tap it directly using a hammer, etc.

Replace the long or little hand
Screw the pinion rest into the pin rest.
Support the pinion with the pinion rest and press-fit the pointer using the punch and a commercially available hammer, etc. When replacing with a new pointer on an old type of dial indicator or test indicator, reaming is necessary before press-fitting. Use a commercially available pin device (for ø0.8 to 1.2) with one of the following reamers attached.

- Pointers of dial indicators (**A** type) and **TI-X** Series*1 do not require a reamer.
- Use the reamer for pointer (ø0.5: 1/20 taper) for **S** type and **T** type dial indicators*2.
- Depending on the shaft diameter, use reamer (ø1: 1/50 taper) or reamer (ø0.6: 1/50 taper) for **F** type dial indicators and other than **TI-X** Series dial test indicators.

*1 Dial test indicator whose model No. ends in "**X**".
*2 Dial indicator whose code No. includes an "**S**" and "**T**".

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SERIES 513 — Dial Test Indicator Features

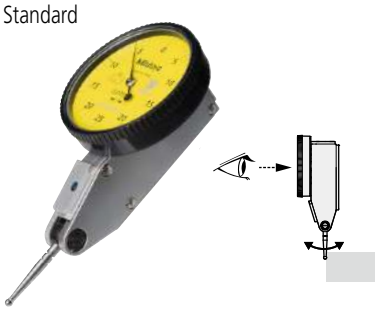
Provides easy access to narrow or recessed areas that cannot be reached with conventional dial indicators.

- Five types are available: standard, standard (20° Tilted face), vertical, horizontal, and universal, allowing users to select the model most suited to their needs.
- Newly designed contact point holder prevents backlash and permits smooth pointer operation.
- Ruby tip has wear-resistance several times greater than a carbide tip and, since it is nonconductive, it can be used safely on an electrical discharge machine.
- The pointer and carbide contact point are weakly magnetic.

  Note 1: Magnetic material is used for some internal parts.
- Contact point length is printed on dial face to avoid accuracy issues.

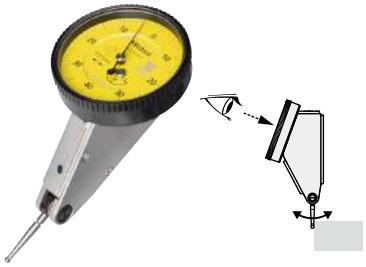
  Note 2: Attaching a contact point of incorrect length will lead to measurement failure.
- Glare-free flat crystal face allows easy reading of graduations. Multi-layer and composite coatings provide a more stain-resistant, anti-reflective crystal.
- Bonding the bezel and crystal together leaves no gap for cutting fluid or oil to penetrate through to the dial face. (Note that this type is NOT water-proof.)
- The main unit is equipped with three dovetails to which the stem with dovetail groove ø6 (standard accessory) can be attached. This greatly improves convenience as the attachment location can be adjusted as needed.
- Metric Dial Test Indicator is inspected according to JIS B 7533:2015. Standard, 20° tilted face, and vertical types are inspected with the dial face in the upward orientation, while the horizontal type is inspected with the dial face in the vertical orientation to guarantee their accuracy.

Standard



Vertical

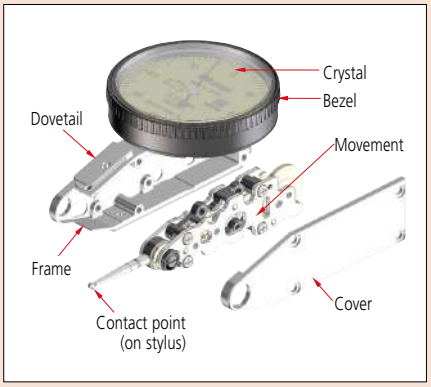
Standard
(20° Tilted face)



Horizontal

Universal

Naming of parts



Feature icons

Icon	Feature description
	High accuracy
	With revolution counter
	Long contact point
	Standard
	Double scale spacing
	Compact (Small face diameter)
	Carbide contact point
	Ruby contact point (Non-conductive and abrasion resistant)

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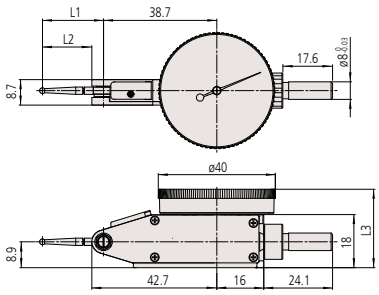
Dial Test Indicator
SERIES 513 — Standard Type

DIMENSIONS

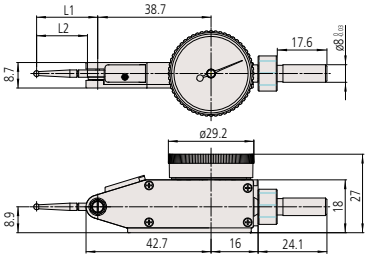
Standard

Unit: mm



Code No.	L1	L2	L3
513-401-10E	14.7	11.2	27
513-471-10E			
513-405-10E/A/T	18.7	15.2	
513-475-10E			
513-425-10E/A			28
513-404-10E/A/T	20.9	17.4	27
513-474-10E			
513-424-10E/A/T	22.2	18.7	
513-426-10E/A			28
513-478-10E			27
513-414-10E/A/T	37.4	33.9	
513-415-10E/A/T	44.5	41.0	
513-477-10E			

Compact



Type	Code No.	L1	L2
Compact	513-465-10E	18.7	15.2
	513-464-10E	20.9	17.4
	513-466-10E	22.2	18.7

Note: A slight difference may occur depending on the center of the contact point, graduation plate, and stem fixing position, etc.

Special Set: 513-908-10E (Metric)

513-404-10E: Dial test indicator
7014-10: Mini magnetic stand

513-907-10E (inch)

513-402-10E: Dial test indicator
7014E-10: Mini magnetic stand

513-404-10E
Contact point No. 103006

Graduation: 0.01 mm
Range: 0.8 mm

513-404-10E / 10A / 10T
Standard
Carbide contact point

Graduation: 0.01 mm
Range: 0.5 mm

513-424-10E / 10A / 10T
Standard
Double scale spacing
Carbide contact point

513-415-10E
Contact point No. 136013

Graduation: 0.01 mm
Range: 0.5 mm

513-414-10E / 10A / 10T
Long contact point
Carbide contact point
Double scale spacing

Graduation: 0.01 mm
Range: 1.0 mm

513-415-10E / 10A / 10T
Long contact point
Carbide contact point

513-465-10E
Contact point No. 103011

Graduation: 0.002 mm
Range: 0.2 mm

513-405-10E / 10A / 10T
Standard
Carbide contact point

Graduation: 0.002 mm
Range: 0.6 mm

513-425-10E / 10A
With revolution counter
Carbide contact point

Graduation: 0.002 mm
Range: 0.2 mm

513-465-10E
Compact
Carbide contact point

Graduation: 0.001 mm
Range: 0.14 mm

513-401-10E
High accuracy
Carbide contact point

513-402-10E
Contact point No. 133195

Graduation: 0.0005 in
Range: 0.03 in

513-402-10E / 10T
Standard
Carbide contact point

Graduation: 0.0001 in
Range: 0.008 in

513-403-10E / 10T
Standard
Carbide contact point

Note: **513-4XX-10** is indicated on the dial face and the inspection certificate.
The code No. with suffix (E/T/A) is a set item which includes accessories. The main unit is not available as a standalone item.

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Dial Test Indicator
SERIES 513 — Standard Type

SPECIFICATIONS

Metric

Code No.			Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)*1 (μm)					Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Plus set	Full set				Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability											
513-424-10E	**513-424-10A**	**513-424-10T**	0.01	0.5	0-25-0	6	–	5	4	3	45	0.3 or less				✔	✔		✔	
513-478-10E	–	–														✔	✔			✔
513-466-10E	–	–									41						✔	✔	✔	
513-414-10E	**513-414-10A**	**513-414-10T**				10			5		45	0.2 or less			✔		✔		✔	
513-426-10E	**513-426-10A**	–		1.5		16	10					0.4 or less		✔			✔		✔	
513-404-10E	**513-404-10A**	**513-404-10T**		0.8	0-40-0	9	–		4			0.3 or less				✔			✔	
513-474-10E	–	–														✔				✔
513-464-10E	–	–									41							✔	✔	
513-415-10E	**513-415-10A**	**513-415-10T**		1.0	0-50-0	10	–		5		45	0.2 or less			✔				✔	
513-477-10E	–	–													✔					✔
513-405-10E	**513-405-10A**	**513-405-10T**	0.002	0.2	0-100-0	4		2	3	1		0.3 or less				✔			✔	
513-475-10E	–	–														✔				✔
513-465-10E	–	–									41							✔	✔	
513-425-10E	**513-425-10A**	–		0.6		7	5		4		45	0.4 or less		✔					✔	
513-401-10E	–	–	0.001	0.14	0-70-0	4	–		3			0.3 or less	✔						✔	
513-471-10E	–	–											✔							✔
513-908-10E*2	–	–	0.01	0.8	0-40-0	9	–	5	4	3	45					✔			✔	

Inch

Code No.			Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)*1 (in)			Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Plus set	Full set				One rev.	Hysteresis	Repeatability										
513-402-10E	–	**513-402-10T**	0.0005	0.03	0-15-0	±0.0005	0.0002	±0.0002	45	0.3 or less				✔			✔	
513-472-10E	–	–												✔				✔
513-412-10E	–	**513-412-10T**								0.2 or less			✔				✔	
513-479-10E	–	–											✔					✔
513-462-10E	–	–							41							✔	✔	
513-407-10E	–	**513-407-10T**	0.00005	0.008	0-4-0	±0.0001	0.0001	±0.00004	45	0.3 or less							✔	
513-403-10E	–	**513-403-10T**	0.0001											✔			✔	
513-473-10E	–	–												✔				✔
513-463-10E	–	–							41							✔	✔	
513-907-10E*3	–	–	0.0005	0.03	0-15-0	±0.0005	0.0002	±0.0002	45					✔			✔	

Metric / Inch

Code No.			Graduation	Range	Dial reading	Maximum permissible error (MPE)*1 (μm)				Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Plus set	Full set				Measuring range	10 scale divisions	Hysteresis	Repeatability										
513-409-10E	–	**513-409-10T**	0.002 mm /0.0001 in	0.2 mm /0.0076 in	0-10-0 /0-38-0	4	2	3	1	45	0.3 or less							✔	

Inch / Metric

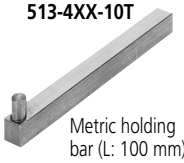
Code No.			Graduation	Range	Dial reading	Maximum permissible error (MPE)*1 (in)			Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Plus set	Full set				One rev.	Hysteresis	Repeatability										
513-406-10E	–	**513-406-10T**	0.0005 in /0.01 mm	0.03 in /0.7 mm	0-15-0 /0-35-0	±0.0005	0.0002	±0.0002	45	0.3 or less							✔	

*1 We guarantee the accuracy of completed products by inspecting them with the dial face facing upward.
*2 A set consisting of **513-404-10E** and **7014-10**.
*3 A set consisting of **513-402-10E** and **7014E-10**.
Note: Stem with dovetail groove is not included in the mass.

Set Configuration: Metric and Metric / Inch

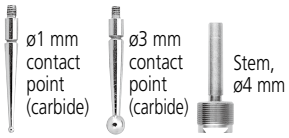
Full set **513-4XX-10T**

Swivel clamp (**900321**, for ø4 mm stem, ø8 mm stem, and dovetail)



Metric holding bar (L: 100 mm)

Plus set **513-4XX-10A**

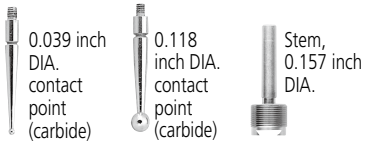


Basic set **513-4XX-10E**

513-4XX-10 is indicated on the dial face.

Set Configuration: Inch and Inch / Metric

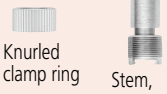
Full set **513-4XX-10T**



Swivel clamp (**900322**, for 0.157 inch DIA. stem, 0.375 inch DIA. stem, and dovetail)

Inch holding bar (L: 4 in)

Basic set **513-4XX-10E**



513-4XX-10 is indicated on the dial face.

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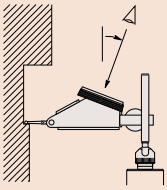
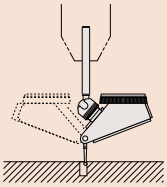
PROPRIETARY INSPECTION CERTIFICATE

Example of use of a test indicator with a tilted dial face

- The dial face obliquely faces upward, allowing users to read the graduations from the user's side. It is convenient when probing on the side of a large workpiece and the workbench is high.



- Using the universal holder allows easy hole centering. The dial face always faces upward when the indicator is rotated, which makes reading easy.



Dial Test Indicator
SERIES 513 — Standard (20° Tilted Face), Vertical, and Horizontal Types

513-454-10E / 10A / 10T
Contact point No. 103006

Carbide contact point

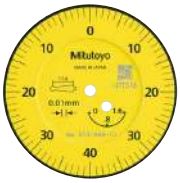
Graduation: 0.01 mm
Range: 0.8 mm

513-452-10E / 10T
Contact point No. 133195

Carbide contact point

Graduation: 0.0005 in
Range: 0.03 in

513-444-10E / 10A / 10T
Contact point No. 103006



With revolution counter
Carbide contact point

Graduation: 0.01 mm
Range: 1.6 mm

513-445-10E / 10A / 10T
Contact point No. 103011

With revolution counter
Carbide contact point

Graduation: 0.002 mm
Range: 0.4 mm

513-484-10E / 10A / 10T
Contact point No. 103006

Carbide contact point

Graduation: 0.01 mm
Range: 0.8 mm

513-485-10E
Contact point No. 103011

Carbide contact point

Graduation: 0.002 mm
Range: 0.2 mm

Note: **513-4XX-10** is indicated on the dial face and the inspection certificate.
The code No. with suffix (E/A/T) is a set item which includes accessories. The main unit is not available as a standalone item.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Mitutoyo

Dial Test Indicators

With revolution counter | Long contact point | Carbide contact point

SPECIFICATIONS

Metric Standard (20° tilted face) type

Code No.			Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (µm)					Mass (g)	Measuring force (N)				Remarks
Basic set	Plus set	Full set				Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability			With revolution counter	Long contact point	Carbide contact point	
513-444-10E	513-444-10A	513-444-10T	0.01	1.6	0-40-0	16	10	5	5	3	48	0.3 or less	✔		✔	
513-445-10E	513-445-10A	513-445-10T	0.002	0.4	0-100-0	6	5	2	4	1			✔		✔	

Inch Standard (20° tilted face) type

Code No.			Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)				Mass (g)	Measuring force (N)				Remarks
Basic set	Plus set	Full set				One rev.	First 2.5 rev.	Hysteresis	Repeatability			With revolution counter	Long contact point	Carbide contact point	
—	513-442-10A	513-442-10T	0.0005	0.06	0-15-0	±0.0005	±0.0005	0.0002	±0.0002	48	0.3 or less	✔		✔	
—	513-442-16A	513-442-16T									0.3 or less	✔		✔	Black dial
—	513-446-10A	513-446-10T									0.2 or less	✔	✔	✔	
—	513-446-16A	513-446-16T									0.2 or less	✔	✔	✔	Black dial
—	513-443-10A	513-443-10T	0.0001	0.016	0-4-0	±0.0002	±0.0002	0.0001	±0.00004		0.3 or less	✔		✔	
—	513-443-16A	513-443-16T									0.3 or less	✔		✔	Black dial

Metric Vertical type

Code No.			Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (µm)					Mass (g)	Measuring force (N)				Remarks
Basic set	Plus set	Full set				Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability			With revolution counter	Long contact point	Carbide contact point	
513-456-10E	—	—	0.01	0.5	0-25-0	6	—	5	4	3	46	0.3 or less			✔	
513-454-10E	513-454-10A	513-454-10T		0.8	0-40-0	9	—								✔	
513-455-10E	513-455-10A	513-455-10T	0.002	0.2	0-100-0	4	—	2	3	1					✔	

Inch Vertical type

Code No.			Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)				Mass (g)	Measuring force (N)				Remarks
Basic set	Plus set	Full set				One rev.	First 2.5 rev.	Hysteresis	Repeatability			With revolution counter	Long contact point	Carbide contact point	
513-452-10E	—	513-452-10T	0.0005	0.03	0-15-0	±0.0005	—	0.0002	±0.0002	46	0.3 or less			✔	
513-453-10E	—	513-453-10T	0.0001	0.008	0-4-0	±0.0001	—	0.0001	±0.00004		0.3 or less			✔	

Metric Horizontal Type

Code No.			Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (µm)					Mass (g)	Measuring force (N)				Remarks
Basic set	Plus set	Full set				Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability			With revolution counter	Long contact point	Carbide contact point	
513-486-10E	—	—	0.01	0.5	0-25-0	6	—	5	4	3	53	0.3 or less			✔	
513-484-10E	513-484-10A	513-484-10T		0.8	0-40-0	9	—								✔	
513-485-10E	—	—	0.002	0.2	0-100-0	4	—	2	3	1					✔	

Inch Horizontal Type

Code No.			Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)				Mass (g)	Measuring force (N)				Remarks
Basic set	Plus set	Full set				One rev.	First 2.5 rev.	Hysteresis	Repeatability			With revolution counter	Long contact point	Carbide contact point	
—	513-482-10A	513-482-10T	0.0005	0.03	0-15-0	±0.0005	—	0.0002	±0.0002	53	0.3 or less			✔	

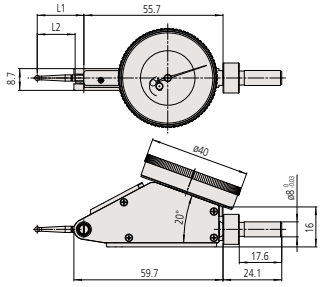
* Standard (20° Tilted Face) Type, Vertical Type: We guarantee the accuracy of completed products by inspecting them with the dial face facing upward.
Horizontal Type: We guarantee the accuracy of completed products by inspecting them with the dial face vertical.

Note: **513-4XX-1X** is indicated on the dial face and the inspection certificate.
The code No. with suffix (E/A/T) is a set item which includes accessories. The main unit is not available as a standalone item.

DIMENSIONS

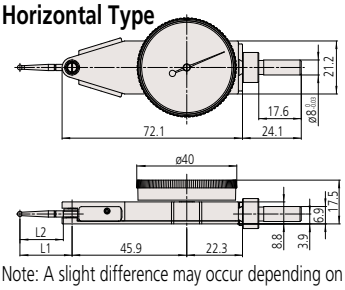
Standard (20° Tilted Face) Type

Unit: mm



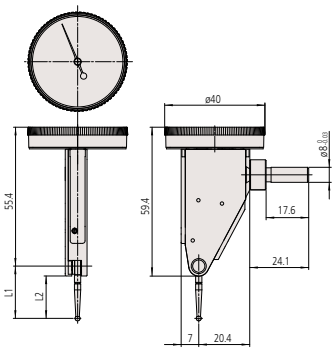
Code No.	L1	L2
513-445-10E	18.7	15.2
513-444-10E	20.9	17.4

Horizontal Type



Code No.	L1	L2
513-484-10E	20.9	17.4
513-485-10E	18.7	15.2
513-486-10E	22.2	18.7

Vertical Type



Code No.	L1	L2
513-454-10E	20.9	17.4
513-455-10E	18.7	15.2
513-456-10E	22.2	18.7

Note: A slight difference may occur depending on the center of the contact point, graduation plate, and stem fixing position, etc.

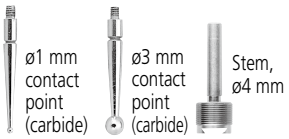
Set Configuration: Metric

Full set 513-4XX-10T

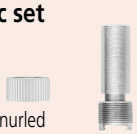
Swivel clamp (**900321**, for ø4 mm stem, ø8 mm stem, and dovetail)

Metric holding bar (L: 100 mm)

Plus set 513-4XX-10A



Basic set 513-4XX-10E



513-4XX-10 is indicated on the dial face.

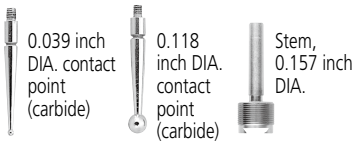
Set Configuration: Inch

Full set 513-4XX-1XT

Swivel clamp (**900322**, for 0.157 inch DIA. stem, 0.375 inch DIA. stem, and dovetail)

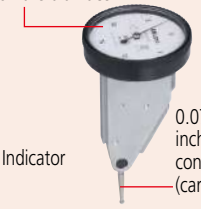
Inch holding bar (L: 4 in)

Plus set 513-4XX-1XA



Basic set 513-4XX-10E

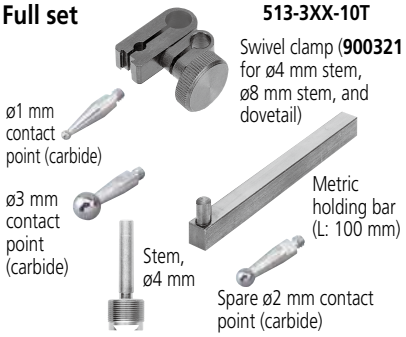
513-4XX-1X is indicated on the dial face.



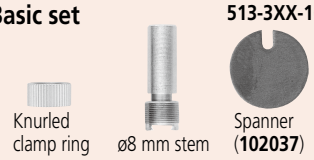
Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

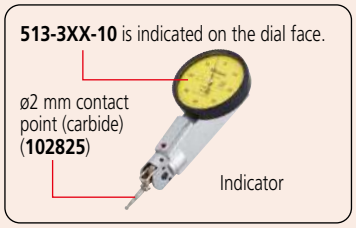
Set Configuration: Metric

Full set — **513-3XX-10T**



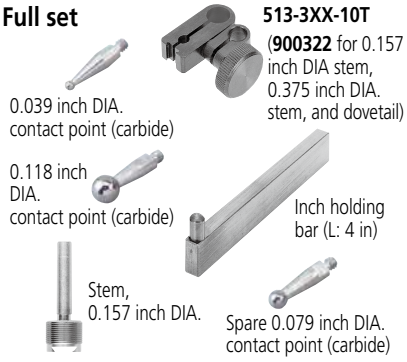
Basic set — **513-3XX-10E**



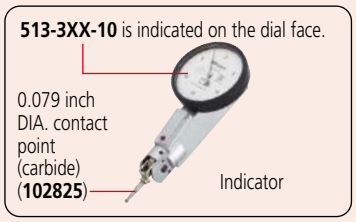


Set Configuration: Inch

Full set — **513-3XX-10T**



Basic set — **513-3XX-10E**



Optional Accessories

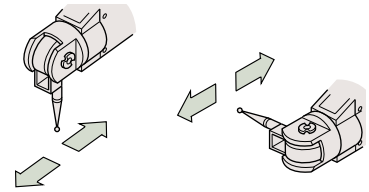
- Swivel clamps (See page 07-84)
- Holding bars (See page 07-85)
- Stems (See page 07-85)

102824: ø1 mm contact point (carbide)
102825: ø2 mm contact point (carbide)
102826: ø3 mm contact point (carbide)

Dial Test Indicator
SERIES 513 — Universal Type

513-304-10E

Universal Type



- The direction of the probe movement can be freely changed by rotating the contact point section of the indicator.

SPECIFICATIONS

Metric

Code No.		Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (µm)					Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Dustproof	Carbide contact point	Ruby contact point
Basic set	Full set				Measuring range	One rev.	10 scale divisions	Hysteresis	Repeatability											
513-304 -10E	513-304-10T	0.01	0.8	0-40-0	9	—	5	4	3	71	0.3 or less								✔	

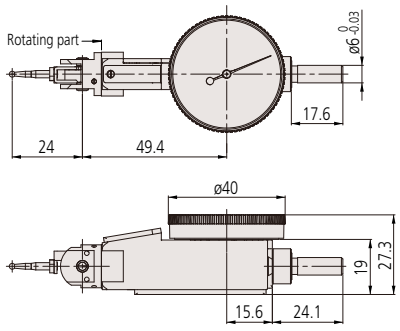
Inch

Code No.		Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)			Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Dustproof	Carbide contact point	Ruby contact point
Basic set	Full set				One rev.	Hysteresis	Repeatability											
513-302-10E	513-302-10T	0.0005	0.03	0-15-0	±0.0005	0.0003	±0.0003	71	0.3 or less								✔	

* The accuracy is guaranteed when used with the dial face facing upward and the contact point oriented as shown in the figure.
Note: **513-3XX-10** is indicated on the dial face and the inspection certificate.
The code No. with suffix (E/T) is a set item which includes accessories. The main unit is not available as a standalone item.

DIMENSIONS

Unit: mm



513-304-10E

Note: A slight difference may occur depending on the center of the contact point, graduation plate, and stem fixing position, etc.

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Pocket Type Dial Test Indicator SERIES 513

- This test indicator series is slimmer than standard test indicators without a clutch lever, making it more suitable for measuring deep points.
- Contact point length is printed on dial face to avoid accuracy issues.

  Note 1: Attaching a contact point of incorrect length will lead to measurement failure.
- Glare-free flat crystal face allows easy reading of graduations. Multi-layer composite coatings make the crystal more anti-reflective and stain resistant.
- Bonding the bezel and crystal together leaves no gap for cutting fluid or oil to penetrate through to the dial face. (Note that this type is NOT water-proof.)
- Clutch type (with a clutch lever)

  Note 2: See page 07-83 for notes on differences with models that do not have a clutch lever.
- A ø2 mm carbide contact point is supplied as standard.
- Metric Dial Test Indicator is inspected according to JIS B 7533:2015. We guarantee accuracy by inspecting with the dial face facing upward.

513-517-10E/
513-517-10T

Standard
Compact
Carbide contact point

Graduation: 0.01 mm
Range: 0.8 mm

513-515-10E/
513-515-10T

Long contact point
Compact
Carbide contact point

Graduation: 0.01 mm
Range: 1 mm

513-501-10E/
513-501-10T

High accuracy
Compact
Carbide contact point

Graduation: 0.001 mm
Range: 0.14 mm

513-514-10E/
513-514-10T

Long contact point
Double scale spacing
Compact
Carbide contact point

Graduation: 0.01 mm
Range: 0.5 mm

513-503-10E/
513-503-10T

Standard
Compact
Carbide contact point

Graduation: 0.002 mm
Range: 0.2 mm

Set Configuration: Metric

Full set **513-5XX-10T**

Swivel clamp (**900321**, for ø4 mm stem, ø8 mm stem, and dovetail)

Metric holding bar (L: 100 mm)

Stem, ø4 mm

Holding bar

Basic set **513-5XX-10E**

Stem, ø8 mm

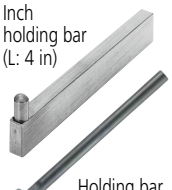
Spanner

513-5XX-10 is indicated on the dial face.

Set Configuration: Inch

Full set **513-5XX-10T**

Swivel clamp (**900322**, for 0.157 inch DIA. stem, 0.375 inch DIA. stem, and dovetail)



Inch holding bar (L: 4 in)

Holding bar

0.039 inch DIA. contact point (carbide)

0.118 inch DIA. contact point (carbide)

Stem, 0.157 inch DIA.

Basic set **513-5XX-10E**

Stem, 0.375 inch DIA.

Spanner

513-5XX-10 is indicated on the dial face.

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Graduation: 0.001 in
Range: 0.04 in

513-518-10E /
513-518-10T

Compact
Carbide contact point

Graduation: 0.0005 in
Range: 0.02 in

513-512-10E /
513-512-10T

Long contact point
Double scale spacing
Compact
Carbide contact point

Graduation: 0.0001 in
Range: 0.01 in

513-504-10E /
513-504-10T

Compact
Carbide contact point

SPECIFICATIONS

Metric

Code No.		Graduation (mm)	Range (mm)	Dial reading	Maximum permissible error (MPE)* (μm)					Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Full set				Measuring range	One rev.	10 scale divisions	Hysteresis	Repetability										
513-517-10E	**513-517-10T**	0.01	0.8	0-40-0	9	–	5	4	3	50	0.3 or less				✔		✔	✔	
513-514-10E	**513-514-10T**	0.01	0.5	0-25-0	10	–	5	5	3	51	0.3 or less			✔		✔	✔	✔	
513-515-10E	**513-515-10T**	0.01	1	0-50-0	10	–	5	5	3	51	0.3 or less			✔			✔	✔	
513-503-10E	**513-503-10T**	0.002	0.2	0-100-0	4	–	2	3	1	50	0.4 or less				✔		✔	✔	
513-501-10E	**513-501-10T**	0.001	0.14	0-70-0	4	–	2	3	1	50	0.5 or less	✔					✔	✔	

Inch

Code No.		Graduation (in)	Range (in)	Dial reading	Maximum permissible error (MPE)* (in)				Mass (g)	Measuring force (N)	High accuracy	With revolution counter	Long contact point	Standard	Double scale spacing	Compact	Carbide contact point	Ruby contact point
Basic set	Full set				One rev.	First 2.5 rev.	Hysteresis	Repetability										
513-518-10E	**513-518-10T**	0.001	0.04	0-20-0	±0.001	–	0.0002	±0.0004	50	0.3 or less						✔	✔	
513-512-10E	**513-512-10T**	0.0005	0.02	0-10-0	±0.0005	–	0.0002	±0.0002	51	0.3 or less			✔		✔	✔	✔	
513-504-10E	**513-504-10T**	0.0001	0.01	0-5-0	±0.0002	–	0.0001	±0.00004	50	0.3 or less						✔	✔	

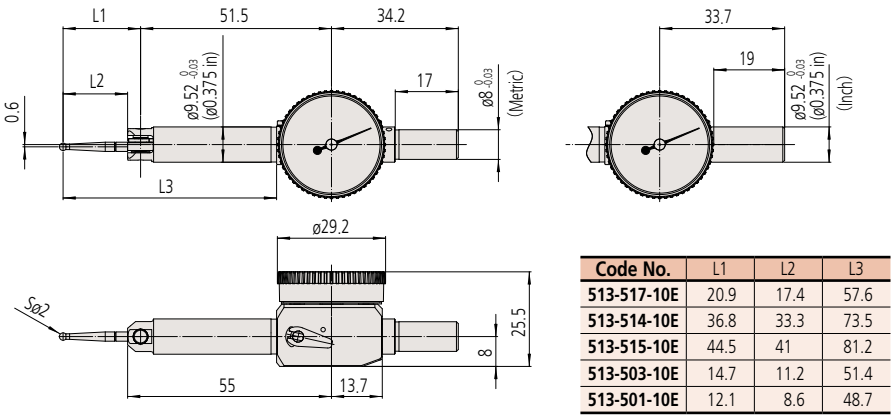
* We guarantee the accuracy of completed products by inspecting them with the dial face facing upward.
Note 1: Be sure to perform calibration with reference gage, etc. after exchanging the contact point. The inside parts may be damaged when the contact point is exchanged due to the breakage. In the case the of the significant deterioration in the operation, repair is required.
Note 2: Stem is not included in the mass.
Note 3: **513-5XX-10** is indicated on the dial face and the inspection certificate.
The code No. with suffix (E/T) is a set item which includes accessories. The main unit is not available as a standalone item.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Pocket Type Dial Test Indicator SERIES 513

DIMENSIONS

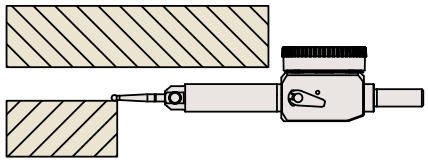
Unit: mm



Code No.	L1	L2	L3
513-517-10E	20.9	17.4	57.6
513-514-10E	36.8	33.3	73.5
513-515-10E	44.5	41	81.2
513-503-10E	14.7	11.2	51.4
513-501-10E	12.1	8.6	48.7

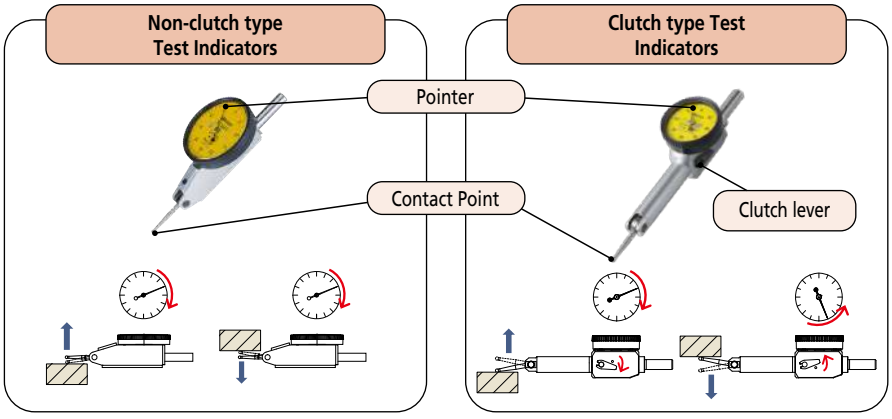
Note: A slight difference may occur depending on the center of the contact point, graduation plate, and stem fixing position, etc.

Pocket type can be fixed at the body (at ø9.52 (ø0.375 in))



The slim body allows measurements in shallow space.

There are two types of Mitutoyo Dial Test Indicator:
The non-clutch type (without a clutch lever) and the clutch type (with a clutch lever)



In the non-clutch type, although the contact point may move either in the upward or downward direction, the pointer always rotates clockwise.
In the clutch type, if the clutch lever is set in one position the contact point moves in the upward direction and the pointer rotates clockwise. Conversely, if the lever is set in the other position the contact point moves in the downward direction and the pointer rotates counterclockwise.

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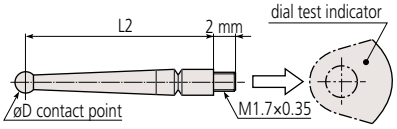
Contact points, Stems and Holders
Optional Accessories for Dial Test Indicators

Contact point (for Metric Models Only*)

* Except for universal type dial test indicator (**513-304-10**).



ø0.5 mm contact point (Steel)

190547 (L2=11.2 mm)
21CAB109 (L2=15.2 mm)
190549 (L2=17.4 mm)
190654 (L2=18.7 mm)
21CAB111 (L2=33.9 mm)
190656 (L2=41.0 mm)

ø0.7 mm contact point (Steel)

190548 (L2=11.2 mm)
21CAB110 (L2=15.2 mm)
190550 (L2=17.4 mm)
190653 (L2=18.7 mm)
21CAB112 (L2=33.9 mm)
190655 (L2=41.0 mm)

ø1 mm contact point (Carbide)

103017 (L2=11.2 mm)
131314 (L2=15.2 mm)
103013 (L2=17.4 mm)
137558 (L2=18.7 mm)
131316 (L2=33.9 mm)
136235 (L2=41.0 mm)

ø2 mm contact point (Carbide)

103010 (L2=11.2 mm)
103011 (L2=15.2 mm)
103006 (L2=17.4 mm)
137557 (L2=18.7 mm)
131324 (L2=33.9 mm)
136013 (L2=41.0 mm)

ø2 mm contact point (Ruby)

21CZA209 (L2=11.2 mm)
21CZB068 (L2=15.2 mm)
21CZA201 (L2=17.4 mm)
21CZA210 (L2=18.7 mm)
21CZA211 (L2=41.0 mm)

ø3 mm contact point (Carbide)

103018 (L2=11.2 mm)
131315 (L2=15.2 mm)
103014 (L2=17.4 mm)
137559 (L2=18.7 mm)
131317 (L2=33.9 mm)
136236 (L2=41.0 mm)

Swivel Clamps

For ø6 mm stem, ø8 mm stem, and dovetail

902053

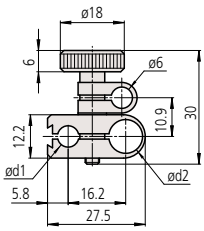
For ø4 mm stem, ø8 mm stem, and dovetail

900321

For 0.157 inch DIA. stem, 0.375 inch DIA. stem, and dovetail

900322

Unit: mm

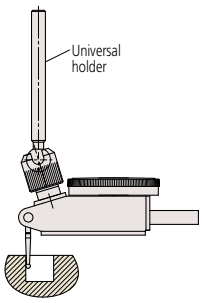


Code No.	d1	d2
902053	6	8
900321	4	8
900322	0.157 in	0.375 in

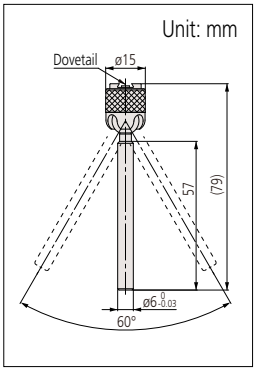
Universal Holder (dovetail clamp)

- A universal holder is an attachment used to mount a dial test indicator in a machine tool spindle so that it can be used to align the spindle axis with a workpiece feature such as a hole center, or a machine axis with an edge. (See diagram on the right.) It also gives some protection against accidental impacts on the indicator.

21CZA233 (ø8 mm stem)
21CZA231 (0.25 inch DIA. stem)
21CZA229 (ø6 mm stem)



Unit: mm



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Mitutoyo

Contact points, Stems and Holders
Optional Accessories for Dial Test Indicators

Spanner

102037

Holding Bars

9×9 mm

953638 (Length: 50 mm)
900209 (Length: 100 mm)

ø8 mm (0.315 inch DIA) **900211** (Length: 115 mm/4.528 in)

0.25 in×0.5 in

953639 (Length: 2 in)
900306 (Length: 4 in)

Stems with Knurled Clamp Ring

ø4 mm
(0.157 inch DIA.)

21CZB131

ø8 mm

21CZB129

0.375 inch DIA.

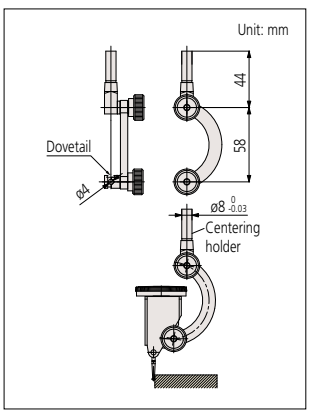
21CZB130

Stem DIA. ød	Stem with dovetail (Individual item)	Nut (Individual item)	Full set (Stem with dovetail+Nut)
	Code No.		
ø4	**21CAB106**	**190322**	**21CZB131**
ø6	**21CAB103**	**190322**	**21CZB128**
ø8	**21CAB104**	**190322**	**21CZB129**
ø0.375 in	**21CAB105**	**190322**	**21CZB130**

Centering Holder

- Allows large diameter cylinders or holes to be centered on a machine tool.

901959 (ø8 mm stem)
901997 (0.25 inch DIA. stem)



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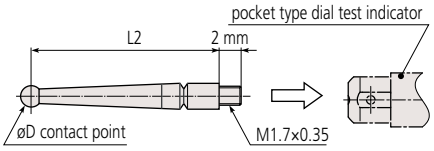
Optional Accessories for Pocket Type Dial Test Indicators

Contact point (for Metric Models Only)



ø0.5 mm contact point (Steel)

190547 (L2=11.2 mm)
190549 (L2=17.4 mm)
190656 (L2=41.0 mm)

ø0.7 mm contact point (Steel)

190548 (L2=11.2 mm)
190550 (L2=17.4 mm)
190655 (L2=41.0 mm)

ø1 mm contact point (Carbide)

136756 (L2=8.6 mm)
103017 (L2=11.2 mm)
103013 (L2=17.4 mm)
137746 (L2=33.3 mm)
136235 (L2=41.0 mm)

ø2 mm contact point (Carbide)

136104 (L2=8.6 mm)
103010 (L2=11.2 mm)
103006 (L2=17.4 mm)
129949 (L2=33.3 mm)
136013 (L2=41.0 mm)

ø2 mm contact point (Ruby)

21CZA209 (L2=11.2 mm)
21CZA201 (L2=17.4 mm)
21CZA211 (L2=41.0 mm)

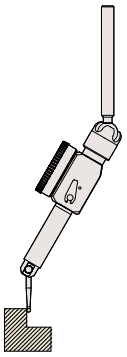
ø3 mm contact point (Carbide)

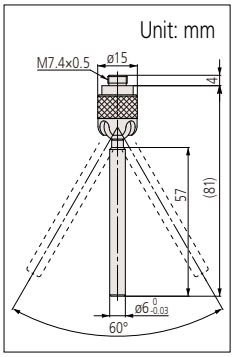
136758 (L2=8.6 mm)
103018 (L2=11.2 mm)
103014 (L2=17.4 mm)
137747 (L2=33.3 mm)
136236 (L2=41.0 mm)

Universal Holder (screw clamp)

- A universal holder is an attachment used to mount a dial test indicator in a machine tool spindle so that it can be used to align the spindle axis with a workpiece feature such as a hole center, or a machine axis with an edge. (See diagram below.) It also gives some protection against accidental impacts on the indicator.

21CZA234 (ø8 mm stem)
21CZA232 (0.25 inch DIA. stem)
21CZA230 (ø6 mm stem)





Swivel Clamps

For ø6 mm stem, ø8 mm stem, and dovetail

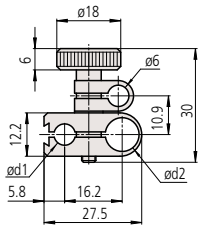
902053

For ø4 mm stem and ø8 mm stem, and dovetail

900321

For 0.157 inch DIA. stem and 0.375 inch DIA. stem, and dovetail

900322



Unit: mm

Code No.	d1	d2
902053	6	8
900321	4	8
900322	0.157 in	0.375 in

Spanner

301336

Holding Bars

9×9 mm **900209** (Length: 100 mm)

ø8 mm (0.315 inch DIA) **900211** (Length: 115 mm)

0.25×0.5 in **953639** (Length: 2 in)
900306 (Length: 4 in)

Note: Suitable for height gages with a scriber section of 12.7×6.35 mm.

Stems

ø4 mm (0.157 inch DIA.)

102036

ø8 mm (0.315 inch DIA.)

102822

0.375 inch DIA.

102081

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i-Checker IC2000
SERIES 170

- The i-Checker makes it easier to continuously perform high-accuracy inspection of various indicators.
- A wide variety of optional accessories enable the inspection and calibration of many types of gages including dial indicators, lever-type dial indicators, dial test indicators, bore gages, Digimatic indicators, linear gages and lever gage heads that use various stem diameters and support systems.
- Can directly inspect indicators with a stroke of up to 100 mm.
- The pointer of the analog indicator is positioned just before the measuring point automatically in the semi-automatic mode.
- Digital indicators equipped with a data output function are checked very efficiently due to spindle positioning at the inspection points and recording of measurement results being under fully automatic control.

IC2000

Typical application for Dial Test Indicator Accessory Set

Typical application using dial test indicator attachment set (**02ASK000**)

SPECIFICATIONS

Code No.		170-402	170-403
Measuring Range		100 mm	
Resolution		0.01 µm	
Accuracy (20 °C)	vertical orientation	(0.1 + 0.4L/100) µm L=Arbitrary length (mm)	
	lateral orientation	(0.15 + 0.6L/100) µm L=Arbitrary length (mm)	
Feed speed		Maximum 10 mm/s	
Drive method		Motor drive (semi-automatic/fully-automatic)	
Measuring Unit		Separate type Linear Encoder	
Measurement method		Semi-automatic measurement	
		Fully automatic measurement (only when using an indicator equipped with data output function)*1*2	
Mass		20 kg	
Operating temperature		20 °C±0.5 °C	
Remarks		with 8 mm bush	with 3/8 in bush

*1 Automatic measurement requires the indicator's connection cable. Additionally some form of indicator, along with the normally connected accessory (the optional accessory for the indicator such as a Digimatic power-supply unit in an EF counter) will be required.
*2 The indicator measured via RS-232C has the capability to receive data from the main unit and output the counter value.

Dial Indicators

Dial Test Indicators

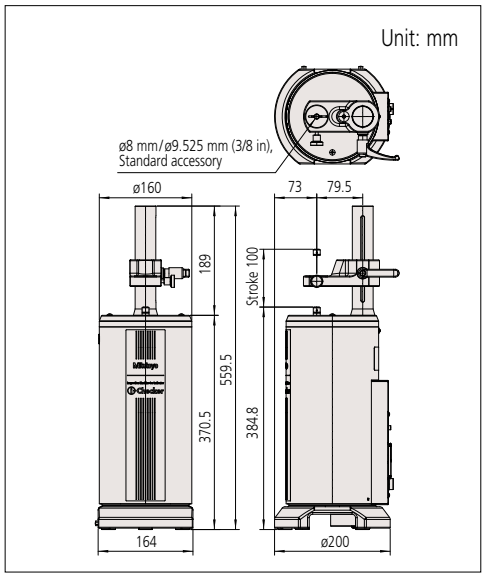
Digimatic Indicators

Linear gages

Bore Gages

Lever gage heads

DIMENSIONS



Product catalog E12015

Video

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SERIES 170 — UDT-2 Calibration Tester

Typical application

Stand for bore gage inspection (**12AAK824**)

Optional accessory

Stand for bore gage inspection (**12AAK824**)
Note: Can be used for the inspection of bore gages SERIES **511** standard type and with micrometer head up to 400 mm. (Refer to pages 08-37 and 08-44 for details.)

- **UDT-2** is an accuracy tester for 0.01 mm resolution/graduation dial indicators, dial test indicators and bore gages.
- With the optional stand, inspection of dial bore gages becomes possible.
- Measuring range: 0 to 25 mm. Accepts ø6 mm, ø8 mm, 1/4 in and 3/8 in indicator stems.

170-102-12

SPECIFICATIONS

Metric

Code No.	Micrometer head		Accuracy (µm)	
	Graduation (mm)	Range (mm)	Feed accuracy (25 mm stroke)	Hysteresis
170-102-12	0.001	0 - 25	±2	0.5

Inch

Code No.	Micrometer head		Accuracy (in)	
	Graduation (in)	Range (in)	Feed accuracy (25 mm stroke)	Hysteresis
170-101-10	0.0001	0 - 1	±0.0001	0.00002

Calibrating a dial test indicator

SERIES 521 — Calibration Tester

- Accuracy tester for 0.01 mm graduation dial indicators and dial test indicators. Can also be used to adjust the sensitivity of electronic micrometers.
- Universal bracket accepts any dial indicator, dial test indicator or electronic gage without any additional accessory. Clamping capacity: ø4 mm to ø10 mm.

521-103

SPECIFICATIONS

Metric

Code No.	Micrometer head		Accuracy (µm)	
	Graduation (mm)	Range (mm)	Indication accuracy	Hysteresis
521-103	0.0002	0 - 1	±0.2	0.2
521-105	0.0002	0 - 5	±0.8	0.8

Inch

Code No.	Micrometer head		Accuracy (in)	
	Graduation (in)	Range (in)	Indication accuracy	Hysteresis
521-104	0.00001	0 - 0.05	±0.00001	0.00001
521-106	0.00001	0 - 0.2	±0.00003	0.00003

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MeasurLink® ENABLED
Data Management Software by Mitutoyo

Thickness Gages SERIES 547, 7

Standard Type (Resolution: 0.01 mm)

- Thickness gages can quickly measure the thickness of thin products such as paper and felt.
- Using a ceramic contact and anvil, there is no need to worry about rust. (except for **547-401A**)

547-301A

547-321A

- Display: 6-digit display, sign (7-digit for models with 0.0005 mm resolution)
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Battery life: Approx. 2.5 years under normal use Approx. 2,700 hours of continuous use
- Response speed: Unlimited (except for scanning measurement)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For models with 0.0005 mm resolution)
- Function Lock
- Calibration schedule warning function
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Refer to page 07-90.

- Measurement Data Management **USB-ITPAK V3.0**: **06AGR543**

SPECIFICATIONS

Metric

Code No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
547-301A	0.01	0 - 10	30	ø10 Flat	10
547-321A	0.01	0 - 10	120	ø10 Flat	10

Code No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
547-301A	±20	1.5 or less	245	Standard, ceramic point/anvil
547-321A	±20	1.5 or less	385	Deep throat, ceramic point/anvil

Inch / Metric

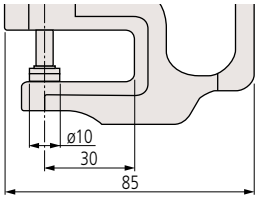
Code No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil
547-526S*	0.0001 in/0.001 mm	0 - 0.47*	30 mm (1.18 in)	ø10 mm (ø0.39 in) Flat	0.0002 in/0.005 mm
547-300A	0.0005 in/0.01 mm	0 - 0.4	30 mm (1.18 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm
547-500S*	0.0005 in/0.01 mm	0 - 0.47*	30 mm (1.18 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm
547-320A	0.0005 in/0.01 mm	0 - 0.4	120 mm (4.72 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm
547-520S*	0.0005 in/0.01 mm	0 - 0.47*	120 mm (4.72 in)	ø10 mm (ø0.39 in) Flat	0.005 in/0.01 mm

Code No.	Accuracy	Measuring force (N)	Mass (g)	Remarks
547-526S*	±0.0002 in/±5 µm	1.5 or less	225	Standard, ceramic point/anvil
547-300A	±0.001 in/±20 µm	1.5 or less	245	Standard, ceramic point/anvil
547-500S*	±0.001 in/±20 µm	1.5 or less	225	Standard, ceramic point/anvil
547-320A	±0.001 in/±20 µm	1.5 or less	385	Deep throat, ceramic point/anvil
547-520S*	±0.001 in/±20 µm	1.5 or less	380	Deep throat, ceramic point/anvil

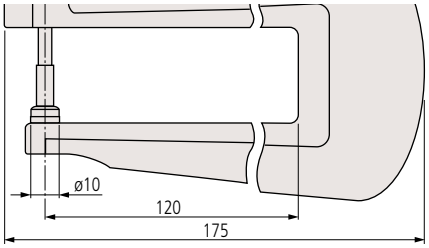
* Using **ID-SX** Digimatic indicator.

DIMENSIONS

547-301A, 547-526S, 547-300A, 547-500S



547-321A, 547-320A, 547-520S



Unit: mm

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Optional Accessories

Code No.	Type	Description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
06AGL011	SF	Connection cable (1 m)
06AGL021	SF	Connection cable (2 m)
06AGQ001F	SF	USB Input Tool Direct (2 m)
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
02AZD810D	—	**U-WAVE-R**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF700	—	Connecting unit for **U-WAVE-TM**/**TMB** (for **ID-C**/**ID-F** Series 12.7 mm/0.5 inch type only)
02AZF670	—	**U-WAVE-TM**/**TMB** mounting bracket: for Digimatic Indicators

High Accuracy Type (Resolution: 0.0005 mm)

547-401A

SPECIFICATIONS

Metric

Code No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
547-401A	0.0005 (0.001/0.01 selectable)	0 - 12	21	ø6.3 Flat (Carbide)	3

Code No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
547-401A	±3	3.5 or less	275	High accuracy, carbide point anvil

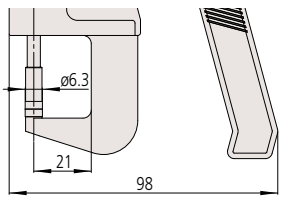
Inch/Metric

Code No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil
547-400A	0.00002/0.00005/ 0.0001/0.0005 in 0.0005/0.001/ 0.01 mm (selectable)	0 - 0.47	21 mm (0.83 in)	ø6.3 mm (ø0.25 in) Flat	0.0001 in/0.003 mm

Code No.	Accuracy	Measuring force (N)	Mass (g)	Remarks
547-400A	±0.00012 in/±3 µm	3.5 or less	275	High accuracy, carbide point anvil

DIMENSIONS

547-401A, 547-400A Unit: mm



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Mitutoyo

Thickness Gages
SERIES 547, 7

Standard Type (Graduation: 0.01 mm)

- Integrated moulding of the bezel and crystal ensures protection against water and oil penetration via the front face.

7301A

7321A

SPECIFICATIONS

Metric

Code No.	Graduation (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
7327A	0.001	0 - 1	30	ø10 Flat	5
7301A	0.01	0 - 10	30	ø10 Flat	5
7305A	0.01	0 - 20	30	ø10 Flat	5
7321A	0.01	0 - 10	120	ø10 Flat	5
7323A	0.01	0 - 20	120	ø10 Flat	5

Code No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
7327A	±5	1.5 or less	225	Fine dial reading, ceramic point/anvil
7301A	±15	1.4 or less	205	Standard, ceramic point/anvil
7305A	±20	2.0 or less	220	Standard, ceramic point/anvil
7321A	±15	1.4 or less	370	Deep throat, ceramic point/anvil
7323A	±22	2.0 or less	370	Deep throat, ceramic point/anvil

Inch

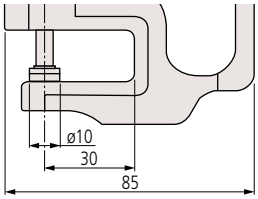
Code No.	Graduation (in)	Range (in)	Measuring depth (in)	Contact point, Anvil (in)	Parallelism of Contact point, Anvil (in)
7326A	0.0001	0 - 0.05	1.18	ø0.39 Flat	0.0002
7300A	0.001	0 - 0.5	1.18	ø0.39 Flat	0.0005
7304A	0.001	0 - 1	1.18	ø0.39 Flat	0.0005
7322A	0.001	0 - 1	4.72	ø0.39 Flat	0.0005

Code No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7326A	±0.0002	2.0 or less	205	Fine dial reading, ceramic point/anvil
7300A	±0.001	1.8 or less	205	Standard, ceramic point/anvil
7304A	±0.002	1.8 or less	220	Standard, ceramic point/anvil
7322A	±0.002	1.8 or less	370	Deep throat, ceramic point/anvil

Note: The dial indicator needs to be reset when a contact point is replaced.

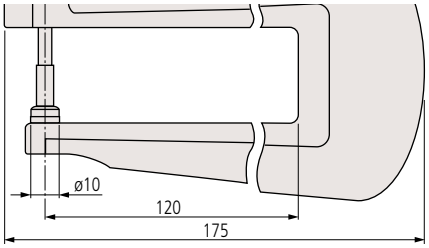
DIMENSIONS

7301A, 7305A, 7327A



7321A, 7322A, 7323A

Unit: mm



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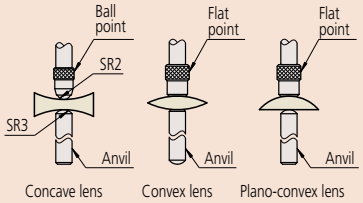
Typical applications



- Display: 6-digit display, sign (7-digit for models with 0.0005 mm resolution)
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Battery life: Approx. 2.5 years under normal use Approx. 2,700 hours of continuous use
- Response speed: Unlimited (except for scanning measurement)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For models with 0.0005 mm resolution)
- Function Lock
- Calibration schedule warning function
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Refer to page 07-90.

- Measurement Data Management **USB-ITPAK V3.0**: **06AGR543**

Lens thickness measurement

- Thickness of concave-convex lenses and surfaces can be measured. (Contact point, Anvil: hardened steel)
- Anvils and contact points are interchangeable to enable concave surfaces to be measured.
- Provided with a ball point as standard.

547-313A **7313A**

SPECIFICATIONS

Metric

Code No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
547-313A	0.01	0 - 10	30	ø6 Flat (Contact point) ø4.8 Flat (Anvil)	12

Code No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
547-313A	±20	1.5 or less	265	Lens thickness

Inch / Metric

Code No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil
547-312A	0.0005 in/0.01 mm	0 - 0.4	30 mm (1.18 in)	ø6 mm (ø0.24 in) Flat (Contact point) ø4.8 mm (ø0.19 in) Flat(Anvil)	0.005 in/0.01 mm
547-512A*	0.0005 in/0.01 mm	0 - 0.47*	30 mm (1.18 in)	ø6 mm (ø0.24 in) Flat (Contact point) ø4.8 mm (ø0.19 in) Flat (Anvil)	0.005 in/0.01 mm

Code No.	Accuracy	Measuring force (N)	Mass (g)	Remarks
547-312A	±0.001 in/±20 µm	1.5 or less	265	Lens thickness
547-512A*	±0.001 in/±20 µm	1.5 or less	240	Lens thickness

* Using **ID-SX** Digimatic indicator.

Metric

Code No.	Graduation (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
7313A	0.01	0 - 10	30	ø6 Flat (Contact point) ø4.8 Flat (Anvil)	5

Code No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
7313A	±15	1.4 or less	215	Lens thickness

Inch

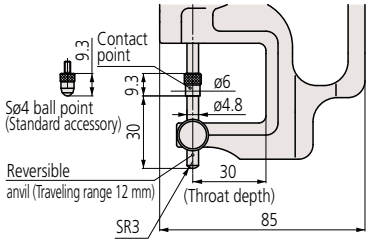
Code No.	Graduation (in)	Range (in)	Measuring depth (in)	Contact point, Anvil (in)	Parallelism of Contact point, Anvil (in)
7312A	0.001	0 - 0.5	1.18	ø0.24 Flat (Contact point) ø0.19 Flat (Anvil)	0.0005

Code No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7312A	±0.001	1.8 or less	215	Lens thickness

Note: The dial indicator needs to be reset when a contact point is replaced.

DIMENSIONS

Unit: mm



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Data Management Software by Mitutoyo

Thickness Gages SERIES 547, 7

Pipe gage measurement

- Pipe wall thickness, thickness of curved boards can be measured. (Contact point, Anvil: hardened steel)

547-360A

7360A

- Display: 6-digit display, sign (7-digit for models with 0.0005 mm resolution)
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Battery life: Approx. 2.5 years under normal use Approx. 2,700 hours of continuous use
- Response speed: Unlimited (except for scanning measurement)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For models with 0.0005 mm resolution)
- Function Lock
- Calibration schedule warning function
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery voltage alarm display
- Error alarm display

SPECIFICATIONS

Metric

Code No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)
547-360A	0.01	0 - 10	20	ø3 Flat (Contact point) ø3.5 Ball (Anvil)

Code No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
547-360A	±20	1.5 or less	230	Pipe gage

Inch / Metric

Code No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil
547-361A	0.0005 in/0.01 mm	0 - 0.4	20 mm (0.79 in)	ø3 mm (ø0.12 in) Flat (Contact point) ø3.5 mm (ø0.14 in) Ball (Anvil)
547-561S	0.0005 in/0.01 mm	0 - 0.47*	20 mm (0.79 in)	ø3 mm (ø0.12 in) Flat (Contact point) ø3.5 mm (ø0.14 in) Ball (Anvil)

Code No.	Accuracy	Measuring force (N)	Mass (g)	Remarks
547-361A	±0.001 in/±20 µm	1.5 or less	230	Pipe gage
547-561S	±0.001 in/±20 µm	1.5 or less	215	Pipe gage

* Using **ID-SX** Digimatic indicator.

Metric

Code No.	Graduation (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)
7360A	0.01	0 - 10	20	ø3 Flat (Contact point) ø3.5 Ball (Anvil)

Code No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
7360A	±15	1.4 or less	200	Pipe gage

Inch

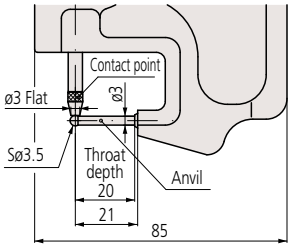
Code No.	Graduation (in)	Range (in)	Measuring depth (in)	Contact point, Anvil (in)
7361A	0.001	0 - 0.5	0.8	ø0.12 Flat (Contact point) ø0.14 Ball (Anvil)

Code No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7361A	±0.001	1.8 or less	200	Pipe gage

Note: The dial indicator needs to be reset when a contact point is replaced.

DIMENSIONS

Unit: mm



Optional Accessories

Refer to page 07-90.

- Measurement Data Management **USB-ITPAK V3.0**: **06AGR543**

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- Display: 6-digit display, sign (7-digit for models with 0.0005 mm resolution)
- Power source: CR2032 battery (1 pc.), included as standard (for operational checks)
- Battery life: Approx. 2.5 years under normal use
  Approx. 2,700 hours of continuous use
- Response speed: Unlimited (except for scanning measurement)
- Zero-setting (INC system)
- Presetting (ABS system)
- Measuring direction switching
- Tolerance judgment
- Resolution switching (For models with 0.0005 mm resolution)
- Function Lock
- Calibration schedule warning function
- Data output
- Display value holding (when no external device is connected)
- 330° rotary display
- Low battery voltage alarm display
- Error alarm display

Optional Accessories

Refer to page 07-90.

- Measurement Data Management **USB-ITPAK V3.0**: **06AGR543**

Blade thickness measurement

- Measuring faces of the contact point and anvil are blade-shaped (thickness: 1 mm). Suitable for measuring narrow grooves.

547-315A **7315A**

SPECIFICATIONS

Metric

Code No.	Resolution (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
547-315A	0.01	0 - 10	30	t=1 Blade	10

Code No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
547-315A	±20	1.5 or less	260	Blade thickness

Inch / Metric

Code No.	Resolution	Range (in)	Measuring depth	Contact point, Anvil	Parallelism of Contact point, Anvil
547-316A	0.0005 in/0.01 mm	0 - 0.4	30 mm (1.18 in)	t=1 mm (0.04 in) Blade	0.005 in/0.01 mm
547-516A*	0.0005 in/0.01 mm	0 - 0.47*	30 mm (1.18 in)	t=1 mm (0.04 in) Blade	0.005 in/0.01 mm

Code No.	Accuracy	Measuring force (N)	Mass (g)	Remarks
547-316A	±0.001 in/±20 µm	1.5 or less	260	Blade thickness
547-516A*	±0.001 in/±20 µm	1.5 or less	240	Blade thickness

* Using **ID-SX** Digimatic indicator.

Metric

Code No.	Graduation (mm)	Range (mm)	Measuring depth (mm)	Contact point, Anvil (mm)	Parallelism of Contact point, Anvil (µm)
7315A	0.01	0 - 10	30	t=1 Blade	5

Code No.	Accuracy (µm)	Measuring force (N)	Mass (g)	Remarks
7315A	±15	1.4 or less	220	Blade thickness

Inch

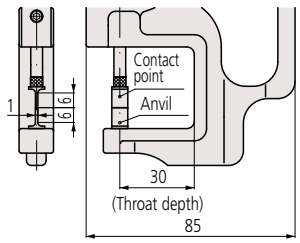
Code No.	Graduation (in)	Range (in)	Measuring depth (in)	Contact point, Anvil (in)	Parallelism of Contact point, Anvil (in)
7316A	0.001	0 - 0.5	1.18	t=0.04 Blade	0.0005

Code No.	Accuracy (in)	Measuring force (N)	Mass (g)	Remarks
7316A	±0.001	1.8 or less	220	Blade thickness

Note: The dial indicator needs to be reset when a contact point is replaced.

DIMENSIONS

Unit: mm



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Contact Force Gage SERIES 546

- Contact Force Gages are widely used to determine the measuring force applied by an instrument to a workpiece, as well as contact forces of electrical relays, micro-switches, valves and precision springs.
- Thanks to the miniature anti-friction bearing in the fulcrum, stable measurement is guaranteed.
- 2 types are available: Standard and peak hold.

Standard type
546-112

Peak hold type
546-137

Measurement example of contact force on a relay

SPECIFICATIONS

mN-scale models

Standard

Code No.	Graduation (mN)	Range (mN)	Accuracy (graduation)
546-112	2	6 - 50	±0.5
546-113	5	10 - 100	
546-114	10	30 - 300	

Peak hold

Code No.	Graduation (mN)	Range (mN)	Accuracy (graduation)
—	—	—	—
546-133	5	10 - 100	±0.5
546-134	10	30 - 300	

Note: Please note that these products are only available in their standard forms; they cannot be customized for special sizes or specifications.

N-scale models

Standard

Code No.	Graduation (N)	Range (N)	Accuracy (graduation)
546-115	0.02	0.06 - 0.5	±0.5
546-116	0.05	0.1 - 1	
546-117	0.05	0.15 - 1.5	
546-118	0.1	0.3 - 3	
546-119	0.2	0.6 - 5	

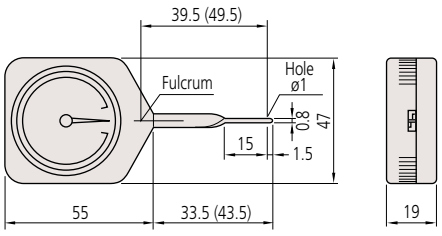
Peak hold

Code No.	Graduation (N)	Range (N)	Accuracy (graduation)
546-135	0.02	0.06 - 0.5	±0.5
546-136	0.05	0.1 - 1	
546-137	0.05	0.15 - 1.5	
546-138	0.1	0.3 - 3	
546-139	0.2	0.6 - 5	

Note: Please note that these products are only available in their standard forms; they cannot be customized for special sizes or specifications.

DIMENSIONS

Unit: mm



( ): **546-112**, **546-113**, **546-133**

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Dial Snap Gage
SERIES 201

- Designed for quick Go/±No-go judgment of diameters of cylinders and shafts in machining processes.
- Enables single-handed comparative measurements of a cylinder diameter, etc. while workpiece processing is taking place.
- The dial indicator and protection cover are optional.
- Some digimatic/dial indicators cannot be used with the dial snap gage. Consult Mitutoyo before using dial indicators which are not recommended.
- Measuring faces: Carbide.
- Anvil positioning range: 25 mm/1 in. Adjustment nut: adjusts the setting anvil to the nominal size required within the measuring range.
- Clamp: clamps the setting anvil at the required position.

201-101

Note: The dial indicator and dial protection cover are optional.

Optional accessories

Dial protection cover: **21DZA000**

Recommended dial indicators/ Digimatic indicators (optional)

- Metric models:
  2046AB: Dial indicator (Graduation: 0.01 mm)
  2109AB-10: Dial indicator (Graduation: 0.001 mm)
  543-700B: Digimatic Indicator (Resolution: 0.0005/0.001/0.01 mm)
- Inch models:
  2414AB: Dial indicator (Graduation: 0.001 in)
  2805AB-10: Dial indicator (Graduation: 0.0001 in)
  543-702B: Digimatic Indicator (Resolution: 0.00002/0.00005/0.0001/0.0005 in (0.0005/0.001/0.01 mm))

SPECIFICATIONS

Metric

Code No.	Range (mm)	Parallelism (μm)	Measuring force* (N)
201-101	0 - 25	5	15±3
201-102	25 - 50		
201-103	50 - 75		
201-104	75 - 100		
201-105	100 - 125		
201-106	125 - 150		
201-107	150 - 175		
201-108	175 - 200		
201-109	200 - 225		
201-110	225 - 250		
201-111	250 - 275		
201-112	275 - 300		

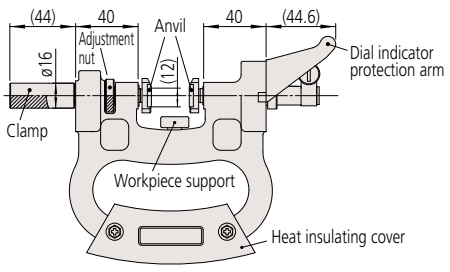
Inch

Code No.	Range (in)	Parallelism (in)	Measuring force* (N)
201-151	0 - 1	0.00025	15±3
201-152	1 - 2		
201-153	2 - 3		
201-154	3 - 4		
201-155	4 - 5		
201-156	5 - 6		
201-157	6 - 7		
201-158	7 - 8		
201-159	8 - 9		
201-160	9 - 10		
201-161	10 - 11		
201-162	11 - 12		

* Measuring force is that force present before an indicator is installed and is determined at the point where the spindle is retracted 1 mm from the rest position.

DIMENSIONS

Unit: mm



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SERIES 7 — Magnetic Stands

- Mitutoyo magnetic stands clamp to iron or steel surfaces with a strong force and are indispensable for temporarily mounting a dial test indicator (or dial indicator) onto a machine tool or fixture for general alignment applications.
- Vertical/horizontal mounting holes and bushes are available for attaching dial test indicators and dial indicators.
- Models **7014-10**, **7014E-10**, **7015-10**, **7031-10**, **7032-10** and **7033-10** have a dovetail groove in the swivel holder for attaching dial test indicators that are equipped with a dovetail.

7010-10

7011-10

7012-10

7014-10
(magnetic clamping is non-switchable)

7033-10

7031-10

7032-10

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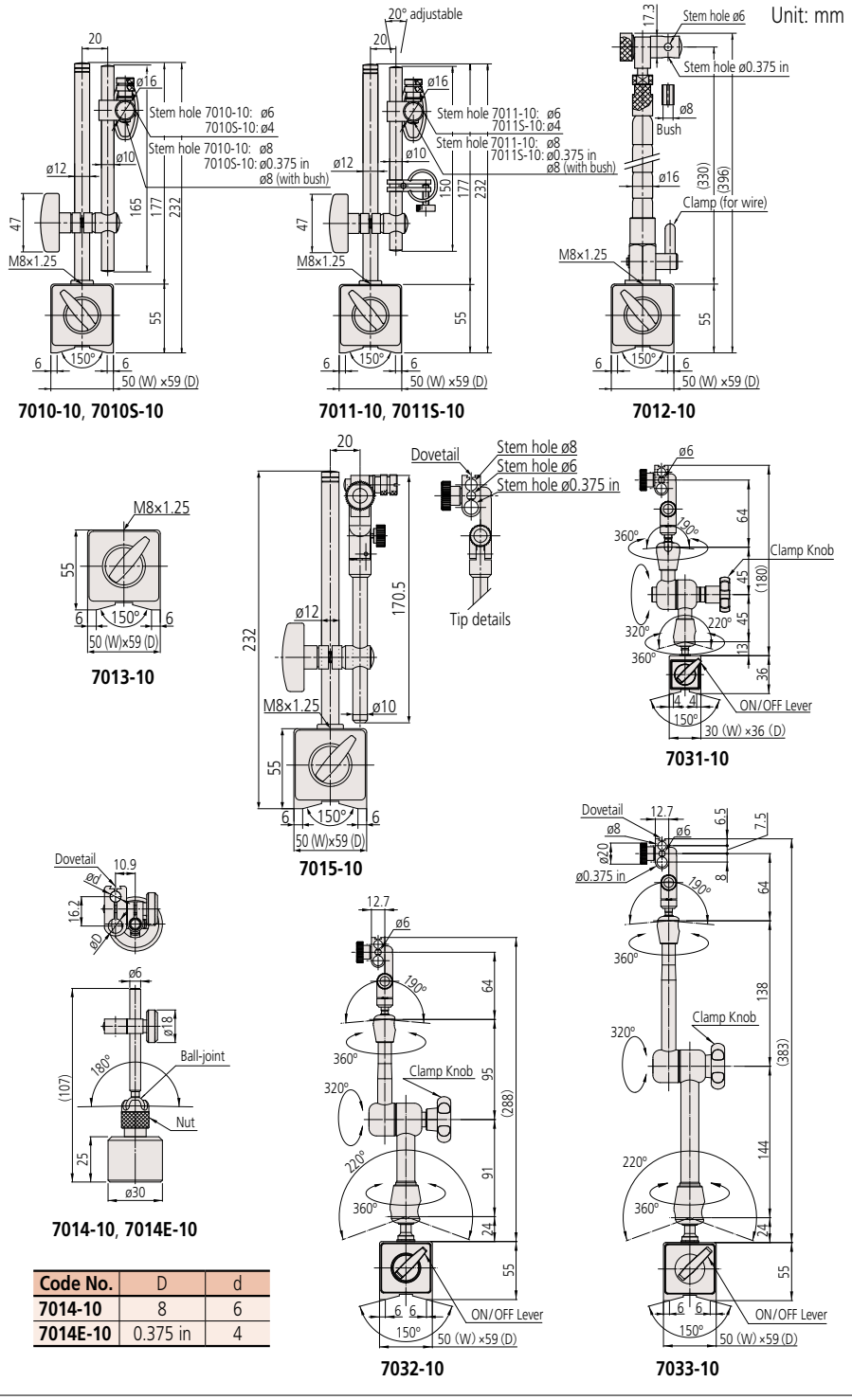
SPECIFICATIONS

Code No.	Description	Applicable holding stem sizes	Magnetic force*1	Remarks
7010-10[*2*3]	Magnetic stand	ø6 mm, ø8 mm	Approx. 600 N	—
7010S-10[*2*3]	Magnetic stand	ø4 mm, ø8 mm, ø0.375 in	Approx. 600 N	—
7011-10[*2*3]	Magnetic stand	ø6 mm, ø8 mm	Approx. 600 N	With fine adjustment
7011S-10[*2*3]	Magnetic stand	ø4 mm, ø8 mm, ø0.375 in	Approx. 600 N	With fine adjustment
7012-10[*4]	Magnetic stand	ø6 mm, ø8 mm, ø0.375 in	Approx. 600 N	—
7013-10	Magnetic stand base	—	Approx. 600 N	—
7014-10[*4]	Mini magnetic stand	ø6 mm, ø8 mm, with dovetail	Approx. 150 N	Without magnet ON/OFF
7014E-10[*2*3]	Mini magnetic stand	ø4 mm, ø0.375 in	Approx. 150 N	Without magnet ON/OFF
7015-10	Magnetic stand	ø6 mm, ø8 mm, ø0.375 in, with dovetail	Approx. 600 N	Without magnet ON/OFF
7031-10	Universal magnetic stand	ø6 mm, ø8 mm, ø0.375 in, with dovetail	Approx. 300 N	With mechanical locking system
7032-10	Universal magnetic stand	ø6 mm, ø8 mm, ø0.375 in, with dovetail	Approx. 600 N	With mechanical locking system
7033-10	Universal magnetic stand	ø6 mm, ø8 mm, ø0.375 in, with dovetail	Approx. 600 N	With mechanical locking system

*1 The magnetic holding force applies to that needed for vertical separation from a thick and flat steel object.
*2 Back plunger type (**1160A**, etc.) cannot be attached.
*3 When attaching a compact dial indicator (outer frame diameter 31, 36 or 40 mm), select a back cover type with a lug.
*4 Use with a dial test indicator or SERIES **1** dial indicator (compact or lightweight type) is recommended.

DIMENSIONS

Unit: mm



Code No.	D	d
7014-10	8	6
7014E-10	0.375 in	4

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Dial Gage Stands
SERIES 7

- Dial Gage Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator. An anvil is provided as standard.
- Anvil: ø58 mm serrated anvil, ø58 mm flat anvil, 90 mm square anvil and domed anvil (optional)
- Vertical fine adjustment is available with one-touch control thanks to the parallel spring suspension.

7002-10
(with ø58 mm non-serrated anvil)

SPECIFICATIONS

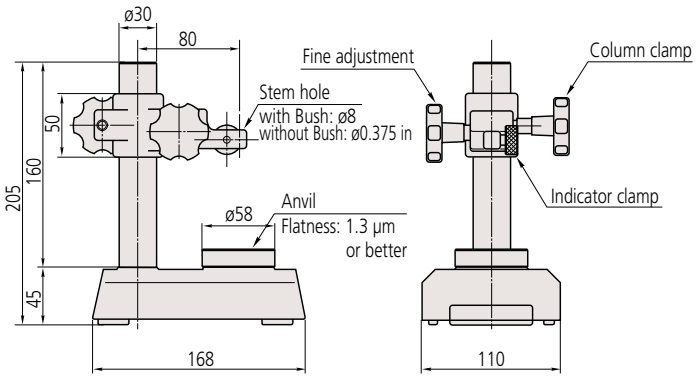
Metric

Code No.	Clamping range on column (mm)	Stem hole (mm)	Remarks
7001-10	0 to 95	ø8, ø0.375 in	With serrated anvil
7002-10			With flat anvil

Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm
Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).
Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS

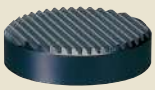
Unit: mm



7001-10, 7002-10
- Clamping range on column: 0 to 95 mm
- Flatness of reference surface: 1.3 µm

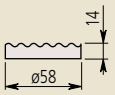
Optional Accessories

101462: Hardened steel serrated anvil
(standard accessory for **7001-10**)

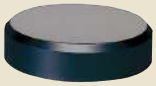


Unit: mm

Hardened steel

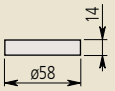


101461: Hardened steel non-serrated anvil
(standard accessory for **7002-10**)



Unit: mm

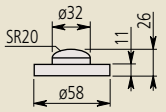
Hardened steel



101463: Hardened steel domed anvil* (optional)
* Not available for **7007-10**.

Unit: mm

Hardened steel



Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

7007-10
(with 90 mm square semi-serrated anvil)

SPECIFICATIONS

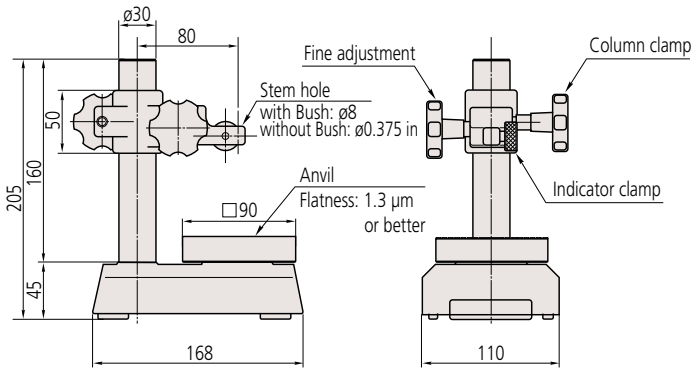
Metric

Code No.	Clamping range on column (mm)	Stem hole (mm)	Remarks
7007-10	0 to 90	ø8, ø0.375 in	With square anvil

Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm
Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).
Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS

Unit: mm



7007-10
- Clamping range on column: 0 to 90 mm
- Flatness of reference surface: 1.3 µm

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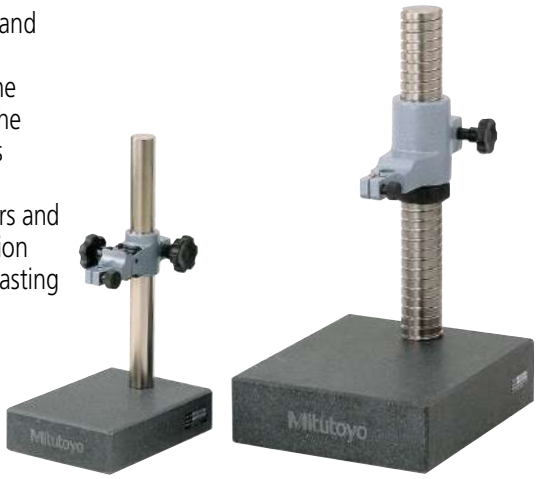
SERIES 215 — Granite Base Comparator Stands

- The plates are made of natural stone and will hardly deteriorate over time. (While the appearance of natural stone base varies according to the source, the high stability for which this material is known can always relied upon.)
- The rigid granite base is free from burrs and pileups due to its fine-grain composition and less viscousness compared with casting iron. The flatness is always accurate.



215-151-10 **215-156-10**

Optional Accessories

ø15 mm bush (for **215-156-10**, **215-505-10**):
21JAA331

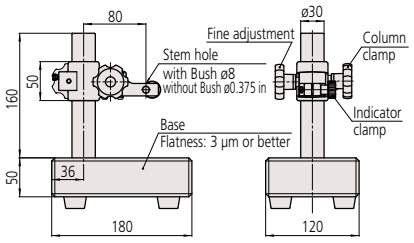
SPECIFICATIONS

Code No.	Granite base size (WxDxH) (mm)	Clamping range on column (mm)	Stem hole (mm)	Remarks
215-150-10	120×180×50	0 to 110	ø8, ø0.375 in	With fine adjustment of 1 mm range
215-151-10	150×200×50	0 to 250		
215-153-10	200×250×80	0 to 260		
215-156-10	300×250×80	0 to 275	ø8, ø0.375 in, ø20	With fine adjustment over entire travel

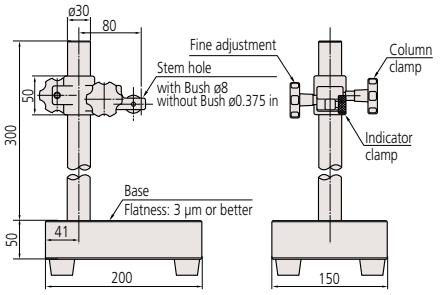
Note 1: Perpendicularity of the stem hole to the anvil is better than 0.2 mm/100 mm.
Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).
Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS

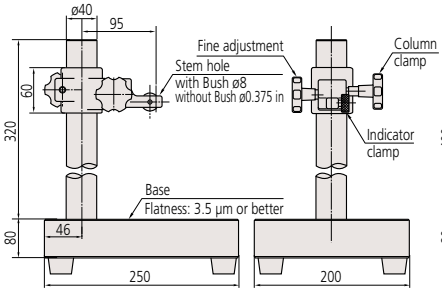
Unit: mm



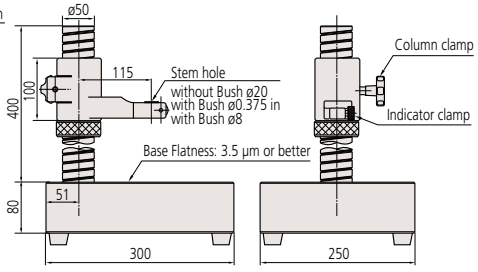
215-150-10
• Clamping range on column: 0 to 110 mm



215-151-10
• Clamping range on column: 0 to 250 mm



215-153-10
• Clamping range on column: 0 to 260 mm



215-156-10
• Clamping range on column: 0 to 275 mm

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SERIES 215 — Cast Iron Base Comparator Stands

Example of attaching the Digimatic Indicator

Digimatic Indicator **ID-H**.

Optional Accessories

Refer to page 07-101.

- Comparator Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator.
- The partially serrated anvil prevents very flat workpieces from wringing to it.

215-405-10

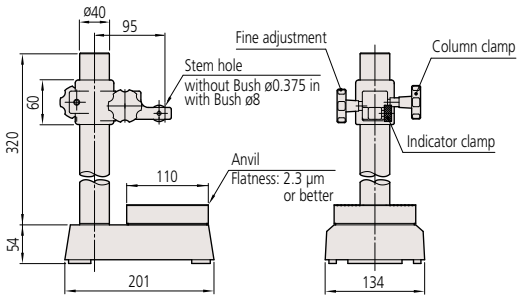
SPECIFICATIONS

Code No.	Anvil	Clamping range on column (mm)	Micromotion mechanism (Adjustment range)	Stem hole (mm)
215-405-10	Square semi-serrated anvil (110×110 mm)	0 to 235	Vertical fine adjustment (1 mm)	ø0.375 in, ø8 with Bush
215-505-10	Square semi-serrated anvil (150×150 mm)	0 to 275	Micromotion screw	ø20, ø0.375 in with Bush, ø8 with Bush

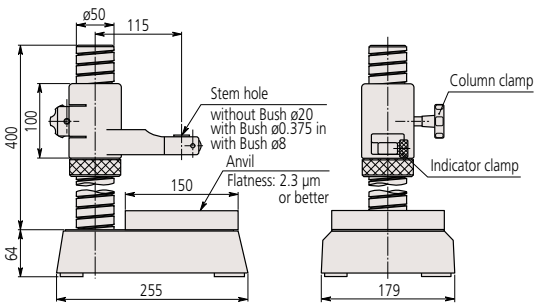
Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm.
Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).
Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS

Unit: mm



215-405-10
- Clamping range on column: 0 to 235 mm



215-505-10
- Clamping range on column: 0 to 275 mm

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Mitutoyo

SERIES 519 — Transfer Stands

- Transfer Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator.

519-109-10
(with a serrated anvil)

SPECIFICATIONS

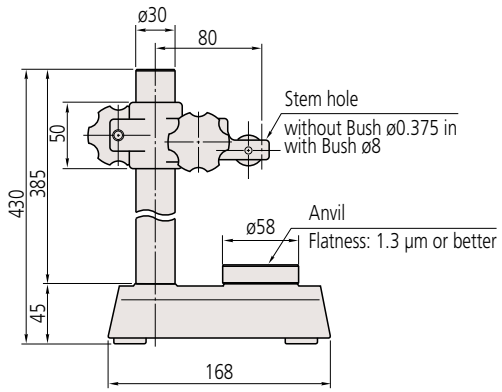
Metric

Code No.	Anvil	Clamping range on column (mm)	Micromotion adjustment range (mm)	Stem hole (mm)
519-109-10	With a serrated anvil (ø58 mm)	0 to 320	1	ø0.375 in, ø8 with Bush

Note 1: Perpendicularity of the stem hole to the anvil is better than 0.4 mm/100 mm.
Note 2: Take note that when mounting high-accuracy Linear Gages (with resolution of 0.1 µm or better) to these stands, accuracy may be affected depending on the perpendicularity of the mounting hole to the top surface of the anvil (cosine effect).
Note 3: Compact dial indicators (bezel ø31, ø36) are not suitable for use with these stands.

DIMENSIONS

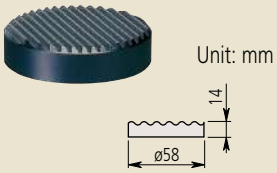
Unit: mm



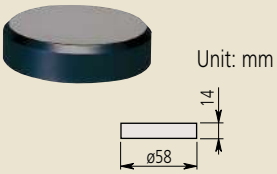
- Clamping range on column: 0 to 320 mm
- Flatness of the bottom surface: 0.003 mm

Optional Accessories

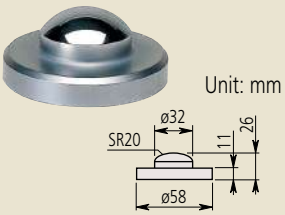
101462: Hardened steel serrated anvil (standard accessory)



101461: Hardened steel non-serrated anvil (optional)



101463: Hardened steel domed anvil (optional)



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08

Inside Measuring Instruments

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

IP65

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level.
(Refer to page 3)

TÜVRheinland CERTIFIED
Dust- and Water-Protected
www.tuv.com ID 0000040191

TÜV Rheinland Certification Marks

All products with the marks have passed the IP test carried out by the German accreditation organization, TÜV Rheinland.

PROPRIETARY INSPECTION CERTIFICATE
Mitutoyo guarantees the product quality. Mitutoyo guarantees the product quality.

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

ABSOLUTE™

ABSOLUTE Linear Encoder

Mitutoyo developed the unique ABSOLUTE method to retain position information after the power is turned off.
The origin is set once - thereafter the live position is displayed when the power is turned on.

Digimatic Holtest

Holtest

ABSOLUTE Borematic

Inside Micrometers (Caliper Type)

Bore Gages

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Mitutoyo

Digimatic Holtest
SERIES 468 — Three-point Bore Micrometers

- These three-point bore Digimatic micrometers for inside measurement are suitable for highly accurate measurements.
- Can measure deep holes using an extension rod (optional).
- Can measure close to the bottom of a blind hole.
- Titanium-coated measuring pins provide excellent durability and impact resistance.
- Two values can be preset as a reference point, allowing you to store multiple measured values of setting rings and to quickly prepare for measurement.

468-161 468-168 468-174

SPECIFICATIONS

Metric

Code No.	Range*2 (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)*1	Extension Rod (optional)
468-161	6 - 8	0.001	±2 (maximum difference 2)	**952322** (100 mm)
468-162	8 - 10			
468-163	10 - 12			
468-164	12 - 16		±3 (maximum difference 3)	**952621** (150 mm)
468-165	16 - 20			
468-166	20 - 25			**952622** (150 mm)
468-167	25 - 30			
468-168	30 - 40			
468-169	40 - 50			**952623** (150 mm)
468-170	50 - 63			
468-171	62 - 75		±4 (maximum difference 4)	
468-172	75 - 88			
468-173	87 - 100			
468-174	100 - 125		±5 (maximum difference 5)	
468-175	125 - 150			
468-176	150 - 175			
468-177	175 - 200			
468-178	200 - 225		±6 (maximum difference 6)	
468-179	225 - 250			
468-180	250 - 275			
468-181	275 - 300			

Inch / Metric

Code No.	Range*2 (in)	Resolution	Maximum permissible error J_{MPE} (in)*1	Extension Rod (optional)
468-261	0.275 - 0.35	0.00005 in/ 0.001 mm	±0.0001 (maximum difference 0.0001)	**952322** (100 mm)
468-262	0.35 - 0.425			
468-263	0.425 - 0.5			
468-264	0.5 - 0.65		±0.00015 (maximum difference 0.00015)	**952621** (150 mm)
468-265	0.65 - 0.8			
468-266	0.8 - 1			**952622** (150 mm)
468-267	1 - 1.2			
468-268	1.2 - 1.6			
468-269	1.6 - 2			**952623** (150 mm)
468-270	2 - 2.5			
468-271	2.5 - 3		±0.0002 (maximum difference 0.0002)	
468-272	3 - 3.5			
468-273	3.5 - 4			
468-274	4 - 5	0.0001 in/ 0.001 mm	±0.00025 (maximum difference 0.00025)	
468-275	5 - 6			
468-276	6 - 7			
468-277	7 - 8			
468-278	8 - 9		±0.0003 (maximum difference 0.0003)	
468-279	9 - 10			
468-280	10 - 11			
468-281	11 - 12			

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 1.2 years under normal use
- Position detection method: Electromagnetic induction-type rotary encoder

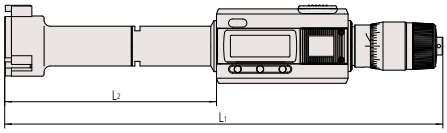
*1 Additionally, the difference in permissible error allowable is limited to a value within this range, as given in parentheses, and is measured with the entire measuring surface in contact with the object measured.

*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

Note: Setting rings are optional.

DIMENSIONS

Unit: mm



Range	L_2*	L_1
6 - 8, 8 - 10, 10 - 12 mm	59	175 - 177
12 - 16, 16 - 20 mm	84	197 - 201
20 - 25, 25 - 30 mm	93	206 - 211
30 - 40, 40 - 50 mm	103	214 - 224
50 - 63, 62 - 75, 75 - 88, 87 - 100 mm	105	219 - 232
100 - 125, 125 - 150, 150 - 175, 175 - 200, 200 - 225, 225 - 250, 250 - 275, 275 - 300 mm	151	286 - 311

* L_2 is maximum depth of measurement possible.
Note: External view differs depending on measurement range.

MeasurLink® ENABLED
Data Management Software by Mitutoyo

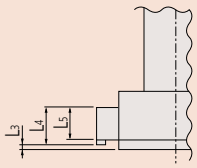
IP65

Dust- and Water-Protected

Measurement example

Reference dimensions when measuring a blind hole

Range (mm)	L_3 (mm)	L_4 (mm)	L_5 (mm)
6 - 12	2 or below	—	2.5
12 - 20	0.3 or below	5.6	3.5
20 - 30		8.3	5.2
30 - 50		13.0	10.0
50 - 100		17.0	14.0
100 - 300	12.4 or below	21.0	13.8



Functions

Zero-setting
Origin restoration
Data hold
2-point Preset
Function lock
inch/mm readout (inch/mm type)
Automatic power ON/OFF
Error alarm
Data output

Optional Accessories

Code No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730*	IP67	**U-WAVE-T**
02AZD880*	Buzzer	**U-WAVE-T**
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch

* Add suffix to Code No.; **G** for Asia, Europe and the Americas, **H** for Brazil and **J** for Korea.

Mounting bracket (optional)

A bracket used to fix a micrometer on the **MS-R** micrometer stand.
04AZB157

For details of Special-order Products, refer to page 13-16.

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Optional Accessories

Code No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730*	IP67	**U-WAVE-T**
02AZD880*	Buzzer	**U-WAVE-T**
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch

* Add suffix to Code No.; **G** for Asia, Europe and the Americas, **H** for Brazil and **J** for Korea.

Interchangeable Head Sets

468-971

468-972

468-973

468-974

Metric

Set code No.	Range* (mm)	Content of set
468-971	6 - 12	Display unit 6 - 12 mm 1 pc. Measuring head 6 - 8 mm 1 pc. 8 - 10 mm 1 pc. 10 - 12 mm 1 pc. Setting ring (ø8, ø10) 1 pc. each Extension rod (100 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.
468-972	12 - 20	Display unit 12 - 20 mm 1 pc. Measuring head 12 - 16 mm 1 pc. 16 - 20 mm 1 pc. Setting ring (ø16) 1 pc. Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.
468-973	20 - 50	Display unit 20 - 50 mm 1 pc. Measuring head 20 - 25 mm 1 pc. 25 - 30 mm 1 pc. 30 - 40 mm 1 pc. 40 - 50 mm 1 pc. Setting ring (ø25, ø40) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.
468-974	50 - 100	Display unit 50 - 100 mm 1 pc. Measuring head 50 - 63 mm 1 pc. 62 - 75 mm 1 pc. 75 - 88 mm 1 pc. 87 - 100 mm 1 pc. Setting ring (ø62, ø87) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.

Inch / Metric

Set code No.	Range* (in)	Content of set
468-976	0.275 - 0.5	Display unit 0.275 - 0.5 in 1 pc. Measuring head 0.275 - 0.35 in 1 pc. 0.35 - 0.425 in 1 pc. 0.425 - 0.5 in 1 pc. Setting ring 1 pc. each (0.35 in DIA., 0.425 in DIA.) Extension rod (100 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.
468-977	0.5 - 0.8	Display unit 0.5 - 0.8 in 1 pc. Measuring head 0.5 - 0.65 in 1 pc. 0.65 - 0.8 in 1 pc. Setting ring (0.65 in DIA.) 1 pc. Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.
468-978	0.8 - 2	Display unit 0.8 - 2 in 1 pc. Measuring head 0.8 - 1 in 1 pc. 1 - 1.2 in 1 pc. 1.2 - 1.6 in 1 pc. 1.6 - 2 in 1 pc. Setting ring 1 pc. each (1 in DIA., 1.6 in DIA.) Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.
468-979	2 - 4	Display unit 2 - 4 in 1 pc. Measuring head 2 - 2.5 in 1 pc. 2.5 - 3 in 1 pc. 3 - 3.5 in 1 pc. 3.5 - 4 in 1 pc. Setting ring 1 pc. each (2.5 in DIA., 3.5 in DIA.) Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

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Mitutoyo

Digimatic Holtest
SERIES 468 — Three-point Bore Micrometers

Interchangeable Head Sets

Setting rings are supplied as standard (ø125, ø175) (Packed separately)

468-975

08
Inside Measuring Instruments
Holtest

Metric

Set code No.	Range* (mm)	Content of set	
468-975	100 - 200	Display unit	
		100 - 200 mm	1 pc.
		Measuring head	
		100 - 125 mm	1 pc.
		125 - 150 mm	1 pc.
		150 - 175 mm	1 pc.
		175 - 200 mm	1 pc.
		Setting ring (ø125, ø175)	1 pc. each
		Extension rod (150 mm)	1 pc.
		Spanner	2 pcs.
		Hex wrench	1 pc.
		Phillips screwdriver	1 pc.

Inch / Metric

Set code No.	Range* (in)	Content of set	
468-980	4 - 8	Display unit	
		4 - 8 in	1 pc.
		Measuring head	
		4 - 5 in	1 pc.
		5 - 6 in	1 pc.
		6 - 7 in	1 pc.
		7 - 8 in	1 pc.
		Setting ring (5 in DIA., 7 in DIA.)	1 pc. each
		Extension rod (150 mm)	1 pc.
		Spanner	2 pcs.
		Hex wrench	1 pc.
		Phillips screwdriver	1 pc.

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

Accessories (optional)

Refer to page 08-4.

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Accessories (optional)

Refer to page 08-4.

Non-interchangeable Head Sets

468-981

468-982

468-983

468-984

468-985

Metric

Set code No.	Range*2 (mm)	Content of set	Extension rod (optional)
468-981	6 - 12	Display unit 6 - 8 mm 1 pc. 8 - 10 mm 1 pc. 10 - 12 mm 1 pc. Setting ring (ø8, ø10) 1 pc. each Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.	100 mm 1 pc.
468-982	12 - 25	Display unit 12 - 16 mm 1 pc. 16 - 20 mm 1 pc. 20 - 25 mm 1 pc. Setting ring (ø16, ø20) 1 pc. each Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 2 pcs.*1
468-983	25 - 50	Display unit 25 - 30 mm 1 pc. 30 - 40 mm 1 pc. 40 - 50 mm 1 pc. Setting ring (ø30, ø40) 1 pc. each Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.
468-984	50 - 75	Display unit 50 - 63 mm 1 pc. 62 - 75 mm 1 pc. Setting ring (ø62) 1 pc. Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.
468-985	75 - 100	Display unit 75 - 88 mm 1 pc. 87 - 100 mm 1 pc. Setting ring (ø87) 1 pc. Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.

Inch / Metric

Set code No.	Range*2 (in)	Content of set	Extension rod (optional)
468-986	0.275 - 0.5	Display unit 0.275 - 0.35 in 1 pc. 0.35 - 0.425 in 1 pc. 0.425 - 0.5 in 1 pc. Setting ring 1 pc. each (0.35 in DIA., 0.425 in DIA.) Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.	100 mm 1 pc.
468-987	0.5 - 1	Display unit 0.5 - 0.65 in 1 pc. 0.65 - 0.8 in 1 pc. 0.8 - 1 in 1 pc. Setting ring 1 pc. each (0.65 in DIA., 0.8 in DIA.) Spanner 2 pcs. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 2 pcs.*1
468-988	1 - 2	Display unit 1 - 1.2 in 1 pc. 1.2 - 1.6 in 1 pc. 1.6 - 2 in 1 pc. Setting ring 1 pc. each (1.2 in DIA., 1.6 in DIA.) Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.
468-989	2 - 3	Display unit 2 - 2.5 in 1 pc. 2.5 - 3 in 1 pc. Setting ring (2.5 in DIA.) 1 pc. Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.
468-990	3 - 4	Display unit 3 - 3.5 in 1 pc. 3.5 - 4 in 1 pc. Setting ring (3.5 in DIA.) 1 pc. Spanner 1 pc. Hex wrench 1 pc. Phillips screwdriver 1 pc.	150 mm 1 pc.

*1 Total 2 pcs. of extension rods: Code No. **952621** (for measuring range 12 to 16 mm, 16 to 20 mm) and code No. **952622** (for measuring range 20 to 25 mm).
Two extension rods cannot be connected due to the different mounting positions.

*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Mitutoyo

Holtest
SERIES 368 — Three-point/Two-point Bore Micrometers

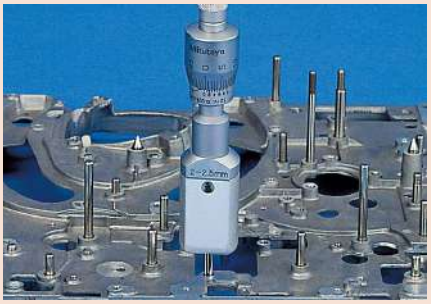
- These are standard analog three-point bore micrometers. (A two-point contact type with measuring range of 2 to 6 mm diameter is available to measure extremely small holes.)
- Three-point bore micrometer allows stable measurement through self centering.
- Can measure close to the bottom of a blind hole.
- Titanium-coated measuring pins on the three-point type (over 6 mm range models) provide excellent durability and impact resistance.
- Three-point type can measure deep holes by attaching an extension rod (optional).

368-001
(Two-point contact type)

368-168
(Three-point contact type)

368-174
(Three-point contact type)

Measurement example



SPECIFICATIONS

Metric

Code No.	Range*2 (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)*1	Extension Rod (optional)
(Two-point)				
368-001	2 - 2.5			
368-002	2.5 - 3			
368-003	3 - 4			
368-004	4 - 5			
368-005	5 - 6	0.001	±2 (maximum difference 2)	—
(Three-point)				
368-161	6 - 8			**952322** (100 mm)
368-162	8 - 10			
368-163	10 - 12			
368-164	12 - 16			**952621** (150 mm)
368-165	16 - 20			
368-166	20 - 25		±3 (maximum difference 3)	
368-167	25 - 30			**952622** (150 mm)
368-168	30 - 40			
368-169	40 - 50			
368-170	50 - 63			
368-171	62 - 75		±4 (maximum difference 4)	
368-172	75 - 88	0.005		
368-173	87 - 100			
368-174	100 - 125		±5 (maximum difference 5)	**952623** (150 mm)
368-175	125 - 150			
368-176	150 - 175			
368-177	175 - 200			
368-178	200 - 225		±6 (maximum difference 6)	
368-179	225 - 250			
368-180	250 - 275			
368-181	275 - 300			

Inch

Code No.	Range*2 (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)*1	Extension Rod (optional)
(Two-point)				
368-021	0.08 - 0.1			
368-022	0.1 - 0.12			
368-023	0.12 - 0.16			
368-024	0.16 - 0.2			
368-025	0.2 - 0.24	0.0001	±0.0001 (maximum difference 0.0001)	—
368-026	0.24 - 0.28			
(Three-point)				
368-261	0.275 - 0.35			**952322** (100 mm)
368-262	0.35 - 0.425			
368-263	0.425 - 0.5			
368-264	0.5 - 0.65			**952621** (150 mm)
368-265	0.65 - 0.8			
368-266	0.8 - 1		±0.00015 (maximum difference 0.00015)	
368-267	1 - 1.2			**952622** (150 mm)
368-268	1.2 - 1.6			
368-269	1.6 - 2			
368-270	2 - 2.5			
368-271	2.5 - 3		±0.0002 (maximum difference 0.0002)	
368-272	3 - 3.5	0.0002		
368-273	3.5 - 4			
368-274	4 - 5		±0.00025 (maximum difference 0.00025)	**952623** (150 mm)
368-275	5 - 6			
368-276	6 - 7			
368-277	7 - 8			
368-278	8 - 9		±0.0003 (maximum difference 0.0003)	
368-279	9 - 10			
368-280	10 - 11			
368-281	11 - 12			

*1 Additionally, the difference in permissible error allowable is limited to a value within this range, as given in parentheses, and is measured with the entire measuring surface in contact with the object measured.
*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).
Note: Setting rings are optional.

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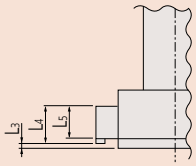
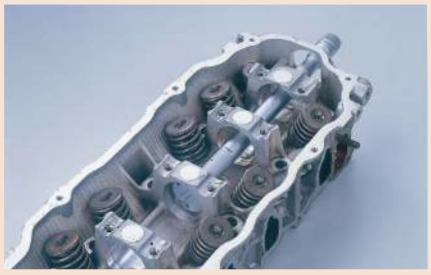
Reference dimensions when measuring a blind hole

Range (mm)	L_3 (mm)	L_4 (mm)	L_5 (mm)
2 - 6	—	—	2
6 - 12	2 or below	—	2.5
12 - 20	0.3 or below	5.6	3.5
20 - 30		8.3	5.2
30 - 50		13.0	10.0
50 - 100		17.0	14.0
100 - 300	12.4 or below	21.0	13.8



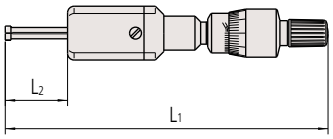
Typical application of Extension Rod



For details of Special-order Products, refer to page 13-16.

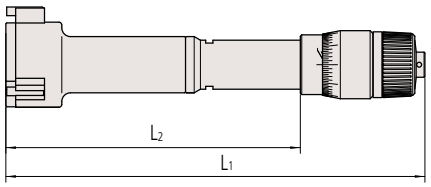
DIMENSIONS

Unit: mm



Range	L_2	L_1
2 - 2.5, 2.5 - 3 mm	12	103.5 - 104
3 - 4, 4 - 5, 5 - 6 mm	22	113 - 114

Note: External appearance differs depending on the measuring range.



Range	L_2	L_1
6 - 8, 8 - 10, 10 - 12 mm	59	102 - 104
12 - 16, 16 - 20 mm	82	126 - 130
20 - 25, 25 - 30 mm	94	137 - 142
30 - 40, 40 - 50 mm	102	145 - 155
50 - 63, 62 - 75, 75 - 88, 87 - 100 mm	105	150 - 163
100 - 125, 125 - 150, 150 - 175, 175 - 200, 200 - 225, 225 - 250, 250 - 275, 275 - 300 mm	161	227 - 252

Note: External appearance differs depending on the measuring range.

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Holtest
SERIES 368 — Three-point/Two-point Bore Micrometers

Non-interchangeable Head Sets

368-906

368-907

368-911

368-912

Metric

Set code No.	Range* (mm)	Graduation (mm)	Content of Set
(Two-point) **368-906**	2 - 3	0.001	Micrometer head unit 2 - 2.5 mm 1 pc. 2.5 - 3 mm 1 pc. Setting ring (ø2.5) 1 pc. Hex wrench 1 pc.
368-907	3 - 6		Micrometer head unit 3 - 4 mm 1 pc. 4 - 5 mm 1 pc. 5 - 6 mm 1 pc. Setting ring (ø4, ø5) 1 pc. each Hex wrench 1 pc.
(Three-point) **368-911**	6 - 12		Micrometer head unit 6 - 8 mm 1 pc. 8 - 10 mm 1 pc. 10 - 12 mm 1 pc. Setting ring (ø8, ø10) 1 pc. each Extension rod (100 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-912	12 - 20	0.005	Micrometer head unit 12 - 16 mm 1 pc. 16 - 20 mm 1 pc. Setting ring (ø16) 1 pc. Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.

Inch

Set code No.	Range* (in)	Graduation (in)	Content of Set
(Two-point) **368-926**	0.08 - 0.12	0.0001	Micrometer head unit 0.08 - 0.1 in 1 pc. 0.1 - 0.12 in 1 pc. Setting ring (0.1 in DIA.) 1 pc. Hex wrench 1 pc.
368-927	0.12 - 0.28		Micrometer head unit 0.12 - 0.16 in 1 pc. 0.16 - 0.2 in 1 pc. 0.2 - 0.24 in 1 pc. 0.24 - 0.28 in 1 pc. Setting ring (0.16 in DIA., 0.24 in DIA.) 1 pc. each Hex wrench 1 pc.
(Three-point) **368-916**	0.275 - 0.5		Micrometer head unit 0.275 - 0.35 in 1 pc. 0.35 - 0.425 in 1 pc. 0.425 - 0.5 in 1 pc. Setting ring (0.35 in DIA., 0.5 in DIA.) 1 pc. each Extension rod (100 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-917	0.5 - 0.8	0.0002	Micrometer head unit 0.5 - 0.65 in 1 pc. 0.65 - 0.8 in 1 pc. Setting ring (0.65 in DIA.) 1 pc. Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

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Non-interchangeable Head Sets

368-913

368-914

Setting rings are supplied as standard (ø125, ø175) (Packed separately)

368-915

Metric

Set code No.	Range* (mm)	Graduation (mm)	Content of Set
(Three-point) **368-913**	20 - 50	0.005	Micrometer head unit 20 - 25 mm 1 pc. 25 - 30 mm 1 pc. 30 - 40 mm 1 pc. 40 - 50 mm 1 pc. Setting ring (ø25, ø40) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-914	50 - 100		Micrometer head unit 50 - 63 mm 1 pc. 62 - 75 mm 1 pc. 75 - 88 mm 1 pc. 87 - 100 mm 1 pc. Setting ring (ø62, ø87) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-915	100 - 200		Micrometer head unit 100 - 125 mm 1 pc. 125 - 150 mm 1 pc. 150 - 175 mm 1 pc. 175 - 200 mm 1 pc. Setting ring (ø125, ø175) 1 pc. each Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.

Inch

Set code No.	Range* (in)	Graduation (in)	Content of Set
(Three-point) **368-918**	0.8 - 2	0.0002	Micrometer head unit 0.8 - 1 in 1 pc. 1 - 1.2 in 1 pc. 1.2 - 1.6 in 1 pc. 1.6 - 2 in 1 pc. Setting ring 1 pc. each (1 in DIA., 1.6 in DIA.) Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-919	2 - 4		Micrometer head unit 2 - 2.5 in 1 pc. 2.5 - 3 in 1 pc. 3 - 3.5 in 1 pc. 3.5 - 4 in 1 pc. Setting ring 1 pc. each (2.5 in DIA., 3.5 in DIA.) Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.
368-920	4 - 8		Micrometer head unit 4 - 5 in 1 pc. 5 - 6 in 1 pc. 6 - 7 in 1 pc. 7 - 8 in 1 pc. Setting ring 1 pc. each (5 in DIA., 7 in DIA.) Extension rod (150 mm) 1 pc. Spanner 2 pcs. Hex wrench 1 pc.

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

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Mitutoyo

Holtest (Type II)
SERIES 368 — Three-point Bore Micrometers

- The Holtests (type II) have three contact points made of alloy steel for a more economically priced tool.
- Same accuracy as the titanium-coated Holtest models.
- Constant-force device allows stable measurement.
- Can measure deep holes using an extension rod (optional).

368-769

368-770

368-774

SPECIFICATIONS

Metric Individual

Code No.	Range*2 (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)*1	Extension Rod (optional)
368-764	12 - 16	0.005	±3 (maximum difference 3)	**952621** (150 mm)
368-765	16 - 20			
368-766	20 - 25			**952622** (150 mm)
368-767	25 - 30			
368-768	30 - 40			
368-769	40 - 50			**952623** (150 mm)
368-770	50 - 63		±4 (maximum difference 4)	
368-771	62 - 75			
368-772	75 - 88			
368-773	87 - 100			
368-774	100 - 125		±5 (maximum difference 5)	
368-775	125 - 150			
368-776	150 - 175			
368-777	175 - 200			
368-778	200 - 225		±6 (maximum difference 6)	
368-779	225 - 250			
368-780	250 - 275			
368-781	275 - 300			

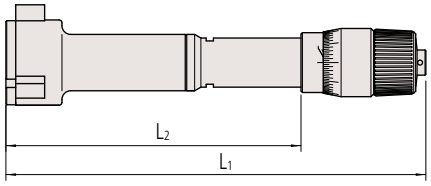
Inch Individual

Code No.	Range*2 (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)*1	Extension Rod (optional)
368-864	0.5 - 0.65	0.0002	±0.00015 (maximum difference 0.00015)	**952621** (150 mm)
368-865	0.65 - 0.8			
368-866	0.8 - 1			**952622** (150 mm)
368-867	1 - 1.2			
368-868	1.2 - 1.6			
368-869	1.6 - 2			**952623** (150 mm)
368-870	2 - 2.5		±0.0002 (maximum difference 0.0002)	
368-871	2.5 - 3			
368-872	3 - 3.5			
368-873	3.5 - 4			
368-874	4 - 5		±0.00025 (maximum difference 0.00025)	
368-875	5 - 6			
368-876	6 - 7			
368-877	7 - 8			
368-878	8 - 9		±0.0003 (maximum difference 0.0003)	
368-879	9 - 10			
368-880	10 - 11			
368-881	11 - 12			

*1 Additionally, the difference in permissible error allowable is limited to a value within this range, as given in parentheses, and is measured with the entire measuring surface in contact with the object measured.
*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).
Note: Setting rings are optional.

DIMENSIONS

Unit: mm



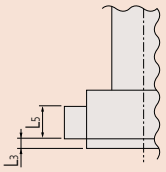
Range	L2	L1
12 - 16, 16 - 20	82	126 - 130
20 - 25, 25 - 30	94	137 - 142
30 - 40, 40 - 50	102	145 - 155
50 - 63, 62 - 75, 75 - 88, 87 - 100	105	150 - 163
100 - 125, 125 - 150, 150 - 175, 175 - 200 200 - 225, 225 - 250, 250 - 275, 275 - 300	161	227 - 252

Note: External appearance differs depending on the measuring range.

Measurement example

Reference dimensions when measuring a blind hole

Range (mm)	L3 (mm)	L5 (mm)
12 - 20	2.6 or below	3.5
20 - 30	3.4 or below	5.2
30 - 50		10.0
50 - 100		14.0
100 - 300	19.6 or below	13.8



For details of Special-order Products, refer to page 13-16.

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Non-interchangeable Head Sets

368-991

368-992

368-993

Setting rings are supplied as standard (ø125, ø175) (Packed separately)

368-994

Metric

Code No.	Range* (mm)	Graduation (mm)	Content of Set	
368-991	12 - 20	0.005	Micrometer head unit	
			12 - 16 mm	1 pc.
			16 - 20 mm	1 pc.
			Setting ring (ø16)	1 pc.
			Extension rod (150 mm)	1 pc.
			Spanner	2 pcs.
			Hex wrench	1 pc.
368-992	20 - 50		Micrometer head unit	
			20 - 25 mm	1 pc.
			25 - 30 mm	1 pc.
			30 - 40 mm	1 pc.
			40 - 50 mm	1 pc.
			Setting ring (ø25, ø40)	1 pc. each
			Extension rod (150 mm)	1 pc.
			Spanner	2 pcs.
			Hex wrench	1 pc.
368-993	50 - 100		Micrometer head unit	
			50 - 63 mm	1 pc.
			62 - 75 mm	1 pc.
			75 - 88 mm	1 pc.
			87 - 100 mm	1 pc.
			Setting ring (ø62, ø87)	1 pc. each
			Extension rod (150 mm)	1 pc.
			Spanner	2 pcs.
			Hex wrench	1 pc.
368-994	100 - 200		Micrometer head unit	
			100 - 125 mm	1 pc.
			125 - 150 mm	1 pc.
			150 - 175 mm	1 pc.
			175 - 200 mm	1 pc.
			Setting ring (ø125, ø175)	1 pc. each
			Extension rod (150 mm)	1 pc.
			Spanner	2 pcs.
			Hex wrench	1 pc.

Inch

Code No.	Range* (in)	Graduation (in)	Content of Set	
368-995	0.5 - 0.8	0.0002	Micrometer head unit	
			0.5 - 0.65 in	1 pc.
			0.65 - 0.8 in	1 pc.
			Setting ring (0.65 in DIA.)	1 pc.
			Extension rod (150 mm)	1 pc.
			Spanner	2 pcs.
			Hex wrench	1 pc.
368-996	0.8 - 2		Micrometer head unit	
			0.8 - 1 in	1 pc.
			1 - 1.2 in	1 pc.
			1.2 - 1.6 in	1 pc.
			1.6 - 2 in	1 pc.
			Setting ring (1 in DIA., 1.6 in DIA.)	1 pc. each
			Extension rod (150 mm)	1 pc.
			Spanner	2 pcs.
			Hex wrench	1 pc.
368-997	2 - 4		Micrometer head unit	
			2 - 2.5 in	1 pc.
			2.5 - 3 in	1 pc.
			3 - 3.5 in	1 pc.
			3.5 - 4 in	1 pc.
			Setting ring (2.5 in DIA., 3.5 in DIA.)	1 pc. each
			Extension rod (150 mm)	1 pc.
			Spanner	2 pcs.
			Hex wrench	1 pc.
368-998	4 - 8		Micrometer head unit	
			4 - 5 in	1 pc.
			5 - 6 in	1 pc.
			6 - 7 in	1 pc.
			7 - 8 in	1 pc.
			Setting ring (5 in DIA., 7 in DIA.)	1 pc. each
			Extension rod (150 mm)	1 pc.
			Spanner	2 pcs.
			Hex wrench	1 pc.

* The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

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Mitutoyo

MeasurLink® ENABLED
Data Management Software by Mitutoyo

PROPRIETARY INSPECTION CERTIFICATE

ABSOLUTE™

ABSOLUTE Boremetic
SERIES 568 — ABSOLUTE Digimatic Snap-Open Bore Gages

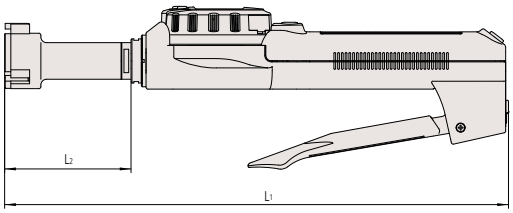
- Activation handle with precision-balanced spring allows for easier inside-diameter measurements.
- Titanium-coated measuring pins provide excellent durability and impact resistance.
- Three-Point contact measuring head enables stable measurement.
- Can measure deep holes using an extension rod (optional).

568-364-10

568-368-10

DIMENSIONS

Unit: mm



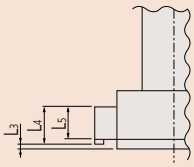
Range	L2	L1
6 - 8, 8 - 10, 10 - 12 mm	83	284
12 - 16, 16 - 20 mm	53	255
20 - 25, 25 - 30 mm	59	261
30 - 40, 40 - 50 mm	67	269
50 - 63, 62 - 75, 75 - 88, 87 - 100, 100 - 113, 112 - 125 mm	75	277

Note: External appearance differs depending on the measuring range.

Measurement example

Reference dimensions when measuring a blind hole

Range (mm)	L3 (mm)	L4 (mm)	L5 (mm)
6 - 12	2 or below	—	2.5
12 - 20	0.3 or below	5.6	3.5
20 - 30		8.3	5.2
30 - 50		13.0	10.0
50 - 125		17.0	14.0



Functions

GO/NO-GO judgment
GO/NO-GO judgment zoom
2-Point Preset
Zero-setting
Data hold, Error alarm
Low battery voltage alert
Data output
Function Lock
330° rotary display
ON/OFF function
inch/mm conversion (inch/mm type)

Optional Accessories

Code No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730*	IP67	**U-WAVE-T**
02AZD880*	Buzzer	**U-WAVE-T**
02AZD790F	F	Connection cable for **U-WAVE-T** (160 mm)
02AZE140F	F	Connection cable for **U-WAVE-T** For foot switch

* Add suffix to Code No.; **G** for Asia, Europe and the Americas, **H** for Brazil and **J** for Korea.

For details of Special-order Products, refer to page 13-16.

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SPECIFICATIONS

Metric Individual

Code No.	Range*2 (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)*1	Mass (g)	Extension Rod (optional)
568-361-10	6 - 8	0.001	±5 (maximum difference 5)	480	**952322** (100 mm)
568-362-10	8 - 10			485	
568-363-10	10 - 12			485	
568-364-10	12 - 16			475	**952621** (150 mm)
568-365-10	16 - 20			480	
568-366-10	20 - 25		±6 (maximum difference 6)	540	**952622** (150 mm)
568-367-10	25 - 30			555	
568-368-10	30 - 40			565	
568-369-10	40 - 50			610	
568-370-10	50 - 63			730	**952623** (150 mm)
568-371-10	62 - 75			740	
568-372-10	75 - 88			790	
568-373-10	87 - 100			800	
568-374-10	100 - 113			900	
568-375-10	112 - 125			910	

Inch / Metric Individual

Code No.	Range*2 (in)	Resolution	Maximum permissible error J_{MPE} (in)*1	Mass (g)	Extension Rod (optional)
568-461-10	0.275 - 0.35	0.00005 in / 0.001 mm	±0.00025 (maximum difference 0.00025)	480	**952322** (100 mm)
568-462-10	0.35 - 0.425			485	
568-463-10	0.425 - 0.5			485	
568-464-10	0.5 - 0.65			475	**952621** (150 mm)
568-465-10	0.65 - 0.8			480	
568-466-10	0.8 - 1		±0.0003 (maximum difference 0.0003)	540	**952622** (150 mm)
568-467-10	1 - 1.2			555	
568-468-10	1.2 - 1.6			565	
568-469-10	1.6 - 2			610	
568-470-10	2 - 2.5			730	**952623** (150 mm)
568-471-10	2.5 - 3			740	
568-472-10	3 - 3.5			790	
568-473-10	3.5 - 4			800	
568-474-10	4 - 4.5			900	
568-475-10	4.5 - 5			910	

- Response speed: Unlimited
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Position detection method: Electrostatic capacitance type absolute encoder
- Battery life: Approx. 5 years under normal use. Approx. 10,000 hours in continuous use.

*1 Additionally, the difference in permissible error allowable is limited to a value within this range, as given in parentheses, and is measured with the entire measuring surface in contact with the object measured.

*2 The measurement range cannot be enlarged by measuring heads that are not standard-supplied (the accuracy is not guaranteed).

Note: Setting rings are optional.

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ABSOLUTE Boremetic
SERIES 568 — ABSOLUTE Digimatic Snap-Open Bore Gages

Interchangeable-head Bore Gage Sets

568-924-10

568-926-10

Metric

Code No.	Range (mm)	Content of Set	
568-924-10	6 - 12	Display unit	1 pc.
		Measuring head	
		6 - 8 mm	1 pc.
		8 - 10 mm	1 pc.
		10 - 12 mm	1 pc.
		Attachment	1 pc.
		Setting ring (ø8, ø10)	1 pc. each
		Spanner	3 pcs.
568-925-10	12 - 25	Display unit	1 pc.
		Measuring head	
		12 - 16 mm	1 pc.
		16 - 20 mm	1 pc.
		20 - 25 mm	1 pc.
		Attachment	2 pcs.
		Setting ring (ø16, ø20)	1 pc. each
		Spanner	2 pcs.
568-926-10	25 - 50	Display unit	1 pc.
		Measuring head	
		25 - 30 mm	1 pc.
		30 - 40 mm	1 pc.
		40 - 50 mm	1 pc.
		Attachment	1 pc.
		Setting ring (ø30, ø40)	1 pc. each
		Spanner	2 pcs.
568-927-10	50 - 100	Display unit	1 pc.
		Measuring head	
		50 - 63 mm	1 pc.
		62 - 75 mm	1 pc.
		75 - 88 mm	1 pc.
		87 - 100 mm	1 pc.
		Attachment	1 pc.
		Setting ring (ø62, ø87)	1 pc. each
		Spanner	2 pcs.

Inch / Metric

Code No.	Range (in)	Content of Set	
568-928-10	0.275 - 0.5	Display unit	1 pc.
		Measuring head	
		0.275 - 0.35 in	1 pc.
		0.35 - 0.425 in	1 pc.
		0.425 - 0.5 in	1 pc.
		Attachment	1 pc.
		Setting ring (0.35 in DIA., 0.425 in DIA.)	1 pc. each
		Spanner	3 pcs.
568-929-10	0.5 - 1	Display unit	1 pc.
		Measuring head	
		0.5 - 0.65 in	1 pc.
		0.65 - 0.8 in	1 pc.
		0.8 - 1 in	1 pc.
		Attachment	2 pcs.
		Setting ring (0.65 in DIA., 0.8 in DIA.)	1 pc. each
		Spanner	2 pcs.
568-930-10	1 - 2	Display unit	1 pc.
		Measuring head	
		1 - 1.2 in	1 pc.
		1.2 - 1.6 in	1 pc.
		1.6 - 2 in	1 pc.
		Attachment	1 pc.
		Setting ring (1.2 in DIA., 1.6 in DIA.)	1 pc. each
		Spanner	2 pcs.
568-936 -10	2 - 4	Display unit	1 pc.
		Measuring head	
		2 - 2.5 in	1 pc.
		2.5 - 3 in	1 pc.
		3 - 3.5 in	1 pc.
		3.5 - 4 in	1 pc.
		Attachment	1 pc.
		Setting ring (2.5 in DIA., 3.5 in DIA.)	1 pc. each
		Spanner	2 pcs.

Optional Accessories

Refer to page 08-13.

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Non-interchangeable-head Snap-open Bore Gage Sets

Each set includes complete gages (display units and measuring heads for each size).

568-955-10

568-957-10

568-959-10

Metric

Code No.	Range (mm)	Content of Set	
568-955-10	6 - 12	Display unit	
		6 - 8 mm	1 pc.
		8 - 10 mm	1 pc.
		10 - 12 mm	1 pc.
		Setting ring (ø8, ø10)	1 pc. each
		Spanner	3 pcs.
568-956-10	12 - 25	Display unit	
		12 - 16 mm	1 pc.
		16 - 20 mm	1 pc.
		20 - 25 mm	1 pc.
		Setting ring (ø16, ø20)	1 pc. each
		Spanner	2 pcs.
568-957-10	25 - 50	Display unit	
		25 - 30 mm	1 pc.
		30 - 40 mm	1 pc.
		40 - 50 mm	1 pc.
		Setting ring (ø30, ø40)	1 pc. each
		Spanner	2 pcs.
568-958-10	50 - 75	Display unit	
		50 - 63 mm	1 pc.
		62 - 75 mm	1 pc.
		Setting ring (ø62)	1 pc.
		Spanner	2 pcs.
568-959-10	75 - 100	Display unit	
		75 - 88 mm	1 pc.
		87 - 100 mm	1 pc.
		Setting ring (ø87)	1 pc.
		Spanner	2 pcs.

Inch / Metric

Code No.	Range (in)	Content of Set	
568-965-10	0.275 - 0.5	Display unit	
		0.275 - 0.35 in	1 pc.
		0.35 - 0.425 in	1 pc.
		0.425 - 0.5 in	1 pc.
		Setting ring (0.35 in DIA., 0.425 in DIA.)	1 pc. each
		Spanner	3 pcs.
568-966-10	0.5 - 1	Display unit	
		0.5 - 0.65 in	1 pc.
		0.65 - 0.8 in	1 pc.
		0.8 - 1 in	1 pc.
		Setting ring (0.65 in DIA., 0.8 in DIA.)	1 pc. each
		Spanner	2 pcs.
568-967-10	1 - 2	Display unit	
		1 - 1.2 in	1 pc.
		1.2 - 1.6 in	1 pc.
		1.6 - 2 in	1 pc.
		Setting ring (1.2 in DIA., 1.6 in DIA.)	1 pc. each
		Spanner	2 pcs.
568-968-10	2 - 3	Display unit	
		2 - 2.5 in	1 pc.
		2.5 - 3 in	1 pc.
		Setting ring (2.5 in DIA.)	1 pc.
		Spanner	2 pcs.
568-969-10	3 - 4	Display unit	
		3 - 3.5 in	1 pc.
		3.5 - 4 in	1 pc.
		Setting ring (3.5 in DIA.)	1 pc.
		Spanner	2 pcs.

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Mitutoyo

Tubular Inside Micrometers
SERIES 133 — Single-Rod Type

- Standard Single-rod Type inside micrometer.
- Carbide-tipped measuring faces.
- A reference gage is necessary for reference point setting.
- An optional reference gage, such as Gauge Block Accessory Set, CERA inside Micro Checker or a setting ring, is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, 08-30, and 08-53 for details)

Measurement example

133-143

SPECIFICATIONS

Metric Individual

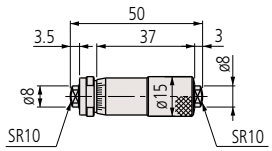
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)
133-143	50 - 75	0.01	±3

Inch Individual

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)
133-223	2 - 3	0.001	±0.00015

DIMENSIONS

133-143 Unit: mm



133-144

SPECIFICATIONS

Metric Individual

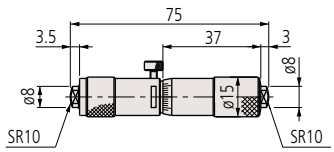
Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)
133-144	75 - 100	0.01	±4

Inch Individual

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)
133-224	3 - 4	0.001	±0.0002

DIMENSIONS

133-144 Unit: mm



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Micrometer Set

133-901 (Metric)
- Range: 50 - 150 mm (4 heads/set)
- Models included:
  133-143 133-144
  133-145 133-146
  with fitted case

133-902 (Metric)
- Range: 50 - 300 mm (10 heads/set)
- Models included:
  133-143 133-144
  133-145 133-146
  133-147 133-148
  133-149 133-150
  133-151 133-152
  with fitted case

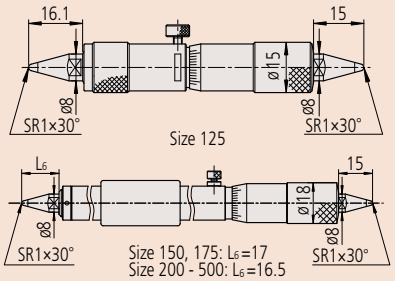
133-903 (Inch)
- Range: 2 - 6 in (4 heads/set)
- Models included:
  133-223 133-224
  133-225 133-226
  with fitted case

133-904 (Inch)
- Range: 2 - 12 in (10 heads/set)
- Models included:
  133-223 133-224
  133-225 133-226
  133-227 133-228
  133-229 133-230
  133-231 133-232
  with fitted case

Special sizes and specifications other than standard can be custom-made by special order. Please contact your local Mitutoyo Sales Office for more information.

Example

Measuring face: point
For models with a measuring range 100 - 500 mm



133-152

SPECIFICATIONS

Metric Individual

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)
133-145	100 - 125	0.01	±5
133-146	125 - 150		
133-147	150 - 175		
133-148	175 - 200		
133-149	200 - 225		
133-150	225 - 250		±6
133-151	250 - 275		
133-152	275 - 300		
133-153	300 - 325		±7
133-154	325 - 350		
133-155	350 - 375		
133-156	375 - 400		±8
133-157	400 - 425		
133-158	425 - 450		
133-159	450 - 475		±9
133-160	475 - 500		
133-161	500 - 525		
133-162	525 - 550		±10
133-163	550 - 575		
133-164	575 - 600		
133-165	600 - 625		±11
133-166	625 - 650		
133-167	650 - 675		
133-168	675 - 700		±12
133-169	700 - 725		
133-170	725 - 750		
133-171	750 - 775		±13
133-172	775 - 800		
133-173	800 - 825		
133-174	825 - 850		±14
133-175	850 - 875		
133-176	875 - 900		
133-177	900 - 925		±15
133-178	925 - 950		
133-179	950 - 975		
133-180	975 - 1000		±16

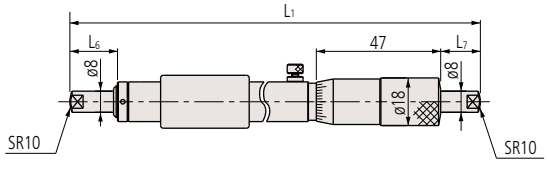
Inch Individual

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)
133-225	4 - 5	0.001	±0.00025
133-226	5 - 6		
133-227	6 - 7		
133-228	7 - 8		
133-229	8 - 9		
133-230	9 - 10		±0.0003
133-231	10 - 11		
133-232	11 - 12		

DIMENSIONS

133-145 to 133-180

Unit: mm



Code No.	L1	L6	L7
133-145	100	5	3
133-146	125	5	3
133-147	150	18	15
133-148	175	18	15
133-149	200	18	15
⋮	⋮	⋮	⋮
133-180	975	18	15

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Tubular Inside Micrometers
SERIES 137, 337 — Extension-Rod Type

- Wide range of inside measurements possible by combining extension rods and anvils with the micrometer head.
- A reference gage is necessary for reference point setting.
- Two types of measuring faces are available: with or without carbide tip. (The SERIES **337** is only available with carbide tip)
- An optional reference gage, such as Gauge Block Accessory Set, CERA inside Micro Checker or a setting ring (nominal size 300 mm or less), is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, and 08-53 for details)

337-301

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Spindle feed error* (μm)	Micrometer head stroke (mm)	Extension rods Qty	Extension rods Size (mm)	Display unit (mm)
337-101	200 - 225	0.001	3	25	—	—	200 - 225
337-301	200 - 1000				6	25, 50, 100 (2 pcs.), 200, 300	
337-302	200 - 1500				7	25, 50, 100, 200, 300 (3 pcs.)	

Inch / Metric

Code No.	Range (in)	Resolution	Spindle feed error* (in)	Micrometer head stroke (in)	Extension rods Qty	Extension rods Size (in)	Display unit (in)
337-102	8 - 9	0.0001 in/ 0.001 mm	0.00015	1	—	—	8 - 9
337-303	8 - 40				6	1, 2, 4 (2 pcs.), 8, 12	
337-304	8 - 60				7	1, 2, 4, 8, 12 (3 pcs.)	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 1.2 years under normal use
- Position detection method: Electromagnetic induction-type rotary encoder

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

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IP65

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Applicable models:
SERIES **337**

Measurement example

Functions

Zero-setting
Origin restoration
Data hold
2-point Preset
Function lock
Automatic power ON/OFF
Error alarm
Data output

Optional Accessories

Code No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730*	IP67	**U-WAVE-T**
02AZD880*	Buzzer	**U-WAVE-T**
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch

* Add suffix to Code No.; **G** for Asia, Europe and the Americas, **H** for Brazil and **J** for Korea.

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137-205

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Spindle feed error* (µm)	Micrometer head stroke (mm)	Extension rods Qty	Extension rods Size (mm)	Main unit (mm)
137-201	50 - 150	0.01	3	13	3	13, 25, 50	50 - 63
137-202	50 - 300				5	13, 25, 50 (2 pcs.), 100	
137-203	50 - 500				6	13, 25, 50 (2 pcs.), 100, 200	
137-204	50 - 1000				8	13, 25, 50 (2 pcs.), 100, 200 (2 pcs.), 300	
137-205	50 - 1500				10	13, 25, 50 (2 pcs.), 100, 200 (3 pcs.), 300 (2 pcs.)	
With carbide measuring face							
137-206	50 - 150	0.01	3	13	3	13, 25, 50	50 - 63
137-207	50 - 300				5	13, 25, 50 (2 pcs.), 100	
137-208	50 - 500				6	13, 25, 50 (2 pcs.), 100, 200	
137-209	50 - 1000				8	13, 25, 50 (2 pcs.), 100, 200 (2 pcs.), 300	
137-210	50 - 1500				10	13, 25, 50 (2 pcs.), 100, 200 (3 pcs.), 300 (2 pcs.)	

Inch

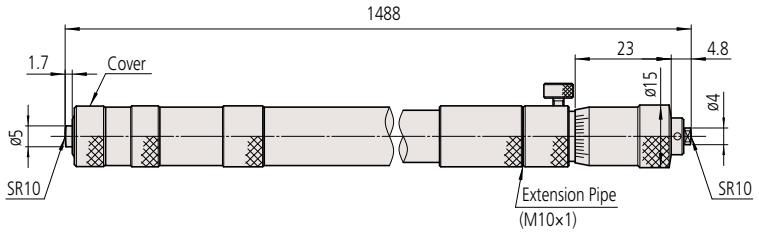
Code No.	Range (in)	Graduation (in)	Spindle feed error* (in)	Micrometer head stroke (in)	Extension rods Qty	Extension rods Size (in)	Main unit (in)
137-211	2 - 6	0.001	0.00015	0.5	3	0.5, 1, 2	2 - 2.5
137-212	2 - 12				5	0.5, 1, 2 (2 pcs.), 4	
137-213	2 - 20				6	0.5, 1, 2 (2 pcs.), 4, 8	
137-214	2 - 40				8	0.5, 1, 2 (2 pcs.), 4, 8 (2 pcs.), 12	
137-215	2 - 60				10	0.5, 1, 2 (2 pcs.), 4, 8 (3 pcs.), 12 (2 pcs.)	
With carbide measuring face							
137-216	2 - 6	0.001	0.00015	0.5	3	0.5, 1, 2	2 - 2.5
137-217	2 - 12				5	0.5, 1, 2 (2 pcs.), 4	
137-218	2 - 20				6	0.5, 1, 2 (2 pcs.), 4, 8	
137-219	2 - 40				8	0.5, 1, 2 (2 pcs.), 4, 8 (2 pcs.), 12	
137-220	2 - 60				10	0.5, 1, 2 (2 pcs.), 4, 8 (3 pcs.), 12 (2 pcs.)	

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

DIMENSIONS

137-205

Unit: mm



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Tubular Inside Micrometers
SERIES 137 — Extension-Rod Type (main unit)

- Micrometer head for Extension-rod Type inside micrometer.
- A reference gage is necessary for reference point setting.
- An optional reference gage, such as Gauge Block Accessory Set or a setting ring, is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22 and 08-53 for details)

137-011

SPECIFICATIONS

Metric

Code No.	Range (mm)	Spindle feed error* (µm)	Graduation (mm)	Micrometer head stroke (mm)
137-011 Carbide-tipped **137-013**	50 - 63	3	0.01	13

Inch

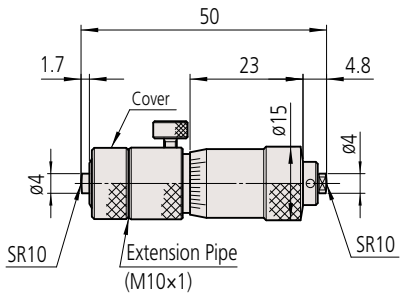
Code No.	Range (in)	Spindle feed error* (in)	Graduation (in)	Micrometer head stroke (in)
137-012 Carbide-tipped **137-014**	2 - 2.5	0.00015	0.001	0.5

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the specification range of the micrometer head

DIMENSIONS

137-011

Unit: mm



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Measurement example

Functions

Zero-setting
Origin restoration
Data hold
Function lock
Automatic power ON/OFF
2-point Preset
Error alarm
Data output

Optional Accessories

Code No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730*	IP67	**U-WAVE-T**
02AZD880*	Buzzer	**U-WAVE-T**
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch

* Add suffix to Code No.; **G** for Asia, Europe and the Americas, **H** for Brazil and **J** for Korea.

Tubular Inside Micrometers
SERIES 339 — Extension-Pipe Type

- Wide range of inside measurements possible by combining Extension pipes and anvils with the micrometer head.
- A reference gage is necessary for reference point setting.
- Carbide-tipped measuring faces.
- IP65 (water-proof) protection level that enables use in the presence of cutting fluid.

339-301

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Spindle feed error* (μm)	Micrometer head stroke (mm)	Extension pipes Qty	Extension pipes Size (mm)	Display unit (mm)
339-101	200 - 225	0.001	3	25	—	—	200 - 225
339-301	200 - 1000				5	25, 50, 100, 200, 400	
339-302	200 - 2000				8	25, 50, 100, 200 (2 pcs.), 400 (3 pcs.)	

Inch/Metric

Code No.	Range (in)	Resolution	Spindle feed error* (in)	Micrometer head stroke (in)	Extension pipes Qty	Extension pipes Size (in)	Display unit (in)
339-102	8 - 9	0.0001 in/ 0.001 mm	0.00015	1		—	8 - 9
339-303	8 - 40				5	1, 2, 4, 8, 16	
339-304	8 - 80				8	1, 2, 4, 8 (2 pcs.), 16 (3 pcs.)	

- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 1.2 years under normal use
- Position detection method: Electromagnetic induction-type rotary encoder

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

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Tubular Inside Micrometers
SERIES 139, 140 — Extension-Pipe Type

- Wide range of inside measurements possible by combining Extension pipes and anvils with the micrometer head.
- An optional reference gage is required for accurately setting the micrometer before measuring.
- Carbide-tipped measuring faces.

139-177

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Spindle feed error* (µm)	Micrometer head stroke (mm)	Extension pipes		Main unit (mm)
					Qty	Size (mm)	
139-173	100 - 500	0.01	3	25	4	25, 50, 100, 200	100 - 125
139-174	100 - 900				5	25, 50, 100, 200, 400	
139-175	100 - 1300				6	25, 50, 100, 200, 400 (2 pcs.)	
139-176	100 - 1700				7	25, 50, 100, 200, 400 (3 pcs.)	
139-177	100 - 2100				8	25, 50, 100, 200, 400 (4 pcs.)	

Inch

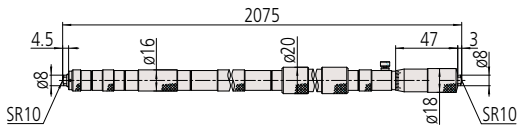
Code No.	Range (in)	Graduation (in)	Spindle feed error* (in)	Micrometer head stroke (in)	Extension pipes		Main unit (in)
					Qty	Size (in)	
139-178	4 - 20	0.001	0.00015	1	4	1, 2, 4, 8	4 - 5
139-179	4 - 36				5	1, 2, 4, 8, 16	
139-180	4 - 52				6	1, 2, 4, 8, 16 (2 pcs.)	
139-181	4 - 68				7	1, 2, 4, 8, 16 (3 pcs.)	
139-182	4 - 84				8	1, 2, 4, 8, 16 (4 pcs.)	

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

DIMENSIONS

139-177

Unit: mm



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140-158

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Spindle feed error* (µm)	Micrometer head stroke (mm)	Extension pipes		Main unit (mm)
					Qty	Size (mm)	
140-157	1000 - 2000	0.01	6	50	5	50, 100 (2 pcs.), 200, 500	1000 - 1050
140-158	1000 - 3000				6	50, 100 (2 pcs.), 200, 500, 1000	
140-159	1000 - 4000				7	50, 100 (2 pcs.), 200, 500, 1000 (2 pcs.)	
140-160	1000 - 5000				8	50, 100 (2 pcs.), 200, 500, 1000 (3 pcs.)	

Inch

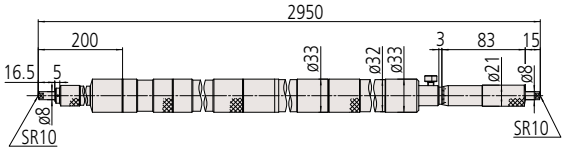
Code No.	Range (in)	Graduation (in)	Spindle feed error* (in)	Micrometer head stroke (in)	Extension pipes		Main unit (in)
					Qty	Size (in)	
140-161	40 - 80	0.001	0.0003	2	5	2, 4 (2 pcs.), 8, 20	40 - 42
140-162	40 - 120				6	2, 4 (2 pcs.), 8, 20, 40	
140-163	40 - 160				7	2, 4 (2 pcs.), 8, 20, 40 (2 pcs.)	
140-164	40 - 200				8	2, 4 (2 pcs.), 8, 20, 40 (3 pcs.)	

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the measuring range of the micrometer head

DIMENSIONS

140-158

Unit: mm



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Tubular Inside Micrometers
SERIES 139 — Extension-Pipe Type (main unit)

- Micrometer head for Extension-pipe Type inside micrometer.
- A reference gage is necessary for reference point setting.
- An optional reference gage, such as Gauge Block Accessory Set, CERA Inside Micro Checker or a setting ring, is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, 08-30, and 08-53 for details)

139-001

SPECIFICATIONS

Metric

Code No.	Range (mm)	Spindle feed error* (µm)	Graduation (mm)	Micrometer head stroke (mm)
139-001	100 - 125	3	0.01	25

Inch

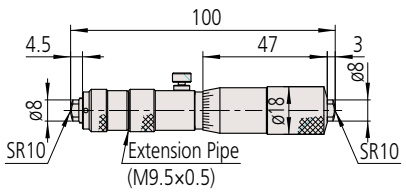
Code No.	Range (in)	Spindle feed error* (in)	Graduation (in)	Micrometer head stroke (in)
139-002	4 - 5	0.00015	0.001	1

* "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the specification range of the micrometer head

DIMENSIONS

139-001

Unit: mm



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Inside Micrometers
SERIES 345 — Caliper Type

- Useful for measuring workpieces with grooves that cannot be measured by a two-point or three-point inside micrometer.
- Carbide-tipped measuring faces.
- Equipped with a constant measuring-force device.
- An optional reference gage, such as Gauge Block Accessory Set, CERA Inside Micro Checker (more than 25 mm) or a setting ring (nominal size below 300 mm), is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, 08-30, and 08-53 for details)

Measurement example

345-250-30

Optional Accessories

Code No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
05CZA662	B	Connection cable (1 m)
05CZA663	B	Connection cable (2 m)
06AFM380B	B	USB Input Tool Direct (2 m)
02AZD730*	IP67	**U-WAVE-T**
02AZD880*	Buzzer	**U-WAVE-T**
02AZD790B	B	Connection cable for **U-WAVE-T** (160 mm)
02AZE140B	B	Connection cable for **U-WAVE-T** For foot switch
264-622	IP67	**U-WAVE-TM**
264-623	Buzzer	**U-WAVE-TM**
264-626	IP67	**U-WAVE-TMB**
264-627	Buzzer	**U-WAVE-TMB**
02AZF310	IP67	Connecting unit for **U-WAVE-TM/TMB**

* Add suffix to Code No.; **G** for Asia, Europe and the Americas, **H** for Brazil and **J** for Korea.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Resolution (mm)	Maximum permissible error J_{MPE} (µm)	Jaw	Mass (g)
345-250-30	5 - 30	0.001	±5	Pin	320
345-251-30	25 - 50		±6	Anvil	325

Inch / Metric

Code No.	Range (in)	Resolution	Maximum permissible error J_{MPE} (in)	Jaw	Mass (g)
345-350-30	0.2 - 1.2	0.00005 in/ 0.001 mm	±0.00025	Pin	320
345-351-30	1 - 2		±0.0003	Anvil	325

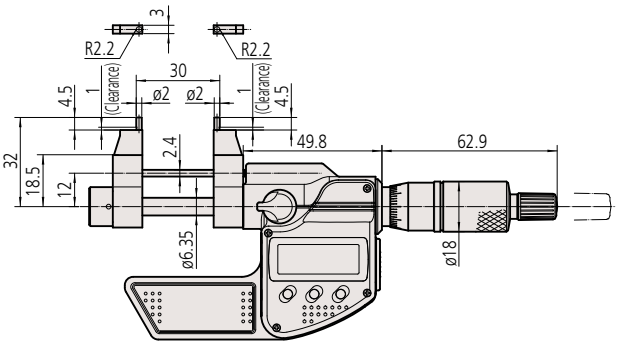
- Power source: SR44 battery (1 pc.), **938882** included as standard (for operational checks)
- Battery life: Approx. 2.4 years under normal use
- Position detection method: Electromagnetic induction-type rotary encoder

Note 1: For the functions, refer to SERIES **293** with SPC data output on page 02-7.
This model is NOT water-proof. Also, the origin setting is the free preset type.
Note 2: The minimum pitch circle measurement is ø5 mm with pin type (**345-250-30**, **345-350-30**).

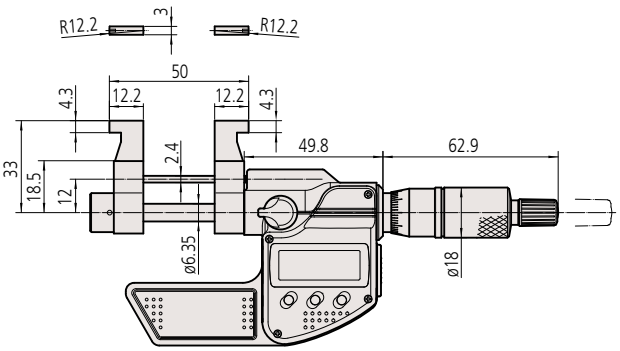
DIMENSIONS

345-250-30

Unit: mm



345-251-30



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Inside Micrometers
SERIES 145 — Caliper Type

- This is an analog version of the SERIES **345** calliper type micrometer for inside measurement.
- Carbide-tipped measuring faces.
- Equipped with a constant measuring-force device.
- An optional reference gage, such as Gauge Block Accessory Set, CERA Inside Micro Checker (more than 25 mm) or a setting ring (nominal size below 300 mm), is required for accurately setting the micrometer before measuring. (refer to pages 01-19 to 01-22, 08-30, and 08-53 for details)

145-185

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Jaw	Mass (g)
145-185	5 - 30	0.01	±5	Pin	130
145-186	25 - 50		±6	Anvil	140

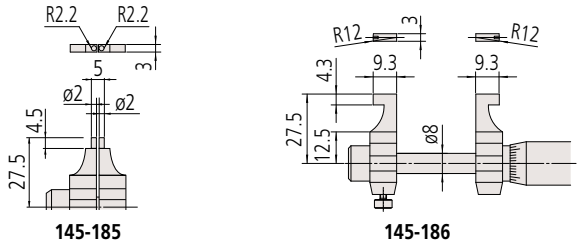
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Jaw	Mass (g)
145-193	0.2 - 1.2	0.001	±0.00025	Pin	130
145-194	1 - 2		±0.0003	Anvil	140

Note: The minimum pitch circle measurement is ø5 mm with pin type (**145-185**, **145-193**).

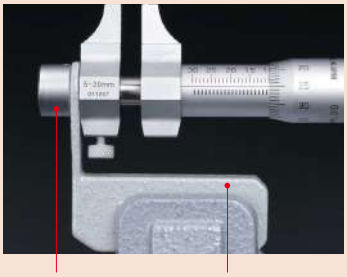
DIMENSIONS

Unit: mm



145-185 **145-186**

Accessories for 145-185 / 186 / 193 / 194 (optional)



Cap (**300401**) Holder (**300400**)

Note 1: This instrument requires the cap and the holder for mounting on a micrometer stand.
Note 2: It may not be applicable to a custom specification.

Optional Accessories

Refer to page 08-26.

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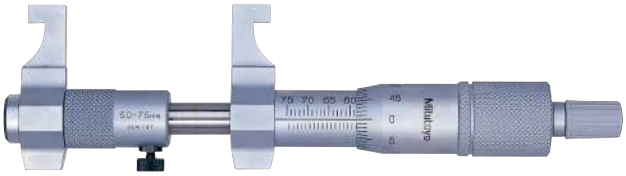


145-187

SPECIFICATIONS

Metric

Code No.	Range (mm)	Graduation (mm)	Maximum permissible error J_{MPE} (µm)	Jaw	Mass (g)
145-187	50 - 75	0.01	±7	Anvil	160
145-188	75 - 100		±8		180
145-189	100 - 125		±9		210
145-190	125 - 150				230
145-191	150 - 175		±10		250
145-192	175 - 200				270
145-217	200 - 225		±11		310
145-218	225 - 250				330
145-219	250 - 275		±12		350
145-220	275 - 300				370
145-221	300 - 325		±16		390
145-222	325 - 350				410
145-223	350 - 375				430
145-224	375 - 400				450
145-225	400 - 425		±21		470
145-226	425 - 450				490
145-227	450 - 475				510
145-228	475 - 500				530

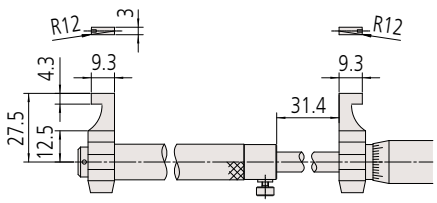
Inch

Code No.	Range (in)	Graduation (in)	Maximum permissible error J_{MPE} (in)	Jaw	Mass (g)
145-195	2 - 3	0.001	±0.00035	Anvil	160
145-196	3 - 4		±0.0004		180

DIMENSIONS

145-187 to 145-220

Unit: mm



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Inside Micrometers
SERIES 141 — Interchangeable-Rod Type

- Wide range of inside measurements possible by combining one or more interchangeable rods.
- For models supplied with more than one interchangeable rod, the full measuring range is achieved by combining spacing collars with the rods.

141-101

When using one of the extension rods supplied (Measuring range 25 to 32 mm)

Measurement example

SPECIFICATIONS

Metric

Code No.	Range (mm)	Spindle feed error*2 (µm)	Graduation (mm)	Micrometer head stroke (mm)	Remarks
141-101 / 141-103*1	25 - 50	3	0.01	7	with 2 rods
141-205 / 141-211*1	50 - 200			13	with 3 rods
141-206 / 141-212*1	50 - 300				with 5 rods
141-117	200 - 500			25	with 3 rods
141-118	200 - 1000				with 8 rods

Inch

Code No.	Range (in)	Spindle feed error*2 (in)	Graduation (in)	Micrometer head stroke (in)	Remarks
141-102 / 141-104*1	1 - 2	0.00015	0.001	0.25	with 2 rods
141-208 / 141-214*1	2 - 8			0.5	with 3 rods
141-233 / 141-215*1	2 - 12				with 5 rods
141-121	8 - 20			1	with 3 rods
141-122	8 - 40				with 8 rods

*1 With carbide measuring face
*2 "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the specification range of the micrometer head

Metric Micrometer head only model

Code No.	Range (mm)	Spindle feed error*2 (µm)	Graduation (mm)	Micrometer head stroke (mm)
141-001 / 141-003*1	—	3	0.01	7
141-025 / 141-027*1	—			13
141-009 / 141-011*1	200 - 225			25

Inch Micrometer head only model

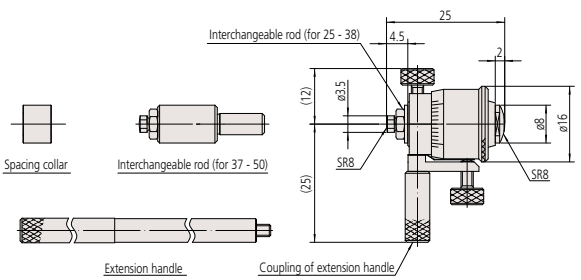
Code No.	Range (in)	Spindle feed error*2 (in)	Graduation (in)	Micrometer head stroke (in)
141-002 / 141-004*1	—	0.00015	0.001	0.25
141-026 / 141-028*1	—			0.5
141-010 / 141-012*1	8 - 9			1

*1 With carbide measuring face
*2 "Spindle feed error" refers to the difference between the maximum and minimum indication error values within the specification range of the micrometer head

DIMENSIONS

141-101

Unit: mm



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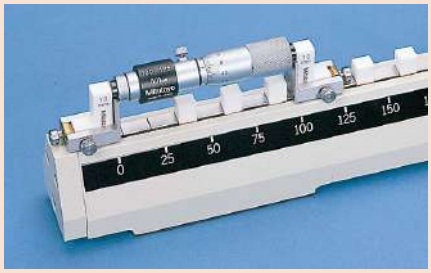
CERA Inside Micro Checker SERIES 515

- The Inside Micro Checker is designed to act as a setting standard for inside micrometers.
- Applicable for SERIES **133**, **139** and **145** (over 50 mm). Not applicable for SERIES **137**, **141**, **337** and **339**.

515-585

Measurement example



Standard accessory set

Support clamps	**940286***	Pair
Auxiliary block 10 mm		2 pcs.
Collar	**602195**	2 pcs.
Clamp screwdriver	**600324**	1 pc.

* Code No. is equivalent to a pair (2 pcs.)

Wooden box (optional)

602160 (for **515-585**)
602163 (for **515-586**)

SPECIFICATIONS

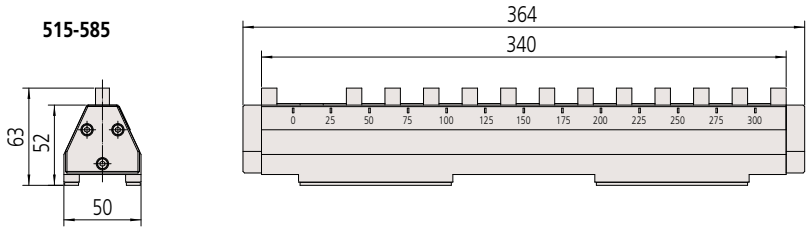
Code No.	Length to check (mm)	Block pitch accuracy
515-585	25 - 300	±(1 + L/150) µm L: Length to check (mm)
515-586	25 - 600	

Note: Please note that the bottom surface and the contact faces are not precisely perpendicular to each other.

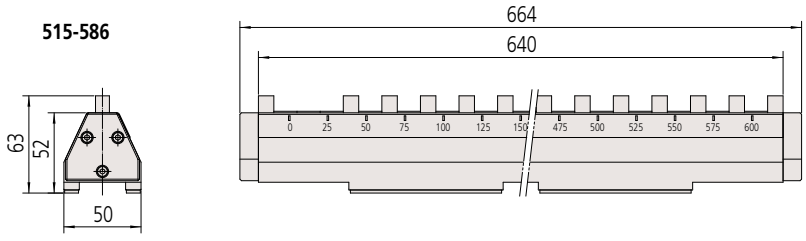
DIMENSIONS

Unit: mm

515-585



515-586



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Bore Gages
SERIES 526 — for Extra Small Holes

- This bore gage is designed to measure small holes of 1 to 7 mm diameter.
- The dial indicator is optional. Refer to page 08-52 for recommended indicators.
- Optional stand (**215-120-10**) is available for efficient measurement of multiple small holes.

526-170-11

Note: The dial indicator and the dial protection cover are optional.
Refer to page 08-52 for details.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Accuracy* (µm)	Repeatability* (µm)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-170-10	0.95 - 1.55	4	1	526-170-10	Not supplied	Not supplied	Not supplied
526-160-10	1.50 - 3.95	4		526-160-10			
526-150-10	3.70 - 7.30	6		526-150-10			
526-172-20	0.95 - 1.55	4		526-170-10	**2109AB-10** (Graduation: 0.001 mm)	21DZA000	
526-162-20	1.50 - 3.95	4		526-160-10			
526-152-20	3.70 - 7.30	6		526-150-10			
526-173-20	0.95 - 1.55	4		526-170-10	**2046AB** (Graduation: 0.01 mm)	21DZA000	
526-163-20	1.50 - 3.95	4		526-160-10			
526-153-20	3.70 - 7.30	6		526-150-10			
526-170-11	0.95 - 1.55	4		526-170-10	Not supplied	Not supplied	Supplied
526-160-11	1.50 - 3.95	4		526-160-10			
526-150-11	3.70 - 7.30	6		526-150-10			
526-172-21	0.95 - 1.55	4		526-170-10	**2109AB-10** (Graduation: 0.001 mm)	21DZA000	
526-162-21	1.50 - 3.95	4		526-160-10			
526-152-21	3.70 - 7.30	6		526-150-10			
526-173-21	0.95 - 1.55	4		526-170-10	**2046AB** (Graduation: 0.01 mm)	21DZA000	
526-163-21	1.50 - 3.95	4		526-160-10			
526-153-21	3.70 - 7.30	6		526-150-10			

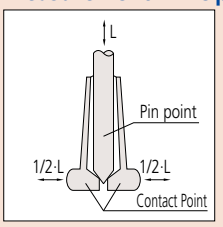
Inch

Code No.	Range (in)	Accuracy* (in)	Repeatability* (in)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-175-10	0.037 - 0.061	0.00016	0.00004	526-175-10	Not supplied	Not supplied	Not supplied
526-165-10	0.059 - 0.156	0.00016		526-165-10			
526-155-10	0.146 - 0.287	0.00024		526-155-10			
526-176-20	0.037 - 0.061	0.00016		526-175-10	**2923AB-10** (Graduation: 0.0001 in)	21DZA000	
526-166-20	0.059 - 0.156	0.00016		526-165-10			
526-156-20	0.146 - 0.287	0.00024		526-155-10			
526-175-11	0.037 - 0.061	0.00016		526-175-10	Not supplied	Not supplied	Supplied
526-165-11	0.059 - 0.156	0.00016		526-165-10			
526-155-11	0.146 - 0.287	0.00024		526-155-10			
526-176-21	0.037 - 0.061	0.00016		526-175-10	**2923AB-10** (Graduation: 0.0001 in)	21DZA000	
526-166-21	0.059 - 0.156	0.00016		526-165-10			
526-156-21	0.146 - 0.287	0.00024		526-155-10			

* Accuracy of the bore gage alone.
Note: Setting rings are not supplied with some models. Please purchase them separately if necessary. For details of setting rings, refer to page 08-53.

Measurement example

Measurement Principle



Setting Rings (Metric)

Nominal size

- **Code No. 526-170-11 etc.**
  - **177-220**: 1.0 mm
  - **177-222**: 1.1 mm
  - **177-225**: 1.2 mm
  - **177-227**: 1.3 mm
  - **177-230**: 1.4 mm
- **Code No. 526-160-11 etc.**
  - **177-236**: 1.75 mm
  - **177-239**: 2.00 mm
  - **177-242**: 2.25 mm
  - **177-208**: 2.50 mm
  - **177-246**: 2.75 mm
  - **177-248**: 3.00 mm
  - **177-250**: 3.25 mm
  - **177-252**: 3.50 mm
  - **177-255**: 3.75 mm
- **Code No. 526-150-11 etc.**
  - **177-204**: 4.0 mm
  - **177-257**: 4.5 mm
  - **177-205**: 5.0 mm
  - **177-263**: 5.5 mm
  - **177-267**: 6.0 mm
  - **177-271**: 6.5 mm
  - **177-275**: 7.0 mm

Setting Rings (Inch)

Nominal size

- **Code No. 526-175-11 etc.**
  - **177-350**: 0.040 in
  - **177-351**: 0.045 in
  - **177-352**: 0.050 in
  - **177-353**: 0.055 in
  - **177-354**: 0.060 in
- **Code No. 526-165-11 etc.**
  - **177-355**: 0.07 in
  - **177-356**: 0.08 in
  - **177-357**: 0.09 in
  - **177-358**: 0.10 in
  - **177-359**: 0.11 in
  - **177-360**: 0.12 in
  - **177-361**: 0.13 in
  - **177-362**: 0.14 in
  - **177-363**: 0.15 in
- **Code No. 526-155-11 etc.**
  - **177-364**: 0.16 in
  - **177-365**: 0.18 in
  - **177-366**: 0.20 in
  - **177-367**: 0.22 in
  - **177-368**: 0.24 in
  - **177-369**: 0.26 in
  - **177-370**: 0.28 in

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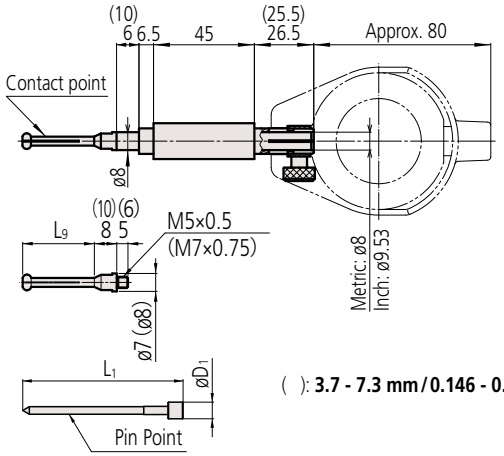
DIMENSIONS

Unit: mm



( ): **3.7 - 7.3 mm / 0.146 - 0.287 in range model**

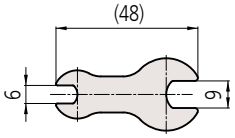
Bore gage (Main body)	Contact point				Pin point		
	Marked No.	Code No.	Range	L9	L1	øD1	Code No.
526-170-10 **526-175-10**	1.0	**21DAA601A**	0.95 - 1.15 mm/0.037 - 0.045 in	11.5	27.5	2.5	**201435**
	1.1	**21DAA601B**	1.07 - 1.25 mm/0.042 - 0.049 in				
	1.2	**21DAA601C**	1.17 - 1.35 mm/0.046 - 0.053 in				
	1.3	**21DAA601D**	1.27 - 1.45 mm/0.050 - 0.057 in				
	1.4	**21DAA601E**	1.37 - 1.55 mm/0.054 - 0.061 in				
526-160-10 **526-165-10**	1.75	**21DAA602A**	1.50 - 1.90 mm/0.059 - 0.075 in	17.5	33.8	3.5	**201436**
	2.00	**21DAA602B**	1.80 - 2.20 mm/0.071 - 0.087 in				
	2.25	**21DAA602C**	2.05 - 2.45 mm/0.081 - 0.096 in				
	2.50	**21DAA602D**	2.30 - 2.70 mm/0.091 - 0.106 in	22.5	39.3	3.5	**201437**
	2.75	**21DAA602E**	2.55 - 2.95 mm/0.100 - 0.116 in				
	3.00	**21DAA602F**	2.80 - 3.20 mm/0.110 - 0.126 in				
	3.25	**21DAA602G**	3.05 - 3.45 mm/0.120 - 0.136 in				
	3.50	**21DAA602H**	3.30 - 3.70 mm/0.130 - 0.146 in				
	3.75	**21DAA602J**	3.55 - 3.95 mm/0.140 - 0.156 in				
526-150-10 **526-155-10**	4.0	**21DAA603A**	3.7 - 4.3 mm/0.146 - 0.169 in	32	53	5.5	**201438**
	4.5	**21DAA603B**	4.2 - 4.8 mm/0.165 - 0.189 in				
	5.0	**21DAA603C**	4.7 - 5.3 mm/0.185 - 0.209 in				
	5.5	**21DAA603D**	5.2 - 5.8 mm/0.205 - 0.228 in				
	6.0	**21DAA603E**	5.7 - 6.3 mm/0.224 - 0.248 in				
	6.5	**21DAA603F**	6.2 - 6.8 mm/0.244 - 0.268 in				
	7.0	**21DAA603G**	6.7 - 7.3 mm/0.264 - 0.287 in				

Note: Pin point and contact point are consumable parts. Please replace them with new one when degrading of accuracy, operation, or measuring range. After replacement, calibrate using a reference instrument.

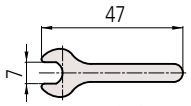
Unit: mm

Spanner

210188



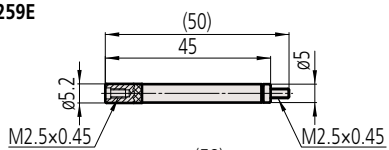
102148



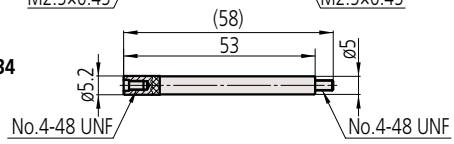
Thickness: 1.5

Extension rod

21AAA259E



213634



( ): **3.7 - 7.3 mm / 0.146 - 0.287 in range model**

Bore gage	Spanner	Extension rod
526-170-10	**210188**	**21AAA259E**
526-160-10		
526-150-10	**102148**	
526-175-10	**210188**	**213634**
526-165-10		
526-155-10	**102148**	

Note: This is not a component for extending the probing depth. (Standard Accessory)

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Mitutoyo

Bore Gages
SERIES 526 — for Extra Small Holes

- This bore gage is designed to measure small holes of 7 to 18 mm diameter.
- The dial indicator is optional. Refer to page 08-52 for recommended indicators.
- Optional stand (**215-120-10**) is available for efficient measurement of multiple small holes.

526-101

Note: The dial indicator and the dial protection cover are optional.
Refer to page 08-52 for details.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Accuracy* (µm)	Repeatability* (µm)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-101	7 - 10	4	2	**526-101**	Not supplied	Not supplied	Not supplied
526-102	10 - 18	6		**526-102**			
526-124-20	7 - 10	4		**526-101**	**2109AB-10** (Graduation: 0.001 mm)	**21DZA000**	
526-125-20	10 - 18	6		**526-102**			
526-126-20	7 - 10	4		**526-101**	**2046AB** (Graduation: 0.01 mm)		
526-127-20	10 - 18	6		**526-102**			

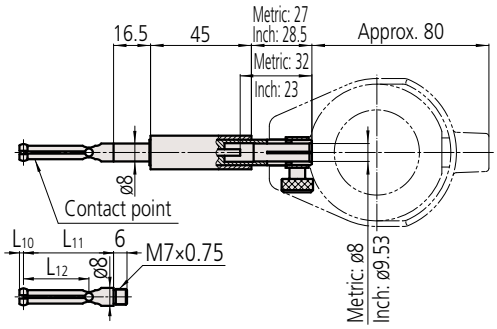
Inch

Code No.	Range (in)	Accuracy* (in)	Repeatability* (in)	Bore gage	Dial indicator	Dial protection cover	Setting ring
526-103	0.3 - 0.4	0.00016	0.00008	**526-103**	Not supplied	Not supplied	Not supplied
526-104	0.4 - 0.7	0.00024		**526-104**			
526-122-20	0.3 - 0.4	0.00016		**526-103**	**2923AB-10** (Graduation: 0.0001 in)	**21DZA000**	
526-123-20	0.4 - 0.7	0.00024		**526-104**			
526-119-20	0.3 - 0.4	0.00016		**526-103**	**2922AB** (Graduation: 0.0005 in)	**21DZA000**	
526-120-20	0.4 - 0.7	0.00024		**526-104**			

* Accuracy of the bore gage alone.
Note: Setting rings are not supplied.
Please purchase them separately if necessary. For details of the setting rings, refer to page 08-53.

DIMENSIONS

Unit: mm



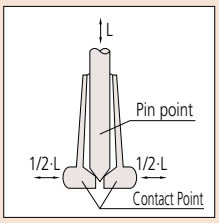
STANDARD ACCESSORIES

Bore gage (Main body)	Contact point						Spanner
	Marked No.	Code No.	Range	L_{10}	L_{11}	L_{12}	Code No.
526-101 **526-103**	1	**102469**	7.0 - 7.5 mm/0.28 - 0.30 in	1.8	40	29.2	**102148**
	2	**102470**	7.5 - 8.0 mm/0.30 - 0.32 in				
	3	**102471**	8.0 - 8.5 mm/0.32 - 0.34 in				
	4	**102472**	8.5 - 9.0 mm/0.34 - 0.36 in				
	5	**102473**	9.0 - 9.5 mm/0.36 - 0.38 in				
	6	**102474**	9.5 - 10.0 mm/0.38 - 0.40 in				
526-102 **526-104**	1	**102454**	10 - 11 mm/0.40 - 0.44 in	2.1	46	38	**102148**
	2	**102455**	11 - 12 mm/0.44 - 0.48 in	2.7			
	3	**102456**	12 - 13 mm/0.48 - 0.52 in				
	4	**102457**	13 - 14 mm/0.52 - 0.56 in				
	5	**102458**	14 - 15 mm/0.56 - 0.60 in				
	6	**102459**	15 - 16 mm/0.60 - 0.64 in				
	7	**102460**	16 - 17 mm/0.64 - 0.68 in				
	8	**102461**	17 - 18 mm/0.68 - 0.72 in				

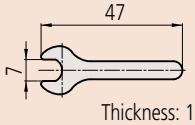
Note: Contact point is consumable part. Please replace it with new one when degrading of accuracy, operation, or measuring range.

Measurement example

Measurement Principle



Spanner
102148



Unit: mm

Thickness: 1.5

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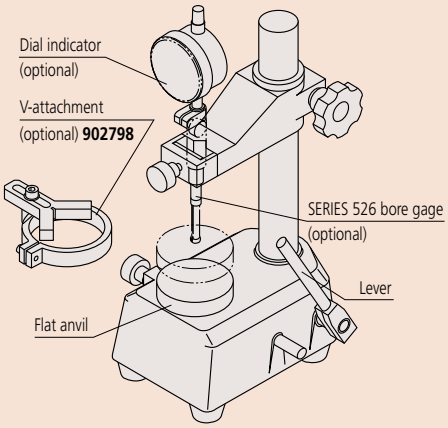
Bore Gage Stand
SERIES 215

Operating Method

- Pulling the lever forwards moves the platen upwards and the instrument goes into measurement mode.
- The V-attachment (optional) aids positioning the workpiece on the platen and is useful when measuring a large number of the same size of workpiece.



- Optimal for efficient measurement of multiple small holes with a bore gage. (SERIES **526**)

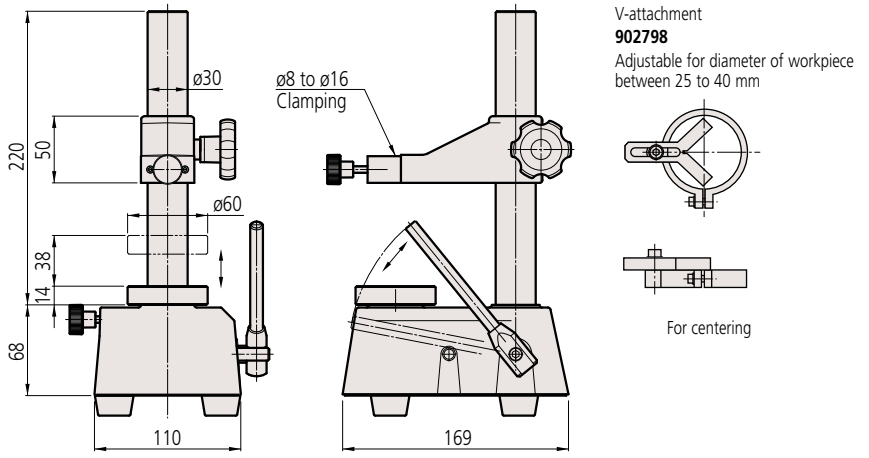
215-120-10

SPECIFICATIONS

Code No.	Measuring table displacement (mm)	Measuring table
215-120-10	38	Anvil (ø60 mm)

DIMENSIONS

Unit: mm



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Bore Gages
SERIES 511 — for Small Holes

- This bore gage is designed to measure the diameters of very small holes.
- The dial indicator is optional. Refer to page 08-52 for recommended indicators.
- Customized products with a longer rod below the grip or with a carbide anvil are available upon request.
- An optional setting ring is available for accurately setting the gage before measuring. Refer to pages 08-53 to 08-55.

511-201

Note: The dial indicator and the dial protection cover are optional. Refer to page 08-52 for details.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (µm)	Repeatability* (µm)	Adjacent error* (µm)	Measuring force (N)	Guide force (N)
511-209	6 - 10	0.5	5	2	2	2 or less	—
511-201	10 - 18.5	0.6					6 or less
511-210-20	6 - 10	0.5	5	2	2	2 or less	—
511-203-20	10 - 18.5	0.6					6 or less
511-211-20	6 - 10	0.5	5	2	2	2 or less	—
511-204-20	10 - 18.5	0.6					6 or less

Code No.	Content of set					Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-209	**511-209**	Not supplied	Not supplied	9 pcs.	Not supplied	50
511-201	**511-201**				1 pc.	100
511-210-20	**511-209**	**2109AB-10** (Graduation: 0.001 mm)	**21DZA000**	9 pcs.	Not supplied	50
511-203-20	**511-201**				1 pc.	100
511-211-20	**511-209**	**2046AB** (Graduation: 0.01 mm)	**21DZA000**	9 pcs.	Not supplied	50
511-204-20	**511-201**				1 pc.	100

Inch

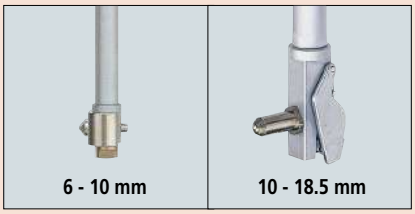
Code No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-214	0.24 - 0.4	0.020	0.0002	0.00008	0.00008	2 or less	—
511-205	0.4 - 0.74	0.024					6 or less
511-212-20	0.24 - 0.4	0.020	0.0002	0.00008	0.00008	2 or less	—
511-206-20	0.4 - 0.74	0.024					6 or less
511-213-20	0.24 - 0.4	0.020	0.0002	0.00008	0.00008	2 or less	—
511-207-20	0.4 - 0.74	0.024					6 or less

Code No.	Content of set					Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	
511-214	**511-214**	Not supplied	Not supplied	9 pcs.	Not supplied	2
511-205	**511-205**				1 pc.	4
511-212-20	**511-214**	**2923AB-10** (Graduation: 0.0001 in)	**21DZA000**	9 pcs.	Not supplied	2
511-206-20	**511-205**				1 pc.	4
511-213-20	**511-214**	**2922AB** (Graduation: 0.0005 in)	**21DZA000**	9 pcs.	Not supplied	2
511-207-20	**511-205**				1 pc.	4

* Accuracy of the bore gage alone.

Measurement example

Contact Points

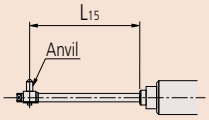


The dial protection cover, recommended indicators

Refer to page 08-52.

Special sizes and specifications other than standard can be custom-made by special order. Please contact your local Mitutoyo Sales Office for more information.

Example



Length below the grip

Model	L15 (mm)
511-209	100, 150, 200, 250
511-201	50, 150, 200, 250, 300

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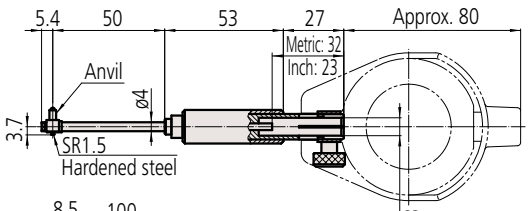
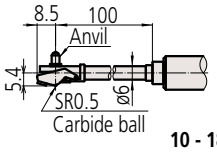
DIMENSIONS

Unit: mm



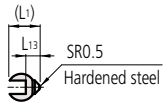
6 - 10 mm / 0.24 - 0.4 in range model



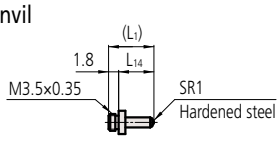
10 - 18.5 mm / 0.4 - 0 .74 in range model

Unit: mm

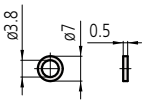
511-209 / 511-214
Anvil



511-201 / 511-205
Anvil



Interchangeable washer
(Supplied only with **511-201 / 511-205**)



204355

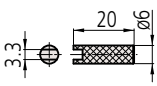
STANDARD ACCESSORIES

Bore gage (Main body)	Anvil					Interchangeable Washer	Spanner
	Marked No.	**Code No.**	Indication of measuring size	L1	L13	**Code No.**	**Code No.**
511-209 511-214	1	**952168**	6.0 mm/0.24 in	4.7	1.2	Not supplied	**206709**
	2	**952169**	6.5 mm/0.26 in	5.3	1.7		
	3	**952170**	7.0 mm/0.28 in	5.8	2.2		
	4	**952414**	7.5 mm/0.30 in	6.3	2.7		
	5	**952415**	8.0 mm/0.32 in	6.8	3.2		
	6	**952416**	8.5 mm/0.34 in	7.3	3.7		
	7	**952417**	9.0 mm/0.36 in	7.8	4.2		
	8	**952418**	9.5 mm/0.38 in	8.3	4.7		
	9	**952419**	10.0 mm/0.40 in	8.8	5.2		

Bore gage (Main body)	Anvil					Interchangeable Washer	Spanner
	Marked No.	**Code No.**	Indication of measuring size	L1	L14	**Code No.**	**Code No.**
511-201 511-205	1	**204356**	10 mm/0.40 in	3.8	2	**204355**	**204354**
	2	**204357**	11 mm/0.44 in	4.8	3		
	3	**204358**	12 mm/0.48 in	5.8	4		
	4	**204359**	13 mm/0.52 in	6.8	5		
	5	**204360**	14 mm/0.56 in	7.8	6		
	6	**204361**	15 mm/0.60 in	8.8	7		
	7	**204362**	16 mm/0.64 in	9.8	8		
	8	**204363**	17 mm/0.68 in	10.8	9		
	9	**204364**	18 mm/0.72 in	11.8	10		

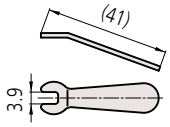
Spanner

206709



204354

Unit: mm



Thickness: 1.5

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Bore Gages SERIES 511

- This is a bore gage for measuring 18 to 400 mm inside diameter. It is suitable for highly accurate measurements.
- Carbide-tipped contact point and anvil for durability and wear resistance.
- Optional extension rods can be attached for measuring deep holes.

511-702

Note: The dial indicator and the dial protection cover are optional. Refer to page 08-52 for details.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (µm)	Repeatability* (µm)	Adjacent error* (µm)	Measuring force (N)	Guide force (N)
511-701	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-702	35 - 60						
511-703	50 - 150	1.6				5 or less	10 or less
511-704	100 - 160						
511-705	160 - 250					6 or less	15 or less
511-706	250 - 400						
511-721-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-722-20	35 - 60						
511-723-20	50 - 150	1.6				5 or less	10 or less
511-724-20	100 - 160						
511-725-20	160 - 250					6 or less	15 or less
511-726-20	250 - 400						
511-711-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-712-20	35 - 60						
511-713-20	50 - 150	1.6				5 or less	10 or less
511-714-20	100 - 160						
511-715-20	160 - 250					6 or less	15 or less
511-716-20	250 - 400						
511-921-20	18 - 150	See SPECIFICATIONS of **511-701/702/703**					
511-922-20							
511-925-10							

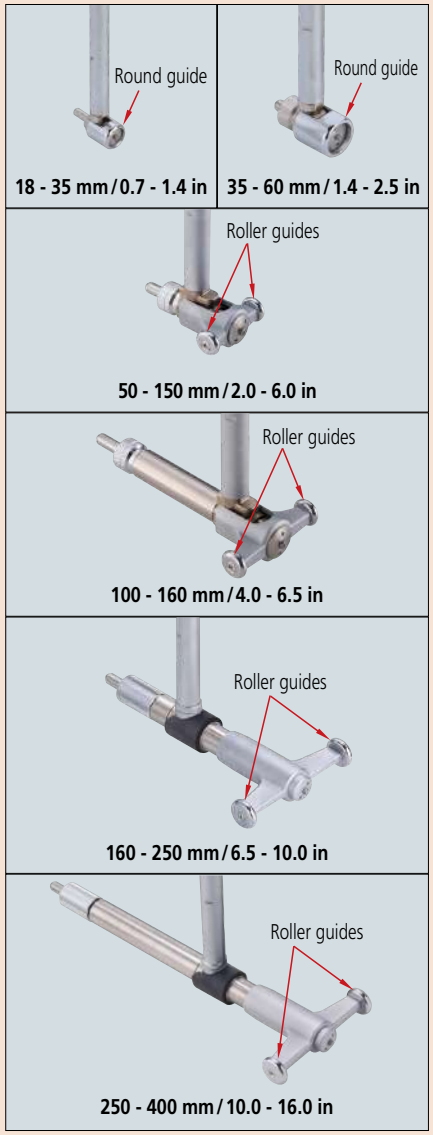
Code No.	Content of set							Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-701	**511-701**	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	100
511-702	**511-702**			6 pcs.	4 pcs.		Not supplied	150
511-703	**511-703**			11 pcs.		1 pc.		
511-704	**511-704**			13 pcs.		Not supplied		
511-705	**511-705**			6 pcs.	7 pcs.			250
511-706	**511-706**			5 pcs.		1 pc.		
511-721-20	**511-701**	**2109AB-10** (Graduation: 0.001 mm)	**21DZA000**	9 pcs.	2 pcs.	Not supplied	1 pc.	100
511-722-20	**511-702**			6 pcs.	4 pcs.		Not supplied	150
511-723-20	**511-703**			11 pcs.		1 pc.		
511-724-20	**511-704**			13 pcs.		Not supplied		
511-725-20	**511-705**			6 pcs.	7 pcs.			250
511-726-20	**511-706**			5 pcs.		1 pc.		
511-711-20	**511-701**	**2046AB** (Graduation: 0.01 mm)	**21DZA000**	9 pcs.	2 pcs.	Not supplied	1 pc.	100
511-712-20	**511-702**			6 pcs.	4 pcs.		Not supplied	150
511-713-20	**511-703**			11 pcs.		1 pc.		
511-714-20	**511-704**			13 pcs.		Not supplied		
511-715-20	**511-705**			6 pcs.	7 pcs.			250
511-716-20	**511-706**			5 pcs.		1 pc.		
511-921-20	Set of **511-701/702/703**	**2046AB**	**21DZA000**	See SPECIFICATIONS of **511-701/702/703**				
511-922-20		**2109AB-10**						
511-925-10		**543-310B**						

* Accuracy of the bore gage alone.

Note 1: A 50 mm sub-anvil is supplied with **511-703**, and a 75 mm sub-anvil is supplied with **511-706**.

Note 2: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Contact Points



Extension Rod

Refer to page 08-51.

The dial protection cover, recommended indicators

Refer to page 08-52.

Setting rings

Refer to pages 08-53 to 08-56.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Recommended Digimatic Indicators (see Chapter 07)

- Metric type: **543-310B-10** (0.001 mm)
- Inch type: **543-312B-10** (0.001 mm/0.00005 in)

- The ID measurement can be performed easily since the minimum value is detected automatically.
- Up to three combinations of master value and tolerance value can be set.
- Nine measurement results (maximum) can be saved and recalled from memory (when no external device is connected). Refer to page 07-15 for details.

- Metric type: **543-700B** (0.0005 mm)
- Inch type: **543-702B** (0.0005 mm/0.00002 in)

- When using with **543-700B** or **543-702B**, modification of the setting is required. Refer to page 07-5 for details.

Anvil

A carbide ball is used for the contact point. It is more abrasion resistant than a hardened steel ball and, as its surface is smoother than that of a carbide tip, the workpiece is less liable to be marked.

Comparison of abrasion resistance

Hardened steel ball (conventional model)

Abrasion depth: 0.1 mm
750 HV or more

Carbide ball (current model)

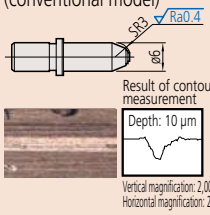
Abrasion depth: 0.001 mm
1350 HV or more

Inspection method

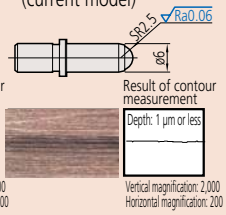
- Load a 0.5 N weight on the anvil, and slide for 1,000 m on abrasive paper of 9 µm (#2000) particle size.

Comparison of marks on the workpiece

Carbide tip (conventional model)



Carbide ball (current model)



Inspection method

- Load a 4 N weight on the anvil, and slide on the aluminum plate back and forth for 20 times.

SPECIFICATIONS

Inch

Code No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-731	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-732	1.4 - 2.5						
511-733	2.0 - 6.0	0.063				5 or less	10 or less
511-734	4.0 - 6.5						
511-735	6.5 - 10.0					6 or less	15 or less
511-736	10.0 - 16.0						
511-751-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-752-20	1.4 - 2.5						
511-753-20	2.0 - 6.0	0.063				5 or less	10 or less
511-754-20	4.0 - 6.5						
511-755-20	6.5 - 10.0					6 or less	15 or less
511-756-20	10.0 - 16.0						
511-741-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-742-20	1.4 - 2.5						
511-743-20	2.0 - 6.0	0.063				5 or less	10 or less
511-744-20	4.0 - 6.5						
511-745-20	6.5 - 10.0					6 or less	15 or less
511-746-20	10.0 - 16.0						
511-931-20	0.7 - 6.0	See SPECIFICATIONS of **511-731/732/733**					
511-932-20							
511-935-10							

Code No.	Content of set							Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-731	**511-731**	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	4
511-732	**511-732**			6 pcs.	4 pcs.	1 pc.	Not supplied	6
511-733	**511-733**			11 pcs.		Not supplied		
511-734	**511-734**			13 pcs.		1 pc.		10
511-735	**511-735**			6 pcs.	7 pcs.	Not supplied		
511-736	**511-736**			5 pcs.		1 pc.		
511-751-20	**511-731**	**2923AB-10** (Graduation: 0.0001 in)	**21DZA000**	9 pcs.	2 pcs.	Not supplied	1 pc.	4
511-752-20	**511-732**			6 pcs.	4 pcs.	1 pc.	Not supplied	6
511-753-20	**511-733**			11 pcs.		Not supplied		
511-754-20	**511-734**			13 pcs.		1 pc.		10
511-755-20	**511-735**			6 pcs.	7 pcs.	Not supplied		
511-756-20	**511-736**			5 pcs.		1 pc.		
511-741-20	**511-731**	**2922AB** (Graduation: 0.0005 in)	**21DZA000**	9 pcs.	2 pcs.	Not supplied	1 pc.	4
511-742-20	**511-732**			6 pcs.	4 pcs.	1 pc.	Not supplied	6
511-743-20	**511-733**			11 pcs.		Not supplied		
511-744-20	**511-734**			13 pcs.		1 pc.		10
511-745-20	**511-735**			6 pcs.	7 pcs.	Not supplied		
511-746-20	**511-736**			5 pcs.		1 pc.		
511-931-20	Set of **511-731/732/733**	**2922AB**	**21DZA000**	See SPECIFICATIONS of **511-731/732/733**				
511-932-20		**2923AB-10**						
511-935-10		**543-312B**						

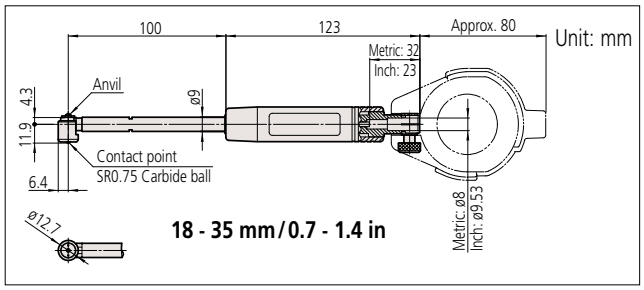
* Accuracy of the bore gage alone.

Note 1: A 2" sub-anvil is supplied with **511-733**, and a 3" sub-anvil is supplied with **511-736**.

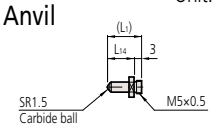
Note 2: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

DIMENSIONS

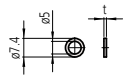
Unit: mm



Anvil



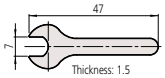
Interchangeable washer



t (mm)	Code No.
0.5	**205623**
1	**205624**

Spanner

102148



STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	Code No.	Indication of measuring size	L1	L14
511-701 **511-731**	1	**21DZA213A**	18 mm/0.71 in	5.5	2.5
	2	**21DZA213B**	20 mm/0.79 in	7.5	4.5
	3	**21DZA213C**	22 mm/0.87 in	9.5	6.5
	4	**21DZA213D**	24 mm/0.94 in	11.5	8.5
	5	**21DZA213E**	26 mm/1.02 in	13.5	10.5
	6	**21DZA213F**	28 mm/1.10 in	15.5	12.5
	7	**21DZA213G**	30 mm/1.18 in	17.5	14.5
	8	**21DZA213H**	32 mm/1.26 in	19.5	16.5
	9	**21DZA213J**	34 mm/1.34 in	21.5	18.5

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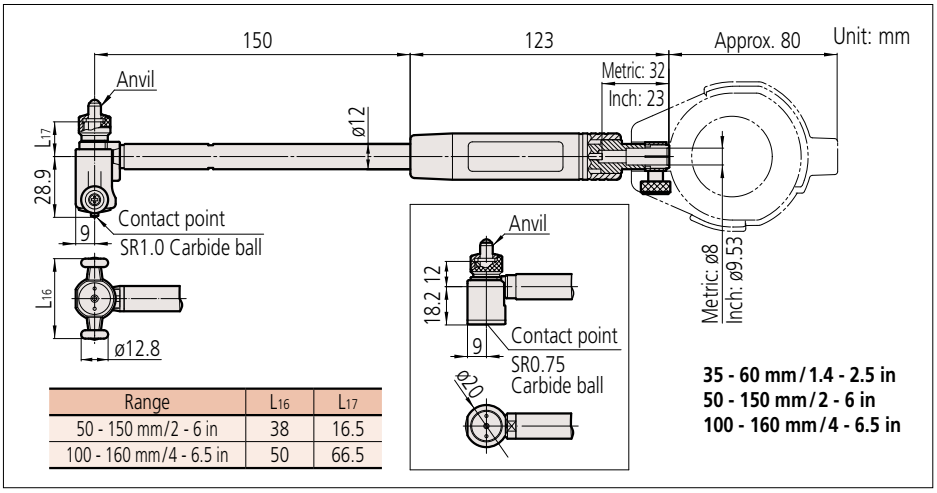
Bore Gages
SERIES 511

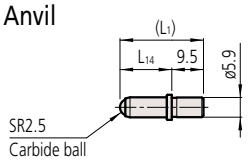
DIMENSIONS



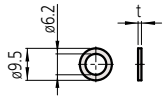
Range	L16	L17
50 - 150 mm/2 - 6 in	38	16.5
100 - 160 mm/4 - 6.5 in	50	66.5

35 - 60 mm/1.4 - 2.5 in
50 - 150 mm/2 - 6 in
100 - 160 mm/4 - 6.5 in

Anvil



Interchangeable washer

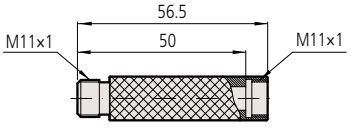


t (mm)	Code No.
0.5	**205457**
1	**205458**
2	**205459**
3	**205460**

Sub-anvil

Unit: mm

(Supplied only for **511-703/733**)



102178

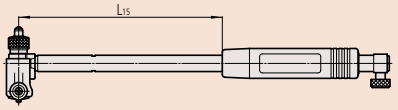
Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	**Code No.**	Indication of measuring size	L1	L14
511-702 **511-732**	1	**21DZA232A**	35 mm/1.38 in	15	5.5
	2	**21DZA232B**	40 mm/1.57 in	20	10.5
	3	**21DZA232C**	45 mm/1.77 in	25	15.5
	4	**21DZA232D**	50 mm/1.97 in	30	20.5
	5	**21DZA232E**	55 mm/2.17 in	35	25.5
	6	**21DZA232F**	60 mm/2.36 in	40	30.5
511-703 **511-733** ( ) Using 50 mm/2 in Sub-Anvil	1	**21DZA232A**	50 mm (100 mm)/1.97 in (3.94 in)	15	5.5
	2	**21DZA232B**	55 mm (105 mm)/2.17 in (4.13 in)	20	10.5
	3	**21DZA232C**	60 mm (110 mm)/2.36 in (4.33 in)	25	15.5
	4	**21DZA232D**	65 mm (115 mm)/2.55 in (4.53 in)	30	20.5
	5	**21DZA232E**	70 mm (120 mm)/2.74 in (4.72 in)	35	25.5
	6	**21DZA232F**	75 mm (125 mm)/2.93 in (4.92 in)	40	30.5
	7	**21DZA232G**	80 mm (130 mm)/3.12 in (5.12 in)	45	35.5
	8	**21DZA232H**	85 mm (135 mm)/3.31 in (5.31 in)	50	40.5
	9	**21DZA232J**	90 mm (140 mm)/3.50 in (5.51 in)	55	45.5
	10	**21DZA232L**	95 mm (145 mm)/3.69 in (5.71 in)	60	50.5
	11	**21DZA232M**	100 mm (150 mm)/3.88 in (5.91 in)	65	55.5
511-704 **511-734**	1	**21DZA232A**	100 mm/3.94 in	15	5.5
	2	**21DZA232B**	105 mm/4.13 in	20	10.5
	3	**21DZA232C**	110 mm/4.33 in	25	15.5
	4	**21DZA232D**	115 mm/4.53 in	30	20.5
	5	**21DZA232E**	120 mm/4.72 in	35	25.5
	6	**21DZA232F**	125 mm/4.92 in	40	30.5
	7	**21DZA232G**	130 mm/5.12 in	45	35.5
	8	**21DZA232H**	135 mm/5.31 in	50	40.5
	9	**21DZA232J**	140 mm/5.51 in	55	45.5
	10	**21DZA232L**	145 mm/5.71 in	60	50.5
	11	**21DZA232M**	150 mm/5.91 in	65	55.5
	12	**21DZA232N**	155 mm/6.10 in	70	60.5
	13	**21DZA232P**	160 mm/6.30 in	75	65.5

Special sizes and specifications other than standard can be custom-made by special order. Please contact your local Mitutoyo Sales Office for more information.

Example



Length below the grip

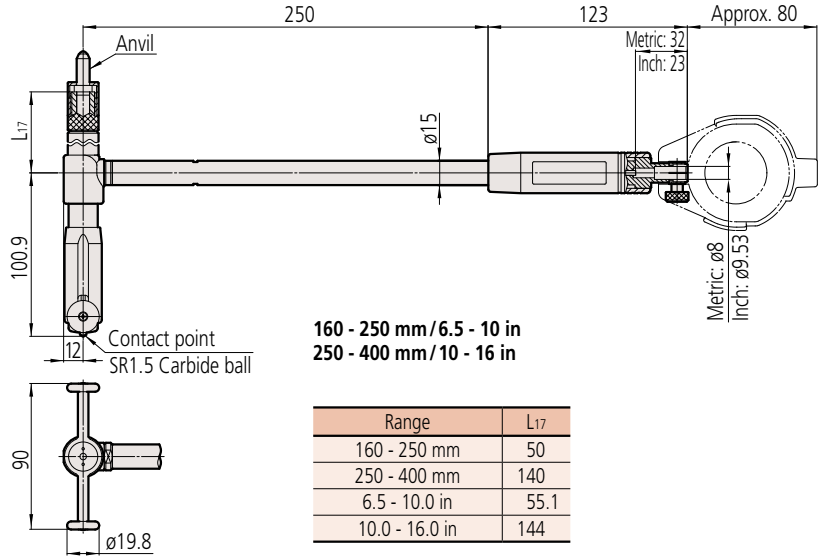
Model	L15 (mm)
511-701	150, 200, 250, 300, 400, 500
511-702/703/704	100, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000
511-705/706	100, 150, 200, 300, 400, 500, 600, 700, 800, 900, 1000

Note: The length over listed above is not available.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

DIMENSIONS

Unit: mm

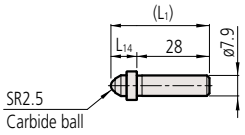


160 - 250 mm / 6.5 - 10 in
250 - 400 mm / 10 - 16 in

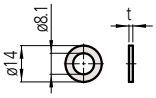
Range	L_{17}
160 - 250 mm	50
250 - 400 mm	140
6.5 - 10.0 in	55.1
10.0 - 16.0 in	144

Unit: mm

Anvil



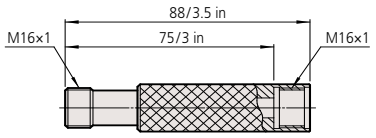
Interchangeable washer



t (mm)	Code No.
0.5	**205467**
1	**205461**
2	**205462**
3	**205463**
4	**205464**
5	**205465**
6	**205466**

Sub-anvil

Supplied only for **511-706** (**202974**) and **511-736** (**202975**)



202974 (**511-706**)
202975 (**511-736**)

Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	**Code No.**	Indication of measuring size	L_1	L_{14}
511-705 **511-735**	1	**21DZA241A**	160 mm/6.50 in	38	10
	2	**21DZA241B**	175 mm/7.09 in	53	25
	3	**21DZA241C**	190 mm/7.68 in	68	40
	4	**21DZA241D**	205 mm/8.27 in	83	55
	5	**21DZA241E**	220 mm/8.86 in	98	70
	6	**21DZA241F**	235 mm/9.45 in	113	85
511-706 **511-736** ( ) Using 75 mm/3 in Sub-Anvil	1	**21DZA241A**	250 mm (325 mm)/10.00 in (13.00 in)	38	10
	2	**21DZA241B**	265 mm (340 mm)/10.59 in (13.59 in)	53	25
	3	**21DZA241C**	280 mm (355 mm)/11.18 in (14.18 in)	68	40
	4	**21DZA241D**	295 mm (370 mm)/11.77 in (14.77 in)	83	55
	5	**21DZA241E**	310 mm (385 mm)/12.36 in (15.36 in)	98	70

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Bore Gages
SERIES 511 — Short Leg Type

- This is a bore gage for measuring 18 to 160 mm inside diameter.
- With a short length below the grip, a lightweight and easy-to-handle body makes it easier to insert the gage in a narrow space or perform measurements on a table.
- Carbide-tipped contact point and anvil for durability and wear resistance.

511-761

Note: The dial indicator and the dial protection cover are optional.
Refer to page 08-52 for details.

SPECIFICATIONS

Metric

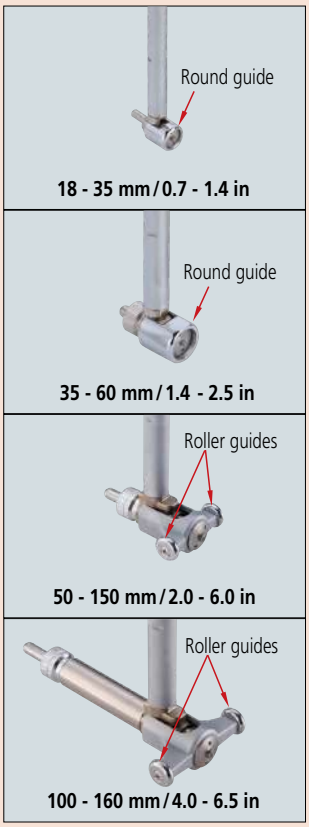
Code No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (µm)	Repeatability* (µm)	Adjacent error* (µm)	Measuring force (N)	Guide force (N)
511-761	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-762	35 - 60						
511-763	50 - 150	1.6				5 or less	10 or less
511-764	100 - 160						
511-771-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-772-20	35 - 60						
511-773-20	50 - 150	1.6				5 or less	10 or less
511-774-20	100 - 160						
511-766-20	18 - 35	1.2	2	0.5	1	4 or less	6 or less
511-767-20	35 - 60						
511-768-20	50 - 150	1.6				5 or less	10 or less
511-769-20	100 - 160						

Code No.	Content of set							Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-761	**511-761**	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-762	**511-762**			6 pcs.	4 pcs.		Not supplied	
511-763	**511-763**			11 pcs.		1 pc.		
511-764	**511-764**			13 pcs.		Not supplied		
511-771-20	**511-761**	**2109AB-10** (Graduation: 0.001 mm)	**21DZA000**	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-772-20	**511-762**			6 pcs.	4 pcs.		Not supplied	
511-773-20	**511-763**			11 pcs.		1 pc.		
511-774-20	**511-764**			13 pcs.		Not supplied		
511-766-20	**511-761**	**2046AB** (Graduation: 0.01 mm)	**21DZA000**	9 pcs.	2 pcs.	Not supplied	1 pc.	50
511-767-20	**511-762**			6 pcs.	4 pcs.		Not supplied	
511-768-20	**511-763**			11 pcs.		1 pc.		
511-769-20	**511-764**			13 pcs.		Not supplied		

* Accuracy of the bore gage alone.
Note 1: A 50 mm sub-anvil is supplied with **511-763**.
Note 2: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Measurement example

Contact Points



The dial protection cover, recommended indicators

Refer to page 08-52.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

SPECIFICATIONS

Inch

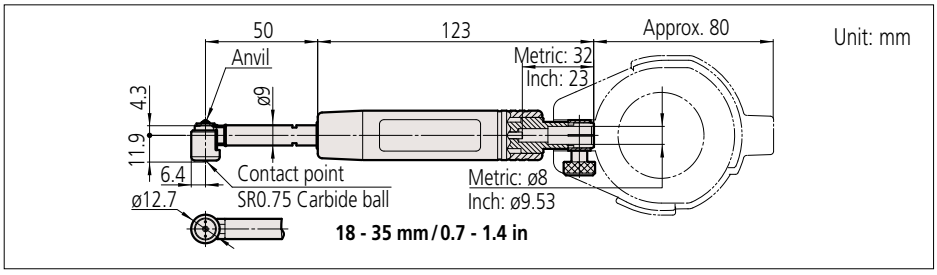
Code No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-781	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-782	1.4 - 2.5						
511-783	2.0 - 6.0	0.063				5 or less	10 or less
511-784	4.0 - 6.5						
511-791-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-792-20	1.4 - 2.5						
511-793-20	2.0 - 6.0	0.063				5 or less	10 or less
511-794-20	4.0 - 6.5						
511-786-20	0.7 - 1.4	0.047	0.00008	0.00002	0.00004	4 or less	6 or less
511-787-20	1.4 - 2.5						
511-788-20	2.0 - 6.0	0.063				5 or less	10 or less
511-789-20	4.0 - 6.5						

Code No.	Content of set							Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Anvil	Interchangeable Washer	Sub-Anvil	Spanner	
511-781	**511-781**	Not supplied	Not supplied	9 pcs.	2 pcs.	Not supplied	1 pc.	2
511-782	**511-782**			6 pcs.	4 pcs.		Not supplied	
511-783	**511-783**			11 pcs.		1 pc.		
511-784	**511-784**			13 pcs.		Not supplied		
511-791-20	**511-781**	**2923AB-10** (Graduation: 0.0001 in)	**21DZA000**	9 pcs.	2 pcs.	Not supplied	1 pc.	2
511-792-20	**511-782**			6 pcs.	4 pcs.		Not supplied	
511-793-20	**511-783**			11 pcs.		1 pc.		
511-794-20	**511-784**			13 pcs.		Not supplied		
511-786-20	**511-781**	**2922AB** (Graduation: 0.0005 in)	**21DZA000**	9 pcs.	2 pcs.	Not supplied	1 pc.	2
511-787-20	**511-782**			6 pcs.	4 pcs.		Not supplied	
511-788-20	**511-783**			11 pcs.		1 pc.		
511-789-20	**511-784**			13 pcs.		Not supplied		

* Accuracy of the bore gage alone.
Note 1: A 2" sub-anvil is supplied with **511-783**.
Note 2: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

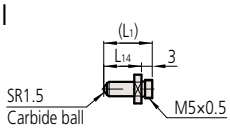
DIMENSIONS

Unit: mm

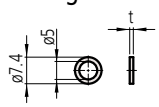


Unit: mm

Anvil

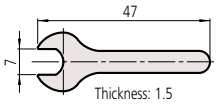


Interchangeable washer



t (mm)	Code No.
0.5	**205623**
1	**205624**

Spanner **102148**



STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	Code No.	Indication of measuring size	L_1	L_{14}
511-761 **511-781**	1	**21DZA213A**	18 mm/0.71 in	5.5 mm/0.22 in	2.5 mm/0.10 in
	2	**21DZA213B**	20 mm/0.79 in	7.5 mm/0.30 in	4.5 mm/0.18 in
	3	**21DZA213C**	22 mm/0.87 in	9.5 mm/0.37 in	6.5 mm/0.26 in
	4	**21DZA213D**	24 mm/0.94 in	11.5 mm/0.45 in	8.5 mm/0.33 in
	5	**21DZA213E**	26 mm/1.02 in	13.5 mm/0.53 in	10.5 mm/0.41 in
	6	**21DZA213F**	28 mm/1.10 in	15.5 mm/0.61 in	12.5 mm/0.49 in
	7	**21DZA213G**	30 mm/1.18 in	17.5 mm/0.69 in	14.5 mm/0.57 in
	8	**21DZA213H**	32 mm/1.26 in	19.5 mm/0.77 in	16.5 mm/0.65 in
	9	**21DZA213J**	34 mm/1.34 in	21.5 mm/0.85 in	18.5 mm/0.73 in

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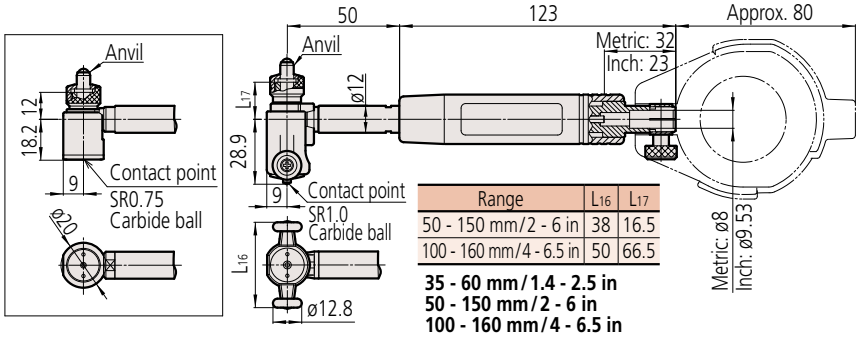
Bore Gages
SERIES 511 — Short Leg Type

DIMENSIONS

Unit: mm

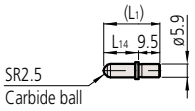


Range	L16	L17
50 - 150 mm/2 - 6 in	38	16.5
100 - 160 mm/4 - 6.5 in	50	66.5

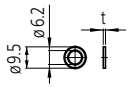
35 - 60 mm/1.4 - 2.5 in
50 - 150 mm/2 - 6 in
100 - 160 mm/4 - 6.5 in

Unit: mm

Anvil

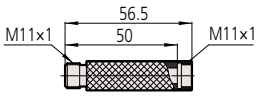


Interchangeable washer



t (mm)	Code No.
0.5	**205457**
1	**205458**
2	**205459**
3	**205460**

Sub-anvil (Supplied only for **511-763** and **511-783**.)



102178

Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

STANDARD ACCESSORIES

Bore gage (Main body)	Anvil				
	Marked No.	**Code No.**	Indication of measuring size	L1	L14
511-762 **511-782**	1	**21DZA232A**	35 mm/1.38 in	15	5.5
	2	**21DZA232B**	40 mm/1.57 in	20	10.5
	3	**21DZA232C**	45 mm/1.77 in	25	15.5
	4	**21DZA232D**	50 mm/1.97 in	30	20.5
	5	**21DZA232E**	55 mm/2.17 in	35	25.5
	6	**21DZA232F**	60 mm/2.36 in	40	30.5
511-763 **511-783** ( ) Using 50 mm/2 in Sub-Anvil	1	**21DZA232A**	50 mm (100 mm)/1.97 in (3.94 in)	15	5.5
	2	**21DZA232B**	55 mm (105 mm)/2.17 in (4.13 in)	20	10.5
	3	**21DZA232C**	60 mm (110 mm)/2.36 in (4.33 in)	25	15.5
	4	**21DZA232D**	65 mm (115 mm)/2.55 in (4.53 in)	30	20.5
	5	**21DZA232E**	70 mm (120 mm)/2.74 in (4.72 in)	35	25.5
	6	**21DZA232F**	75 mm (125 mm)/2.93 in (4.92 in)	40	30.5
	7	**21DZA232G**	80 mm (130 mm)/3.12 in (5.12 in)	45	35.5
	8	**21DZA232H**	85 mm (135 mm)/3.31 in (5.31 in)	50	40.5
	9	**21DZA232J**	90 mm (140 mm)/3.50 in (5.51 in)	55	45.5
	10	**21DZA232L**	95 mm (145 mm)/3.69 in (5.71 in)	60	50.5
	11	**21DZA232M**	100 mm (150 mm)/3.88 in (5.91 in)	65	55.5
511-764 **511-784**	1	**21DZA232A**	100 mm/3.94 in	15	5.5
	2	**21DZA232B**	105 mm/4.13 in	20	10.5
	3	**21DZA232C**	110 mm/4.33 in	25	15.5
	4	**21DZA232D**	115 mm/4.53 in	30	20.5
	5	**21DZA232E**	120 mm/4.72 in	35	25.5
	6	**21DZA232F**	125 mm/4.92 in	40	30.5
	7	**21DZA232G**	130 mm/5.12 in	45	35.5
	8	**21DZA232H**	135 mm/5.31 in	50	40.5
	9	**21DZA232J**	140 mm/5.51 in	55	45.5
	10	**21DZA232L**	145 mm/5.71 in	60	50.5
	11	**21DZA232M**	150 mm/5.91 in	65	55.5
	12	**21DZA232N**	155 mm/6.10 in	70	60.5
	13	**21DZA232P**	160 mm/6.30 in	75	65.5

Recommended Digimatic Indicators

Refer to page 08-38.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Bore Gages
SERIES 511 — with Micrometer Head

- Micrometer head is attached to the anvil for convenient and accurate dimensional measurements.
- Carbide-tipped contact point for durability and wear resistance.

511-803

Note: The dial indicator and the dial protection cover are optional. Refer to page 08-52 for details.

Measurement example

The dial protection cover, recommended indicators

Refer to page 08-52.

SPECIFICATIONS

Metric

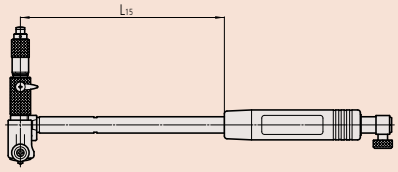
Code No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (µm)	Repeatability* (µm)	Adjacent error* (µm)	Measuring force (N)	Guide force (N)
511-803	60 - 100	1.6	2	0.5	1	5 or less	10 or less
511-804	100 - 160						
511-805	150 - 250					6 or less	15 or less
511-806	250 - 400						
511-807	400 - 600						20 or less
511-808	600 - 800						
511-823-20	60 - 100	1.6	2	0.5	1	5 or less	10 or less
511-824-20	100 - 160						
511-825-20	150 - 250					6 or less	15 or less
511-826-20	250 - 400						
511-827-20	400 - 600						20 or less
511-828-20	600 - 800						
511-813-20	60 - 100	1.6	2	0.5	1	5 or less	10 or less
511-814-20	100 - 160						
511-815-20	150 - 250					6 or less	15 or less
511-816-20	250 - 400						
511-817-20	400 - 600						20 or less
511-818-20	600 - 800						

Code No.	Content of set						Probing depth (mm)
	Bore gage	Dial indicator	Dial protection cover	Micrometer head	Sub-Anvil	Spanner	
511-803	**511-803**	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	150
511-804	**511-804**				3 pcs.	2 pcs.	
511-805	**511-805**				4 pcs.		250
511-806	**511-806**				3 pcs.		
511-807	**511-807**				2 pcs.		
511-808	**511-808**				2 pcs.		
511-823-20	**511-803**	**2109AB-10** (Graduation: 0.001 mm)	**21DZA000**	1 pc.	2 pcs.	3 pcs.	150
511-824-20	**511-804**				3 pcs.	2 pcs.	
511-825-20	**511-805**				4 pcs.		250
511-826-20	**511-806**				3 pcs.		
511-827-20	**511-807**				2 pcs.		
511-828-20	**511-808**				2 pcs.		
511-813-20	**511-803**	**2046AB** (Graduation: 0.01 mm)	**21DZA000**	1 pc.	2 pcs.	3 pcs.	150
511-814-20	**511-804**				3 pcs.	2 pcs.	
511-815-20	**511-805**				4 pcs.		250
511-816-20	**511-806**				3 pcs.		
511-817-20	**511-807**				2 pcs.		
511-818-20	**511-808**				2 pcs.		

* Accuracy of the bore gage alone.
Note 1: Storage boxes for **511-807/808** models are made of wood. The boxes of other models are made of plastic.
Note 2: It is not permissible to expand measuring range using sub-anvils other than as supplied as standard accessories. (The measurement accuracy in such cases is not guaranteed.)

Special sizes and specifications other than standard can be custom-made by special order. Please contact your local Mitutoyo Sales Office for more information.

Example



Length below the grip

Model	L15 (mm)
511-803/804	50, 100, 200, 250, 300, 400, 500, 600, 700, 800, 900, 1000
511-805/806/807/808	50, 100, 150, 200, 300, 400, 500, 600, 700, 800, 900, 1000

Note: The length over listed above is not available.

Mitutoyo reserves the right to change any or all aspects of any product specification, including prices, designs and service content, without notice.

Bore Gages
SERIES 511 — with Micrometer Head

SPECIFICATIONS

Inch

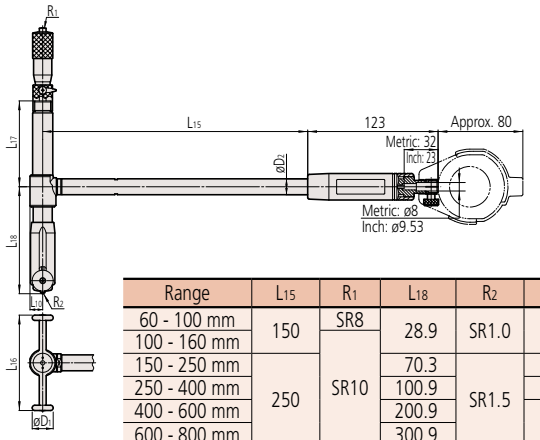
Code No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)
511-833	2.4 - 4.0	0.063	0.00008	0.00002	0.00004	5 or less	10 or less
511-834	4.0 - 6.4						
511-835	6.0 - 10.0					6 or less	15 or less
511-836	10.0 - 16.0						
511-837	16.0 - 24.0						20 or less
511-838	24.0 - 32.0						
511-853-20	2.4 - 4.0	0.063	0.00008	0.00002	0.00004	5 or less	10 or less
511-854-20	4.0 - 6.4						
511-855-20	6.0 - 10.0					6 or less	15 or less
511-856-20	10.0 - 16.0						
511-857-20	16.0 - 24.0						20 or less
511-858-20	24.0 - 32.0						
511-843-20	2.4 - 4.0	0.063	0.00008	0.00002	0.00004	5 or less	10 or less
511-844-20	4.0 - 6.4						
511-845-20	6.0 - 10.0					6 or less	15 or less
511-846-20	10.0 - 16.0						
511-847-20	16.0 - 24.0						20 or less
511-848-20	24.0 - 32.0						

Code No.	Content of set						Probing depth (in)
	Bore gage	Dial indicator	Dial protection cover	Micrometer head	Sub-Anvil	Spanner	
511-833	**511-833**	Not supplied	Not supplied	1 pc.	2 pcs.	3 pcs.	6
511-834	**511-834**				3 pcs.	2 pcs.	
511-835	**511-835**				4 pcs.		10
511-836	**511-836**				3 pcs.		
511-837	**511-837**				2 pcs.		
511-838	**511-838**				2 pcs.		
511-853-20	**511-833**	**2923AB-10** (Graduation: 0.0001 in)	**21DZA000**	1 pc.	2 pcs.	3 pcs.	4
511-854-20	**511-834**				3 pcs.	2 pcs.	6
511-855-20	**511-835**				4 pcs.		
511-856-20	**511-836**				3 pcs.		
511-857-20	**511-837**				2 pcs.		10
511-858-20	**511-838**				2 pcs.		
511-843-20	**511-833**	**2922AB** (Graduation: 0.0005 in)	**21DZA000**	1 pc.	2 pcs.	3 pcs.	4
511-844-20	**511-834**				3 pcs.	2 pcs.	6
511-845-20	**511-835**				4 pcs.		
511-846-20	**511-836**				3 pcs.		
511-847-20	**511-837**				2 pcs.		10
511-848-20	**511-838**				2 pcs.		

* Accuracy of the bore gage alone.
Note 1: Storage boxes for **511-837 / 838** models are made of wood. The boxes of other models are made of plastic.
Note 2: It is not permissible to expand measuring range using sub-anvils other than as supplied as standard accessories.
(The measurement accuracy in such cases is not guaranteed.)

DIMENSIONS

Unit: mm



Range	L15	R1	L18	R2	L10	L16	øD1	øD2	L17
60 - 100 mm	150	SR8	28.9	SR1.0	9	38	ø12.8	ø12	7
100 - 160 mm		SR10				50			16.5
150 - 250 mm	250		70.3	SR1.5	15	78	ø19.8	ø15	25.1
250 - 400 mm			100.9		12	90			81
400 - 600 mm			200.9		16	120			85
600 - 800 mm			300.9						185
2.4 - 4 in	150	SR8	28.9	SR1.0	9	38	ø12.8	ø12	7
4 - 6.4 in		SR10				50			16.5
6 - 10 in	250		70.3	SR1.5	15	78	ø19.8	ø15	25.9
10 - 16 in			100.9		12	90			81
16 - 24 in			200.9		16	120			85
24 - 32 in			300.9						188.2

Recommended Digimatic Indicators
Refer to page 08-38.

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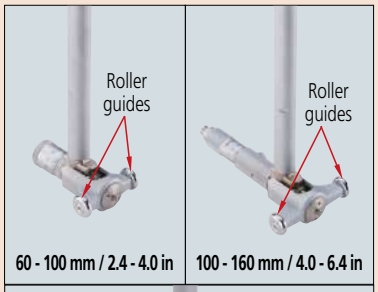
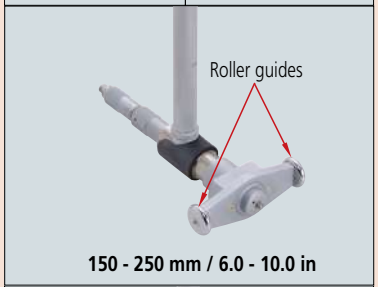
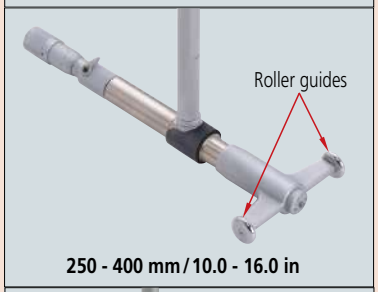
Contact Points



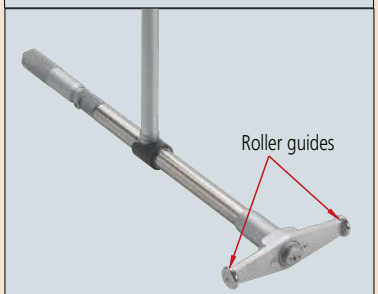
60 - 100 mm / 2.4 - 4.0 in | 100 - 160 mm / 4.0 - 6.4 in



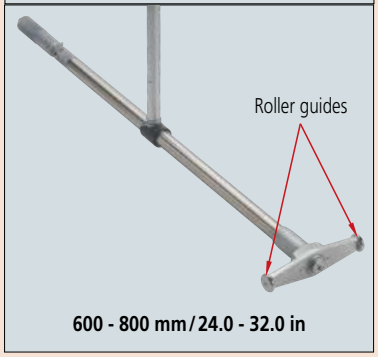
150 - 250 mm / 6.0 - 10.0 in



250 - 400 mm / 10.0 - 16.0 in



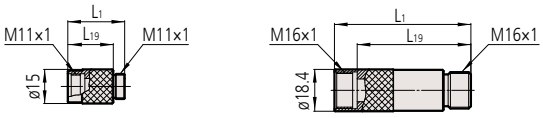
400 - 600 mm / 16.0 - 24.0 in



600 - 800 mm / 24.0 - 32.0 in

Sub-anvil

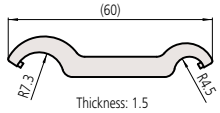
Unit: mm



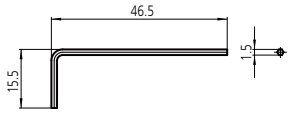
Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Spanner

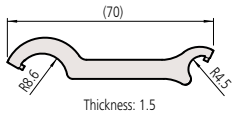
301336



202863



200154



STANDARD ACCESSORIES

Metric

Bore gage (Main body)	Micrometer head			Sub-Anvil				Spanner
	Code No.	Stroke (mm)	Screw size	Marked No. (mm)	Code No.	L1 (mm)	L19 (mm)	Code No.
511-803	21DZA267	10	M11×1	10	208892	15	10	301336 (2 pcs.) 202863 (1 pc.)
				20	208894	25	20	
511-804	21DZA268	13	M11×1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
511-805	21DZA268	13	M11×1	10	208892	15	10	301336 (2 pcs.)
				20	208894 (2 pcs.)	25	20	
				50	21DAA492	55	50	
511-806	953118	25	M16×1	25	208926	35	25	200154 (2 pcs.)
				50	208928 (2 pcs.)	60	50	
511-807	953120	50	M16×1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	
511-808	953120	50	M16×1	50	208928	60	50	200154 (2 pcs.)
				100	208932	110	100	

Inch

Bore gage (Main body)	Micrometer head			Sub-Anvil				Spanner
	Code No.	Stroke (in)	Screw size	Marked No. (in)	Code No.	L1 (in)	L19 (in)	Code No.
511-833	21DZA272	0.4	M11×1	0.4	208893	0.6	0.4	301336 (2 pcs.) 202863 (1 pc.)
				0.8	208895	1.0	0.8	
511-834	21DZA273	0.5	M11×1	0.4	208893	0.6	0.4	301336 (2 pcs.)
				0.8	208895 (2 pcs.)	1.0	0.8	
511-835	21DZA273	0.5	M11×1	0.4	208893	0.6	0.4	301336 (2 pcs.)
				0.8	208895 (2 pcs.)	1.0	0.8	
				2	21DAA493	2.2	2	
511-836	21DZA275	1.0	M16×1	1	208927	1.4	1	200154 (2 pcs.)
				2	208929 (2 pcs.)	2.4	2	
511-837	902313	2.0	M16×1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	
511-838	902313	2.0	M16×1	2	208929	2.4	2	200154 (2 pcs.)
				4	208933	4.4	4	

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Bore Gages
SERIES 511 — for Blind Holes

- This is a bore gage for measuring diameters near the bottom of a hole.
- Carbide-tipped contact point and anvil for durability and wear resistance.
- Optional extension rods can be attached for measuring deep holes.

511-415

Note: The dial indicator and the dial protection cover are optional. Refer to page 08-52 for details.

SPECIFICATIONS

Metric

Code No.	Range (mm)	Stroke of contact point (mm)	Accuracy* (µm)	Repeatability* (µm)	Adjacent error* (µm)	Measuring force (N)	Guide force (N)	Content of set: Bore gage	Dial indicator	Dial protection cover	Anvil	Washer	Probing depth (mm)
511-415	15 - 35	1.2	4	1	1	4 or less	6 or less	**511-415**	Not supplied	Not supplied	11 pcs.	1 pc.	150
511-416	35 - 60							**511-416**			6 pcs.	4 pcs.	
511-417	50 - 150					5 or less	10 or less	**511-417**			11 pcs.		
511-425-20	15 - 35	1.2	4	1	1	4 or less	6 or less	**511-415**	**2046AB** (Graduation: 0.01 mm)	**21DZA000**	11 pcs.	1 pc.	150
511-426-20	35 - 60							**511-416**			6 pcs.	4 pcs.	
511-427-20	50 - 150					5 or less	10 or less	**511-417**			11 pcs.		
511-435-20	15 - 35	1.2	4	1	1	4 or less	6 or less	**511-415**	**2109AB-10** (Graduation: 0.001 mm)	**21DZA000**	11 pcs.	1 pc.	150
511-436-20	35 - 60							**511-416**			6 pcs.	4 pcs.	
511-437-20	50 - 150					5 or less	10 or less	**511-417**			11 pcs.		

Inch

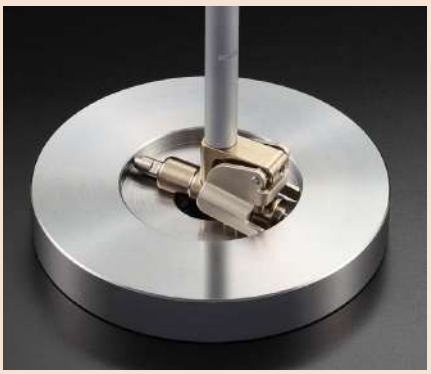
Code No.	Range (in)	Stroke of contact point (in)	Accuracy* (in)	Repeatability* (in)	Adjacent error* (in)	Measuring force (N)	Guide force (N)	Content of set: Bore gage	Dial indicator	Dial protection cover	Anvil	Washer	Probing depth (in)
511-418	0.6 - 1.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	**511-418**	Not supplied	Not supplied	11 pcs.	1 pc.	6
511-419	1.4 - 2.4							**511-419**			6 pcs.	4 pcs.	
511-420	2.0 - 6.0					5 or less	10 or less	**511-420**			11 pcs.		
511-428-20	0.6 - 1.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	**511-418**	**2922AB** (Graduation: 0.0005 in)	**21DZA000**	11 pcs.	1 pc.	6
511-429-20	1.4 - 2.4							**511-419**			6 pcs.	4 pcs.	
511-430-20	2.0 - 6.0					5 or less	10 or less	**511-420**			11 pcs.		
511-438-20	0.6 - 1.4	0.047	0.00016	0.00004	0.00004	4 or less	6 or less	**511-418**	**2923AB-10** (Graduation: 0.0001 in)	**21DZA000**	11 pcs.	1 pc.	6
511-439-20	1.4 - 2.4							**511-419**			6 pcs.	4 pcs.	
511-440-20	2.0 - 6.0					5 or less	10 or less	**511-420**			11 pcs.		

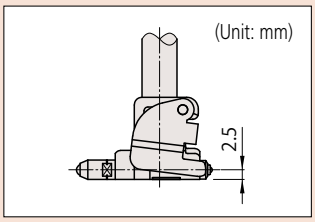
* Accuracy of the bore gage alone.

Note 1: A 10 mm (0.4 in) sub-anvil is supplied with **511-415**/**425-20**/**435-20**/**418**/**428-20**/**438-20** and a 50 mm (2 in) sub-anvil is supplied with **511-417**/**427-20**/**437-20**/**420**/**430-20**/**440-20**.

Note 2: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

Measurement example





Extension Rod

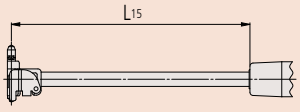
Refer to page 08-51.

The dial protection cover, recommended indicators

Refer to page 08-52.

Special sizes and specifications other than standard can be custom-made by special order. Please contact your local Mitutoyo Sales Office for more information.

Example



Length below the grip

Model	L15 (mm)
511-415/**416**/**417**	50, 150, 200, 250, 300 400, 500

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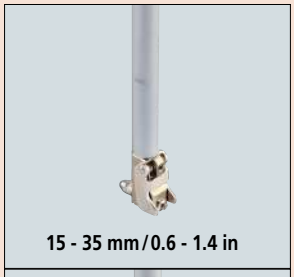
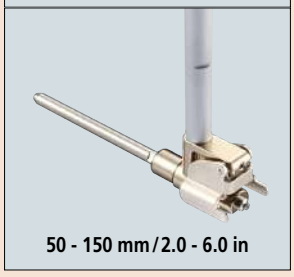
Contact Points



15 - 35 mm/0.6 - 1.4 in

35 - 60 mm/1.4 - 2.4 in



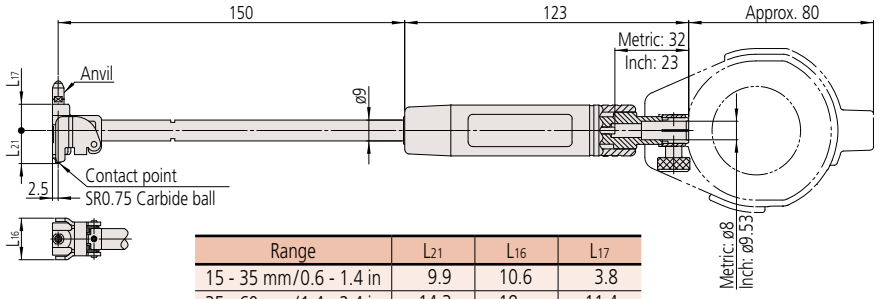
50 - 150 mm/2.0 - 6.0 in

Recommended Digimatic Indicators

Refer to page 08-38.

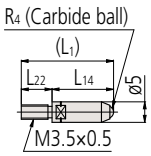
DIMENSIONS

Unit: mm

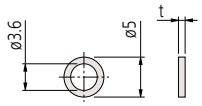


Range	L21	L16	L17
15 - 35 mm/0.6 - 1.4 in	9.9	10.6	3.8
35 - 60 mm/1.4 - 2.4 in	14.3	18	11.4
50 - 150 mm/2.0 - 6.0 in	22.7	22	18

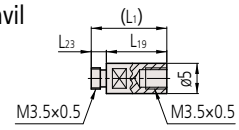
Anvil



Interchangeable washer



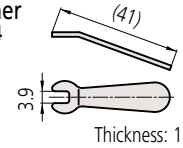
Sub-anvil



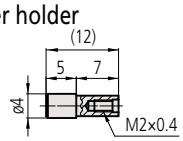
Unit: mm

Note: It is not permissible to use a sub-anvil other than as supplied as a standard accessory, or widen a measuring range by using multiple sub-anvils. (The measurement accuracy in such cases is not guaranteed.)

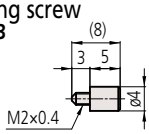
Spanner
204354



Washer holder
212202



Locking screw
212203



STANDARD ACCESSORIES

Bore gage (Main body)	Anvil							Interchangeable washer		Sub-Anvil		
	Marked No.	Code No.	Indication of measuring size	L1	L22	R4	L14	Code No.	t	Code No.	L23	L19
511-415 511-418 ( ) Using 10 mm/0.4 in Sub-Anvil	1	21DZA376A	15 mm (25 mm)/0.59 in (0.98 in)	4.5	2.5	SR1	2	212127	0.5 mm/0.02 in	21DAA563	2.5	10 mm/0.4 in
	2	21DZA376B	16 mm (26 mm)/0.63 in (1.02 in)	5.5			3					
	3	21DZA376C	17 mm (27 mm)/0.67 in (1.06 in)	6.5			4					
	4	21DZA376D	18 mm (28 mm)/0.71 in (1.10 in)	7.5			5					
	5	21DZA376E	19 mm (29 mm)/0.75 in (1.14 in)	8.5			6					
	6	21DZA376F	20 mm (30 mm)/0.79 in (1.18 in)	9.5		SR1.5	7					
	7	21DZA376G	21 mm (31 mm)/0.83 in (1.22 in)	10.5			8					
	8	21DZA376H	22 mm (32 mm)/0.87 in (1.26 in)	11.5			9					
	9	21DZA376J	23 mm (33 mm)/0.91 in (1.30 in)	12.5			10					
	10	21DZA376L	24 mm (34 mm)/0.94 in (1.34 in)	13.5			11					
	11	21DZA376M	25 mm (35 mm)/0.98 in (1.38 in)	14.5			12					
511-416 511-419	1	21DZA404A	35 mm/1.38 in	17.5	7.5	SR1.5	10	212127 212128 212129 212130	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in			
	2	21DZA404B	40 mm/1.57 in	22.5			15					
	3	21DZA404C	45 mm/1.77 in	27.5			20					
	4	21DZA404D	50 mm/1.97 in	32.5			25					
	5	21DZA404E	55 mm/2.17 in	37.5			30					
	6	21DZA404F	60 mm/2.36 in	42.5			35					
511-417 511-420 ( ) Using 50 mm/2 in Sub-Anvil	1	21DZA404A	50 mm (100 mm)/1.97 in (3.94 in)	17.5	7.5	SR1.5	10	212127 212128 212129 212130	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in	21DAA596	7.5	50 mm/2 in
	2	21DZA404B	55 mm (105 mm)/2.17 in (4.13 in)	22.5			15					
	3	21DZA404C	60 mm (110 mm)/2.36 in (4.33 in)	27.5			20					
	4	21DZA404D	65 mm (115 mm)/2.56 in (4.53 in)	32.5			25					
	5	21DZA404E	70 mm (120 mm)/2.76 in (4.72 in)	37.5			30					
	6	21DZA404F	75 mm (125 mm)/2.95 in (4.92 in)	42.5			35					
	7	21DZA404G	80 mm (130 mm)/3.15 in (5.12 in)	47.5			40					
	8	21DZA404H	85 mm (135 mm)/3.35 in (5.31 in)	52.5			45					
	9	21DZA404J	90 mm (140 mm)/3.54 in (5.51 in)	57.5			50					
	10	21DZA404L	95 mm (145 mm)/3.74 in (5.71 in)	62.5			55					
	11	21DZA404M	100 mm (150 mm)/3.94 in (5.91 in)	67.5			60					

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MeasurLink® ENABLED Data Management Software by Mitutoyo ABSOLUTE™

Bore Gages
SERIES 511 — ABSOLUTE Digimatic Bore Gages

- An easy-to-use digital bore gage with preset and data output functions not available on analog models for use in various applications. Analog bar indicator allows for fast Go/No-go judgements.
- The minimum value holding function provides easy measurement of hole diameters.
- ABS (ABSOLUTE) type bore gages are not subject to overspeed error.
- The display and grip can be rotated up to 320° and the display can be inclined up to 90°, so that it is easily readable from any direction.
- Up to four extension rods (optional) can be used for measuring at the bottom of a hole 2 m deep.

511-501

Measurement example

Function

- Preset function
- Master value registration (3 values maximum)
- Tolerance judgment
- Upper/lower limit registration (3 values maximum)
- Minimum value holding
- Data output
- Display rotation (320°)
- Display inclination (90°, 7 steps)
- Low battery alarm display
- Error display

Extension Rod (optional)

250 mm (10 in): **21DZA089**
500 mm (20 in): **21DZA081**
Up to four extension rods can be jointed, and a maximum length of 2 m is allowed.

SPECIFICATIONS

Metric

Code No.	511-501	511-502
Range	45 - 100 mm	100 - 160 mm
Stroke of contact point	1.2 mm	
Resolution	0.001 mm	
Wide range accuracy*1	0.003 mm or less	
Adjacent error	0.002 mm or less	
Repeatability	0.002 mm or less	
Measuring force	5 N or less	
Guide force	10 N or less	
Power source	SR44 battery (2 pcs.), **938882** included as standard (for operational checks)	
Battery life*2	Approx. 2,000 hours under normal use.	
Position detection method	ABSOLUTE electrostatic linear encoder	
Sampling frequency*3	50 times/s	
Dust / Water protection level*4	IP53 (IEC 60529, JIS C 0920)	
Display	· 7 segments 6 digits decimal numeric with minus sign, Unit (mm) · Tolerance judge indication · Analog indication	
Net weight	500 g	570 g

Inch

Code No.	511-521	511-522
Range	1.8 - 4.0 in	4.0 - 6.5 in
Stroke of contact point	0.048 in/1.2 mm	
Resolution	0.00005 in/0.001 mm	
Wide range accuracy*1	0.0001 in/0.003 mm or less	
Adjacent error	0.00008 in/0.002 mm or less	
Repeatability	0.0001 in/0.002 mm or less	
Measuring force	5 N or less	
Guide force	10 N or less	
Power source	SR44 battery (2 pcs.), **938882** included as standard (for operational checks)	
Battery life*2	Approx. 2,000 hours under normal use.	
Position detection method	ABSOLUTE electrostatic linear encoder	
Sampling frequency*3	50 times/s	
Dust / Water protection level*4	IP53 (IEC 60529, JIS C 0920)	
Display	· 7 segments 6 digits decimal numeric with minus sign, Unit (in/mm) · Tolerance judge indication · Analog indication	
Net weight	500 g	570 g

*1 A quantizing error is excluded.
*2 When the usage time per day is eight hours.
*3 If the contact point detecting speed is over 50 µm/s, the peak value may not be displayed correctly.
*4 The level indicated is valid only if the output connector cap is installed.

Optional Accessories

Code No.	Type	description
264-020	—	USB Input Tool Series USB Keyboard Signal Conversion Type **IT-020U**
905338	F	Connection cable (1 m)
905409	F	Connection cable (2 m)
06AFM380F	F	USB Input Tool Direct (2 m)
02AZD730*	IP67	**U-WAVE-T**
02AZD880*	Buzzer	**U-WAVE-T**
02AZD790F	F	Connection cable for **U-WAVE-T** (160 mm)
02AZE140F	F	Connection cable for **U-WAVE-T** For foot switch
02AZD810D	—	**U-WAVE-R**

* Add suffix to Code No.; **G** for Asia, Europe and the Americas, **H** for Brazil and **J** for Korea.

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Gauge Blocks and Block Sets for Setting the Origin or Master Value (optional)

• Typical application

• Rectangular gauge blocks
Note: Available only for **511-501**/**521**
516-118-10
516-118-60 with calibration certificate

Description*		Code No.	Qty
Nominal length (mm)	1	**611611-021**	1
	2	**611612-021**	1
	3	**611613-021**	1
	5	**611615-021**	1
	10	**611671-021**	1
	20	**611672-021**	1
	30	**611673-021**	1
	40	**611674-021**	1
Flat jaw		**630030**	1 pair (2 pcs.)
Holder 160 mm		**619004**	1
Inspection certificate (8 pcs.)		—	1

* Equivalent to JIS B 7506 Grade 0

• Square gauge blocks
Note: Available only for **511-501**/**521**
516-119-10
516-119-60 with calibration certificate

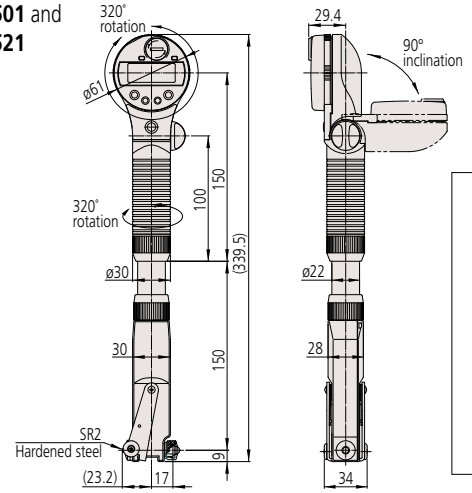
Description*		Code No.	Qty
Nominal length (mm)	1	**614611-021**	1
	2	**614612-021**	1
	3	**614613-021**	1
	5	**614615-021**	1
	10	**614671-021**	1
	20	**614672-021**	1
	30	**614673-021**	1
	40	**614674-021**	1
Flat jaw		**619072**	1 pair (2 pcs.)
Tie rod 3 in		**619062**	1
Tie rod 2 1/4 in		**619063**	1
Tie rod 1 1/2 in		**619064**	1
Flat head screw 1 1/4 in		**619057**	2
Flat head screw 5/8 in		**619058**	2
Inspection certificate (8 pcs.)		—	1

* Equivalent to JIS B 7506 Grade 0

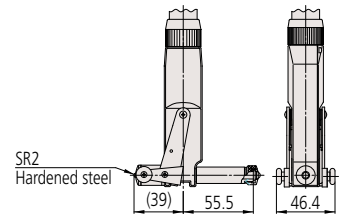
DIMENSIONS

511-501 and **511-521**

Unit: mm

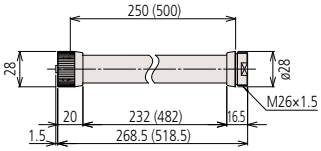


511-502 and **511-522**



Extension rod (optional)

Unit: mm

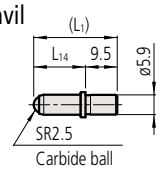


( ): 500 mm type

STANDARD ACCESSORIES

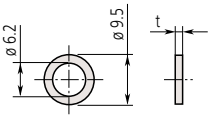
Bore gage	Anvil					Interchangeable washer	
(Main body)	Marked No.	Code No.	Indication of measuring size	L_1 (mm)	L_{14} (mm)	Code No.	t
511-501 **511-521**	1	**21DZA232A**	45 mm/1.8 in	15	5.5	**205457** **205458** **205459** **205460**	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in
	2	**21DZA232B**	50 mm/2.0 in	20	10.5		
	3	**21DZA232C**	55 mm/2.2 in	25	15.5		
	4	**21DZA232D**	60 mm/2.4 in	30	20.5		
	5	**21DZA232E**	65 mm/2.6 in	35	25.5		
	6	**21DZA232F**	70 mm/2.8 in	40	30.5		
	7	**21DZA232G**	75 mm/3.0 in	45	35.5		
	8	**21DZA232H**	80 mm/3.2 in	50	40.5		
	9	**21DZA232J**	85 mm/3.4 in	55	45.5		
	10	**21DZA232L**	90 mm/3.6 in	60	50.5		
	11	**21DZA232M**	95 mm/3.8 in	65	55.5		
	12	**21DZA232N**	100 mm/4.0 in	70	60.5		
511-502 **511-522**	1	**21DZA232A**	100 mm/4.0 in	15	5.5	**205457** **205458** **205459** **205460**	0.5 mm/0.02 in 1.0 mm/0.04 in 2.0 mm/0.08 in 3.0 mm/0.12 in
	2	**21DZA232B**	105 mm/4.2 in	20	10.5		
	3	**21DZA232C**	110 mm/4.4 in	25	15.5		
	4	**21DZA232D**	115 mm/4.6 in	30	20.5		
	5	**21DZA232E**	120 mm/4.8 in	35	25.5		
	6	**21DZA232F**	125 mm/5.0 in	40	30.5		
	7	**21DZA232G**	130 mm/5.2 in	45	35.5		
	8	**21DZA232H**	135 mm/5.4 in	50	40.5		
	9	**21DZA232J**	140 mm/5.6 in	55	45.5		
	10	**21DZA232L**	145 mm/5.8 in	60	50.5		
	11	**21DZA232M**	150 mm/6.0 in	65	55.5		
	12	**21DZA232N**	155 mm/6.2 in	70	60.5		
	13	**21DZA232P**	160 mm/6.4 in	75	65.5		

Anvil



Interchangeable washer

Unit: mm



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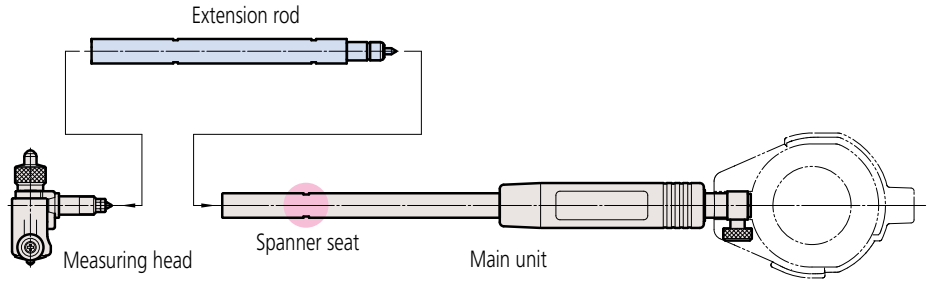
Extension Rod
SERIES 511 — Accessories for Bore Gages

- Extension rods are available to assist in deep-hole measurement. (For applicable combination with bore gages, see the table below)

Note 1: When using a 500 mm (or longer) extension rod, use the bore gage in an upright position.
Note 2: Only one extension rod can be attached to a bore gage. It is not possible to use more than one extension rod.
Note 3: The extension rod cannot be used for products with a custom size or custom specifications.



SPECIFICATIONS

Applicable model	Extension rod length (mm)					Extension rod diameter (mm)	Spanner code No.
Code No.	125	250	500	750	1000		
511-701/511-731 **511-415/511-418** **511-416/511-419** **511-417/511-420**	**953549**	**953550**	**953551**	—	—	ø9	**102148** (2 pcs.)
511-702/511-732 **511-703/511-733** **511-704/511-734** **511-803/511-833** **511-804/511-834**	**953552**	**953553**	**953554**	**953555**	**953556**	ø12	**212556** (2 pcs.)
511-705/511-735 **511-706/511-736** **511-805/511-835** **511-806/511-836** **511-807/511-837** **511-808/511-838**	**953557**	**952361**	**953558**	**953559**	**953560**	ø15	**212556** (2 pcs.)

Note 1: If an extension rod is attached, the measuring accuracy may degrade due to factors such as rod deflection.
Note 2: Spanner is supplied as standard.

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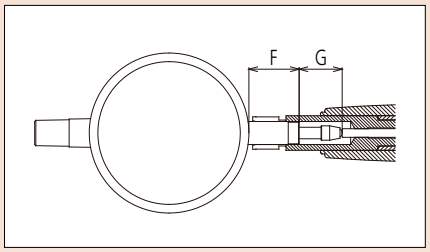
Note: Among indicators other than those recommended, the following types of indicator cannot be used.
- Indicators with a total length of F and G of less than 31.8 mm
- Indicators with a measuring range of more than 12.7 mm (ISO/JIS Type)/0.9 in (ASME/ANSI Type)
- Dust-proof and water-proof indicators with a spindle covered with rubber

Please contact us if you have any questions about products.



Recommended Indicators Accessories for Bore Gages

- These are the recommended indicators for bore gages. Select the best one for your application.

RECOMMENDED INDICATORS

2046AB
Graduation 0.01 mm,
Measuring range 10 mm
Refer to page 07-26 for details.

2109AB-10
Graduation 0.001 mm,
Measuring range 1 mm
Refer to page 07-28 for details.

2972AB
One revolution type,
Graduation 0.01 mm,
Measuring range 1 mm
Refer to page 07-40 for details.

2900AB-10
One revolution type,
Graduation 0.001 mm,
Measuring range 0.08 mm
Refer to page 07-34 for details.

543-310B-10
ABSOLUTE Digimatic Indicator
Resolution 0.001 mm
Refer to page 07-15 for details.

543-700 B
Resolution 0.0005 mm
Refer to page 07-5 for details.

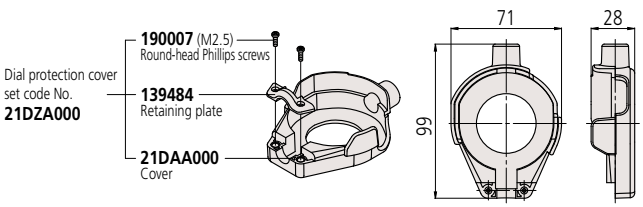
Note: Settings should be modified prior to use. Refer to the user's manual for details.

DIAL PROTECTION COVER

- The cover protects the indicator from unexpected impact while handling the bore gage.
- Can also be used for **543-310B-10**, an ABS Digimatic indicator for bore gages.

Note: This protect cover is intended to be attached to a bore gage and cannot be used for a dial indicator or Digimatic indicator alone.

Unit: mm



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Setting Rings
SERIES 177 — Accessories for Inside Micrometers, Holtest and Dial Bore Gages

- Used for quick and accurate setting of dial bore gages, Holtest, and inside micrometers.
- Actual diameter is marked in 0.001 mm increments. (Measuring position of dimension is the center of the height T.)

Steel Setting Rings

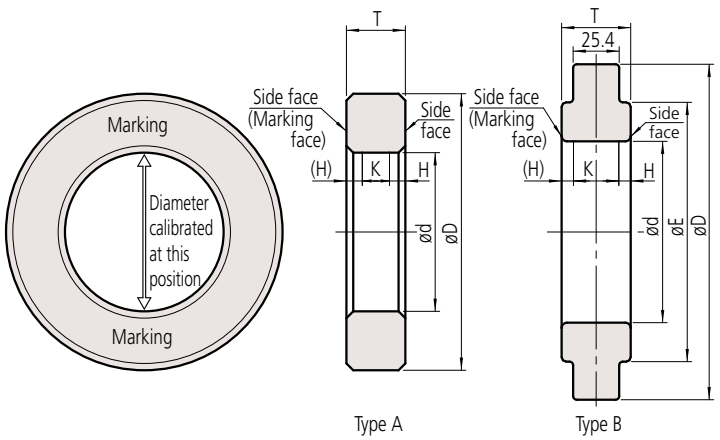
177-300

CERA Setting Rings

177-432

DIMENSIONS

Unit: mm



Suffix

177-*-62**: With Inspection Certificate (provides a record of the calibrated diameter) and Calibration Certificate

177-*-82**: With Inspection Certificate (provides a record of the calibrated diameter), Calibration Certificate, and Traceability System Chart

Note 1: The Inspection Certificate is not a substitute for a calibration certificate as it is undated.
Note 2: A more detailed inspection certificate describing roundness and cylindricity is available on request.

Made-to-order

- Custom-made setting rings
  Mitutoyo can manufacture settings rings to the size and design you need.
- Nominal size range
  1 mm to 305 mm/0.04 in to 12 in (steel)
  4 mm to 50 mm/0.16 in to 2 in (ceramic)
- Nominal size increment
  0.01 mm (up to 45 mm)
  0.02 mm (over 45 mm)
  0.0001 in (inch)

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SPECIFICATIONS

Steel Setting Rings

Metric

Code No.	Nominal size ød (mm)	Dimensions (mm)			Type	Accuracy				
		øD	øE	T		Tolerance between the nominal size and the actual diameter (µm)	Uncertainty of marked diameter value*1 (µm)	Roundness/ Cylindricity*2 (µm)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-220	1	20	—	4	A	±10	1.5	1.0	1.6	0.8
177-222	1.1	20	—	4	A	±10	1.5	1.0	1.6	0.8
177-225	1.2	20	—	4	A	±10	1.5	1.0	1.6	0.8
177-227	1.3	20	—	4	A	±10	1.5	1.0	1.6	0.8
177-230	1.4	20	—	4	A	±10	1.5	1.0	1.6	0.8
177-236	1.75	25	—	5	A	±10	1.5	1.0	1.6	1.8
177-239	2	25	—	5	A	±10	1.5	1.0	1.6	1.8
177-242	2.25	25	—	5	A	±10	1.5	1.0	1.6	1.8
177-208	2.5	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-246	2.75	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-248	3	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-250	3.25	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-252	3.5	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-255	3.75	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-204	4	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-257	4.5	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-205	5	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-263	5.5	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-267	6	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-271	6.5	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-275	7	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-125	8	32	—	10	A	±10	1.5	1.0	2.0	6.0
177-279	9	32	—	10	A	±10	1.5	1.0	2.0	6.0
177-126	10	32	—	10	A	±10	1.5	1.0	2.0	6.0
177-284	12	32	—	10	A	±10	1.5	1.0	2.0	6.0
177-132	14	38	—	10	A	±10	1.5	1.0	2.0	6.0
177-177	16	45	—	10	A	±10	1.5	1.0	2.0	6.0
177-133	17	45	—	10	A	±10	1.5	1.0	2.0	6.0
177-285	18	45	—	10	A	±10	1.5	1.0	2.0	6.0
177-286	20	45	—	10	A	±10	1.5	1.0	2.0	6.0
177-139	25	53	—	15	A	±10	1.5	1.0	3.2	8.6
177-288	30	71	—	15	A	±10	1.5	1.0	3.2	8.6
177-140	35	71	—	15	A	±10	1.5	1.0	3.2	8.6
177-290	40	71	—	15	A	±10	1.5	1.0	3.2	8.6
177-178	45	85	—	15	A	±10	1.5	1.0	3.7	7.6
177-146	50	85	—	20	A	±20	1.5	1.0	3.7	12.6
177-292	60	112	—	20	A	±20	1.5	1.0	3.7	12.6
177-314	62	112	—	20	A	±20	1.5	1.5	3.7	12.6
177-147	70	112	—	20	A	±20	1.5	1.5	3.7	12.6
177-316	75	125	—	25	A	±20	1.5	1.5	4.2	16.6
177-294	80	125	—	25	A	±20	1.5	1.5	4.2	16.6
177-318	87	140	—	25	A	±20	1.5	1.5	4.2	16.6
177-148	90	140	—	25	A	±20	1.5	1.5	4.2	16.6
177-296	100	160	—	25	A	±20	1.5	2.0	4.2	16.6
177-298	125	210	168	38.1 (25.4)	B	±20	2.5	2.0	5.3	27.5
177-300	150	235	187		B	±20	2.5	2.0	5.3	27.5
177-302	175	260	215		B	±20	2.5	2.5	5.3	27.5
177-304	200	311	244		B	±20	2.5	2.5	5.3	27.5
177-306	225	337	264		B	±20	2.5	2.5	5.3	27.5
177-308	250	362	290		B	±20	2.5	3.0	5.3	27.5
177-310	275	413	321		B	±20	2.5	3.0	5.3	27.5
177-312	300	438	340		B	±20	2.5	3.0	5.3	27.5

*1 Actual diameter is marked in 0.001 mm increments. (Dimension measuring position is the center of the height T.)

*2 Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity." Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each side and the center.

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Mitutoyo

Setting Rings
SERIES 177 — Accessories for Inside Micrometers, Holtest and Dial Bore Gages

Inch

Code No.	Nominal size ød (in)	Dimensions (mm)			Type	Accuracy				
		øD	øE	T		Tolerance between the nominal size and the actual diameter (in)	Uncertainty of marked diameter value*1 (in)	Roundness/ Cylindricity*2 (in)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-209	0.1	25	—	7	A	±0.0004	0.00006	0.00004	1.7	3.6
177-206	0.16	25	—	7	A	±0.0004	0.00006	0.00004	1.7	3.6
177-207	0.24	25	—	7	A	±0.0004	0.00006	0.00004	1.7	3.6
177-281	0.275	25	—	7	A	±0.0004	0.00006	0.00004	2.0	3.0
177-179	0.35	32	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-283	0.425	32	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-180	0.5	32	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-181	0.6	38	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-182	0.65	45	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-183	0.7	45	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-287	0.8	45	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-184	1	53	—	15	A	±0.0004	0.00006	0.00004	3.2	8.6
177-289	1.2	71	—	15	A	±0.0004	0.00006	0.00004	3.2	8.6
177-185	1.4	71	—	15	A	±0.0004	0.00006	0.00004	3.2	8.6
177-291	1.6	71	—	15	A	±0.0004	0.00006	0.00004	3.2	8.6
177-186	1.8	85	—	15	A	±0.0004	0.00006	0.00004	3.7	7.6
177-187	2	85	—	20	A	±0.0008	0.00006	0.00004	3.7	12.6
177-293	2.4	112	—	20	A	±0.0008	0.00006	0.00004	3.7	12.6
177-315	2.5	112	—	20	A	±0.0008	0.00006	0.00006	4.2	11.6
177-188	2.8	112	—	20	A	±0.0008	0.00006	0.00006	4.2	11.6
177-317	3	125	—	25	A	±0.0008	0.00006	0.00006	4.2	16.6
177-295	3.2	125	—	25	A	±0.0008	0.00006	0.00006	4.2	16.6
177-319	3.5	140	—	25	A	±0.0008	0.00006	0.00006	4.2	16.6
177-189	3.6	140	—	25	A	±0.0008	0.00006	0.00006	4.2	16.6
177-297	4	160	—	25	A	±0.0008	0.00006	0.00008	4.2	16.6
177-299	5	210	168	38.1	B	±0.0008	0.00010	0.00008	5.3	27.5
177-301	6	235	187	38.1	B	±0.0008	0.00010	0.00008	5.3	27.5
177-303	7	260	215	38.1	B	±0.0008	0.00010	0.00010	5.3	27.5
177-305	8	311	244	38.1	B	±0.0008	0.00010	0.00010	5.3	27.5
177-307	9	337	264	38.1	B	±0.0008	0.00010	0.00010	5.3	27.5
177-309	10	362	290	38.1	B	±0.0008	0.00010	0.00012	5.3	27.5
177-311	11	413	321	38.1	B	±0.0008	0.00010	0.00012	5.3	27.5
177-313	12	438	340	38.1	B	±0.0008	0.00010	0.00012	5.3	27.5

*1 Actual diameter is marked in 0.001 mm increments. (Dimension measuring position is the center of the height T.)
*2 Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity." Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each side and the center.

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SPECIFICATIONS

CERA Setting Rings

Metric

Code No.	Nominal size ød (mm)	Dimensions (mm)			Type	Accuracy				
		øD	øE	T		Tolerance between the nominal size and the actual diameter (µm)	Uncertainty of marked diameter value*1 (µm)	Roundness/ Cylindricity*2 (µm)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-418	4	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-420	6	25	—	7	A	±10	1.5	1.0	1.7	3.6
177-423	8	32	—	10	A	±10	1.5	1.0	2.0	6.0
177-424	10	32	—	10	A	±10	1.5	1.0	2.0	6.0
177-425	12	32	—	10	A	±10	1.5	1.0	2.0	6.0
177-427	16	45	—	10	A	±10	1.5	1.0	2.0	6.0
177-429	20	45	—	10	A	±10	1.5	1.0	2.0	6.0
177-430	25	53	—	15	A	±10	1.5	1.0	3.2	8.6
177-431	30	71	—	15	A	±10	1.5	1.0	3.2	8.6
177-432	35	71	—	15	A	±10	1.5	1.0	3.2	8.6
177-433	40	71	—	15	A	±10	1.5	1.0	3.2	8.6
177-434	45	85	—	15	A	±10	1.5	1.0	3.7	7.6

Inch

Code No.	Nominal size ød (in)	Dimensions (mm)			Type	Accuracy				
		øD	øE	T		Tolerance between the nominal size and the actual diameter (in)	Uncertainty of marked diameter value*1 (in)	Roundness/ Cylindricity*2 (in)	Distance from the side face H (mm)	Size of warranted calibration surface K (mm)
177-518	0.16	25	—	7	A	±0.0004	0.00006	0.00004	1.7	3.6
177-520	0.24	25	—	7	A	±0.0004	0.00006	0.00004	1.7	3.6
177-522	0.275	25	—	7	A	±0.0004	0.00006	0.00004	1.7	3.6
177-523	0.35	32	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-524	0.425	32	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-525	0.5	32	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-527	0.65	45	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-529	0.8	45	—	10	A	±0.0004	0.00006	0.00004	2.0	6.0
177-530	1	53	—	15	A	±0.0004	0.00006	0.00004	3.2	8.6
177-531	1.2	71	—	15	A	±0.0004	0.00006	0.00004	3.2	8.6
177-532	1.4	71	—	15	A	±0.0004	0.00006	0.00004	3.2	8.6
177-533	1.6	71	—	15	A	±0.0004	0.00006	0.00004	3.2	8.6
177-534	1.8	85	—	15	A	±0.0004	0.00006	0.00004	3.7	7.6

*1 Actual diameter is marked in 0.001 mm increments. (Dimension measuring position is the center of the height T.)
*2 Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity." Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each side and the center.

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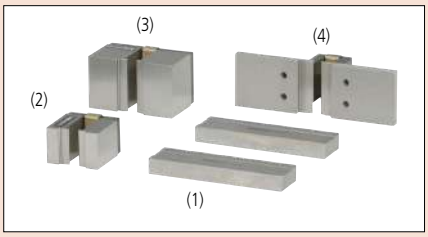
Bore Gage Checker SERIES 515

- The Bore Gage Checker allows easy setting of dial bore gages with ranges of 18 mm (0.7 in) through 400 mm (16 in) using gauge blocks.
- Can be used in both vertical and horizontal positions.

515-590

Measurement example

Standard Accessories



(1) Parallel jaw 2 pcs. **630030**
(2) Attachment A **940088**
(3) Attachment B **940089**
(4) Attachment C **940090**

SPECIFICATIONS

Code No.	Applicable range	Flatness of parallel jaw	Parallelism of parallel jaw
515-590	18 - 400 mm (0.7 - 16 in)	0.5 µm	1 µm

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09

Measurement Data Management

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

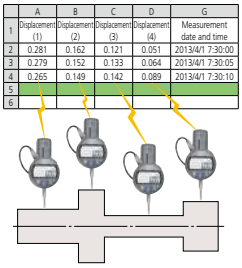
MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

Digimatic Gage/PC Data Input Device Input Tools

USB-ITN/IT-020U/IT-007R

Measurement Data Wireless Communication System

U-WAVE Series



	A	B	C	D	G
1	Displacement (1)	Displacement (2)	Displacement (3)	Displacement (4)	Measurement date and time
2	0.281	0.162	0.121	0.051	2013/4/1 7:30:00
3	0.279	0.152	0.133	0.064	2013/4/1 7:30:05
4	0.265	0.149	0.142	0.089	2013/4/1 7:30:10
5					
6					

Measurement Data Collection Software

USB-ITPAK V3.0/V2.1

Mini-Printer Equipped with Data Logging Function

DP-1VA LOGGER

Measurement Data Network System

MeasurLink®

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Measurement Data Wireless Communication System **U-WAVE-TMB**/**TCB** (**U-WAVE fit *Bluetooth*®**) ··· 09-13
Measurement Navigation Applications ····· 09-13

Software

Measurement Data Collection Software **USB-ITPAK V3.0**/**V2.1** ····· 09-15
Data Conversion Program into Inspection Certificates in Excel Format **MeasureReport** ····· 09-19

Data Logger/Multiplexer

Digimatic Mini-Processor **DP-1VA LOGGER** ····· 09-20
Multiplexer **MUX-10F** ····· 09-21

Gage connector dimensions ····· 09-22

SPC Software

Measurement Data Network System **MeasurLink®** ····· 09-25
Real-Time Standard/**Real-Time Professional**/**Real-Time Professional 3D** ····· 09-27
MeasurLink® Report Scheduler ····· 09-28
Process Analyzer Professional ····· 09-29
Process Manager ····· 09-29
Gage R&R ····· 09-30
Gage Management ····· 09-30

Example of Measurement Data Management System Design

A system for recording and analyzing measurement results from various Mitutoyo measuring instruments for quality assurance purposes.

Recording measurement results

No more transcribing

Equipped with the data logger function, it allows batch transfer of stored data to a PC with a USB cable.

DP-1VA LOGGER 09-20

Direct data input to a PC

Connection cable-integrated **USB-ITN**

USB Input Tool Direct 09-5

Lineup of two models with different output specifications
IT-020U/IT-007R

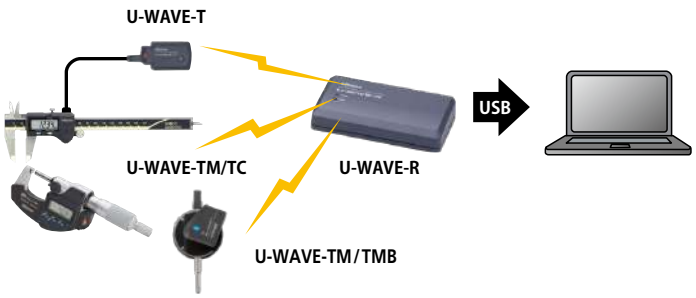
Input Tool SERIES 09-6

Connect to a RS-232C interface PC with 4 channels and a sequencer

Multiplexer MUX-10F 09-21

Wireless

..... 09-8

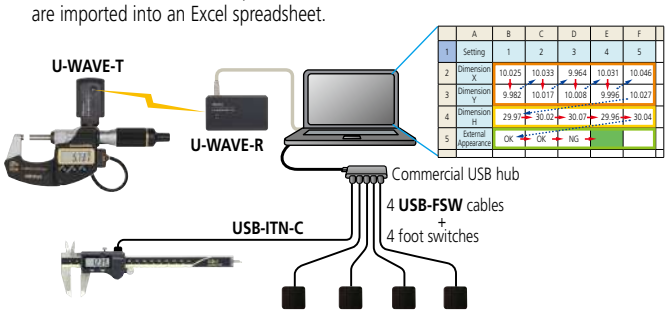


U-WAVE 09-9

Software dedicated to inspection and quality control

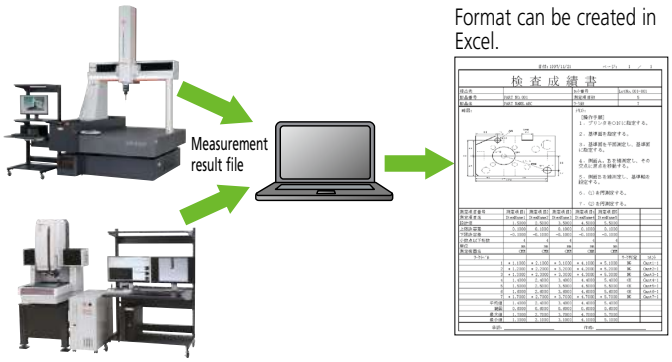
Inspection certificate creation

Measurement data from calipers and micrometers are imported into an Excel spreadsheet.



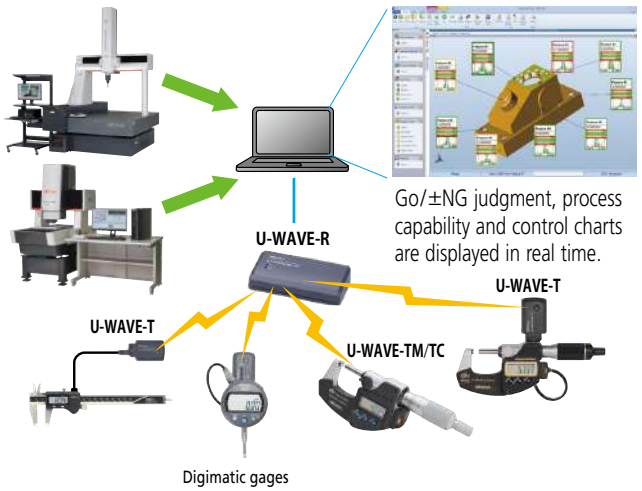
USB-ITPAK 09-15

Format can be created in Excel.



MeasureReport 09-19

Statistical Process Control



Go/±NG judgment, process capability and control charts are displayed in real time.

MeasurLink® 09-25

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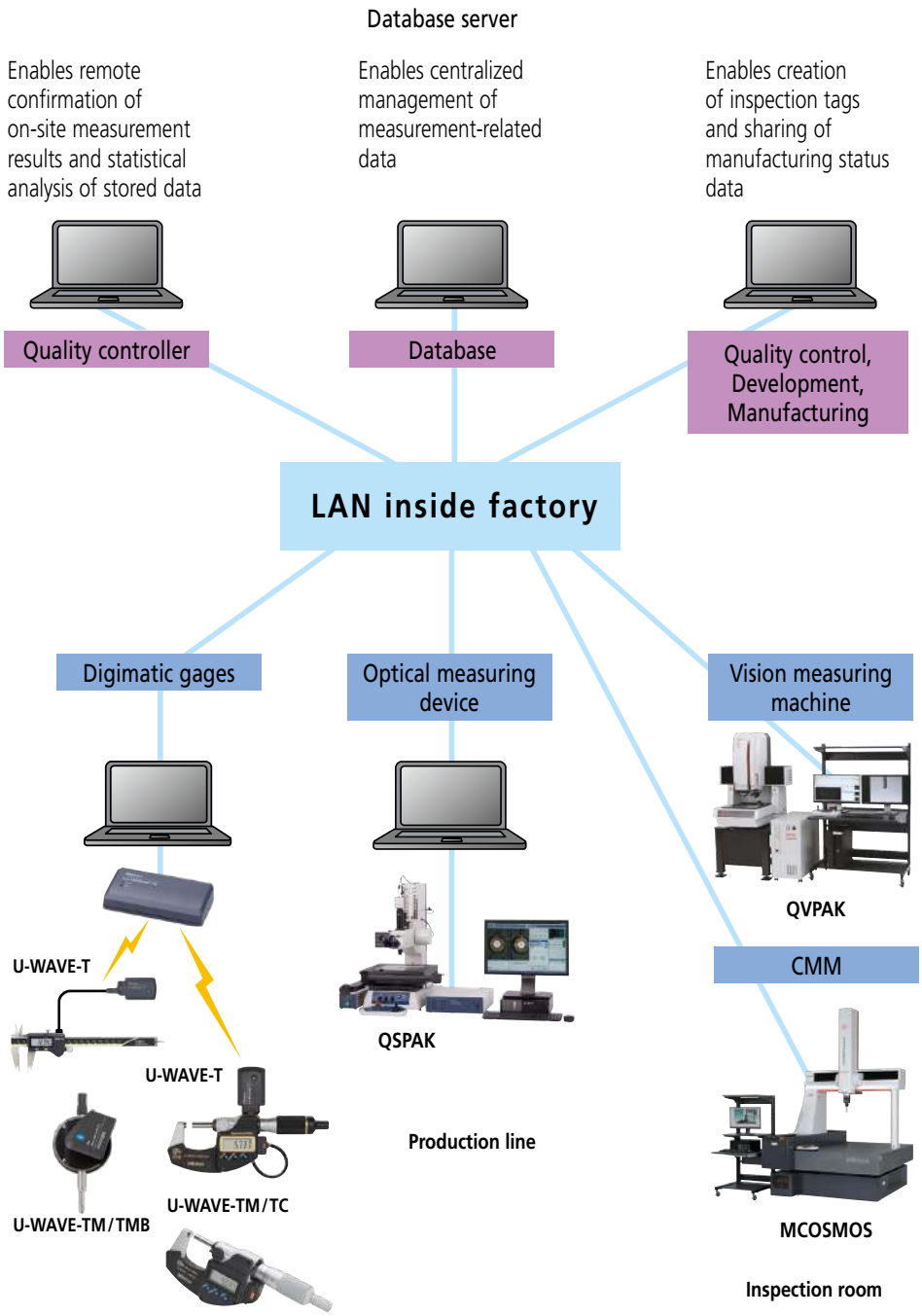
Network the quality control information of whole the factory

Unify and control the measurement results through the network



MeasurLink® 09-25

Other peripheral devices and software

Condition Monitor

Conduct preventive maintenance through CMM status monitoring

Status Monitor

Can remotely monitor measuring machines

Note: For details on the above, contact your local Mitutoyo sales office.

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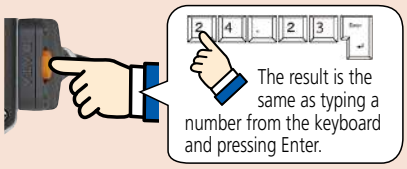
Digimatic Gage/PC Data Input Device
USB Input Tool Direct USB-ITN

- Converts measurement data to keyboard signals and directly inputs them to spreadsheet software such as Excel and Notepad.
- When using with optionial software (refer to page 09-15), you can easily create Microsoft Excel worksheets, enabling further improvement of work efficiency.

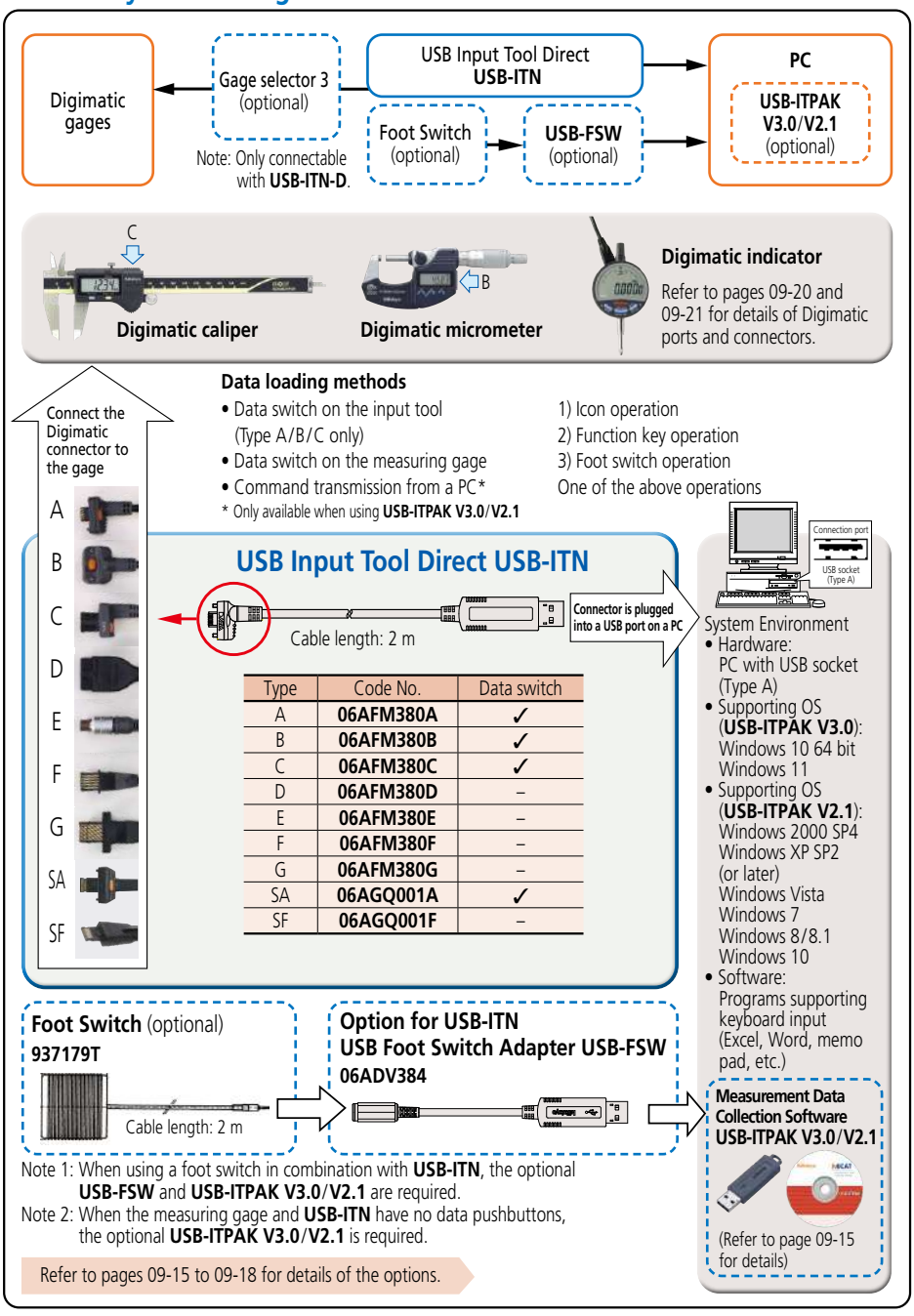
The input tool is automatically recognized as an HID* keyboard device (a standard Windows driver) just by connecting it to a USB port.

* HID (Human Interface Device)

Input data to the PC with the push of a button



USB-ITN System Configuration



Type	Code No.	Data switch
A	06AFM380A	✓
B	06AFM380B	✓
C	06AFM380C	✓
D	06AFM380D	–
E	06AFM380E	–
F	06AFM380F	–
G	06AFM380G	–
SA	06AGQ001A	✓
SF	06AGQ001F	–

Connection example

Main specification

- Output compatibility: USB2.0 or USB1.0
- Supporting driver software: Switchable between 2 items below
  1) When using standalone: HID keyboard device*
  2) When using with **USB-ITPAK V3.0/V2.1**: Virtual COM port (VCP)
- Communication speed: 12 Mbps (Full Speed)
- Power source: USB bus power
- Mass: 59 g
- USB2.0 certificate
- Conforms to EU EMC Directive

* Since this device is compatible with Windows standard driver software, dedicated driver software is not required.

Note: Information regarding **USB-ITPAK V3.0** can be downloaded from our website.

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Measurement Data Input Tool
Input Tool SERIES IT-020U/IT-007R

Main Specifications of IT-020U

Output specification: USB2.0 or USB1.0
Supported driver software: Changeable between two types
1) Stand-alone: HID keyboard device*
2) Using **USB-ITPAK V3.0/V2.1**: Virtual COM port (VCP)
Communication speed: 12 Mbps (Full Speed)
Power source: USB bus power
USB2.0 certificate
Conforms to EMC Directive
* This product is compatible with the standard driver software for Windows. No dedicated driver software is required.

The input tool is automatically recognized as an HID* keyboard device (a standard Windows driver) just by connecting it to a USB port.

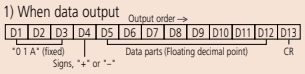
* HID (Human Interface Device)

Specifications of IT-007R RS-232C Communication

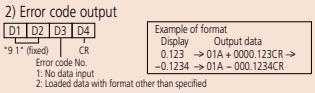
• Output specification: RS-232C compliant
Communication method: Full duplex
Communication speed: 2400 bps (fixed)
Bit configuration: Start bit 1
Data length 8
(Most significant bit, 0 (fixed))
Parity, None
Stop bit 1
Flow control: None
Home position: DCE (modem definition)

• Data format

1) When data output

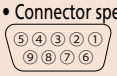


2) Error code output



• Data request signal
Data can be output by transmitting a character from the PC.

• Connector specification and power supply from the PC



This product operates while accumulating the power supplied from the PC. A second or more input interval is required.

Pin No.	Symbol	in/out	Description of functions
1	(N.C.)	—	No connection
2	RXD	OUT	Data output from this product to the PC
3	TXD	IN	Data input from the PC to this product
4	DTR	IN	+12 V power supply from the PC*
5	GND	—	Ground
6	DSR	OUT	Not used
7	RTS	IN	+12 V power supply from the PC*
8	CTS	OUT	Not used
9	(N.C.)	—	No connection

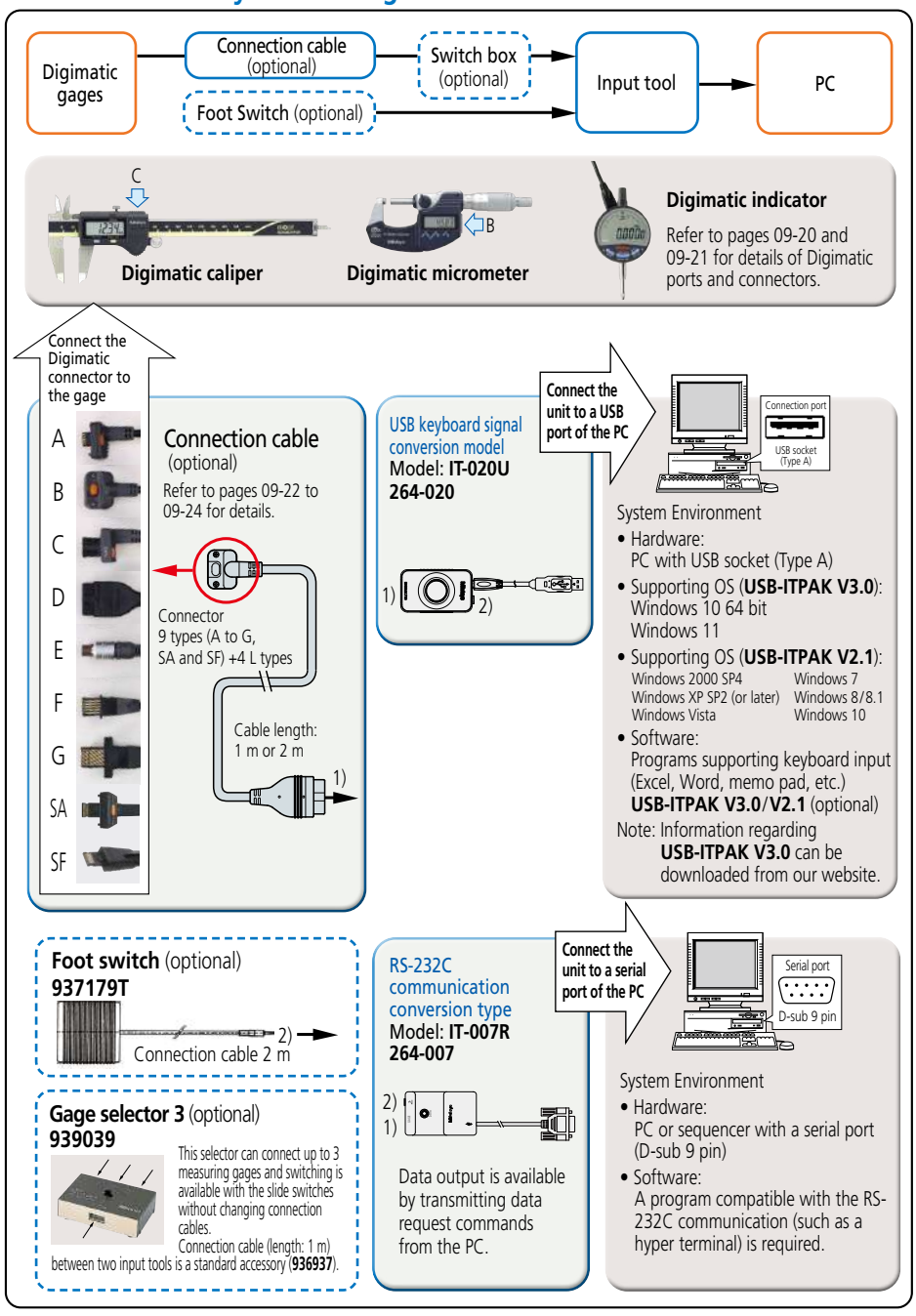
* When connecting to a sequencer, a power supply is required.
Input voltage: Supplied in the range 6 V to 16 V
Power supply terminal: Supplied to pins 4 and 7
Note: "4" and "6", "7" and "8" are connected with each other inside this product.

- **IT-020U** is an easy-to-use, expandable input tool with a large data switch and a foot switch connector. **IT-007R** is an RS-232C communication-type input tool that can be controlled by data request commands from a PC.
- It can be connected to various types of measuring instruments using optional connection cables.
- When using with optionial software (refer to page 09-15), you can easily create Microsoft Excel worksheets, enabling further improvement of work efficiency.

IT-020U

IT-007R

IT-020U/IT-007R System Configuration



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Mitutoyo

Measurement Data Management

What is the U-WAVE Series?

- The **U-WAVE** Measurement Data Wireless Communication System quickly collects accurate measurement data from the on-site inspection process to help perform detailed analysis.
- Measurement results can be sent wirelessly and saved on a PC, smartphone or tablet. This is a smart system not requiring handwriting or manual input from a keyboard.

Acquire measurement data from various Digimatic gages equipped with U-WAVE. ⇢ **Instantly transfer data wirelessly to your PC, smartphone or tablet.**

You can choose from a variety of products and applications.

Stable communication is possible up to a maximum communication distance of 16-20 m*.
Efficiency is greatly improved by being able to work without worrying about cable length or snags, etc.

- Freedom of movement
- Human error during manual input is eliminated
- Flexible layout of measurement site
- Stable wireless communication

Digimatic gage + Transmitter

Receiver

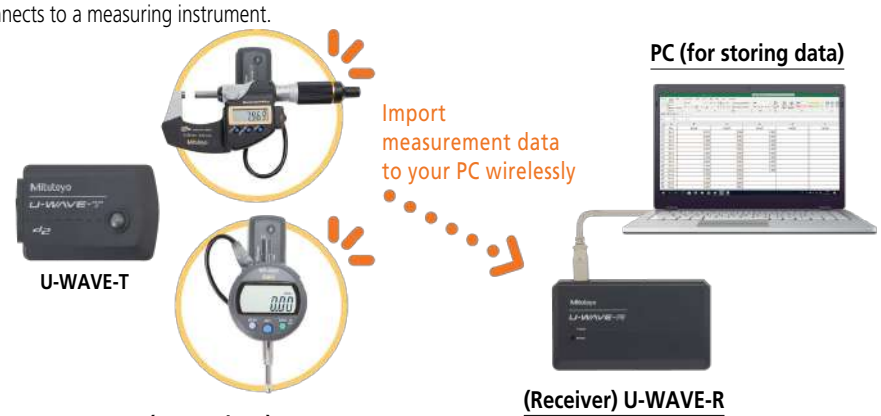
Note: Receiver not necessary when using with **Mitutoyo *Bluetooth*® U-WAVE fit**

*May be affected by the electromagnetic environment.

The following three types are currently available.

U-WAVE

The system consists of a "**U-WAVE-R**" receiver that connects to a PC and a "**U-WAVE-T**" transmitter that connects to a measuring instrument.



PC (for storing data)

U-WAVE-T

(Transmitter) U-WAVE-T + Digimatic gage

(Receiver) U-WAVE-R

Product catalog
E12051

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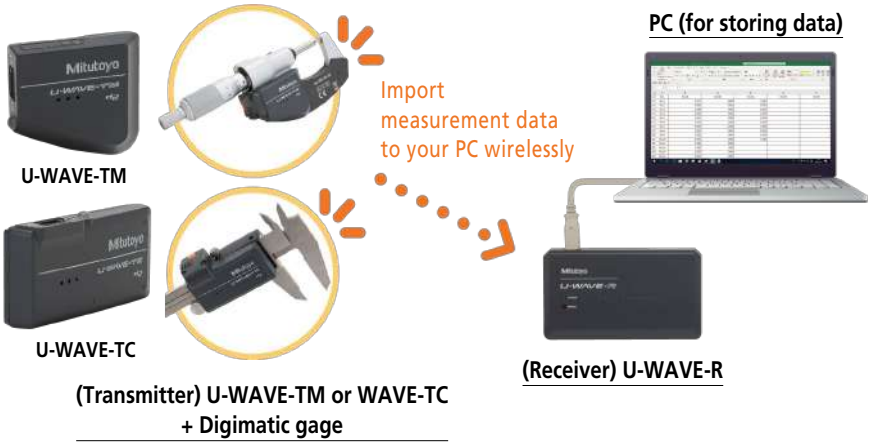
U-WAVE fit

While inheriting the functions and performance of **U-WAVE**, these models have been made smaller and thinner, and have improved operability, being designed specifically for use with small digimatic gages.



U-WAVE fit *Bluetooth*®

This is a ***Bluetooth***® version of **U-WAVE fit**. It can connect to a ***Bluetooth***®-enabled device such as a PC, smartphone, or tablet without going through a **U-WAVE-R** or similar dedicated receiver.

Note: Connectivity of the dedicated Mitutoyo **U-WAVE fit *Bluetooth***® application and **U-WAVE-TMB/TCB** to every single Bluetooth® device is not guaranteed.

Function comparison table

	U-WAVE	U-WAVE fit*1	U-WAVE fit *Bluetooth*®*1
Transmission method	Original <based on IEEE802.15.4 (2.4 GHz)>		Bluetooth®
Communication distance	Approx. 20 m (line of sight)		Approx. 16 m (line of sight)
Connectible model	Digimatic gages	Digimatic small measuring instruments*3	
Dedicated application/ software	**U-WAVEPAK** (included with **U-WAVE** receiver) **USB-ITPAK***2		**U-WAVEPAK-BW** **U-WAVEPAK-BM** **U-WAVE Navi** **USB-ITPAK***2

*1 Please check the list of compatible models since the unit may not be attachable to some models.
*2 The device may not be recognised when using older versions of Windows OS.
*3 A Digimatic indicator (**ID-CNX**) can also be connected using a connecting unit.

Product catalog
E12051

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Measurement Data Wireless Communication System

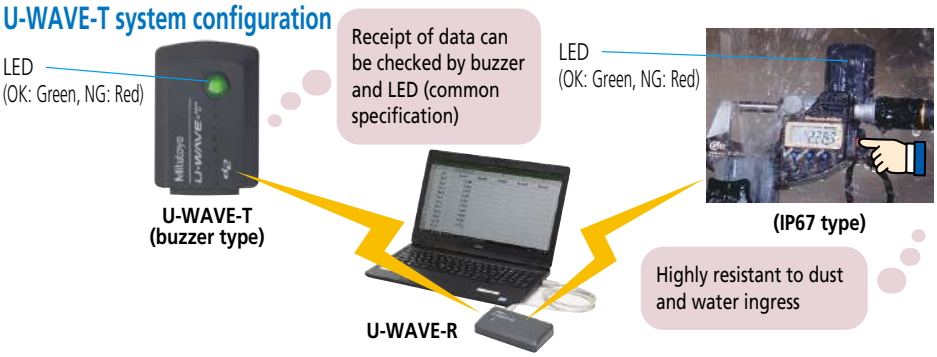
U-WAVE-T

- The system using our proprietary communication method features stable communication and low power consumption, resulting in improved work efficiency.
- It can be connected to various types of tools using optional special connection cables.

Model	U-WAVE-T (IP67 type)	U-WAVE-T (buzzer type)
Code No.*	**02AZD730G/02AZD730H/02AZD730J**	**02AZD880G/02AZD880H/02AZD880J**
Protection Rating	IP67	None
Data reception indication	LEDs	buzzer and LEDs
Power source	Lithium battery CR2032×1	
Battery life	Approx. 400,000 transmissions	
Dimensions (mm)	44×29.6×18.5	
Mass (g)	23	

* To use this product, conformity to the applicable radio law in each country is required. Code number differs depending on the destination country. Please contact your nearest Mitutoyo sales office.

U-WAVE-T system configuration



U-WAVE-T dedicated connection cable

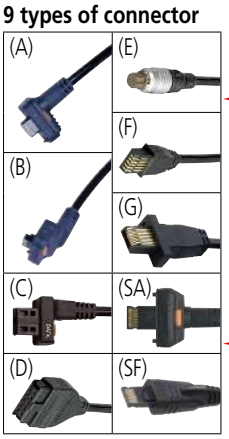
A dedicated cable connects a Digimatic gage to **U-WAVE-T**. Check the connector (A to G, SA and SF; refer to pages 09-23 and 09-24 for details) compatible with the Digimatic gage to be used and select either standard type (figure 1) or foot switch type (figure 2) according to your application.

Type	Standard connection cable Code No.	Connection cable for foot switch Code No.
(A) Water-proof model with output button	**02AZD790A**	**02AZE140A**
(B) Water-proof model with output button	**02AZD790B**	**02AZE140B**
(C) With data-out button	**02AZD790C**	**02AZE140C**
(D) 10-pin plain type	**02AZD790D**	**02AZE140D**
(E) 6-pin round type	**02AZD790E**	**02AZE140E**
(F) Plain type straight	**02AZD790F**	**02AZE140F**
(G) Plain type straight water-proof model	**02AZD790G**	**02AZE140G**
(SA) Water-proof straight model with data output button	**02AZF960**	**02AZF960**
(SF) Straight standard type	**02AZG011**	**02AZG021**

Standard accessory
Clip for cable fixing

Application example of the clip

9 types of connector



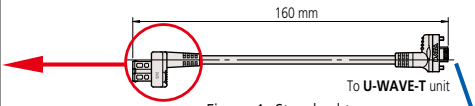


Figure 1. Standard type connection cable

Foot switch (optional)
937179T

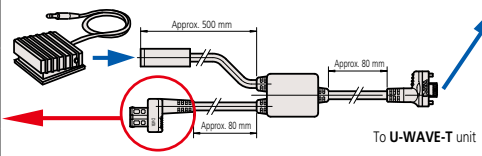
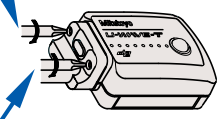


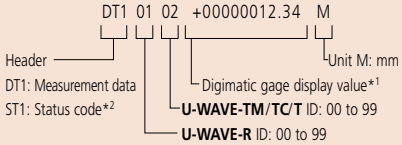
Figure 2. Connection cable for foot switch



Connector attached to **U-WAVE-T** by 2 screws

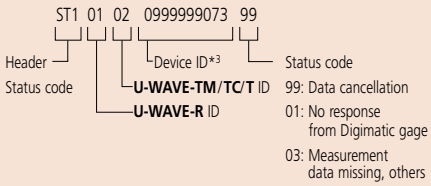
- Data format

Example of format when the Digimatic gage displays 12.34



*1 Data interface function is switchable to "Measurement value only" e.g.) 12.34

*2 Example of status code format



*3 Unique number assigned to **U-WAVE** at shipment

Notes on Identification of Measurement Data and Multiple Systems Operation

Following the above format, the **U-WAVE** data format starts with a 4-digit code where the first two digits represent receiver channels and the last two are transmitter channels. The large number of transmitter/receiver combinations possible with this scheme ensures that the receivers in a factory measurement system only accept data from the intended transmitters, even when several receivers are all within communication range of different transmitters using the same channel. Different frequency bands (up to 15 available) may also be used to further ensure that there are no communication problems between adjacent **U-WAVE-R** units.

U-WAVE-T (U-WAVE fit) System Communication Specifications

- Wireless communication

Wireless specifications	Original <based on IEEE802.15.4 (2.4 GHz)>
Wireless communication distance	Approx. 20 m (line of sight)
Wireless communication speed	250 kbps
Transmission output	0 mW (1 dBm) or less
Modulation method	DS-SS (Direct Sequence - Spread Spectrum) Resistant to interfering signals and noise
Communication frequency	2.405 to 2.475 GHz
Used band	15 channels (2.405 to 2.475 GHz at intervals of 5 MHz) The noise search function avoids interference with other communication devices.

Note: Please purchase **U-WAVE-T** in the country where you intend to use it.

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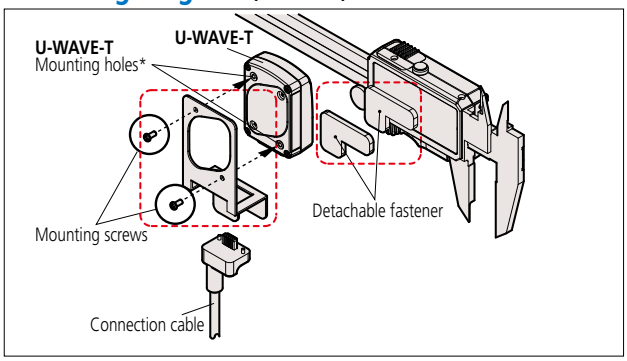
Optional Accessories for U-WAVE

U-WAVE-T mounting bracket

Supports the **U-WAVE-T** on a Digimatic gage by detachable fastener. Batteries can be replaced without needing to detach the **U-WAVE-T** from the gage.

U-WAVE-T mounting bracket
02AZE200
Standard accessories
• Detachable fasteners: 1 set
• Mounting screw: 2 pcs.

Mounting diagram (02AZE200)

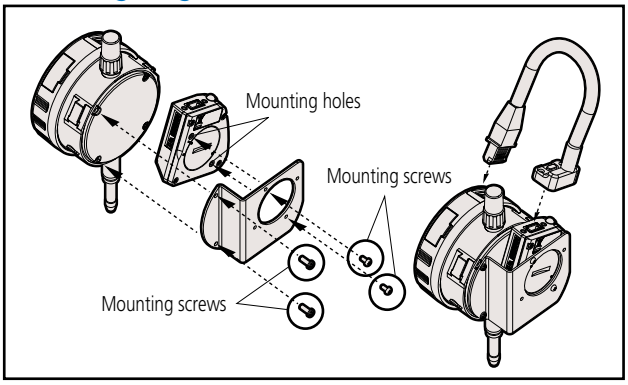


Note: In order to avoid loss of adhesion, do not allow oil or coolant to come into contact with the bonding surfaces of the detachable fasteners.

U-WAVE-TM/TMB mounting bracket for Digimatic indicator

U-WAVE-TM/TMB
mounting bracket for **Digimatic indicator**
02AZF670/02AZF675
Standard accessories
• Mounting screw: 4 pcs.

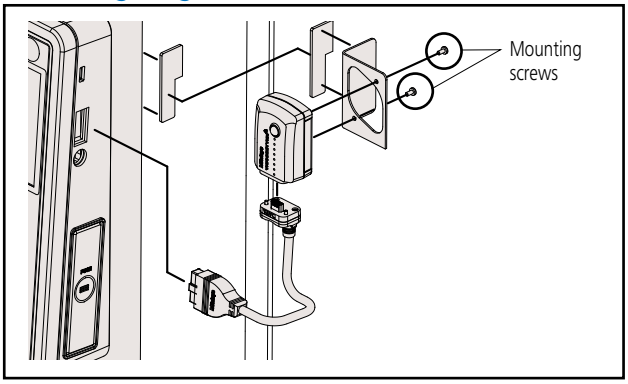
Mounting diagram (02AZF670)



U-WAVE-T mounting bracket for QM-Height

U-WAVE-T mounting bracket for **QM-Height**
02AZE990
Standard accessories
• Detachable fastener: 2 pcs. (mirror-imaged)
• Mounting screw: 2 pcs.

Mounting diagram (02AZE990)



* The two **U-WAVE-T** mounting holes are on a relatively fragile plastic part. Be careful not to apply too much force when tightening.

Product catalog
E12051

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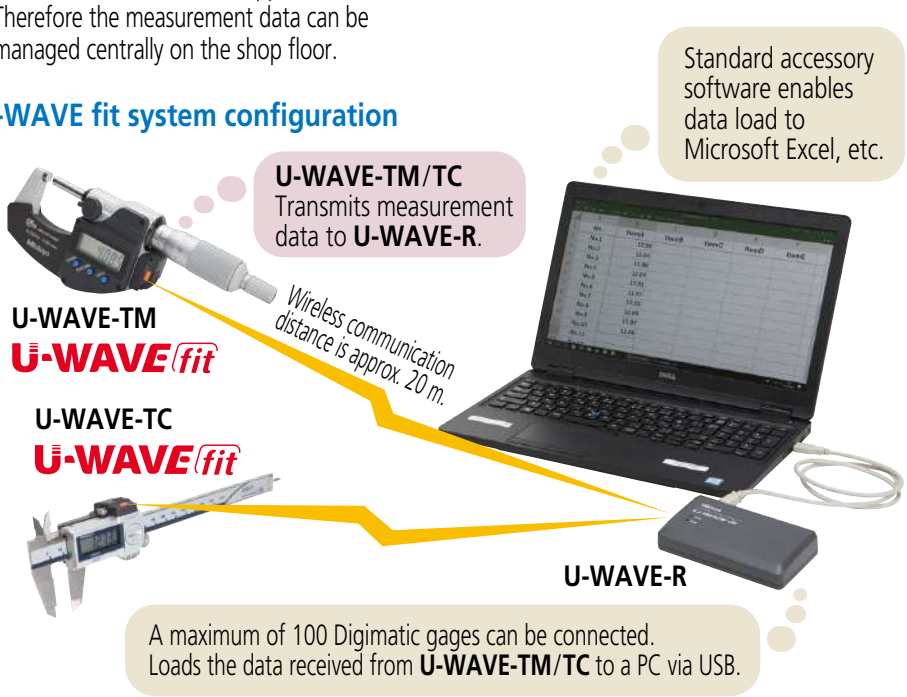
Measurement Data Wireless Communication System U-WAVE-TM/TC (U-WAVE fit)

- While inheriting the functions and performance of **U-WAVE**, these models have been made smaller and thinner, and have improved operability, being designed specifically for use with small Digimatic gages.
- The system using our proprietary transmission method features stable communication and low power consumption, resulting in improved work efficiency.
- Up to 100 Digimatic gages can be registered to a single **U-WAVE-R**, and wireless communication distance is approx. 20 m. Therefore the measurement data can be managed centrally on the shop floor.
- The wireless system without cabling can keep the workplace tidy and increase workability during measurement.
- Installing the optional **USB-ITPAK V3.0/V2.1** software enables the use of Excel to improve measurement efficiency. It makes it possible to populate the data from multiple measuring instruments into separate spreadsheets or input the data collectively at the same time.

U-WAVE fit system configuration



U-WAVE-R

Model	U-WAVE-R
Code No.*	02AZD810D/02AZD810E/02AZD810F
Power source	USB bus power system
Number of **U-WAVE-R** units that can be connected to one PC	Up to 15
Number of **U-WAVE-T** units that can be connected	Up to 100
External dimensions (mm)	140×80×31.6
Mass (g)	130

* Code number differs depending on the destination country.

U-WAVE-R main unit

USB2.0 cable (1 m) attached

U-WAVEPAK

U-WAVEPAK software (standard accessory)

System Environment: Compatible OS
Windows 2000 Professional (SP4 or later)
Windows XP Home Edition (SP2 or later)
Windows XP Professional (SP2 or later)*
Windows Vista*, Windows 7*, Windows 8/8.1*
Windows 10*
Windows 11 Version 1022B or later
* 32-bit, 64-bit OS supported
<Versions confirmed operational on Windows 10>
- **U-WAVEPAK Version1.020** or later

Connectability confirmed for tablet PC
- Microsoft Surface Pro 6 (the version whose operation on Windows 10 Professional is confirmed)
- Required environment: DVD drive (required for installation), USB port ×2 ports or more

Note: Cannot be connected to a device other than a PC (such as **DP-1VA LOGGER**, sequencer etc.).

U-WAVEPAK software can be downloaded here.

U-WAVE-TM/TC (U-WAVE fit) System Communication Specifications

- Wireless communication

Wireless specifications	Original <based on IEEE802.15.4 (2.4 GHz)>
Wireless communication distance	Approx. 20 m (line of sight)
Wireless communication speed	250 kbps
Transmission output	2.5 mW (4 dBm) or less
Modulation method	DS-SS (Direct Sequence - Spread Spectrum) Resistant to interfering signals and noise
Communication frequency	2.405-GHz band (ISM band: Universal frequency)
Used band	15 channels (2.405 to 2.475 GHz at intervals of 5 MHz) The noise search function avoids interference with other communication devices.

Note: Please purchase **U-WAVE-TM/TC/R** in the country where you intend to use it.

Main specifications of U-WAVEPAK

- Setup of dedicated driver software (USB and virtual COM port)
- Initial setting of ID number and frequency selection (required only once for the first time)
- Load data to Microsoft Excel or Notepad through the data interface function

Product catalog E12051

Video

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Typical applications

U-WAVE-TM (264-622)

U-WAVE-TC (264-621)

Transmitter / connecting unit

264-622

02AZF310

264-621

02AZF300

SPECIFICATIONS

IP67 type is resistant to water and dust ingress. Buzzer type notifies data reception by buzzer sound and LED.

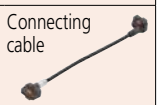
Connectable measuring instruments	Micrometer		Caliper	
Code No.	**264-622**	**264-623**	**264-620**	**264-621**
Model	**U-WAVE-TM** (IP67 type)	**U-WAVE-TM** (buzzer type)	**U-WAVE-TC** (IP67 type)	**U-WAVE-TC** (buzzer type)
Protection Rating	IP67	N/A	IP67	N/A
Data reception indication	LEDs	buzzer and LEDs	LEDs	buzzer and LEDs
Power source	Lithium battery CR2032×1			
Battery life	Approx. 400,000 times continuous data transmission			
External dimensions (mm)	41.9×12.9×38.8		56×11.45×30.4	
Mass (g)	18			

Fixed to transmission unit and inserted into output connector of Digimatic gage.

Code No.	**02AZF310**	**02AZF300**	**02AZF960**	**02AZF700**
Protection level	IP67	N/A	IP67	N/A
Mass (g)	6			10
Connectable transmitter	**U-WAVE-TM/TC** (IP67 type)	**U-WAVE-TC** (for standard type)	**U-WAVE-TM** (for **QuantuMike***)	**ID-CNX/ID-FNX** (12.7mm type only)

Note 1: **02AZF310** ensures water-proof performance only when attached to measuring instruments of IP67 type.
For information on supported connecting units, please contact your local Mitutoyo sales office.
Note 2: Water-proof performance is ensured only when attached to measuring instruments of IP67 type.
* **02AZF960** is applicable to new models (**293-14X-40**/**293-18X-40**). Refer to 02-5.

Compatibility of measuring tool and unit

Digimatic gage		Connecting unit/connecting cable		Transmitter		Receiver
Digimatic Micrometers		Standard type	**02AZF310**		Buzzer type **U-WAVE-TM 264-623**	**U-WAVE-R 02AZD810D**
		QuantuMike* (Refer to 02-5)	**02AZF960**		IP67 type **U-WAVE-TM 264-622**	
Digimatic Calipers		Standard type	**02AZF300**		Buzzer type **U-WAVE-TC 264-621**	
		Coolant-proof type	**02AZF310**		IP67 type **U-WAVE-TC 264-620**	
Digimatic Indicators and Others		**ID-CNX/ ID-FNX** Series (12.7 mm type only)	**02AZF700**		Buzzer type **U-WAVE-TM 264-623**	Design registered in Japan
					IP67 type **U-WAVE-TM 264-622**	
		Other	Connecting cable  Bracket		Buzzer type **U-WAVE-T 02AZD880G**	
					IP67 type **U-WAVE-T 02AZD730G**	

* To use this product, conformity to the applicable radio law in each country is required. Code number differs depending on the destination country. Please contact your nearest Mitutoyo sales office.
* **02AZF960** is applicable to new models (**293-14X-40**/**293-18X-40**). Refer to 02-5.

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Measurement Data Wireless Communication System U-WAVE-TMB/TCB (U-WAVE fit *Bluetooth*®)

- Bluetooth® communication allows for wireless transmission of measurement data from Digimatic micrometers and calipers to PCs, smartphones, tablets and other such terminals.
- Bluetooth® communication does not require a conventional receiver unit (**U-WAVE-R**) which improves operability and reduces costs. Use in outdoor locations where PCs cannot be used can now be easily realized.
- **U-WAVEPAK-BM** (free), the measurement support application software for smartphones is available for download from app stores (Google Play, Apple Store).
- **U-WAVEPAK-BW** (free), the communication software for transferring measurement data to optional computer software (**USB-ITPAK, MeasurLink®**) is available for download from our company's website.
https://www.mitutoyo.co.jp/eng/contact/products/u-wave/

U- WAVEPAK-BM

Get from Google Play

Download from App Store

U-WAVE fit *Bluetooth*® system configuration

No receiver is required, and one PC can connect up to seven units of **U-WAVE fit *Bluetooth*®**.

For Digimatic micrometers
U-WAVE-TMB

For Digimatic calipers
U-WAVE-TCB

Example of attaching the Digimatic indicator

Measurement Navigation Applications

Application	Mitutoyo U-WAVE Navi	U-WAVEPAK-BM	U-WAVEPAK-BW
Purpose	Using the application, create a measurement procedure, display and navigate the measurement, and manage the measurement results	Measure a workpiece to perform a simple trend management	Up to seven units of **U-WAVE-TCB/TMB** can be set up. Measuring results can be transferred to Excel spread sheet.
Possible actions (Functions)	• Create/perform a measurement procedure (including GO/NG judgement) • Navigate a measurement procedure • Manage/transfer a measurement procedure • Display a list of measurement results • Transfer a measurement result	• Go/±NG judgment • Data logging • Graphical display of measurement result • Display the histogram of measurement results • Transfer a measurement result (log data)	Identification of data origin Upper application (connection with **USB-ITPAK**, **MeasurLink**)
Display language	Japanese/English (Depends on the OS settings)	16 languages including English*	Japanese/English (Depends on the OS settings)
Compatible OS	Android 7.0 or later (iOS not supported) **Available from Google Play for free download.** Get from Google Play U-WAVE Navi	Android 7.0 or later/iOS 10.0 or later **U-WAVEPAK-BM (English version only) can be downloaded for free from each app store.** Get from Google Play / Download from App Store U-WAVEPAK-BM	Windows10 Pro 64bit **DL from the following URL** **https://www2.mitutoyo.co.jp/eng/contact/products/u-wave/index2.html**

* Japanese, English, German, French, Italian, Polish, Portuguese, Hungarian, Korean, Chinese (traditional/simplified), Vietnamese, Thai, Malay, Indonesian, Spanish

Note1: Google Play and the Google Play logo are trademarks of Google LLC. Apple and the Apple logo are trademarks of Apple Inc.
Note2: We cannot guarantee the operation of this application and **U-WAVE TMB/TCB** with all Bluetooth® equipped devices.

U-WAVE-TMB/TCB (U-WAVE fit *Bluetooth*®) System Communication Specifications

• Wireless Communication Specifications

Wireless communication	Bluetooth® 4.2 Low Energy
Wireless communication distance	Approx. 16 m (line of sight) Approx. 10 m (in a factory environment)
Transmission output	2.5 mW (5 dBm) or less (Class2)
Modulation method	FH-SS (Frequency-hopping spread spectrum)
Communication frequency	2.4 GHz band

Note 1: Please purchase **U-WAVE-TMB/TCB** in the country where you intend to use it.
Note 2: **U-WAVE-TMB/TCB** is not compatible with **U-WAVE fit**, for which communication specifications are different.
Note 3: Connectivity of **U-WAVE-TMB/TCB** to every single Bluetooth® device is not guaranteed.

USB-ITPAK V3.0

Download software

USB dongle

Allows for use of all functions of the software when connected to a PC

USB-ITPAK V2.1

USB dongle

Allows for use of the software when connected to a PC

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Typical applications

U-WAVE-TMB (264-626)

U-WAVE-TCB (264-625)

Transmitter / connecting unit

264-626

02AZF310

264-625

02AZF300

SPECIFICATIONS

	For Digimatic micrometers		For Digimatic calipers	
Code No.	**264-626**	**264-627**	**264-624**	**264-625**
Model	**U-WAVE-TMB** (IP67 type)	**U-WAVE-TMB** (buzzer type)	**U-WAVE-TCB** (IP67 type)	**U-WAVE-TCB** (buzzer type)
Protection level	IP67	N/A	IP67	N/A
Data reception indication	LED	LED, buzzer	LED	LED, buzzer
Power source	Lithium battery CR2032×1			
Battery life	Windows OS: Approx. 3 months, iOS/Android: Approx. 1 year			
Mass (g)	18			

Choose a connecting unit compatible with your gage.

Code No.	**02AZF310**	**02AZF300**	**02AZF960**	**02AZF700**
Protection level	IP67	N/A	IP67	N/A
Mass (g)	6			10
Connectable transmitter	**U-WAVE-TMB/TCB** (IP67 type)	**U-WAVE-TCB** (for standard type)	**U-WAVE-TM** (for **QuantuMike***)	**ID-CNX/ID-FNX** (12.7mm type only)

Note: Water-proof performance is ensured only when attached to measuring instruments of IP67 type.
* **02AZF960** is applicable to new models (**293-14X-40**/**293-18X-40**). Refer to 02-5.

Compatibility of measuring tool and unit

Digimatic gage		Connecting unit/connecting cable		Transmitter	
Digimatic Micrometers		Standard type	02AZF310		Buzzer type **U-WAVE-TMB 264-627**
		QuantuMike* (Refer to 02-5)	02AZF960	IP67	IP67 type **U-WAVE-TMB 264-626**
Digimatic Calipers		Standard type	02AZF300		Buzzer type **U-WAVE-TCB 264-625**
		Coolant-proof type	02AZF310	IP67	IP67 type **U-WAVE-TCB 264-624**
Digimatic Indicators		**ID-CNX/ID-FNX** Series (12.7 mm type only)	02AZF700		Buzzer type **U-WAVE-TMB 264-627**
				IP67	IP67 type **U-WAVE-TMB 264-626**

* **02AZF960** is applicable to new models (**293-14X-40**/**293-18X-40**). Refer to 02-5.

Product catalog E12051

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Mitutoyo

Measurement Data Collection Software USB-ITPAK V3.0/V2.1

(**IT-016U**/**IT-020U**/**USB-ITN**/**U-WAVE**/**DP-1VA LOGGER** can be used to send the data to a Microsoft® Excel® worksheet.)

- **USB-ITPAK V3.0**/**V2.1** creates a procedure to input data from gages equipped with Digimatic output to Excel spreadsheets via **IT-016U**, **IT-020U**, **USB-ITN** or **U-WAVE**. This optional software facilitates the daily inspection work for mass-produced products.

V2.1	V3.0	Function
✓	✓	Sequential measurement: Inserts measurement data into the inspection certificate (Excel)
✓	✓	Simultaneous measurement: Simultaneously collects measurement data from multiple measuring instruments mounted on a jig
✓	✓	Individual measurement: Collects measurement data of separately conducted inspections into a single PC
—	✓	Simple measurement function: Automatically sorts measurement data and inserts the data into different columns in Excel
—	✓[1]	Setting of measuring instrument: Sets the calibration year and month, preset values, zero-setting, etc. for a measuring instrument
—	✓[1]	Measurement history: Records operators and measuring tools used in measurement data

Symbol: ✓[1]: Can be used only when connected with **USB-ITPAK V3.0**, **ID-CNX**/**ID-FNX** and **USB-ITN-SF**/**IT-020U**. ✓: Can be used —: Cannot be used

Note 1: **V3.0** can be downloaded from our website.
Note 2: For **V3.0**, features common with **V2.1** can be used by purchasing **V3.0** (**06AGR543**) and connecting a USB dongle to your PC.

Main features of USB-ITPAK V3.0/V2.1

- **Setting of Microsoft Excel input:**
  Designation of where to input (workbook, worksheet, cell range), cursor move (right, down), and others.
- **Selection of measuring method (3 modes available)**
  1) Sequential measurement 2) Simultaneous measurement 3) Individual measurement (refer to page 09-17 for details).
- **Control item and instruction at data input**

Control item	Mouse operation	Function key	Foot switch + USB-FSW	Data switch when using **U-WAVE**	Data switch other than **U-WAVE**
Data output request	✓*1	✓*1	✓	✓*2	✓
Data cancel	✓*1	✓*1	✓	✓ Press and hold*2	
Data skip	✓*1	✓*1	✓		
Character input (example: OK or NG etc.)			✓ Pre-registered character strings		

*1 Not available during individual measurement.
*2 Not available during simultaneous measurement in the event driven mode.

- **Number of connectable gages**

Available devices	Maximum number of connection (total of (1), (2), and (3))	Others
1) **IT-020U**/**USB-ITN**	For Windows 2000/XP Up to 100 units*3 For Windows Vista/7/8/8.1/10/11 Up to 20 units*3 (For **U-WAVE-R**, plus 100 per unit in terms of available gages.)	• Maximum registration (total of (1), (2), and (3)) 400 units
2) **USB-FSW**		• Control/identification of connecting gage VCP (Virtual COM port) Switch from HID to VCP for (1) and (2). The VCP driver software is supplied with **USB-ITPAK**.
3) **U-WAVE-R** (Up to 100 gages connectable to each **U-WAVE-R**. **U-WAVE-T** ID: 00 to 99)		

- **Data loading time**: when using **IT-020U**/**USB-ITN**, 0.2 s to 0.3 s per gage unit
  U-WAVE event driven mode: 0.5 s data refresh interval
- **Timer input function** (only in simultaneous measurement)
  Input interval (time): 0.1 s*4 to 24 hours at maximum
- **Measurement date/time display function** (available in sequential and simultaneous measurements)
  The display format is subject to the setting of the Excel sheet.

*3 The actual number can be less depending on the system configuration.
*4 If a shorter time is set, a priority is given to the longer time compared with the actual communication time.

Optional Accessories for USB-ITPAK

USB Foot Switch Adapter USB-FSW

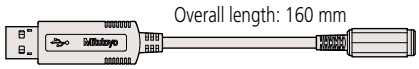
This USB adapter for connecting a PC is required when using the Foot Switch (**937179T**) in **USB-ITN**.
A dedicated VCP driver for this adapter is included in **USB-ITPAK**.

Main specification

- With **USB-ITPAK**, application of the foot switch can be set.
- Data control: "Data request", "Data cancel", "Data skip"
- Character string input (e.g. GO/NG, etc.)

Note: **USB-FSW** is used for installation of the VCP driver.

Foot Switch Adapter USB-FSW



Optional Accessories

Model	USB-ITPAK V3.0	USB-ITPAK V2.1
Code No.	**06AGR543** (USB dongle only)	**06AFM386** (Software+USB dongle)
Compatible OS (Windows)	Windows 10 64 bit only Windows 11	Windows 2000 SP4 to Windows 10
Compatible Excel version	Excel 2010, 2013, 2016, 2021, Microsoft 365	Excel 2002, 2003, 2007, 2010, 2013, 2016, Microsoft 365

Upgrading from **V1.0**/**V2.0** is not supported.

USB-ITPAK V3.0

Download software

USB dongle

Allows for use of all functions of the software when connected to a PC

USB-ITPAK V2.1

USB dongle

Allows for use of the software when connected to a PC

Operating environment

Compatible OS*1	**USB-ITPAK V3.0**: Windows 10 (64 bit only) Windows 11
	USB-ITPAK V2.1: Windows 2000 SP4 Windows XP SP2 or later Windows Vista Windows 7 Windows 8 Windows 8.1 Windows 10
Supported Excel versions*2	**USB-ITPAK V3.0**: 2010, 2013, 2016, 2021 Microsoft 365
	USB-ITPAK V2.1: 2002, 2003, 2007, 2010, 2013, 2016 Microsoft 365
Hard disk	**USB-ITPAK V3.0**: Free space of more than 15 MB **USB-ITPAK V2.1**: Free space of more than 10 MB
CD-ROM drive	For program installation*4
USB port*3	2 ports or more
Monitor resolution	**USB-ITPAK V3.0**: 1024×768, 256 colors or more **USB-ITPAK V2.1**: 800×600, 256 colors or more

*1 32-bit, 64-bit OS supported
*2 Operation with Excel for MAC OS is not guaranteed.
*3 A commercially available hub can be used. (USB certified product is recommended)
*4 **V3.0** does not require a CD drive but does require an Internet connection for download.

Language support

- Operation language (17 languages)
  Japanese, English, German, French, Spanish, Italian, Czech, Swedish, Turkish, Polish, Hungarian, Russian, Korean, Chinese (traditional/simplified), Dutch, Portuguese
- Operation manual (PDF file)
  Japanese, English, German

Code No.

Model	USB-FSW
Code No.	**06ADV384**

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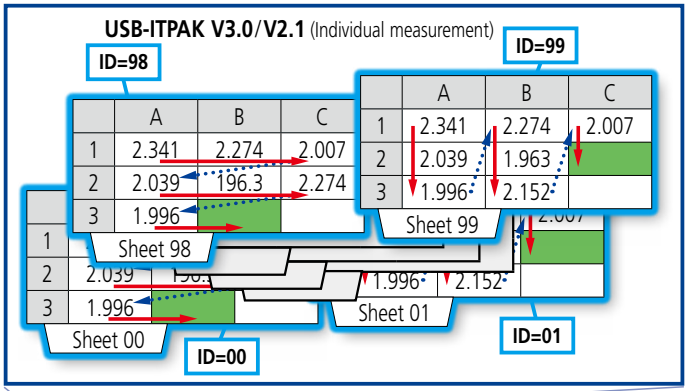
Example of measurement using the U-WAVE Series wireless communication system

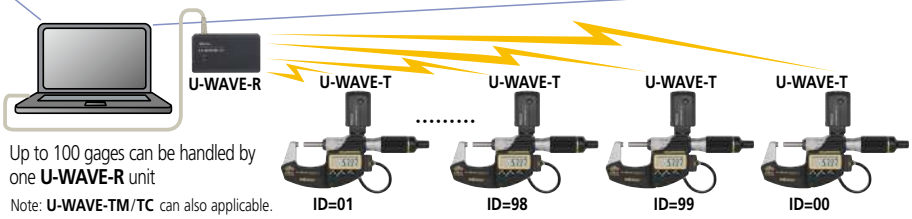
<Data sorting of individual measurements>

Data from multiple Digimatic gages sent to separate Excel sheets

Measurement data from multiple measuring instruments can easily be sorted and inserted into the respective sheets in Excel.



Entry point can be specified per **U-WAVE-T ID**.
- Specifying an Excel file
- Specifying data input cells (example: A1: C3)
- Specifying cursor move



Up to 100 gages can be handled by one **U-WAVE-R** unit

Note: **U-WAVE-TM/TC** can also applicable.

<timer input + measurement date/time display during simultaneous measurement>

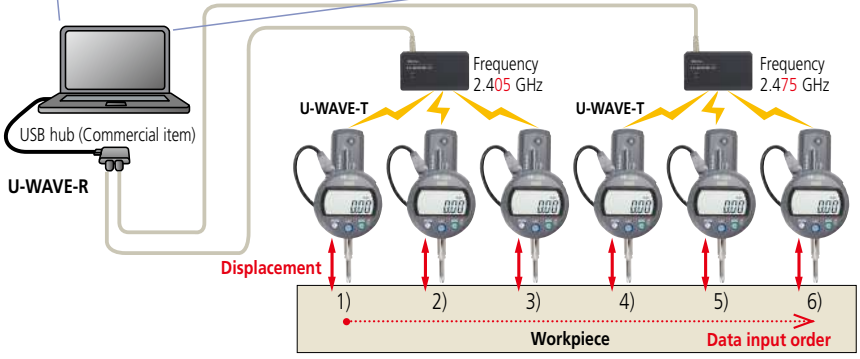
Automatically obtains displacement data in a certain input interval

The event-driven operation function of **U-WAVE** enables data collection at a preset time by timer.

USB-ITPAK V3.0/V2.1 simultaneous measurement + timer input (example: 5 s interval)

	A	B	C	D	E	F	G
1	Displacement 1)	Displacement 2)	Displacement 3)	Displacement 4)	Displacement 5)	Displacement 6)	Measurement date/time
2	0.281	0.162	0.121	0.051	0.011	–0.001	2013/4/1 7 30 00
3	0.279	0.152	0.133	0.064	0.018	–0.003	2013/4/1 7 30 05
4	0.265	0.149	0.142	0.089	0.021	–0.007	2013/4/1 7 30 10
5							
6							

5 s
5 s
5 s



The input interval can be arbitrarily set by 0.1 seconds intervals up to 24 hours. If a smaller value than the data loading time is set, the actual measurement time will be the input interval.
With **U-WAVE**, an error (no data) may occur if less than 0.5 seconds is set for the input interval. This is because the data request signal is issued before the data comes in, based on the event driven data refresh interval that is set to 0.5 seconds (fixed).

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Measurement Data Management
USB-ITPAK V3.0/V2.1 (IT-016U/IT-020U/USB-ITN/U-WAVE/DP-1VA LOGGER connectable)

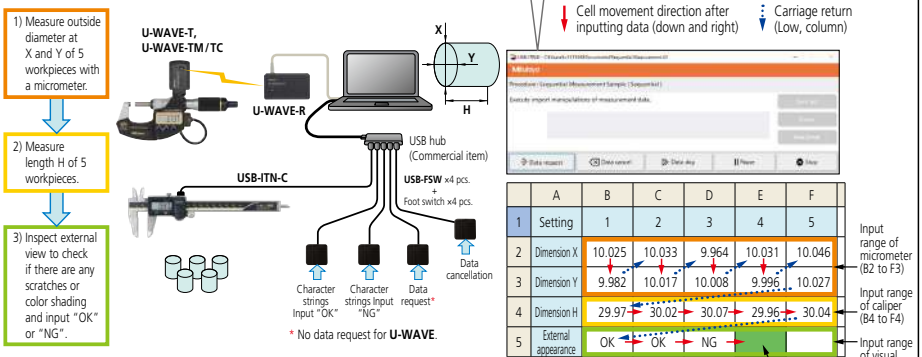
A desired measurement sequence to collect data into Excel can be created by using USB-ITPAK with an input tool or U-WAVE.

Measurement applications of USB-ITPAK (Three examples of how **USB-ITPAK** can be deployed are shown below)

Sequential measurement Example of measurement using input according to pre-registered procedures

(Measurement example) The outside diameters at X and Y and length (H) of 5 workpieces are measured in order, as shown below. Finally, a visual inspection is performed (for scratches, uneven coloring, etc.) to determine Go/±NG judgment.

When a measuring procedure is executed, a window is displayed. "Data request*", "Data cancel*", "Data skip*", "Aborting", "Complete" can be specified. * These operations can be allocated to the function key or foot switch (via **USB-FSW**).

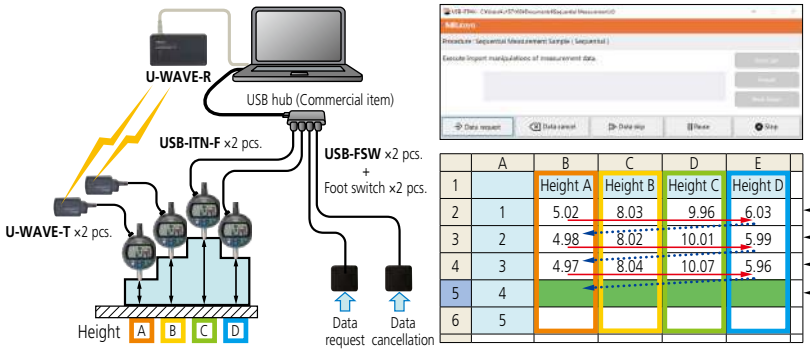


	A	B	C	D	E	F
1	Setting	1	2	3	4	5
2	Dimension X	10.025	10.033	9.964	10.031	10.046
3	Dimension Y	9.982	10.017	10.008	9.996	10.027
4	Dimension H	29.97	30.02	30.07	29.96	30.04
5	External appearance	OK	OK	NG		

* These are common options for **IT-020U**, **USB-ITN**, and **U-WAVE**. They cannot be used with **IT-007R**.

Simultaneous measurement Example of measurement involving importing data from multiple Digimatic gages at once

(Measurement example) Batch (simultaneous) measurement of 4 heights (A to D) of the workpiece shown below.



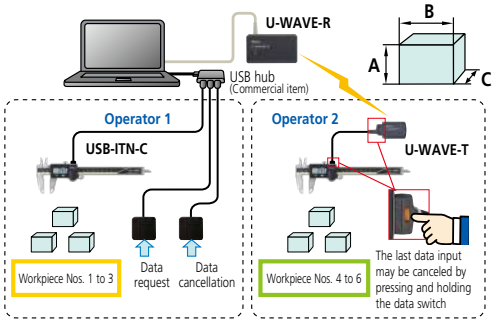
	A	B	C	D	E
1		Height A	Height B	Height C	Height D
2	1	5.02	8.03	9.96	6.03
3	2	4.98	8.02	10.01	5.99
4	3	4.97	8.04	10.07	5.96
5	4				
6	5				

First measurement (finished)
Second measurement (finished)
Third measurement (finished)
Fourth measurement (Wait for next input)

Note: When using **U-WAVE** for batch measurement, it will operate in "Event Drive mode."

Individual measurement Example of simultaneous work by multiple operators

(Measurement example) Two operators measure 6 workpieces 3 workpieces per operator



	A	B	C	D	E	F	G
1	Setting	1	2	3	4	5	6
2	Dimension A	10.02	10.03	9.96	10.15	10.23	10.04
3	Dimension B	9.98	10.01	10.07	9.99	9.78	
4	Dimension C	10.15	10.14		9.96	10.27	

Operator 1 Cell that will receive next input
Operator 2 Cell that will receive next input

USB-FSW ×2 pcs. + Foot switch ×2 pcs.

Notes on using USB-ITPAK V3.0/V2.1:

- Do not merge the cells in the specified range as a measurement data input.
- During measurement, the Microsoft Excel worksheet cannot be modified in any way apart from entering data. If you need to modify the sheet, it is necessary to abort or finish the measurement.
- If the OS build version is old, it may not be possible to use **U-WAVE fit *Bluetooth*®** and **U-WAVE fit** or **U-WAVE-T** together.

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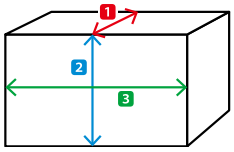
Bidirectional serial communication

With bidirectional serial communication (Digimatic S1) enabled measuring instruments, it is possible to use **USB-ITPAK V3.0** on a PC to control, configure, and collect information from the measuring instruments in addition to ordinary measurement data collection. This reduces labour and time for inspection and greatly increases efficiency.

Equipped with an automatic sorting function for sorting input measurement data [Easy input mode]

This function can be implemented even if the measuring instrument does not support bidirectional serial communication. After setting, measurement values are automatically sorted into an Excel sheet as needed.



Only the number of measurement items is preset.
(Example: number of measurement items = 3)

1 D: 10 mm
2 H: 20 mm
3 W: 30 mm

With normal input
(Entered into column A only.)

		A	B
1	1	10.11	
2	2	20.05	
3	3	29.99	
1	4	10.54	
2	5	20.45	

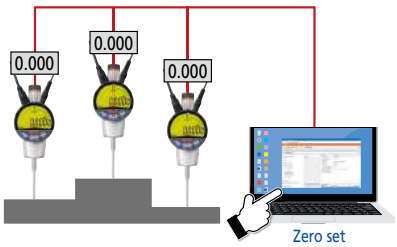
With automatic sorting function
(Once entered into column A, similar data is automatically classified.)

		A	B	C	D	E
1	1	10.11		10.11	20.05	29.99
2	2	20.05		10.54	20.45	29.5
3	3	29.99		9.78	20.3	30.4
1	4	10.54		9.99	20.07	30.22
2	5	20.45				

Digimatic S1 applicable model Example of measurement using the **ID-CNX/ID-FNX**

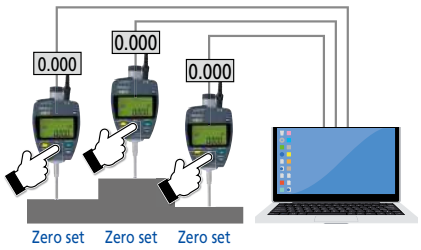
Function example (1) Control of ID-C/ID-F from PC

ID-CNX/ID-FNX + USB-ITPAK V3.0



- It is possible to zero-set or preset measuring instruments collectively from **USB-ITPAK V3.0** on a PC.

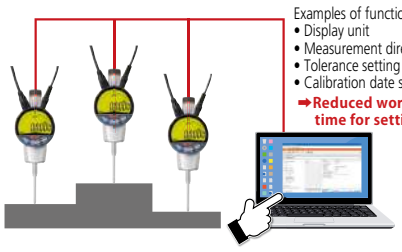
Instruments not supporting bidirectional serial communication + USB-ITPAK



- It is necessary to manually zero-set or preset measuring instruments individually.

Function example (2) Measuring instrument setting

ID-CNX/ID-FNX + USB-ITPAK V3.0

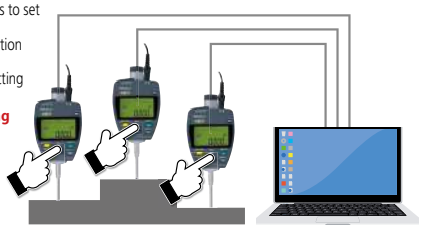


Examples of functions to set
- Display unit
- Measurement direction
- Tolerance setting
- Calibration date setting

➡**Reduced work time for setting**

- It is possible to set the functions of measuring instruments from **USB-ITPAK V3.0**.
- The settings of functions can be saved on a PC and copied to other measuring instruments.

Instruments not supporting bidirectional serial communication + USB-ITPAK



- It is necessary to manually change the settings.

Note: The above is possible only when bidirectional serial communication (Digimatic S1) enabled measuring instruments are used with USB Input Tool Direct or **IT-020U**. It is not possible with measuring instruments not supporting Digimatic S1 or **U-WAVE** Series.

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Measurement Data Management

Data Conversion Program into Inspection Certificates in Excel Format MeasureReport

- Data from a measurement result file generated with a CMM, vision measuring machine or other machine can be output to an inspection certificate generated with Excel. Data from multiple measuring machines can be combined into a single inspection certificate (up to 200 measurement items).
- A customized format can be created for an inspection sheet using simple editing (copy & paste, etc.) by using a sample format as the template.
- The computation function is available for tolerance judgment, workpiece judgment, statistical calculation and other types of processing at inspection-certificate generation time.

Create inspection certificate from measurement result file for each measuring machine (PC data processing)

CMM
MCOSMOS, MICROPAK2700 MICROPAK700

Measurement result file

Vision Measuring Systems
QVPAK, QSPAK QIPAK

Measurement result file

Optical Instruments
Vision Unit QSPAK

Measurement result file

- File conversion: Supported file formats

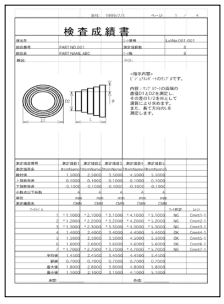
<CMM>
1) **MCOSMOS** ASCII file (**Geopak-3**)
2) **MPK2700** statistic file (Binary format)
3) **MPK2700** ASCII file (Text format)

<Vision Measuring Systems>
1) QUICK VISION **QVPAK-QV Report**
2) QUICK SCOPE **QSPAK** measurement result file
3) QUICK IMAGE **QIPAK** measurement result file

<Optical Instruments>
1) Vision Unit **QSPAK** measurement result file

Measurement result file conversion

Select and extract data, design value, tolerance value, etc., and output in specified Excel format.



Example of inspection certificate.

Excel inspection certificate creation macro program

- Measurement result file, data loaded from on-line communication, or data specified from database file of MeasurLink® can be output to an Excel table.
- Original format can be created by simple editing with sample style as a template.
  Desired template style can be automatically created by specifying required number of items and workpieces.
- Tolerance judgment (* marked in NG data), workpiece judgment (OK or NG is indicated in judgment column), statistical analysis, page break are automatically processed.
- Data from several measuring machines can be combined in one inspection certificate.

Main specifications of MeasureReport

- Document creation:
  Automatic creation of template sample style (Number of items × number of workpieces specified)
- GO/±NG Judgment:
  Tolerance judgment (marked in NG value)
  Workpiece judgment (OK or NG in judgment column)
- Statistical analysis: mean, maximum, minimum, range, standard deviation, Cp, Cpk, fraction defective, number of defectives, etc. 15 items in total.
- Capacity:
  1) Measurement result file conversion
  2) On-line data input
  Max. 200 items × Max. 2,000 workpieces
  3) MeasurLink® database import
  Max. 200 items × Max. 2,000 workpieces or
  Max. 2,000 items × Max. 200 workpieces
- File combined:
  A maximum of 10 measurement files can be specified and both measurement items and workpieces can be combined respectively.
- Printing and saving of inspection certificate:
  Automatic printing and saving in Excel format
- Comment output to the inspection certificate:
  30 items including part number and lot number can be input.
- Workpiece drawing output to the inspection certificate:
  Image files (bmp, jpg) can be displayed in arbitrary positions.
- Others:
  Decimal point digit justification, error display, automatic page break

MeasureReport operation environment (recommended)

OS	Windows 2000 Windows XP Windows Vista (32-bit) Windows 7 (32-bit/64-bit) Windows 10 (64-bit)
Microsoft Excel	2000/2002/2003/2007/2010/2013/2016/2019 (Only 32-bit edition is available regardless of Windows version. It doesn't work on 64-bit Windows.)
CPU	Processor of 1 GHz or more
Memory	2 GB or more
Hard disk	3 GB or more free space
Display	1024×768 or larger
Drive	CD-ROM or DVD drive (required for installation)

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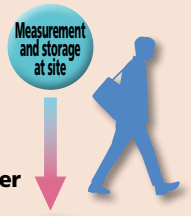
Mini-Printer Equipped with Data Logging Function
SERIES 264 — Digimatic Mini-Processor DP-1VA LOGGER

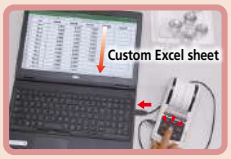
In addition to the conventional (DP-1VR) printing and statistical calculation functions, data logging and USB output functions are added and enhanced.

- This is a palm-sized printer used to print measurement data from Digimatic gages or to perform statistical analysis.
- The versatile **DP-1VA LOGGER** printer not only prints measurement data, but performs a variety of statistical analyses, draws histograms and D-charts and also performs complex operations on Xbar-R control charts.
- The data logger function allows storage of up to 1,000 pieces of data in memory and batch transfer of stored data to an Excel-format inspection certificate, etc., by connecting to a PC via a USB cable (optional).

264-505
DP-1VA LOGGER

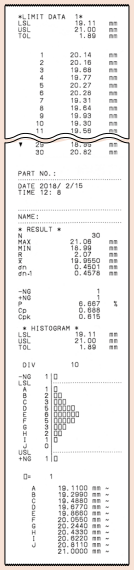
Typical application



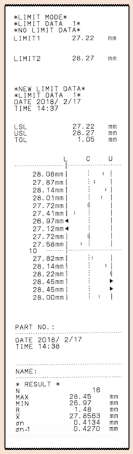


Example of printout

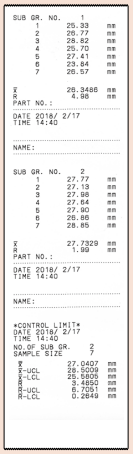
MODE1



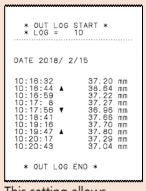
MODE2



MODE3

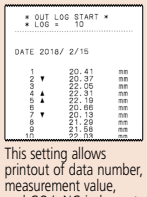


In OUT LOG Setting 1



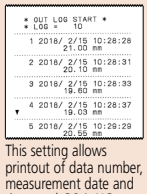
This setting allows printout of measurement time, measurement value, and GO/±NG judgment result.

In OUT LOG Setting 2



This setting allows printout of data number, measurement value, and GO/±NG judgment result.

In OUT LOG Setting 3



This setting allows printout of data number, measurement date and time, and GO/±NG judgment result.

Product catalog E12051

Video

SPECIFICATIONS

Code No.	**264-505***
Model	**DP-1VA LOGGER**
Data input	Digimatic input, RS-232C input (specific to Mitutoyo **KA** counter)
Data processing capacity	Mode 0: 100,000 pcs. of data Modes 1, 2: 9,999 pcs. of data Mode 3: Sample size 10×9,999 subgroups=99,990 pcs. of data
GO/±NG judgment	Five sets can be defined
Output	1) USB output 2) RS-232C data output at TTL levels 3) GO/±NG judgment result output (+NG, GO, –NG)
Input timer	Input intervals: 0.25 s, 1 s, 5 s, 30 s, 1 min, 30 min, 60 min
Printing method	Thermal line printer
Printing speed	0.8 s per line (6.5 mm/s) (using AC adapter)
Printing line	10,000 lines of normal characters per roll 7,000 lines of large characters per roll
Printing paper	High durability thermo-sensitive paper, Width 58 mm × length 48 m Note: If it is to be used for official documents, or stored more than 5 years, it is recommended to make a more durable copy.
Power source	2 power methods 1) AC adapter 100 to 240 V 50/60 Hz AC adapter (6 V, 2 A) as a standard accessory. **06AGZ369JA** (JAPAN, US), **06AGZ369D** (EU), **06AGZ369E** (UK), **06AGZ369K** (Korea), **06AGZ369DC** (China) 2) 4 pcs. of LR6/AA size (alkaline or Ni-Mh) Note: Manganese dioxide batteries are not usable.
Battery life	About 10,000 lines* (if data is printed once every 5 seconds using 1,600 mA NiMH batteries at 20 °C) * This is a typical value and is not guaranteed.
External dimensions	94 (W) ×201 (D) ×75.2 (H) mm
Mass	390 g (main unit)
Optional Accessories	1) USB cable (A-microB) : **06AFZ050** (1 m) 2) RS-232C output cable: **09EAA084** (1 m, D-SUB 9-pin) 3) RS-232C counter cable: **09EAA094** Cable for **KA** counter (1 m, D-SUB 25-pin) 4) GO/±NG judgment cable: **965516** (2 m, 10 pin terminal/separate) 5) Foot switch: **937179T**
Consumable Items	Printing paper (10 rolls): **09EAA082**

* To denote your AC line voltage add the following suffixes. **A** for North America, **D** for Europe, **E** for UK, **K** for Korea, **DC** for China, and no suffix is required for Japan.

Example of printout

MODE1

Various statistical calculations are executed using all input data. If the tolerance limits have been set, GO/±NG judgment and histogram creation are also enabled.

MODE2

In addition to the MODE1 function, measurements within the tolerance limits are printed out as a D chart*. This chart allows you to identify the trend of variations in measurement data.
* D chart stands for Displacement chart.

MODE3

Only input of data automatically enables calculation processing of complex control limit values as well as calculation for creating an Xbar-R control chart.

Statistical calculation data

MODE0

GO/±NG judgment

MODE1, 2

N: Number of pieces of data
MAX: Maximum value
MIN: Minimum value
R: Range
$\bar{X}$: Mean value
σn: Standard deviation of a population (N)
σn-1: Sample standard deviation (N-1)
–NG: For the number of pieces of data smaller than the lower limit
+NG: For the number of pieces of data larger than the upper limit
P: Percentage of rejects
Cp: Maximum process capability potential
Cpk: Actual process capability achieved

MODE3

N: Number of pieces of data
MAX: Maximum value
MIN: Minimum value
n: Number of subgroups (up to 10)
$\bar{X}$: Mean value in a subgroup
R: Range of a subgroup
$\bar{\bar{X}}$: Mean value
$\bar{X}$-UCL: Upper control limit
$\bar{X}$-LCL: Lower control limit
$\bar{R}$: Center (R control)
R-UCL: Upper control limit (R control)
R-LCL: Lower control limit (R control)

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Digimatic/RS-232C Interface Unit Multiplexer MUX-10F

- Multiplexer **MUX-10F** is a measurement data transfer device that converts incoming Digimatic output measurement data to RS-232C and outputs it to other devices such as a PC and sequencer.
- Up to four measuring instruments with Digimatic output can be connected.

264-002
MUX-10F

SPECIFICATIONS

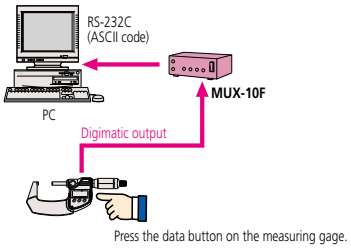
Code No.	**264-002***
Model	**MUX-10F**
Data input port	4 channels for Digimatic gages
Output: (RS-232C)	Data transmission method: Half-duplex, Data transmission code: ASCII/JIS, Data length: 8 bits Parity check: None, Stop bit: 1, Data transmission speed: 300/600/1200/2400/4800/9600/19200 bps
Power source	AC adapter (9 V, 500 mA)
External dimensions	91.4 (W) ×92.5 (D) ×50.4 (H) mm

* To denote your AC line voltage add the following suffixes. **A** for North America, **D** for Europe, **E** for UK, **K** for Korea, **DC** for China, and no suffix is required for Japan.
Note 1: Communication software is not included.
Note 2: Separately purchase the cables. Refer to pages 09-23 and 09-24 for cable types.

Typical Application

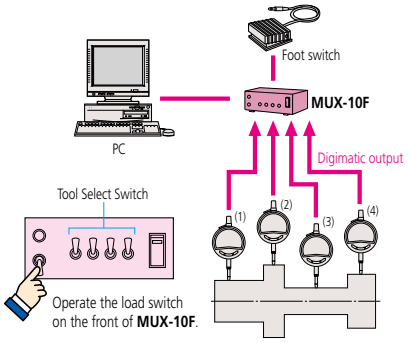
Data input using the data button on the Digimatic gage

- If the Digimatic gage has a data button, data is sent to the **MUX-10F** from the gage, converted to RS-232C and sent out.



Data input using the load switch

- If the Digimatic gage does not have a data button, or when simultaneous measurements are performed, the **MUX-10F** load switch is used to poll data from the measuring gage(s) selected by the tool selection switch (es), converted to RS-232C, and sent out.
- If multiple measuring gages are selected by the tool selection switch, data is input in the order of channels 1 through 4.
- Optional foot switch (**937179T**) is available for quick data entry.

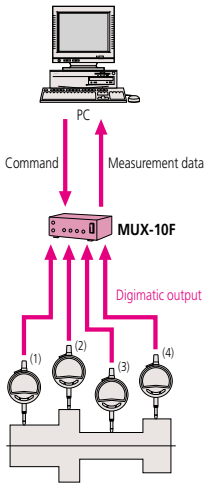


Data input using the external commands

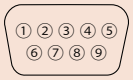
- Data from a specified measuring gage connected to **MUX-10F** can be polled (ch 1 to 4) by inputting a command from the PC.

Commands (ASCII)	Transfer channels
1 (ASCII code31) CR	1
2 (ASCII code32) CR	2
3 (ASCII code33) CR	3
4 (ASCII code34) CR	4
*A (ASCII code41) CR	1, 2, 3, 4
*B (ASCII code42) CR	1, 2, 4
*C (ASCII code43) CR	1, 3, 4
*D (ASCII code44) CR	2, 3, 4
E (ASCII code45) CR	1, 2, 3
F (ASCII code46) CR	1, 2
G (ASCII code47) CR	1, 3
H (ASCII code48) CR	1, 4
I (ASCII code49) CR	2, 3
J (ASCII code50) CR	2, 4
K (ASCII code51) CR	3, 4

* Command will operate the same as previous **MUX-10** when 4-channel mode is turned off.



Connector specification



Pin No.	Signal	Function	in/out
1	CD		out
2	RD	Received data	out
3	TD	Communication data	in
4			
5	GND	Ground	
6	DR		out
7			
8	CS		out
9			

Note: For connection with a PC, use a commercially available RS-232C straight cable.

Data format

1) When data output

D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13
- D1: Data format code No.: 0
- D2: Channel No.: 1 to 4
- D3: Measurement item: A
- D4: Model: + or –
- D5 D6 D7 D8 D9: LSD (Floating decimal point)
- D10 D11 D12 D13: CR

2) Example of format

Display (CH1)	Display (CH2)
-0.018	0.1234
↓	↓
Output data 01 A - 0000.018 CR	Output data 02 A+000.1234 CR

The smallest input channel number data is output first in the output stream, with the others following in ascending order.

3) Error code output

D1 D2 D3 D4
- D1: Error format: 9
- D2: Channel No.: 1 to 4
- D3: Error code No.
  - 1: No data input
  - 2: Loaded data with format other than specified
- D4: CR

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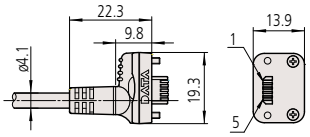
Digimatic data cable specifications (Dimensions)

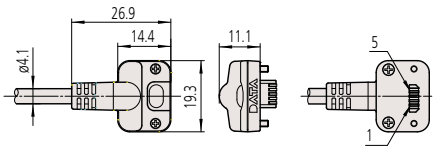
Gage connector dimensions

Unit: mm

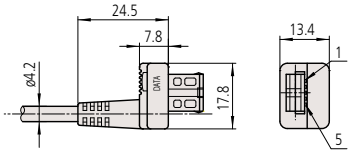
A) 1) **06AFM380A**
2) **05CZA624** (1 m)
05CZA625 (2 m)
3) **02AZD790A** (Standard)
02AZE140A (FSW)



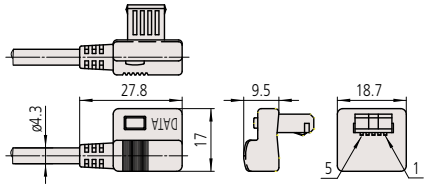
B) 1) **06AFM380B**
2) **05CZA662** (1 m)
05CZA663 (2 m)
3) **02AZD790B** (Standard)
02AZE140B (FSW)



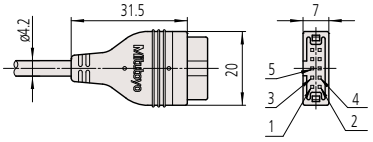
C) 1) **06AFM380C**
2) **959149** (1 m)
959150 (2 m)
3) **02AZD790C** (Standard)
02AZE140C (FSW)



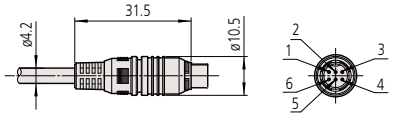
CR) 1) No applicable models
2) **04AZB512** (1 m)
04AZB513 (2 m)
3) No applicable models



D) 1) **06AFM380D**
2) **936937** (1 m)
965014 (2 m)
3) **02AZD790D** (Standard)
02AZE140D (FSW)

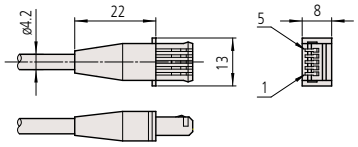


E) 1) **06AFM380E**
2) **937387** (1 m)
965013 (2 m)
3) **02AZD790E** (Standard)
02AZE140E (FSW)

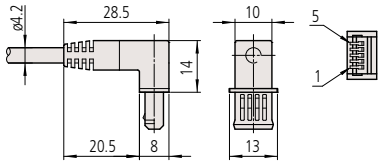


Note: (1), (2) and (3) are for connecting cables listed in 09-23 and 09-24.

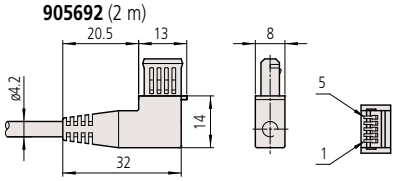
F) 1) **06AFM380F**
2) **905338** (1 m)
905409 (2 m)
3) **02AZD790F** (Standard)
02AZE140F (FSW)



FB) 1) No applicable models
2) **905689** (1 m)
905690 (2 m)
3) No applicable models

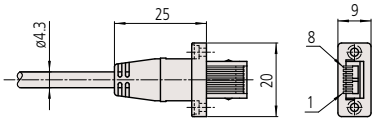


FR) 1) No applicable models
2) **905691** (1 m)
905692 (2 m)
3) No applicable models

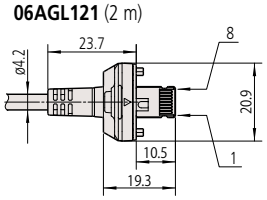


FL) and FR) is symmetrical and the same size.

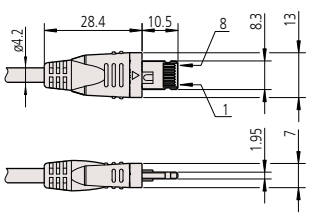
G) 1) **06AFM380G**
2) **21EAA194** (1 m)
21EAA190 (2 m)
3) **02AZD790G** (Standard)
02AZE140G (FSW)



SA) 1) **06AGQ001A**
2) **06AGL111** (1 m)
06AGL121 (2 m)
3) No applicable models



SF) 1) **06AGQ001F**
2) **06AGL011** (1 m)
06AGL021 (2 m)
3) **02AZG011** (Standard)
02AZG021 (FSW)



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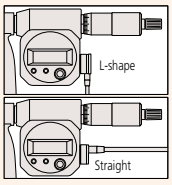
Connection cables and applicable models

			A) Water-proof type with output button	B) Water-proof type with output button	C) Straight type with output button	CR) L-shape type with output button, cable outlet on right	D) Flat 10-pin type
1) USB Input Tool Direct USB-ITN	Connector type						
	Model Code No.		**USB-ITN-A 06AFM380A**	**USB-ITN-B 06AFM380B**	**USB-ITN-C 06AFM380C**	No applicable models **USB-ITN-C** can be used. See figure below	**USB-ITN-D 06AFM380D**
2) IT-020U/IT-007R/DP-1VA LOGGER/ MUX-10F/EC Counter Connector (13 types, A to G, SA and SF) Type D on the other end for all models	Connector type		**A)** Water-proof type with output button	**B)** Water-proof type with output button	**C)** Straight type with output button	**CR)** L-shape type with output button, cable outlet on right	**D)** Flat 10-pin type
	Code No.	1 m	**05CZA624**	**05CZA662**	**959149**	**04AZB512**	**936937**
		2 m	**05CZA625**	**05CZA663**	**959150**	**04AZB513**	**965014**
3) U-WAVE-T	Connector type		**A)** Water-proof type with output button	**B)** Water-proof type with output button	**C)** Straight type with output button	**CR)** L-shape type with output button, cable outlet on right	**D)** Flat 10-pin type
	Standard		**02AZD790A**	**02AZD790B**	**02AZD790C**	No applicable models Type C can be used, but be careful of the cable when operating the thimble. (See figure below)	**02AZD790D**
	For foot switch		**02AZE140A**	**02AZE140B**	**02AZE140C**		**02AZE140D**

For connector types (circled in broken lines), select the model (A to G, SA,SF) that matches the connector shape of the Digimatic gage you are using.

			A) Water-proof type with output button	B) Water-proof type with output button	C) Straight type with output button	CR) L-shape type with output button, cable outlet on right	D) Flat 10-pin type
Gage connectors on data cable The connector dimensions are given on page 09-22.	Connector type						
	Cable Connector shape on Digimatic gage side						
	Data switch		Available	Available	Available	Available	N/A
Digimatic ports on gage Please note that some high-precision Digimatic gages are capable of displaying the measurement result to more than 6 digits. However, according to the Digimatic output specification, the result may be output in 6 digits only. Digimatic gages whose display may exceed 6 digits • Laser Scan Micrometers • Litematic • Linear gage counter (**EH**)	Picture of Digimatic port						
	Applicable models		• Digimatic caliper **500-776/500-777**, etc. **500-712-20/500-713-20**, etc. **500-712** etc. **550-301-10/550-331-10**, etc. **551-301-10/551-331-10**, etc. **552-302-10/552-303-10**, etc. **552-150-10/552-151-10**, etc. **552-155-10/552-156-10**, etc. **552-181-10/552-182-10**, etc. **573-601/573-602**, etc. • Digimatic depth gage **571-251-10/571-252-10**, etc. • Digimatic scale unit **572-600, 572-601**, etc.	• Digimatic micrometer **293-140-30/293-141-30**, etc. **293-230-30** etc. **340-251-30/340-252-30 293-666-20/293-667-20**, etc. **227-201-20/227-203-20**, etc. **227-205-20/227-206-20**, etc. **227-221-20** etc. **227-223-20** etc. **422-230-30/422-231-30**, etc. **406-250-30/406-251-30**, etc. **343-250-30/343-251-30**, etc. **369-250-30/369-251-30**, etc. **345-250-30/345-251-30**, etc. **314-251-30/314-252-30**, etc. • Digimatic micrometer head **350-251-30/350-261-30**, etc. • Digimatic holtest **468-161/468-162**, etc. • Digimatic depth gage **329-250-30/329-251-30**, etc.	• Digimatic caliper **500-150-30/500-151-30**, etc. **500-500-10/500-501-10**, etc. **500-443** etc. **573-118-10/573-119-10**, etc. **573-116-10/573-117-10**, etc. **573-191-30/573-291-30 573-181-30/573-182-30**, etc. • Digimatic depth gage **571-201-30/571-202-30**, etc. • Digimatic micrometer head **164-163/164-164** • Digimatic scale unit **572-203-10/572-213-10 572-300-10/572-301-10**, etc.	• Digimatic micrometer **293-582/293-583**, etc. **389-514/389-714**  Type C straight connectors are available, but may interfere with thimble operation.	• Digimatic indicator **ID-H** **ID-F** (Note 1) • High-precision height gage **QMH-AX/BX** • Mu-checker Digital Mu Checker (Note 1) • Laser scan micrometer **LSM-9506** • Linear gage counter **EF/EH** (Note 2) **EB** (Note 1) and (Note 4), **EC-101D** (Note 1) • Litematic **VL-B/S-B** (Note 2) • Surface roughness measuring machine **SJ-210** (Note 4)/ **310/410** **SJ-500/SV-2100** (Note 3) • Hardness testing machines **HM-210/220** **HV-110/120** **HR-530** **HR-600**

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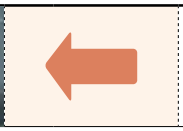
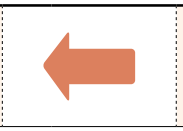
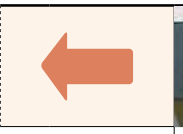
E) Round 6-pin type	**F)** Flat straight type	**FB)** Flat L-shape (cable outlet is back)	**FR)** Flat L-shape (cable outlet is right)	**FL)** Flat L-shape (cable outlet is left)	**G)** Flat straight water-proof type	**SA)** Water-proof straight model with output button	**SF)** Straight standard type
USB-ITN-E 06AFM380E	**USB-ITN-F 06AFM380F**	No applicable models **USB-ITN-F** is available.			**USB-ITN-G 06AFM380G**	**USB-ITN-SA 06AGQ001A**	**USB-ITN-SF 06AGQ001F**

E) Round 6-pin type	**F)** Flat straight type	**FB)** Flat L-shape (cable outlet is back)	**FR)** Flat L-shape (cable outlet is right)	**FL)** Flat L-shape (cable outlet is left)	**G)** Flat straight water-proof type	**SA)** Water-proof straight model with output button	**SF)** Straight standard type
937387	**905338**	**905689**	**905691**	**905693**	**21EAA194**	**06AGL111**	**06AGL011**
965013	**905409**	**905690**	**905692**	**905694**	**21EAA190**	**06AGL121**	**06AGL021**

E) Round 6-pin type	**F)** Flat straight type	**FB)** Flat L-shape (cable outlet is back)	**FR)** Flat L-shape (cable outlet is right)	**FL)** Flat L-shape (cable outlet is left)	**G)** Flat straight water-proof type	**SA)** Water-proof straight model with output button	**SF)** Straight standard type
02AZD790E	**02AZD790F**	No applicable models Use **02AZD790F** or **02AZE140F**.			**02AZD790G**	No applicable models Use **02AZG011** or **02AZG021**.	**02AZG011**
02AZE140E	**02AZE140F**				**02AZE140G**		**02AZG021**

Note 1: **USB-ITN** is required to use in the combination with **USB-ITPAK**, when connected to D) **ID-F**, D) digital Mu-checker, **EB**, **EC-101D**, and F) **ID-U**, **ID-SS**, **ID-SX**.
Note 2: **USB-ITN**, **IT-020U**, and **U-WAVE-T** cannot be used with D) **EF**/**EH** and D) **VL-B**/**S-B**.
Note 3: **USB-ITN** and **U-WAVE-T** cannot be used with D) **SJ-500**/**SV-2100**.
Note 4: **IT-020U** and **USB-ITN-SF** cannot be used with D) **SJ-210** and D) **EB**.

E) Round 6-pin type	**F)** Flat straight type	**FB)** Flat L-shape (cable outlet is back)	**FR)** Flat L-shape (cable outlet is right)	**FL)** Flat L-shape (cable outlet is left)	**G)** Flat straight water-proof type	**SA)** Water-proof straight model with output button	**SF)** Straight standard type
N/A	N/A	N/A	N/A	N/A	N/A	Available	N/A
							
[Hardness testing machines] **HM-102** **HM-103** **HM-320** **HM-430** **HM-411**	• Digimatic indicator **ID-CX**, **ID-C112AX**, **ID-C112RXB**, **ID-C112GXB**, **ID-U** (Note 1), **ID-SS** (Note 1), **ID-SX** (Note 1) **HDM-AX**, **HD-AX**, **HDS-HC**, **HDS-C** • ABS boremetic **568-361**/**568-362**, etc. • Digimatic bore gage **511-501**/**511-502**, etc. • Scale unit **SD-E**, **SDV-E**, **SD-F**, **SDV-F** • Hardness testing machines **HH-300** • Digimatic depth gage **Digimatic type (ID-CX)**				• Digimatic indicator **ID-N** **ID-B**	• Digimatic micrometer **QuantuMike** **(293-14X-40/293-18X-40)**	• Digimatic indicator **ID-CNX** **ID-FNX** • Digimatic depth gage **Digimatic type (ID-CNX)** • Digimatic thickness gage **Digimatic type (ID-CNX)**

[How to check the code No. of the connecting cable used for the measuring instrument]

• For models currently being sold
Please check the optional accessories for the applicable Digimatic gage in the general catalog.
The general catalog can also be viewed on the Mitutoyo website. Web address: **https://www.mitutoyo.co.jp/**

• Regarding discontinued models not listed in the general catalog
(1) How to look for items from the general catalog
For a digimatic indicator, you can check the "New and Old Product Compatibility Table" for compatible connecting cables.
(2) How to look for items from the Mitutoyo website
You can search the "Parts List". Enter the code number of the Digimatic gage you want to search for.
Example: **293-421**, **500-151**, etc.

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Measurement Data Management

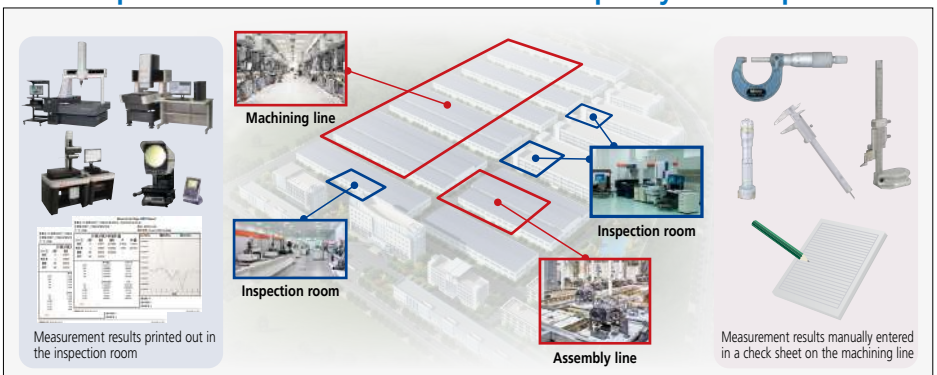
MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System MeasurLink®

- **MeasurLink®** is a data management modular software system that enables collecting data from a wide range of Mitutoyo measuring tools and systems including Coordinate Measuring Machines.
  It supports the "visualization of quality" by showing quality information important for judging the status of processes, such as control charts and process capability indexes, in an easy-to-understand way.

Note: MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

Is the inspection record data utilized to solve quality-related problems?

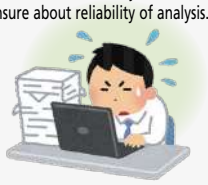


Hard to identify problems with only numerical data

Current problem

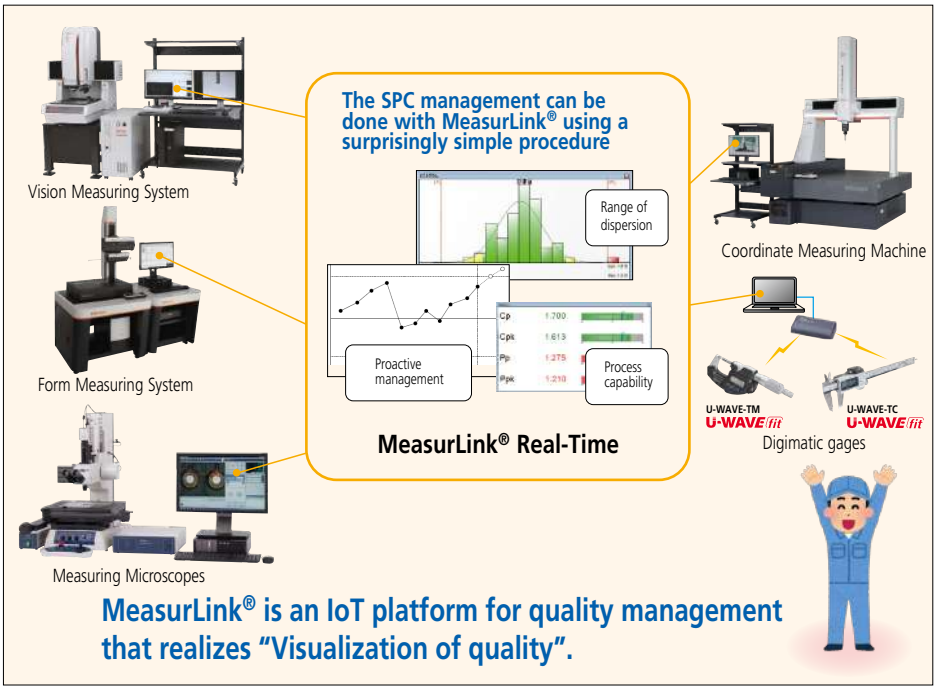
- Data is not leveraged effectively
- Data is at discrete locations
- Management using spreadsheet software
- Every problem needs to be checked with a field operator
- Statistical processing is difficult to learn

Hard to respond quickly since it takes time to enter and analyze data. Unsure about reliability of analysis.



Isn't there any quicker, simpler and more reliable management method?

SPC management can be easily done by combining Mitutoyo measuring instruments and MeasurLink®.



MeasurLink® is an IoT platform for quality management that realizes "Visualization of quality".

Video

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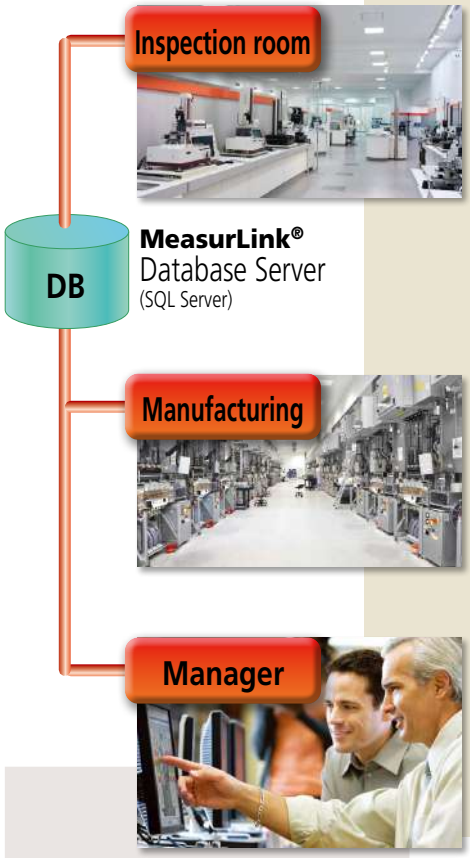
- **Centralized monitoring from all MeasurLink® data collection terminals networked together on the shop floor**
  Enables easy networking through the Database Server (SQL Server). It comprises the six software packages shown in the figure below, and allows for choosing/combining functions necessary for the purpose, such as "data collection" in the inspection room or on the shop floor, or "process monitoring/analysis" by the manager.



Data collection/Analysis module
MeasurLink® Real-Time
(Refer to page 09-27 for details.)

This SPC software allows data collection from each tool and instrument and still allows real-time display of statistical processing data such as control charts, histograms and process capability indexes.

Automatic reporting program
MeasurLink® Report Scheduler
(Refer to page 09-28 for details.)

This program automatically outputs reports created by **Real-Time** or **ProcessAnalyzer** in the preset schedule.

Process Management for Managers
MeasurLink® Process Manager
(Refer to page 09-29 for details.)

This software enables managers to centrally monitor the collected data in **Real-Time**.

Process Analysis module for Managers
MeasurLink® Process Analyzer Proffesional
(Refer to page 09-29 for details.)

This software enables managers to check the collected data in **Real-Time** and analyze in detail.

Evaluation/Analysis Software for Measurement System Analysis (MSA)
MeasurLink® Gage R&R
(Refer to page 09-30 for details.)

This software aids measurement system analysis (MSA) required by IATF 16949.

Gage Management Software
MeasurLink® Gage Management
(Refer to page 09-30 for details.)

This software helps with recording the usage status of gages and planning and implementing a feasible calibration schedule.

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Mitutoyo

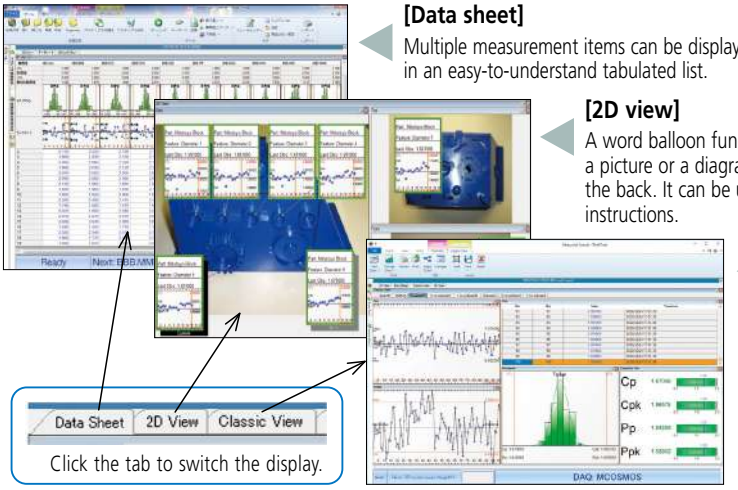
MeasurLink® Data Collection/Analysis Software

Real-Time Standard (RT Std)
Real-Time Professional (RT Pro)
Real-Time Professional 3D (RT Pro 3D)

- **Real-Time** is the Statistical Process Control (SPC) MeasurLink® module that collects data from Mitutoyo and third-party measuring devices and systems to provide analysis functionality in real-time by displaying control charts or process capability indexes.

Various data views

Collected data can be displayed in various views, such as data lists, work instruction images, statistical analysis results, etc. The views can be switched easily according to the needs of the operator.



[Data sheet]
Multiple measurement items can be displayed in an easy-to-understand tabulated list.

[2D view]
A word balloon function is available having a picture or a diagram of the workpiece on the back. It can be used as work process instructions.

[Classic view]
Graphs and lists can be freely selected to display data for a single measurement item. It is useful for checking detailed information such as date and time of the acquired data.

Adding traceability information

Traceability information for each workpiece can be added, for example, serial no., lot no., inspector name, machine no., or cause of problems and remedies. Traceability will also support Barcode scanners for easy error free entry.
This information can be used as search criteria when extracting data using the filtering function (**RT Pro**/**RT Pro 3D**) when a problem occurs.

Alarm function

The operator and management are notified when an "Out of Tolerance" or other events occur.
The method of notification can be selected from a pop-up window, E-mail (Fig. 1), audible alarm or log file.

Subject: Out of tolerance

MeasurLink
Status : Out of tolerance
Station : MeasurLink Demo
Routine : AAA
Run : 2014/01/28 TEST-LOT-03
Characteristic : A
TimeStamp : 2014/12/01 10:19:44
Subgroup Number : 18
Observation Number : 1
Observation : 3
Upper Tolerance Limit : 2.5
Target : 2
Lower Tolerance Limit : 1.5

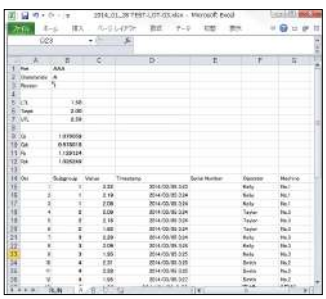
(Fig. 1) Alarm notification by E-mail

Events possible to be logged

- Measurement data
- Retake/modify data
- Failed data tests
- Assignable Cause and Corrective Action

Exporting data to an Excel file

Measurement data can output to an Excel file. This function is useful if the data needs to be used in a department that does not have **MeasurLink®**. (Fig. 2)



(Fig. 2) Export to Excel

MeasurLink® System Requirements

• Operating environments
[Operating System]
Microsoft Windows 7 (32-bit/64-bit)
Microsoft Windows 7 SP1
Microsoft Windows 8.1 (32-bit/64-bit)
(Microsoft Windows 8.1 RT is not supported)
Windows 10 (32-bit/64-bit)
(Windows 10 Mobile and IoT editions are not supported)
Windows 11 (64 bit)
[Database]
Microsoft SQL Server 2017 Standard/Enterprise Edition
Microsoft SQL Server 2016 Standard/Enterprise Edition
Microsoft SQL Server 2014 Standard/Business Intelligense/Enterprise Edition
SQL 2019 Standard/Enterprise

RT Std/RT Pro/RT Pro 3D Common Functions

• Connectable measuring instruments
· Measuring tool with Digimatic output (equipped with PC data processing unit)
[Supported interfaces]
• Wireless (USB) **U-WAVE**/**U-WAVE fit** (VCP)
• Wired (USB) **IT-020U**/**USB-ITN** (VCP or HID)
• Wireless (D-sub 9 pin) **IT-007R, MUX-10F, DP-1VA LOGGER**, and others
• Various RS-232C devices (partially restricted)
• Screen display mode when collecting data
· Classic view
· Data sheet
· 2D view
· Part data sheet, etc.
• Statistical Analysis result
[Chart]
Xbar-R, Xbar-S, X-Rs control charts, Histogram, Run chart, Pre-control chart, Tier chart, Box plot chart, Meter chart, Indicator bar, Multivariate data control chart, etc.
[Statistics]
Maximum value, Minimum value, Standard deviation, Average ±3σ/4σ/6σ, Process capability indexes (Cp, Cpk, Pp, Ppk), Defect ratio, etc.
• Alarm function
[Target items]
· Out of tolerance
· 1 point exceeds control limit line (following are related to management chart)
· Consecutive 9 points on one side of center line
· 6 points successively increasing or decreasing
Others including 8 judgment criteria for Shewhart control chart
• Adding traceability information
· Measurement date (automatically added)
· Serial No. (Keyboard entry)
· Special causes and remedies
· Selection from comment list registered as an option
· Enter from keyboard when measuring classified title registered as an option (e.g. Lot No. LOT 001)
• Report print out function
Measurement values, analysis calculation results and various charts can be arranged to output according to requirements.
• Export function of measurement results
· Excel
· Text
· QIF
· AQDEF
• Security function
Once the access authorization is set, it requires "User name" and "Password" input before the program will start. Data editing actions such as reference, entry and changes require authorization according to the user's role in order to preserve data integrity.
• Operation languages (19 languages)
English, Japanese, French, German, Dutch, Spanish, Swedish, Polish, Italian, Turkish, Korean, Chinese (simplified/traditional), Thai, Hungarian, Czech, Finnish, Portuguese, Russian

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RT Pro/RT Pro 3D Common Functions

• Connectable measuring instrument
· Mitutoyo Measurement Data Management System (equipped with PC data processing unit)
[Supported data processing software]
· CMM: **MCOSMOS V3.2** or later
· Vision System: **QVPAK V10.0** or later/**QSPAK V10.2** or later/**QSPAK MSE V3.1** or later/**QIPAK V4.1** or later
· Vision unit: **QSPAK VUE V4.1** or later
· Surface Roughness/contour instruments: **FORMTRACEPAK V5.311** or later
· Roundness instruments: **ROUNDPAK V7.0** or later
· Hardness testing machines: **AVPAK V2.0** or later
• Filter function
Keyword items for data extraction
· Measurement data (year, month, day, time, week, etc.)
· Serial No.
· Traceability information (e.g. Inspectors, Machine No., etc.)
· Alarm item
• Import function for text data
A custom import template can be built to collect data in **Real-Time Pro/Pro 3D**. MeasurLink® supports ASCII file types such as CSV and TXT with minimum required information (e.g. part name, characteristic name and measurement values, etc.) In addition, MeasurLink® supports QIF, AQDEF, and QMD file types.

RT Pro 3D functions

• Screen display mode when collecting data
· 3D view

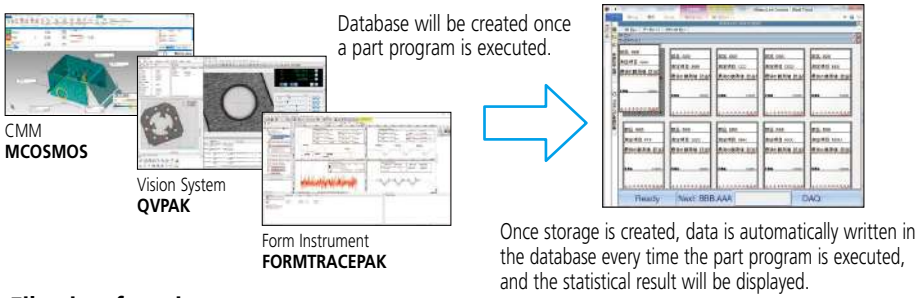
Data collection/analysis software Real-Time functional comparison

Functions		Data collection software		
		Real-Time Standard	Real-Time Professional	Real-Time Professional 3D
Collected data display	Classic view	✓	✓	✓
	Data sheet	✓	✓	✓
	2D view	✓	✓	✓
	3D view (Hoops)			✓
Data extract	Filter		✓	✓
Input from tools and devices	Measuring tools (RS-232C, USB)	✓	✓	✓
	Measuring instruments (DDE)		✓	✓
Text input	Import		✓	✓

• **RT Pro/RT Pro 3D** enables customers to connect and acquire data from Mitutoyo coordinate measuring machines, vision and form measuring systems via native integration (DDE).

• Automatic linking with part programs

To automate the process of linking the CMM, Vision or Form system with MeasurLink®, some easy setup is needed on the device and in MeasurLink®. Then, when the part program is executed, the measurement system will send the part and measurement information to MeasurLink®, along with any tagged data related to the measurement. A new run can be created in **Real-Time Pro/Pro 3D**, or the data can be added to an existing run. The charts and statistics will continuously update and be displayed in the view.



Once storage is created, data is automatically written in the database every time the part program is executed, and the statistical result will be displayed.

• Filtering function

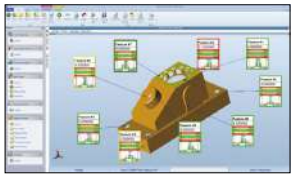
Required data can be easily extracted based on the date and time of the measurement, added comments, or alarms.

• Import function

Measurement data saved in ASCII files can be loaded. Also, a feature to customize a template for loading according to the format is provided.

• RT Pro 3D is a full-spec package

The feature to be measured can be displayed in detail using 3D CAD data.



[3D view]

3D graphics library HOOPS displays real view of the workpiece using an hsf file created from 3D CAD data. The displayed workpiece image can be freely turned, translated, or scaled so that you can get a clear view of the feature to be measured.
The word balloons and lead lines that display the measurement result and measured feature will move following the CAD data translation.

MeasurLink® Automatic Report Generation Program MeasurLink® Report Scheduler

Automatically generates a report created by the **Real-Time (RT Std/RT Pro/RT Pro 3D)** or **Process Analyzer Professional** modules, each of which is connected to the network according to a specified schedule.

The Use of MeasurLink® Report Scheduler

• Typical applications

• Automatic generation of a weekly report specified from among last week's data.
• Automatic report generation by extracting only data with tag information about "tool replacement" (due to wear, breakage, etc.)
• Automatic generation of a daily report for each shift by filtering inspection record data on the basis of a shift

MeasurLink® Report Scheduler common functions

• Report output destinations

• Printer, file, E-mail (as an attached document)

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MeasurLink® Optional Process Analysis Software for Managers Process Analyzer Professional

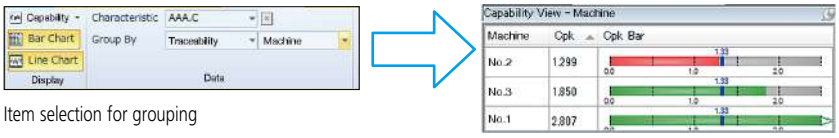
- **Process Analyzer** is optional software for a manager who accesses the database created by the **Real-Time** data collection software to review measurement results and perform statistic analyses.

The same data displayable by data collection software can be displayed, including measurement results, charts, and statistical calculation results with the look and feel of Windows Explorer.

Filtering function that allows data extraction and grouping

Data can be extracted or grouped by selecting the date and time and other traceability information as keywords.

Example) Grouping by Machine No. ..... Cp, Cpk comparison



Item selection for grouping

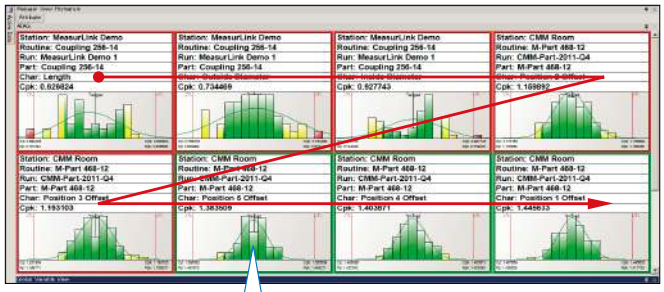
Cpk value and bar graph per machine

MeasurLink® Process Management for Managers Process Manager

- Monitor data as it is collected in Real-Time. **Process Manager** provides managers with the perfect tool to organize and maintain a shop-wide quality program at a glance. Display snapshot windows of characteristics that are currently being collected in MeasurLink® Real-Time. The data can be sorted by inspection station, capability or timestamp. Easily see process information without walking from one inspection area to another by viewing current production across all machines. Show clients your quality operation for the entire facility.

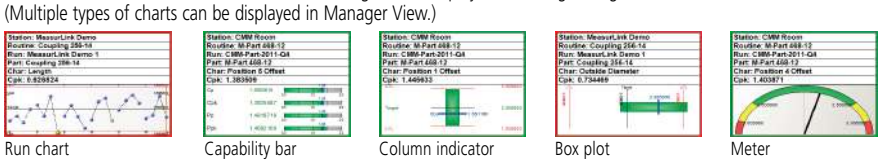
Manager View

Displays various types of charts as an at-a-glance guide. The manager can narrow down all items of data currently being measured into a specific monitoring range of those of critical importance or sort those data (in ascending or descending order) on the basis of process capability index.



Possible to sort charts in the view and narrow down the monitoring range.

Selects various charts such as run charts and histograms to display as an at-a-glance guide.
(Multiple types of charts can be displayed in Manager View.)



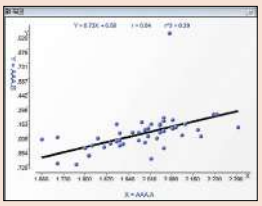
Run chart | Capability bar | Column indicator | Box plot | Meter

PA Pro Functions

- Result display
  · Classic view
  · Data sheet
  · 2D view
  · Part data sheet, etc.
- Statistical Analysis result

[Chart]
Xbar-R, Xbar-S, X-Rs control charts, Histogram, Run chart, Pre-control chart, Tear chart, Box plot chart, Meter chart, Indicator bar, multivariate data control chart, etc.
[Statistics]
Maximum value, Minimum value, Standard deviation, Average ±3σ/4σ/6σ, Process capability indexes (Cp, Cpk, Pp, Ppk), Defect ratio, etc.

- Report print out function
  Measurement values, analysis calculation results and various charts can be arranged to output according to requirements.
- Exporting function of measurement result
  · Excel



Scatter plots: The relationship between two items can be plotted.

- Filter function

Keyword items for data extraction
· Measurement data (year, month, day, time, week, etc.)
· Serial No.
· Traceability information
(e.g. Inspectors, Machine No., etc.)
· Alarm item

- Data processing
  · Data file merging, Copying
  · Editing
- Data processing capability
  Old runs can be archived so they are not available for collection in Real-Time.
- Electronic signature function
  · Provides support for medical and pharmaceutical manufacturers electronic records, including audit trails, e-signatures and advanced security.
  · Conforms to FDA 21CFR Part 11

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MeasurLink® Evaluation/Analysis Software for Measurement System Analysis (MSA) Gage R&R

The evaluation and analysis software supports measurement system analysis (MSA) required by IATF 16949. It uses a statistical method to analyze variations attributable to differences in accuracy among measuring instruments or operators in order to build an optimum measurement system.

• Automatic calculation of MSA evaluation results

This allows the operator to simply input an evaluation method/evaluation condition and measurement data with the Wizard function. The operator can implement MSA evaluation simply by selecting an "investigation type option", "Measuring instrument option", "data input source option", "parameter option", etc.

Investigation type options　Parameter options　Overview

• Evaluation method compliant with MSA (fourth edition)

The software can implement evaluation using the following methods.

1) Measurement value tolerance Gage R&R variance analysis method
2) Measurement value tolerance Gage R&R range & average method
3) Measurement value branching Gage R&R variance analysis method
4) Measurement value branching Gage R&R average & range method
5) Measurement value range method
6) Measurement value simplified method
7) Measurement value MSA4
8) Deviation
9) Linearity
10) Stability

• Analysis chart view

Various charts such as the control chart are effective for analysis/judgment on variations due to operator, the adequacy of gage accuracy, etc., and remedies for problems.

• Registration of gage-specific information

1. Registration of information on gages within the system

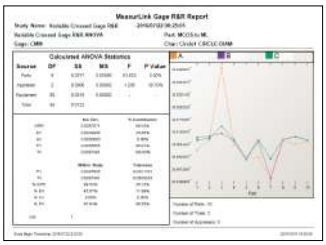
This allows registration of gage information on the following items and association with evaluated results.
Registration items: Gage name, maker, model, resolution, unit, measuring range, etc.

2. Information link between MeasurLink® Gage Management and this software

This software can use measuring instruments information that has been registered in **Gage Management** directly as options.
Additionally, **Gage R&R** evaluation results are reflected in the measuring instruments information, which means the expiry dates determined by **Gage R&R** can be managed by **Gage Management** as well.

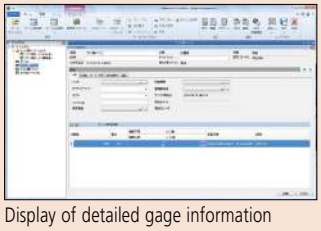
• Output of results as a report

Evaluated results and charts can be printed as a report.



• Confirmation of detailed gage information

Allows confirmation of detailed information on individual gages. The software allows you to display a list of gages depending on "Calibration Overdue", "Next Month Due", etc., by setting a calibration date and confirm detailed information on the calibration history of gages.



Display of detailed gage information

Display of gages listed depending on calibration date

Display of calibration history

MeasurLink® Gage Management Software Gage Management

This software can help you plan and implement a reliable calibration schedule with a powerful retrieval function in addition to recording and controlling the status of measuring instruments. Measuring instrument information can be viewed from any networked terminal on which **Gage Management** is installed since the information is centrally managed in a database. Measuring instruments information can be shared between software packages linked to **Gage R&R**.

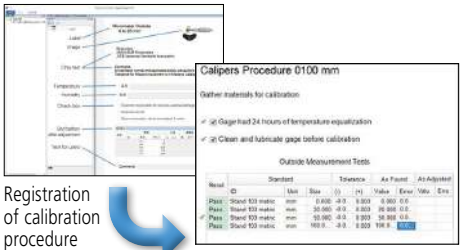
• Creation of a list of calibration-targeted gages from the gage management table

The target gages are retrieved from a variety of search items such as gage ID, gage type, model, maker, distributor, calibration date, current usage state and location to create the list.

Gage management table

• Registration and running a calibration procedure

Allows simple registration of the calibration procedure for each measuring instruments and implementation of the calibration.



Registration of calibration procedure　Calibration run

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10

Portable Surface Roughness Testers

Toolmakers' Microscopes

Hardness Testers

MeasurLink® ENABLED
Data Management Software by Mitutoyo

Measurement Data Network System

MeasurLink® is a measurement data management system based on databases (SQL Server). You can build a network to manage the measurement results and measuring instruments simply by combining the required functions.

MeasurLink® is a registered trademark of Mitutoyo Corporation in Japan and Mitutoyo America Corporation in the United States.

PROPRIETARY INSPECTION CERTIFICATE

Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

SJ-210 Series

SJ-310 Series

Toolmakers' Microscopes TM Series
TM-505B

Rebound Type Portable Hardness Tester
HH-411

Durometers for Sponge, Rubber and Plastics
HH-300

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Portable Surface Roughness Testers

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Toolmakers' Microscopes

Toolmakers' Microscopes **TM-505B**/**TM-1005B** 10-7

Hardness Testers

Rebound Type Portable Hardness Tester **HH-411** 10-8
Durometers for Sponge, Rubber and Plastics **HH-300** 10-9

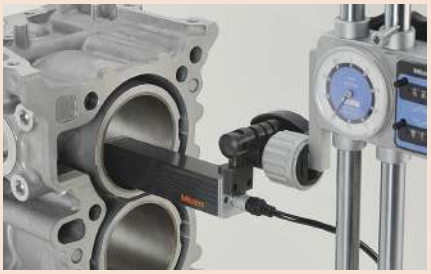
MeasurLink® ENABLED
Data Management Software by Mitutoyo

Portable Surface Roughness Tester Surftest SJ-210 SERIES 178

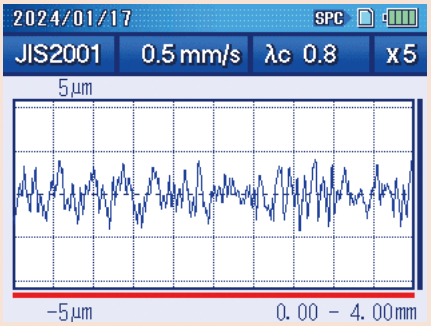
Enhancing your manufacturing with unparalleled performance

- Compact body to carry around or use on-site.
- It can be connected to a PC for greater convenience.
  <Simplified communication program>
- Human error, such as failure to save data and unintended deletion, can be prevented.
- Reliable measurements by contact detection with a visual display of contact status.
- Stabilizer helps eliminate erroneous measurements.

Measuring by monitoring the waveform in real time.



Can be combined with height gage for easy positioning.



Waveform display for checking scuffmarks and surface texture.

SPECIFICATIONS

Model			Standard drive unit		Retractable drive unit		Transverse tracing drive unit	
			SJ-210 (0.75 mN type)	**SJ-210** (4 mN type)	**SJ-210** (0.75 mN type)	**SJ-210** (4 mN type)	**SJ-210** (0.75 mN type)	**SJ-210** (4 mN type)
Code No.		mm	**178-560-11**	**178-560-12**	**178-562-11**	**178-562-12**	**178-564-11**	**178-564-12**
		inch/mm	**178-561-11**	**178-561-12**	**178-563-11**	**178-563-12**	**178-565-11**	**178-565-12**
Measuring range	X axis		16.0 mm				5.6 mm	
	Detector	Range	360 µm (-200 µm to +160 µm)					
		Range/Resolution	360 µm/0.02 µm, 100 µm/0.006 µm, 25 µm/0.002 µm					
Measuring force/Stylus tip shape			Depends on the code number: 0.75 mN/2 µmR 60° (when the code number ends with "**-11**") 4 mN/5 µmR 90° (when the code number ends with "**-12**")					
Applicable standards			JIS B 0601:2001, JIS B 0601:1994, JIS B 0601:1982, VDA, ISO:1997, ANSI					
Assessed profiles			Primary profile, Roughness profile, DF profile, Roughness motif profile					
Parameters			Ra, Ry, Rz, Rq, Rt, Rmax*1, Rp, Rv, R3z, Rsk, Rku, Rc, RPc, Rsm, Rz1max*2, S, HSC, RzJIS*3, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), RδC, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Rpm, tp*4, Htp*4, R, Rx, AR, Possible Customize					
Analysis graphs			Bearning area curve, Amplitude distribution curve					
Filters			Gaussian, 2CR75, PC75					
Cut-off length		λc	0.08, 0.25, 0.8, 2.5 mm					
		λs*5	2.5, 8 µm					
Sampling length			0.08, 0.25, 0.8, 2.5 mm					
Number of sampling lengths			×1, ×2, ×3, ×4, ×5, ×6, ×7, ×8, ×9, ×10, arbitrary length (0.3 to 16.0 mm: 0.01 mm interval)				×1, ×2, ×3, ×4, ×5, ×6, ×7, ×8, ×9, ×10, arbitrary length (0.3 to 5.6 mm: 0.01 mm interval)	
Functions	GO/NG judgment*6		By max value/16%/Standard deviation					

*1 Calculation is available only when selecting the VDA, ANSI, or JIS '82 standard.
*2 Calculation is available only when selecting the ISO '97 standard.
*3 Calculation is available only when selecting the JIS '01 standard.
*4 Calculation is available only when selecting the ANSI standard.
*5 Not available when selecting the JIS '82 standard.
*6 Standard deviation only can be selected in ANSI. 16% rule cannot be selected in VDA.

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MeasurLink® ENABLED
Data Management Software by Mitutoyo

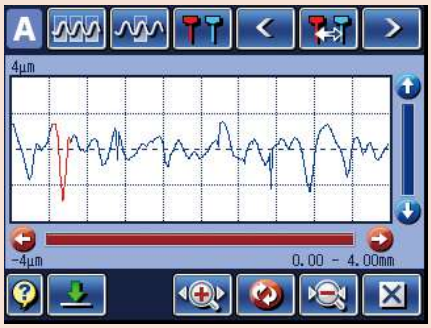
Portable Surface Roughness Tester Surftest SJ-310 SERIES 178

Advanced portable model with a built-in printer allows various kinds of measurement and analysis functions

- Great visibility makes measurement easier. <Large 5.7-inch color graphic LCD touch panel>
- The high-speed printer can output measurement results anywhere, anytime.
- It can be connected to a PC for greater convenience. <Simplified communication program>
- The simultaneous two-profile assessment function enables advanced utilization of measurement data.
- The delete function can expand the range of data utilization.
- Up to three parameters and 300 statistical measurements are supported.

Easy to carry and has a built-in printer for on-site printing.

Easy-to-operate touch panel.



The delete function can expand the range of data utilization.

SPECIFICATIONS

Model			Standard drive unit		Retractable drive unit		Transverse tracing drive unit	
			SJ-310 (0.75 mN type)	**SJ-310** (4 mN type)	**SJ-310** (0.75 mN type)	**SJ-310** (4 mN type)	**SJ-310** (0.75 mN type)	**SJ-310** (4 mN type)
Code No.		mm	**178-570-21**	**178-570-22**	**178-572-21**	**178-572-22**	**178-574-21**	**178-574-22**
		inch/mm	**178-571-21**	**178-571-22**	**178-573-21**	**178-573-22**	**178-575-21**	**178-575-22**
Measuring range	X axis		16.0 mm				5.6 mm	
	Detector	Range	360 µm (-200 µm to +160 µm)					
		Range/ Resolution	360 µm/0.02 µm, 100 µm/0.006 µm, 25 µm/0.002 µm					
Measuring force/Stylus tip shape			Depends on the code number: 0.75 mN/2 µmR 60° (when the code number ends with "**-21**") 4 mN/5 µmR 90° (when the code number ends with "**-22**")					
Applicable standards			JIS B 0601:2001, JIS B 0601:1994, JIS B 0601:1982, VDA, ISO:1997, ANSI					
Assessed profiles			Primary profile, Roughness profile, DF profile, Roughness motif profile, Waviness motif profile					
Parameters			Ra, Ry, Rz, Rq, Rt, Rmax*1, Rp, Rv, R3z, Rsk, Rku, Rc, RPc, Rsm, Rz1max*2, S, HSC, RzJIS*3, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, λa, λq, L0, Rpm, tp*4, Htp*4, R, Rx, AR, W, AW, Wx, Wte, Possible Customize					
Analysis graphs			Bearning area curve, Amplitude distribution curve					
Filters			Gaussian, 2CR75, PC75					
Cut-off length		λc	0.08, 0.25, 0.8, 2.5, 8 mm					
		λs*5	2.5, 8 µm					
Sampling length			0.08, 0.25, 0.8, 2.5, 8 mm					
Number of sampling lengths			×1, ×2, ×3, ×4, ×5, ×6, ×7, ×8, ×9, ×10, Arbitrary (0.3 to 16.0 mm: 0.01 mm Interval)				×1, ×2, ×3, ×4, ×5, ×6, ×7, ×8, ×9, ×10, Arbitrary (0.3 to 5.6 mm: 0.01 mm Interval)	
Functions	GO/NG judgment*6		Max rule/16% rule/Average rule/Standard deviation (1σ, 2σ, 3σ)					

*1 Calculation is available only when selecting the VDA, ANSI, or JIS '82 standard.
*2 Calculation is available only when selecting the ISO '97 standard.
*3 Calculation is available only when selecting the JIS '01 standard.
*4 Calculation is available only when selecting the ANSI standard.
*5 Not available when selecting the JIS '82 standard.
*6 Standard deviation only can be selected in ANSI.16% rule cannot be selected in VDA.

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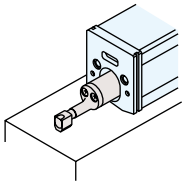
Optional Accessories for Surftest SJ-210/310

Detector

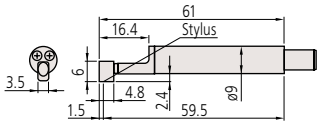
Unit: mm

• Standard detectors

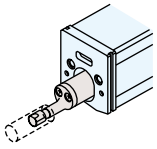


Code No.	Measuring force	Stylus profiles*	Remarks
178-296	0.75 mN	2 µmR/60°	Dedicated to the standard / retractable drive unit
178-390	4 mN	5 µmR/90°	
178-387	0.75 mN	2 µmR/60°	Dedicated to the transverse tracing drive unit
178-386	4 mN	5 µmR/90°	
178-391		10 µmR/90°	Dedicated to the standard / retractable drive unit

*Tip radius/Tip angles

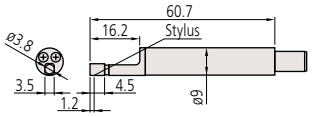


• Small hole detectors

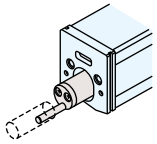


Code No.	Measuring force	Stylus profiles*	Remarks
178-383	0.75 mN	2 µmR/60°	Minimum measurable hole diameter: ø4.5 mm
178-392	4 mN	5 µmR/90°	

*Tip radius/Tip angles

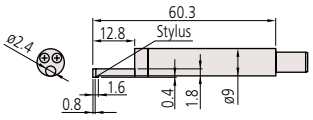


• Extra small hole detectors

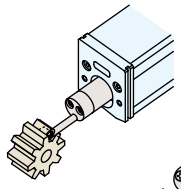


Code No.	Measuring force	Stylus profiles*	Remarks
178-384	0.75 mN	2 µmR/60°	Minimum measurable hole diameter: ø2.8 mm
178-393	4 mN	5 µmR/90°	

*Tip radius/Tip angles

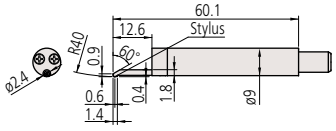


• Gear-tooth surface detectors

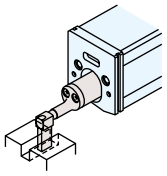


Code No.	Measuring force	Stylus profiles*
178-388	0.75 mN	2 µmR/60°
178-398	4 mN	5 µmR/60°

*Tip radius/Tip angles

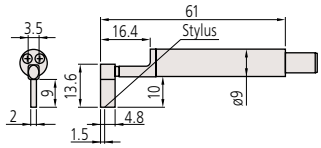


• Deep groove detectors



Code No.	Measuring force	Stylus profiles*	Remarks
178-385	0.75 mN	2 µmR/60°	Not available for the transverse tracing drive unit
178-394	4 mN	5 µmR/90°	

*Tip radius/Tip angles



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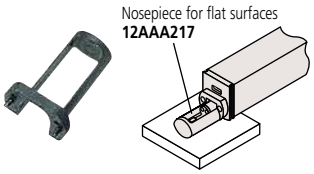
Mounting example

Optional Accessories for Drive Units

•Nosepiece for flat surfaces

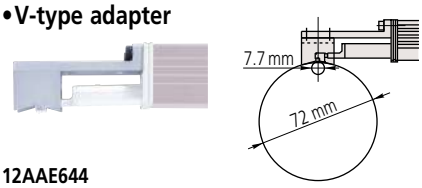


12AAA217
- **SJ-310** standard accessory for standard/detector retracting type. (not for transverse tracing type)

•Nosepiece for cylindrical surfaces

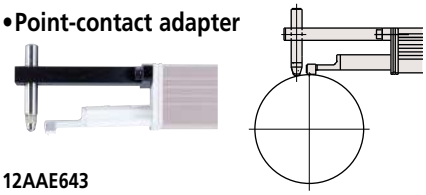
12AAA218
- **SJ-310** standard accessory for standard/detector retracting type. (not for transverse tracing type)

•V-type adapter



12AAE644
- **SJ-210**/**SJ-310** Transverse tracing type standard accessory.
- Dedicated to the transverse tracing type.

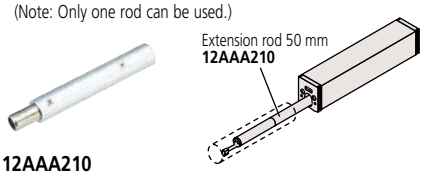
•Point-contact adapter



12AAE643
- **SJ-210**/**SJ-310** Transverse tracing type standard accessory.
- Dedicated to the transverse tracing type.

•Extension rod (50 mm)

(Note: Only one rod can be used.)



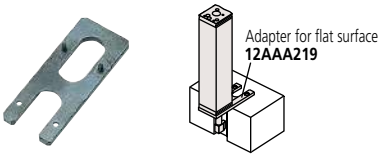
12AAA210
- Not for transverse tracing type.
- Not applicable to upward measurement.

•Extension cable (1 m)

(Note: Only one rod can be used.)

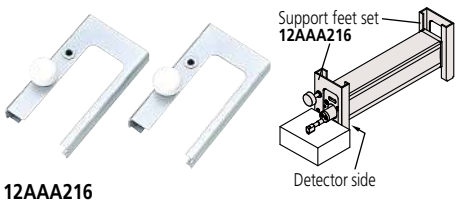
12BAA303
- For the connection between the calculation display unit and drive unit.

•Adapter for flat surface



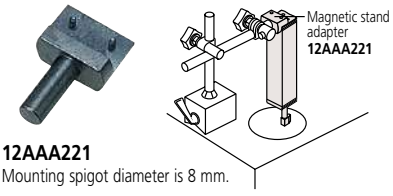
12AAA219
- Not for transverse tracing type.

•Support feet set



12AAA216
- **SJ-310** standard accessory for standard/detector retracting type. (not for transverse tracing type)
- Adjustment range is 28 mm from bottom face.

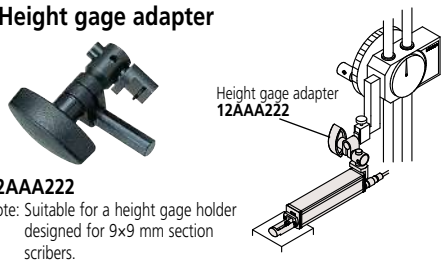
•Magnetic stand adapter



12AAA221
Mounting spigot diameter is 8 mm.

12AAA220
Mounting spigot diameter is 9.5 mm.

•Height gage adapter



12AAA222
Note: Suitable for a height gage holder designed for 9×9 mm section scribers.

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Mitutoyo

MeasurLink® ENABLED
Data Management Software by Mitutoyo

TM
SERIES 176 — Toolmakers' Microscopes

- Compact universal toolmakers' microscope that can be installed on any site.
- The newly designed LED light ensures clear observation. It also provides excellent color reproduction.
- Attaching an optional circular LED light expands the range of observation.
- **TM-505B** achieves a maximum measuring height of 115 mm despite the compact size.
- Digimatic micrometer head (**164-163**, **164-164**, optional) makes measurement easy and precise.

TM-505B

Note: Micrometer heads are optional.

Angle Index (Standard Accessory)

SPECIFICATIONS

Model		TM-505B	TM-1005B
Code No.		176-818-11	176-819-11
Optical tube		Monocular type (Vertical tilt angle: 30°)	
Observation image		Erect	
Eyepiece protractor		Resolution (graduation): 1°, Rotation angle: 360°, Resolution (angle): 6', Adjustable zero point	
Eyepiece		Standard accessory: 15X (field number: 13), Options: 10X, 20X	
Objective		Standard accessory: 2X, Optional: 5X, 10X	
Microscope head	Maximum height of workpiece	115 mm	107 mm
	Focusing method	Manual (Coarse feed)	
Illumination unit	Transmitted illumination	Stepless brightness adjustment, White LED light source with green filter	
	Reflected illumination	Oblique single-source type, Stepless brightness adjustment, White LED light source	
Cross-travel stage	Measuring range	50×50 mm	100×50 mm (An optional 50 mm gauge block is required to cover full range. A CERA block is recommended.)
	Table size	152×152 mm	240×152 mm
	Usable area of the stage glass	96×96 mm	154×96 mm
	Maximum stage glass loading	5 kg	
Linear measurement method		Micrometer head*	
Resolution		Depends on the micrometer head specifications* **164-163** (mm): 0.001 mm or **164-164** (inch/mm): 0.00005 in/0.001 mm	
Micrometer head travel range		**164-163** (mm): 50 mm or **164-164** (inch/mm): 2 in/50 mm	
Power source		AC100 to 240 V 50/60 Hz Maximum power consumption: 4.2 W	
Mass		14 kg	15 kg

* Micrometer heads are optional for **TM-505B** and **TM-1005B**.

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HARDMATIC HH-411
SERIES 810 — Rebound Type Portable Hardness Tester

- Excellent operability that performs hardness tests with the touch of a key and a compact body allows users to measure hardness in the field. This instrument is best suited for on-site hardness tests such as large molds, railroad track, and welded spots in structures.

SPECIFICATIONS

Code No.	810-299-21	810-298-21
Model	HH-411	
Hardness display range	Leeb hardness: 1 to 999 HL	
Display range*1 (This display range varies depending on the conversion table used.)	Vickers hardness: 43 to 950 HV Brinell hardness: 20 to 896 HB Rockwell hardness (C scale): 19.3 to 68.2 HRC Rockwell hardness (B scale): 13.5 to 101.7 HRB	Shore hardness: 30.1 to 99.5 HS (ASTM) 13.2 to 98.6 HS (JIS) Tensile strength: 499 to 1999 MPa
Shore hardness (HS) conversion	VHS (JIS B7731)	HSD
Detector	Impact hammer with integrated detector and carbide-ball tip (D type)	
Display	7-segment LCD	
Specimen requirements	Test points: At least 5 mm from specimen edges and at intervals of at least 3 mm Min. thickness: 5 mm; mass: 5 kg or more (However, specimens with a mass between 0.1 and 5 kg can be tested if fixed to a strong support.)	
Power source	Alkaline AA battery (2 pcs.)*2 or optional AC adapter (battery life: 70 hours)	
External dimensions/Mass	Detector: ø28×175 mm in length, 120 g Display (W×D×H): 70×35×110 mm, 200 g	

*1 For **HH-411**, display values are guaranteed based on Leeb hardness. Converted values are for reference only.
*2 Alkaline AA batteries are not included as standard. Please use commercially available batteries.

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Data Management Software by Mitutoyo

HARDMATIC HH-300
SERIES 811 — Durometers for Sponge, Rubber and Plastics

- These are available in two types: a compact type that can fit in the palm of your hand, and a long type with a slim, easy-to-hold stem. Both are available with an analog or digital indicator.

Compact type

811-330-10 HH-330
811-336-10 HH-336
811-338-10 HH-338

Long type

811-332-10 HH-332
811-334-10 HH-334

SPECIFICATIONS

Code No.		811-330-10	811-332-10	811-334-10
Model		HH-330	HH-332	HH-334
Type		Compact	Long	
Display specification		Digital		
Measurement target		Soft rubber, sponge, felt, hard film, fabric	General rubber, soft plastic	Hard rubber, hard plastic, ebonite
Category in standards		Type E	Type A	Type D
Needle shape	Shaft diameter	ø5 mm	ø1.25 mm	
	Tip shape	Semi-sphere	Circular truncated cone	Cone
	Tip angle	—	35°	30°
	Tip diameter		ø0.79 mm	—
	Tip curvature		—	0.1 mm
Power source		SR44 battery (1 pc.), **938882** included as standard (for operational checks)		
External dimensions (W×D×H)		59×40×147 mm	59×41×190 mm	
Mass		290 g	310 g	

Code No.		811-336-10	811-336-11	811-338-10	811-338-11
Model		HH-336	HH-336-01	HH-338	HH-338-01
Type		Compact			
Display specification		Digital			
Measurement target		General rubber, soft plastic		Hard rubber, hard plastic, ebonite	
Category in standards		Type A		Type D	
Needle shape	Shaft diameter	ø1.25 mm			
	Tip shape	Circular truncated cone		Cone	
	Tip angle	35°		30°	
	Tip diameter	ø0.79 mm		—	
	Tip curvature	—		0.1 mm	
Power source		SR44 battery (1 pc.), **938882** included as standard (for operational checks)			
External dimensions (W×D×H)		59×40×147 mm			
Mass		290 g			

Optional Accessories for Dual-purpose Stand CTS Series

Code No.	811-019	811-012	811-013
Model	CTS-101	CTS-102	CTS-103
Applicable models	HH-332	HH-334/338/338-01	HH-336/336-01

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- Hardness measurements by a durometer are performed by simply holding the instrument against the surface of a specimen and reading the indicated value.
- This type of hardness tester is most widely used for hardness testing of sponge, rubber, plastics and other soft materials.

Compact type

811-329-10 HH-329
811-335-10 HH-335
811-337-10 HH-337

Long type

811-331-10 HH-331
811-333-10 HH-333

SPECIFICATIONS

Code No.		811-329-10	811-331-10	811-333-10
Model		HH-329	HH-331	HH-333
Type		Compact	Long	
Display specification		Analog		
Measurement target		Soft rubber, sponge, felt, hard film, fabric	General rubber, soft plastic	Hard rubber, hard plastic, ebonite
Category in standards		Type E	Type A	Type D
Needle shape	Shaft diameter	ø5 mm	ø1.25 mm	
	Tip shape	Semi-sphere	Circular truncated cone	Cone
	Tip angle	—	35°	30°
	Tip diameter		ø0.79 mm	—
	Tip curvature		—	0.1 mm
External dimensions (W×D×H)		68×34×146 mm	68×35×188 mm	
Mass		300 g	320 g	

Code No.		811-335-10	811-335-11	811-337-10	811-337-11
Model		HH-335	HH-335-01	HH-337	HH-337-01
Type		Compact			
Display specification		Analog			
Measurement target		General rubber, soft plastic		Hard rubber, hard plastic, ebonite	
Category in standards		Type A		Type D	
Needle shape	Shaft diameter	ø1.25 mm			
	Tip shape	Circular truncated cone		Cone	
	Tip angle	35°		30°	
	Tip diameter	ø0.79 mm		—	
	Tip curvature	—		0.1 mm	
External dimensions (W×D×H)		68×34×146 mm			
Mass		300 g			

Optional Accessories for Dual-purpose Stand CTS Series

Code No.	811-019	811-012	811-013
Model	CTS-101	CTS-102	CTS-103
Applicable models	HH-331	HH-333/337/337-01	HH-335/335-01

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11

Sensors and Embedded Equipment

IP67 G

IP Codes

The code indicates the degree of protection against the ingress of foreign materials and water as defined in the IEC standard (IEC 60529). The number indicates the protection level.
(Refer to page 3)

Contact Sensors (Linear Gage)

Litematic

Laser Scan Micrometers

Non-contact Line-laser Sensor

NC Linear Scale (Linear Encoder)

Digital Readout System (DRO)

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Contact Sensors

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Video

Sensors and Embedded Equipment

Mitutoyo offers a variety of contact sensors that can accurately measure not only the movement amount of equipment but also the dimensions of workpieces to be measured, as well as non-contact sensors that can accurately measure the outlines and clearances of cylinders, surface texture of workpieces, etc.

Product catalog
E13022

Contact Sensors (Linear Gage)

A wide range of products are available to best suit your measurement needs, including space-saving, environment resistant, cost, and accuracy. They can help you build an optimized production environment.

Phase-A/B IP67 G

Environment-resistant Linear Gage (Slim type)

LG200

The vibration/shock resistance of the **LG100** Series is delivered in a slimmer body. Approximately 1/5 cross section compared with **LG100**.

- Measuring range: 10 mm
- Resolution: 1 µm/0.5 µm/0.1 µm

Video

Phase-A/B/Z With origin point mark IP67 G

Environment-resistant, Linear Gage

LG100

High-accuracy gage head suitable for in-line and in-laboratory use. Assures the repeatability (2 σ) of 0.3 µm and the narrow range accuracy of 0.5 µm (arbitrary 20 µm range).

- Measuring range: 10 mm/25 mm/50 mm
- Resolution: 1 µm/0.5 µm/0.1 µm

Video

Digimatic IP66

ABSOLUTE Digimatic Linear Gage

LGS-1012P

ABSOLUTE electrostatic capacitance type encoder makes it possible to maintain the reference point even when the power is switched off.

- Measuring range: 12.7 mm
- Resolution: 10 µm

High-accuracy/resolution Linear Gage

LGH

This series has achieved very high accuracy combined with a resolution of 0.01/0.005 µm (according to model), practically equivalent to that of a laser interferometer, and a wide measuring range of 10 mm.

- Measuring range: 10 mm
- Resolution: 0.01 µm/0.005 µm

Contact Sensors (Linear Gage Counter)

A wide range of products are available to best suit your measurement needs, including space-saving, environment resistant, cost, and accuracy. They can help you build an optimized production environment.

Linear Gage Counter (Display Unit)

EJ-102N/NE Counter and Interface Unit

This is a compact counter for linear gages and industrial interface units.

Product catalog
E13022

Linear Gage Counter (Display Unit)

EH Counter

Two types are available for this model: a 1-axis display and a 2-axis display, both of which enable addition or subtraction calculations between two gages.

Product catalog
E13022

Linear Gage Counter (Display Unit)

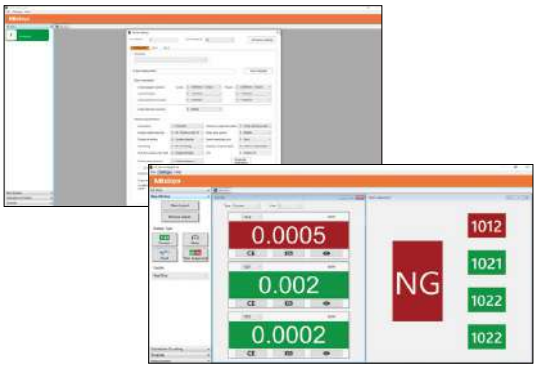
EC Counter

This Digimatic display can be connected to Linear gages with Digimatic output (**LGS**).

Product catalog
E13022

Contact Sensors (Linear Gage Software)

A wide range of products are available to best suit your measurement needs, including space-saving, environment resistant, cost, and accuracy. They can help you build an optimized production environment.



Application Software

LG QuickSetupTool

LG QuickSetupTool is a free software tool for use with the **EJ** counter when connected via the optional USB interface. All kinds of settings normally carried out with counter operating keys now can be easily applied from a computer.

Measurement Data Loading Software

SENSORPAK

This software facilitates loading measurement data onto a personal computer from a linear gage counter with RS-232C/USB output (**EH Counter**), or from a Litematic display (**VL**).

Product catalog
E13022

High-accuracy/resolution Measuring Machine Litematic

These high-resolution Digimatic measuring units can accurately measure the thickness and height of workpieces that are susceptible to a measuring force.

High-accuracy/resolution Measuring Machine Litematic

VL-50-B/50S-B

Features low and constant measuring force suitable for measuring high-precision parts and easily deformed workpieces such as functional thin films. Measuring force can be selected from 0.01 N, 0.15 N and 1.0 N.

- Measuring range: 50 mm
- Resolution: 1.0 µm/0.1 µm/0.01 µm (selectable)

Product catalog
E13022

Non-contact Line-laser Sensor

Non-contact Line-laser Sensor

SurfaceMeasure1008S

This line-laser sensor combines the optical technology and sensor technology of Mitutoyo.

- Maximum measuring width: 100 mm
- Measuring range: 80 mm
- Z-axis repeatability: 0.5 µm

Product catalog
E13023

Non-contact Line-laser Sensor

SurfaceMeasure0303S

This line-laser sensor combines the optical technology and sensor technology of Mitutoyo.

- Maximum measuring width: 32.5 mm
- Measuring range: 25 mm
- Z-axis repeatability: 0.4 µm

Product catalog
E13023

Master2410

Optional Accessory

Sensor Networking Hub Master

In the multi-sensor system, this device is used for distributing power to sensors and synchronizing the sensors.

Optional Accessory

GoMax NX

A calculation unit that accelerates measurement processing without using a PC.

Non-contact Line-laser Sensor

Optional Accessory

Master Cable

Cable for the connection between sensor and Master.

Optional Accessory

Power and Ethernet Cable

Cable to supply and control power without using the Master for the sensor.

Optional Accessory

I/O Cable

Cable to connect the external I/O device to the sensor.

Product catalog
E13024

High-accuracy Non-contact In-line Measuring System/Laser Scan Micrometers

These instruments feature extremely high-speed measurement capabilities thanks to an ultra-high-precision scan motor. They can also meet high-precision needs such as linearity precision.

IP67

Measuring Unit

LSM-02-A

LSM sensor developed for in-line and automated equipment.

- Measuring range: 0.005 mm to 2 mm
- Guaranteed repeatability (2 σ): ±0.015 µm (ø1 mm)
- Guaranteed linearity: ±0.3 µm
- Scanning rate: 3,200 scans/s

IP67

Measuring Unit

LSM-30-A

LSM sensor developed for in-line and automated equipment.

- Measuring range: 0.3 mm to 30 mm
- Guaranteed repeatability (2 σ): ±0.06 µm (ø10 mm)
- Guaranteed linearity: ±1.0 µm
- Scanning rate: 3,200 scans/s

Controller for LSM Developed for In-line and Automated Equipment

LSM-CU-A

- Can be connected to **LSM-02-A**/**LSM-30-A**.
- Compact, thin design that fits in a distribution board or inside equipment.
- Easily mountable on a DIN rail without the need for tools.
- USB Type-C, I/O ports, and industrial interfaces (optional).
- Configuration software included as standard for easy configuration.

Interface Unit

I/F Module

Four types of interfaces are available so you can select the right one to meet your production line requirements.
The controller design enables insertion of a module without changing the layout.

Product catalog
E13024

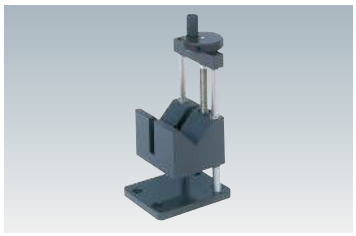
High-accuracy Non-contact In-line Measuring System/Laser Scan Micrometers

These instruments feature extremely high-speed measurement capabilities thanks to an ultra-high-precision scan motor. They can also meet high-precision needs such as linearity precision.

Optional Accessory

Standard Calibration Gage Set

Standard calibration gage set suitable for calibration of Laser Scan Micrometers.



Optional Accessory

Workstage

Easy set-up and height adjustment enables high-precision measurement.
Applicable model: **LSM-30-A**

Optional Accessory

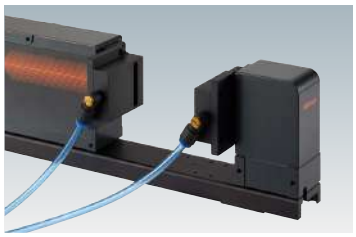
Adjustable Workstage

Vertical/horizontal slide mechanism enables easy measurement of various workpiece diameters.
Applicable model: **LSM-30-A**

Optional Accessory

Wire Guiding Pulley

Used for supporting measurement of outside diameter of fine wire-like materials such as magnetic wire or fiber.
Applicable model: **LSM-02-A**



Optional Accessory

Air Shield

Air blows from the air outlet installed on the laser section to clear dust adhering to the laser window.
Applicable model: **LSM-30-A**

Optional Accessory

Laser Beam Stabilization Shield

This suppresses variation of measured values caused by spatial fluctuation of the measurement environment.
Applicable model: **LSM-30-A**

Optional Accessory

Extension Signal Cable/ Extension Relay Cable

Extension signal cables are necessary when the measuring unit and display unit are separated in operation. Extension relay cables are necessary when the optical section is separated in operation.

NC Linear Scale (Linear Encoder)

The linear encoder detects the amount of linear movement and displacement and can output as digital data. They are useful for positioning and controlling CNC machines, semiconductor manufacturing equipment, inspection equipment, etc.

ABSOLUTE Linear Scale (separate type)

ABS ST700

ABSOLUTE measurement with exposed scales. Non-contact detection is optimal for high speed and high acceleration devices such as linear motors.

- Detection method: Electromagnetic induction
- Maximum effective range: 6000 mm
- Resolution: 0.1 µm
- Maximum response speed: 5000 mm/s

Product catalog
E13005

ABSOLUTE Linear Scale (separate type)

ABS ST1300

The telecentric imaging optical system is used for detecting the position. Outstanding robustness against contamination and GAP allowance compared to earlier optical types. There are three types of attachment methods available according to the application.

- Detection method: Optical
- Maximum effective range: 12000 mm
- Resolution: 0.001 µm
- Maximum response speed: 8000 mm/s

Product catalog
E13005

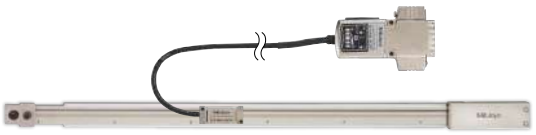
Incremental Linear Scale (separate type)

ST36

A high-accuracy model that outputs a 2-phase sine wave of 4 µm signal period. There are four types of output signal forms selectable for your specifications.

- Detection method: Optical
- Maximum effective range: 3000 mm
- Resolution: 0.01 µm
- Maximum response speed: 1200 mm/s

Product catalog
E13005



Incremental Linear Scale (separate type)

ST46-EZA

Includes an automatic adjustment function for the signal (EZA function) at the push of a button. A wide range of specifications are available to best suit your application(s). With the "setup indicator" installed on the connector shell, adjustment while attached is easy without the need of an oscilloscope or PC.

- Detection method: Optical
- Maximum effective range: 3000 mm
- Resolution: 0.05 µm
- Maximum response speed: 2600 mm/s

Product catalog
E13005

NC Linear Scale (Linear Encoder)

The linear encoder detects the amount of linear movement and displacement and can output as digital data. They are useful for positioning and controlling CNC machines, semiconductor manufacturing equipment, inspection equipment, etc.

ABSOLUTE Linear Scale (assembly type)

ABS AT1300

The telecentric imaging optical system is used for detecting the position. Features outstanding robustness against contamination and scuffing compared to earlier optical types. The best-in-class, smallest resolution of 0.001 µm as an ABSOLUTE scale. Space-saving, slim body.

- Detection method: Optical
- Maximum effective range: 2200 mm
- Resolution: 0.001 µm
- Maximum response speed: 3000 mm/s

Product catalog E13005

ABSOLUTE Linear Scale (assembly type)

ABS AT1100

Electromagnetic induction type with excellent water and oil resistance. Features a structure that can prevent coolant entry and is dust proof as well. This manufacturing site-ready linear scale provides more reliable operation compared with conventional models.

- Detection method: Electromagnetic induction
- Maximum effective range: 3040 mm
- Resolution: 0.05 µm
- Maximum response speed: 3000 mm/s

Product catalog E13005 Video

Incremental Linear Scale (assembly type)

AT211-A, AT211-B

This is a slim, sealed, 2-phase, square-wave scale that can be directly connected to a control unit.

- Detection method: Optical
- Maximum effective range: 1500 mm
- Resolution: 0.1 µm
- Maximum response speed: 2000 mm/s

Product catalog E13005

Digital Readout System (DRO)

The products can be installed on any type of machine tool and increase work efficiency by digitally displaying count values.

Incremental Linear Scale (assembly type)

AT103

A wide choice of measuring range is available in this standard type scale unit. Connectable to the **KA-200** counter or **PSU-200**.

- Detection method: Optical
- Maximum effective range: 6000 mm
- Maximum response speed: 2000 mm/s

Product catalog E13000

Incremental Linear Scale (assembly type)

AT113

Slim spar type with unit sectional dimensions of 22×35 mm. Connectable to the **KA-200** counter or **PSU-200**.

- Detection method: Optical
- Maximum effective range: 1500 mm
- Maximum response speed: 2000 mm/s

Product catalog E13000

IP67

ABSOLUTE Linear Scale (assembly type)

ABS AT715

Electromagnetic induction principle means scales are unaffected by contamination.

- Detection method: Electromagnetic induction
- Maximum effective range: 3000 mm
- Resolution: 1 µm
- Maximum response speed: 833 mm/s

Product catalog E13000

Counter (Display Unit)

KA-200

A high-performance display unit that has special functions for lathes and milling machines as standard.

Product catalog E13000

ABSOLUTE Digimatic Scale Units

The scale units developed from digital callipers can be installed to position a small machine tool, jig, tool, etc.

IP66
Applicable models: **SD-G**

Digimatic Scale Units

SD

SD Series can be easily mounted on jigs, tools, and small machine tools to enable accurate positioning.

- Detection method: Electromagnetic induction, Electrostatic capacitance
- Maximum effective range: 1000 mm
- Resolution: 0.01 mm
- Response speed: Unlimited

Accessories, Options

Various signal controller units and programs for linear gages are available.

Pulse Signal Interface Unit

PSU-200

The **PSU-200**, which can convert a sine wave into a square wave signal and output it, allows the use of a linear gage with a CNC feedback system or measurement control equipment to improve positioning accuracy and resolution.

Product catalog
E13005

Serial Signal Interface Unit

PSU-251/252

PSU-251 Series is a serial signal interface unit for incremental linear scales.

Product catalog
E13005

12

Measuring Equipment

Coordinate Measuring Machines

Vision Measuring Systems

Optical Measuring Instruments

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Mitutoyo

Coordinate Measuring Machines

These coordinate measuring machines help determine spatial coordinates in 3 directions (X, Y and Z) on a workpiece surface to accurately capture the position and shape. Mitutoyo offers a wide range of models and probes to suit your application.

Standard CNC CMM

Suitable for automated measurements of small and medium-sized workpieces. The line-up includes various models that can be installed in temperature-controlled rooms and next to production lines.

Bridge Type Standard CNC CMM

CRYSTA-Apex V500/700/900

Versatile CNC coordinate measuring machines providing high-accuracy, high-speed, and high-acceleration measurements.

$E_{0,MPE}$: 1.7 + 3L/1000 µm*
(L: Measuring length in mm)

Product catalog
E16026

5-axis CNC CMM

A 5-axis CNC CMM is also available for efficient measurement of workpieces that have complex shapes with free-form surfaces.

5-axis CNC CMM

CRYSTA-Apex EX 1200R

A versatile CNC coordinate measuring machine equipped with REVO-2, a 5-axis control-scanning probe head.

$E_{0,MPE}$: 2.9 + 4L/1000 µm*
(L: Measuring length in mm)

Product catalog
E16015

High-accuracy CNC CMM

This brings together our advanced precision measurement technologies. The line-up includes models with high-speed and high-acceleration movements.

High-accuracy CNC CMM

STRATO-Apex 500/700/900

High-accuracy CNC coordinate measuring machines with a first term accuracy specification of 0.7 µm.

$E_{0,MPE}$: 0.7 + 2.5L/1000 µm*
(L: Measuring length in mm)

Product catalog
E16001

High-accuracy CNC CMM

STRATO-Active

Offers both high performance and cost-effective measurements.

$E_{0,MPE}$: 1.2 + 3L/1000 µm*
(L: Measuring length in mm)

Product catalog
E16035

* Specifications vary by configuration, size and thermal environment.

Large-sized CNC CMM

The line-up includes models that can measure large workpieces such as car bodies and large structures.

Ultra-high Accuracy CNC CMM

LEGEX 500/700/900 Takumi Model*2

Ultra-high accuracy CNC coordinate measuring machines, boasting best-in-class accuracy (the first term accuracy specification of 0.23 µm), created by thoroughly eliminating error factors and providing excellent straightness and perpendicularity through sophisticated techniques by qualified artisans.

$E_{0,MPE}$: 0.23 + L/1000 µm*1
(L: Measuring length in mm)

*2 Takumi is a Japanese word meaning "artisan" with superb craftsmanship.

Product catalog E16012

Bridge Type Standard CNC CMM

CRYSTA-Apex V1200/1600/2000
STRATO-Apex 1600/2000

Large CNC coordinate measuring machines developed to facilitate quality evaluation and assembly of large workpieces.

$E_{0,MPE}$: 2.3 + 3L/1000 µm*1
$E_{0,MPE}$: 2.5 + 4L/1000 µm*1
(L: Measuring length in mm)

Product catalog E16026

Product catalog E16001

Gantry Type High-accuracy CNC CMM

STRATO-Apex G

A CNC coordinate measuring machine with a moving bridge and installation base designed to provide high-accuracy measurement of large and heavy workpieces.

Horizontal Arm Type CNC CMM for Automobile Bodies

CARBstrato

The **CARBstrato** Series is a large CNC CMM and offers the world's largest class measurement range, making it possible to measure car bodies.

*1 Specifications vary by configuration, size and thermal environment.

Shop-floor/In-line Use Models

The machines can be installed in-line or next to a production line to detect nonconforming products early on. They can reduce risks in the manufacturing process and improve productivity.

Shop-floor Type CNC CMM

MiSTAR 555

Designed for use on any size shop floor.

$E_{0,MPE}$: 2.2 + 3L/1000 µm*
(L: Measuring length in mm)

Product catalog E16028 Video

In-line CNC CMM

MACH-V 9106

The CNC coordinate measuring machine for in-line use provides high acceleration and high-speed movement to enable high-throughput measurements.

$E_{0,MPE}$: 2.5 + 3.5L/1000 µm*
(L: Measuring length in mm)

Product catalog E16010

In-line, Horizontal CNC CMM

MACH-3A 653

A horizontal CNC coordinate measuring machine for in-line use that can not only save space but also increase throughput with high acceleration, high-speed movement, and high-speed measurement. An optional index table allows more flexible measurements.

$E_{0,MPE}$: 2.2 + 3.5L/1000 µm*
(L: Measuring length in mm)

Product catalog E16010

Compact In-line CNC CMM

MACH Ko-ga-me

A standalone CNC CMM measuring head can also be integrated with a single- or multi-axis machine to create a system to measure larger workpieces.

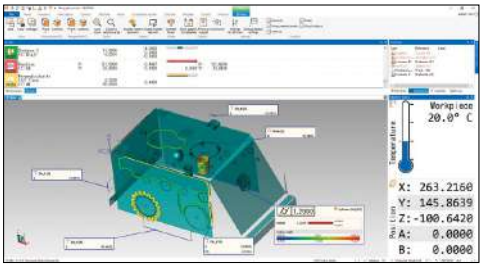
$E_{0,MPE}$: 2.4 + 5.7L/1000 µm*
(L: Measuring length in mm)

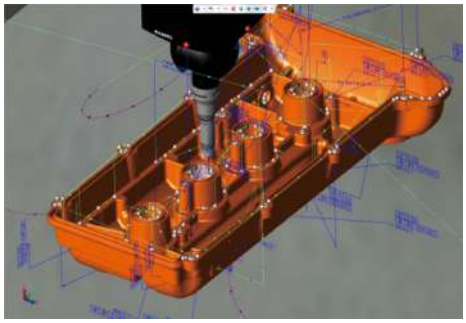
Product catalog E16010

* Specifications vary by configuration, size and thermal environment.

Software

The line-up includes different types of dedicated software for evaluation and processing of data measured by coordinate measuring machines.





Data Processing Software

MCOSMOS

The software package includes data processing programs for coordinate measuring machines. Features a wealth of functions for connecting to 3D CAD models.

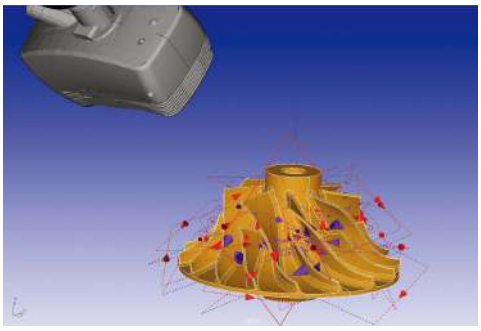
Product catalog
E16008

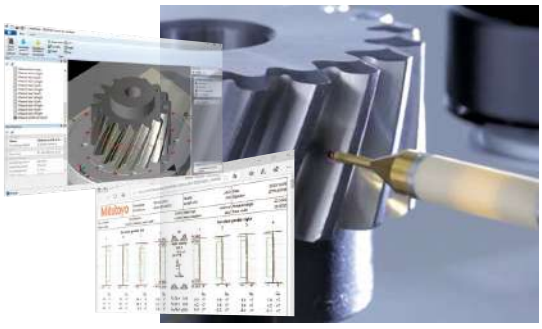
Automatic Measurement Program Generation Software

MiCAT Planner

The software is designed to import 3D CAD models and automatically complete high-quality measurement programs with one click. Time needed to create a measurement program can be greatly reduced.

Product catalog
E16019





Point Cloud Data Measurement Software

MSURF

With **SurfaceMeasure**, a non-contact line laser probe, the software can capture workpiece surface points and execute data analysis and evaluation. Linked with **MCOSMOS**, it can execute fully automatic contact and non-contact measurements.

Product catalog
E16005

Gear Measurement Evaluation Software

GEARPAK Express

Evaluation of tooth profile deviations, measurements, and evaluations of face widths, cylindrical shafts, keyways, etc. can be performed in a single program.

Video

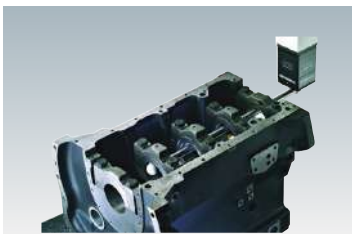
Probes

Various contact and non-contact probing systems are available to measure a wide range of workpieces.

Compact High-accuracy Scanning Probe

SP25M

A compact high-accuracy scanning probe that can be automatically adjusted in orientation.



High-accuracy Scanning Probe

SP80

A high-accuracy scanning probe usable with a long stylus.

High-accuracy and Low Measuring Force Scanning Probe

MPP-310Q

A high-accuracy scanning probe suitable for center alignment measurements and clamped workpiece scanning.

Non-contact Line-laser Probe

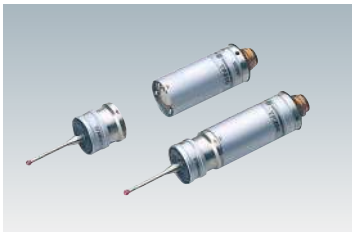
SurfaceMeasure

A non-contact line-laser probe that can collect a large volume of 3D profile data from a workpiece surface.

Vision Probe

QVP

Useful for vision measurements of a large and heavy workpiece that cannot be placed on a vision measuring system.



Compact High-accuracy Touch-trigger Probe

TP200

A high-accuracy touch-trigger probe is capable of changing styli automatically.

Roughness Probe

SURFTEST PROBE

A probe for surface roughness measurement.

5-axis Control Touch-trigger Probe Head

PH20

A 5-axis control touch-trigger probe head without limitations in the probe orientation angle.

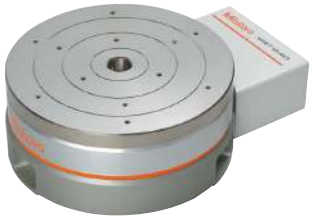
Motorized Probe Head

PH10MQ

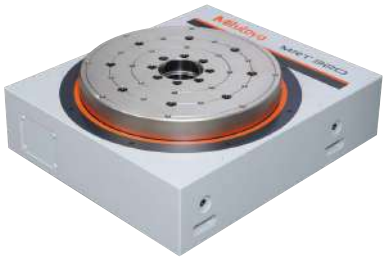
This probe head allows automatic control of positioning (up to 720 directions) of the mounted probe. It is possible to mount **SP25M**, **SurfaceMeasure**, **QVP**, **TP200**, and **SURFTEST** probes to this probe head.

Options

Various options for easier and more efficient measurement with coordinate-measuring machines are available.



MRT240



MRT320

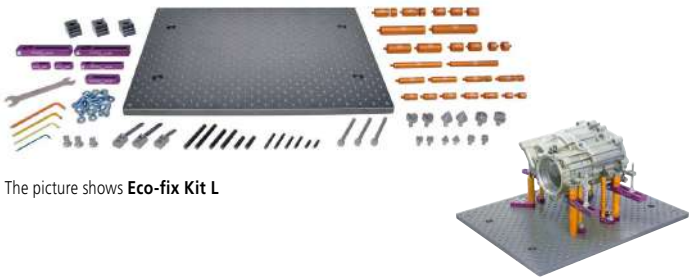
QS600/800

Rotary Table for CNC CMM

MRT240, MRT320, QS600/800

The rotary table helps ensure high-accuracy, highly efficient measurements of a rotating workpiece (a gear, impeller, cylindrical cam, etc.). Used in conjunction with a scanning probe to perform synchronous scanning, a wide variety of contour measurements can be taken, expanding the range of the supported applications.

Eco-fix Kit



The picture shows **Eco-fix Kit L**

Receiver plate set (optional)

Clamping System

Eco-fix Kit

Our tools can be joined as building blocks to create a clamping system in order to clamp a unique workpiece. Using such a clamping system to clamp your specific workpiece can remove the need to create a dedicated clamping system.

Vision Measuring Systems

Our vision measuring systems can provide a wide range of measurements in a single system.
We have a comprehensive line-up to meet various needs.

Standard CNC Vision Measuring System

Vision measuring systems with high functionality and operability make it possible to perform non-contact measurement of various workpieces.

Vision Measuring System Equipped with Color Camera and Zoom

QV Active

A versatile CNC vision measuring system equipped with a color camera and a zoom unit with replaceable lens.

E_{1X}/E_{1Y}: 2 + 3L/1000 µm
(L: Measuring length in mm)

Product catalog
E14022

Standard CNC Vision Measuring System

QV APEX Pro

A CNC vision measuring system with newly developed illumination and control technology for high-speed, high-accuracy measurement.

$E_{UX}/E_{UY,\ MPE}$: 1.5 + 3L/1000 µm
(L: Measuring length in mm)

Product catalog
E14028

Video

High-accuracy CNC Vision Measuring System

This is a high-accuracy version of the standard CNC model.

Ultra-high Accuracy CNC Vision Measuring System

QV ULTRA

An ultra-high accuracy CNC vision measuring system with a first term accuracy of $E_{UX}/E_{UY,\ MPE}$ is 0.35 µm that is enabled by adopting a highly rigid structure and eliminating error factors.

$E_{UX}/E_{UY,\ MPE}$: 0.35 + 1.3L/1000 µm
(L: Measuring length in mm)

Product catalog
E14002

High-accuracy CNC Vision Measuring System

QV HYPER Pro

The **QV HYPER Pro** is a highly accurate model that is equipped with a high-resolution/high-accuracy scale.

$E_{UX}/E_{UY,\ MPE}$: 0.8 + 2L/1000 µm
(L: Measuring length in mm)

Product catalog
E14028

CNC Vision Measuring System with Multiple Sensors

Multi-sensor design allows versatile and flexible measurements.

CNC Vision Measuring System Equipped with Non-contact Displacement Sensor

QVH4 Pro

A complex measuring system with a non-contact displacement sensor that is optimal for measuring steep surfaces or surfaces with different reflection rates.

$E_{UX}/E_{UY, MPE}$: 1.5 + 3L/1000 µm (for QVH4 Apex Pro model)
$E_{UX}/E_{UY, MPE}$: 0.8 + 2L/1000 µm (for QVH4 Hyper Pro model)
(L: Measuring length in mm)

Product catalog E14028

CNC Vision Measuring System Equipped with Non-contact Displacement Sensor

QVH1 Pro

A complex measuring system for micro-form measurement that uses a non-contact displacement sensor with a minimum laser spot diameter.

$E_{UX}/E_{UY, MPE}$: 1.5 + 3L/1000 µm (for QVH1 Apex Pro model)
$E_{UX}/E_{UY, MPE}$: 0.8 + 2L/1000 µm (for QVH1 Hyper Pro model)
(L: Measuring length in mm)

Product catalog E14028

CNC Vision Measuring System Equipped with a Touch-trigger Probe

QVTP Pro

A complex measuring system with a touch-trigger probe suitable for contact measurements of the sides and height of a workpiece.

$E_{UX}/E_{UY, MPE}$: 1.5 + 3L/1000 µm (for QVTP Pro model)
$E_{UX}/E_{UY, MPE}$: 0.8 + 2L/1000 µm (for QVTP Hyper Pro model)
(L: Measuring length in mm)

Product catalog E14028

CNC Vision Measuring System Equipped with a Touch-trigger Probe

QVTP Active

A complex measuring system with a touch-trigger probe suitable for contact measurements of the sides and height of a workpiece.

E_{1X}/E_{1Y}: 2 + 3L/1000 µm
(L: Measuring length in mm)

Product catalog E14022

High-accuracy 3D Measuring System

QVWLI can measure coordinates and dimensions and assess micro-3D forms without contact in a single machine. 3D data captured by the **WLI** optical system enables 3D surface texture analysis and 3D roughness analysis.

Non-contact 3D Measuring System

QVWLI Pro

A high-accuracy 3D measuring system with a WLI optical system that can measure micro-forms to the sub-micrometer level.

$E_{UX}/E_{UY, MPE}$: 0.8 + 2L/1000 µm
(L: Measuring length in mm)

Product catalog
E14001

Large-sized CNC Vision Measuring System

The moving bridge design makes it suitable for measuring large objects as well as small, thin objects. The fixed stage design allows for a more simplified design of the workpiece fixture.

Large-sized Vision Measuring System

QV ACCEL

A vision measuring system with a moving-bridge structure suitable for measurements of a large workpiece.

E_{1X}/E_{1Y}: 1.5 + 3L/1000 µm
(L: Measuring length in mm)

Product catalog
E14028

Micro-form Measuring System

CNC Vision Measuring Machine with Micro-form Scanning Probe

MiSCAN Vision System

A complex measuring system designed for scanning measurements with a stylus ball diameter as small as 125 µm.

$E_{1X}/E_{1Y, MPE}$: 1.5 + 3L/1000 µm
$E_{1X}/E_{1Y, MPE}$: 0.8 + 2L/1000 µm (for MVS Hyper model)
$E_{0,MPE}$: 1.9 + 4L/1000 µm (when using MPP-NANO probe system)
$E_{0,MPE}$: 1.9 + 4L/1000 µm* (when using SP25M probe system)
(L: Measuring length in mm)

Product catalog
E14024

Video

The versatile, high-accuracy micro-form measuring system can measure a wide range of workpieces, from micro-forms to larger pieces.

Micro-form Measuring System

UMAP Vision System TYPE2

Designed for micro-dimension and form measurements with a stylus ball diameter as small as 15 µm.

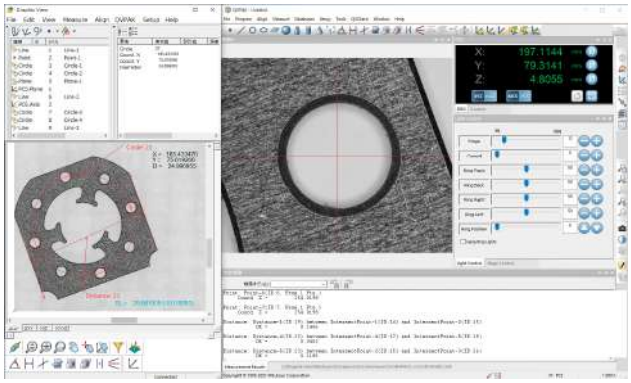
$E_{UX}/E_{UY, MPE}$: 0.8 + 2L/1000 µm (for UVS Hyper model)
$E_{UX}/E_{UY, MPE}$: 0.35 + 1.3L/1000 µm (for UVS ULTRA model)
$E_{1X}/E_{1Y, MPE}$: 1.5 + 3L/1000 µm* (when using UMAP probe system)
(L: Measuring length in mm)

Product catalog
E14000

* Specifications vary by configuration, size and thermal environment.

Software

A wide variety of software applications with high functionality and operability are available to support all kinds of measurements, including simple and complex measurements.



Data Processing Software for QV

QVPAK

Software for high-performance vision measurement and for form analysis using different displacement sensors.

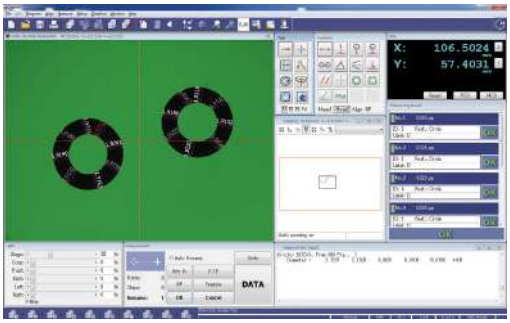
Note: Software for **MiSCAN Vision System** is **MCOSMOS** (Refer to page 12-6).

Product catalog
E14028

Software for QS-L/AF

QSPAK

Easy-to-use software provides stable measurements, even for inexperienced operators.



Software for QI

QIPAK

With a long focal depth, a wide field of view can be measured with one click without the need of focusing on a stepped workpiece.

Manual 3D Vision Measuring System

With a fast auto focus function built in as standard, the manual stage vision measuring system can perform height measurements as well in a single system. This ensures reliable measurement of details.

Manual Stage Vision Measuring System

QS-L/AFC

A vision measuring system with a color camera with high-precision, high-speed auto focus.

Measuring accuracy (X Y): (2.2 + 0.02L) µm
(L: Measuring length in mm)

Product catalog
E14004

Manual 2D Vision Measuring System

The 2D color vision measuring system can stably and accurately measure workpieces of various shapes and sizes. Displaying a whole workpiece can significantly increase measurement efficiency.

2D Color Vision Measuring System

QI

A 2D vision measuring system that has an optical system with deep depth of focus and a screen providing a wide field of view, enabling highly efficient measurements.

E_{1XY}: ± (3.5 + 0.02L) µm
(L: Measuring length in mm)

Product catalog
E14009

Optical Measuring Instruments

A wide variety of optical measuring instruments with in-house-developed lenses, the “eyes” of optical measuring instruments, are available to respond to various measuring applications.

Profile Projector

The projectors display a workpiece image magnified at an accurate ratio on a screen to improve efficiency of measurement, inspection, and observation. They can be installed in various locations such as inspection laboratories and manufacturing and processing sites.

High-accuracy Profile Projector

PJ-H30

A high-end model in the **PJ** Series that can provide a clear and sharp projected image.

Screen effective diameter: ø306 mm
Projected image: Erect

Product catalog
E14005

Profile Projector

PJ-PLUS

A profile projector with highly durable, energy-efficient LED illumination and a built-in counter.

Screen effective diameter: ø315 mm
Projected image: Inverted-reversed
Illumination: White LED

Product catalog
E14005

Profile Projector

PV-5110

Equipped with a large 500 mm screen.
Projected images can be easily traced or compared with a template.

Screen effective diameter: ø508 mm
Projected image: Inverted-reversed

Product catalog
E14005

Profile Projector

PH-3515F

A profile projector suitable for measurement and observation of an end mill, cutter, circular saw, etc. of cutting tools.

Screen effective diameter: ø353 mm
Projected image: Erect-reversed

Product catalog
E14005

Measuring Microscope

Best-in-class accuracy is guaranteed for all models of the series. The intuitive positioning function ensures accuracy and ease of use.

Measuring Microscope with Z-axis Motor Drive

MF-J/MF-UJ/MF-UK

High-accuracy measuring microscopes with a motor drive that can bring the microscope into focus in the "blink of an eye" (approximately 1 second).

Measuring accuracy (X Y): (2.2 + 0.02L) µm
(L: Measuring length in mm)
Observation image: Bright-field/Dark-field/Polarization/Differential Interference Contrast
Z axis feed mechanism: Motor drive

Measuring Microscope

MF-U

Integration of metallurgical and measurement microscope functions provides high-resolution observation and a high-accuracy measurement solution.

Measuring accuracy (X Y): (2.2 + 0.02L) µm
(L: Measuring length in mm)
Observation image: Bright-field/Dark-field

Product catalog
E14003

Measuring Microscope

MF

An easy-to-use, standard measuring microscope model with a dedicated long working distance ML objective lens.

Measuring accuracy (X Y): (2.2 + 0.02L) µm
(L: Measuring length in mm)
Observation image: Bright-field

Product catalog
E14003

Video

Toolmakers' Microscope

TM500

A toolmakers' microscope with an LED illumination useful for observation of a sharp and clear image.

Measuring range: 50×50 mm, 100×50 mm
Maximum load: 5 kg

Data Processing Unit

Vision Unit Retrofit for Microscopes

Vision Unit

Helps increase measurement efficiency and reduce human errors due to operator's skill by providing automatic edge detection and other image processing functions.

Product catalog
E14008

2D Data Processing Unit

QM-Data200

A 2D data processing unit connected to a projector or measuring microscope and used for calculation.

Product catalog
E14008

Microscope Unit

The microscope units have great track records of integration into systems and support a wide variety of observation methods. They are suitable for inspection and analysis of electronic semiconductors and metal parts.

Microscope Unit

FS70

A microscope unit with eyepieces, designed for integration with an instrument.
Supports variable magnification by employing a revolver and can be used for microfabrication with YAG lasers.

Observation image: Bright-field, Bright/Dark-field, Polarization, Differential Interference Contrast

Product catalog
E14020

Video Microscope Unit/Wide-field Video Microscope Unit

VMU/WIDE VMU

Microscope unit for incorporating into optical systems.
Models in the line-up can support observation of an actual field of view of ø30 mm.
Suitable for various types of observation (bright-field, bright/dark-field, and near-infrared) and laser processing.

Observation image: Bright-field, Bright/Dark-field

Product catalog
E14020

Video

Product catalog
E14020

Objectives

The line-up of objective lenses supports a wide range of wavelength bands, from ultraviolet light and visible light to near-infrared light. They can be used in observation, inspection, and laser processing.

Visible radiation range objectives (**VIS**)

Bright-field observation, long working distance, plan apochromat lens.

Visible radiation range objectives (**VIS**)

Bright-field observation/dark-field observation, long working distance, plan apochromat lens.

Near-infrared radiation range objectives (**NIR**)

Bright-field observation/near-infrared observation/ laser processing, long working distance, plan apochromat lens.

Near-ultraviolet radiation range objectives (**NUV**)

Bright-field observation/near-ultraviolet observation/ laser processing, long working distance, plan apochromat lens.

Ultraviolet radiation range objectives (**UV**)

Bright-field observation/ultraviolet observation/laser processing, long working distance, plan lens.

Varifocal Lens

The line-up of ultra-high-speed varifocal lenses can significantly expand the depth of focus. They help reduce the inspection time and greatly increase the observation efficiency.

Varifocal Lens

TAGLENS-T1

Captures a clear image with a deep depth of focus by adjusting the focal length at a high speed.

Resonance frequency: 70 kHz
Effective aperture: ø11 mm

Product catalog E14025

Video

Relay Optical System Microscope Unit

VMU-T1

Microscope unit for configuring a varifocal optical system by incorporating **TAGLENS-T1**, the objective and the camera.

Pulse Illumination Unit for TAGLENS

PLS

Combined with **TAGLENS-T1**, the ultra-high-speed LED pulse illuminator enables capture of an image in focus at a desired point as well as focus stacking.

Form Measuring Systems

The line-up includes a wide range of measuring systems that can capture various form properties such as surface roughness, contour, and roundness.

Roundness/Cylindricity/Surface Roughness/ Contour Measuring System

A high-end system which can combine roundness, contour and surface roughness measurements into one device. It can reduce the measurement time and improve productivity by streamlining processes.

Roundness/Cylindricity Measuring System

ROUNDTRACER EXTREME

The CNC form measuring system can measure surface roughness, contour, and roundness/cylindricity in a single system.

Rotational accuracy (Radial direction): (0.02 + 3.5H/10000) µm
(H: Probing height in mm)
Maximum load: 60 kg

Product catalog E15032

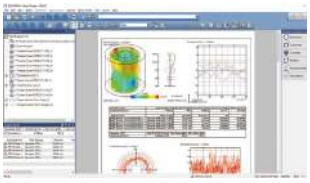
Video

High-speed High-accuracy Roundness/Cylindricity Measuring System

ROUNDTRACER FLASH

A non-contact form measuring system that can evaluate dimensions and form profiles in a few seconds with a 2D image sensor.

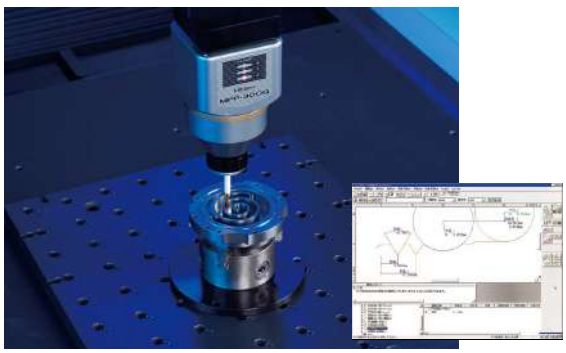
Probing height: 100 mm, 300 mm
Probing diameter: 60 mm
Maximum load: 6 kg



Roundness/Cylindricity Measurement/Analysis Software

ROUNDPAK

A wide variety of parameters including those for roundness/cylindricity, as well as flatness and parallelism, are provided as standard features. Special analyses, such as design value best-fit analysis, harmonic analysis, and peak and bottom detection on a circle, are supported.



Two-dimensional Primary Profile Analyzing Software

FORMTRACEPAK-AP

Optional software for 2D contour analysis and roughness analysis of measurement points obtained by the main programs of vision 3D/ roundness measuring systems.

Mitutoyo

Surface Roughness and Contour Measuring System (Surface Texture Measuring Instrument)

The hybrid model supports surface roughness measurement and contour measurement on a single system, reducing the time required for changeover and measurement.

Surface Roughness and Contour Measuring System

FORMTRACER Avant D3000/4000

Complex measuring systems that can support both surface roughness and contour measurement in a single system by switching the detector without turning off the machine.

Measuring range (X axis): 100 mm, 200 mm
Roughness measuring range (Z1 axis): 800 µm/80 µm/8 µm
Contour measuring range (Z1 axis): Contour 60 mm

Product catalog E15030

CNC Surface Roughness and Contour Measuring System

FORMTRACER Extreme SV-C4500CNC
FORMTRACER Extreme SV-C4500CNC HYBRID TYPE1

Complex CNC measuring systems that can support both surface roughness and contour measurement in a single system by switching the detector without turning off the machine.

Measuring range (X axis): 200 mm
Roughness measuring range (Z1 axis): 800 µm/80 µm/8 µm
Contour measuring range (Z1 axis): Contour 60 mm

Product catalog E15021

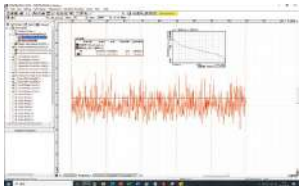
CNC Surface Texture Measuring System

FORMTRACER Extreme CS-5000CNC/CS-H5000CNC

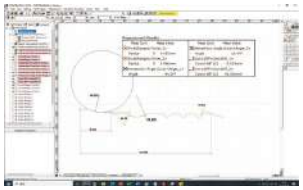
High-accuracy CNC surface measuring instrument that can support both surface roughness and contour evaluation in a single measurement.

Measuring range (X axis): 200 mm
Measuring range (Z1 axis): 12 mm/24 mm

Product catalog E15021



Surface roughness analysis



Contour analysis

Surface Texture Analysis Program

FORMTRACEPAK

Helps with overall operation from measuring system control, surface roughness analysis, and contour analysis/tolerancing, to inspection report creation.

Contour Measuring Instrument

The line-up includes measuring systems designed for contour measurement that can perform easy, accurate and quick form measurement.

High-performance Contour Measuring Instrument

FORMTRACER Avant C3000/4000

Digital contour measuring instruments with a high-speed drive and various time-saving functions for efficient measurement.

Measuring range (X axis): 100 mm, 200 mm
Measuring range (Z1 axis): 60 mm

Product catalog E15030

Contour Measuring Instrument

CONTRACER CV-2100

Contour measuring instruments for easy, accurate, fast measurements by concentrating measurement control switches at the front of the unit.

Measuring range (X axis): 100 mm
Measuring range (Z1 axis): 50 mm

Product catalog E15020

Surface Roughness Instrument

These measuring systems are designed for surface roughness measurement. The line-up includes various models such as portable and stationary types to support different applications.

High-performance Contour Measuring Instrument

FORMTRACER Avant S3000

Surface roughness instruments with a high-speed drive and an automatic changeover unit for efficient measurement.

Measuring range (X axis): 100 mm, 200 mm
Measuring range (Z1 axis): 800 µm/80 µm/8 µm

Product catalog E15030

CNC Surface Roughness Instrument

SURFTEST Extreme SV-3000CNC

A CNC surface roughness instrument suitable for automatic measurements of a large, heavy, complex-shaped workpiece.

Measuring range (X axis): 200 mm
Measuring range (Z1 axis): 800 µm/80 µm/8 µm

Product catalog E15021

Surface Roughness Instrument

These measuring systems are designed for surface roughness measurement. The line-up includes various models such as portable and stationary types to support different applications.

Surface Roughness Instrument

SURFTEST SJ500/SV-2100
SURFTEST SJ-500P/SV-2100M4

High-accuracy, high-performance surface roughness instruments with a dedicated control unit that provides an easy-to-see display and simple operation.

Measuring range (X axis): 50 mm, 100 mm
Measuring range (Z1 axis): 800 µm/80 µm/8 µm

Product catalog
E15006

Compact Surface Roughness Instrument

SURFTEST SJ-410

Compact surface roughness instruments with a large high-visibility color LCD that helps with micro-form evaluation.

Measuring range (X axis): 25 mm, 50 mm
Measuring range (Z1 axis): 800 µm/80 µm/8 µm

Product catalog
E15014

Compact Surface Roughness Instrument

SURFTEST SJ-210/310

Compact, portable, and easy-to-use surface roughness instruments for on-site surface measurements.

Measuring range (X axis): 5.6 mm, 16 mm
Measuring range (Z1 axis): 360 µm

Product catalog
E15028

Roundness Measuring Instrument

These measuring systems are designed for roundness and cylindricity measurement. The line-up includes various models from small to large sizes to measure different workpieces.

High-performance Roundness/Cylindricity Measuring System

ROUNDTEST RA-2200
ROUNDTEST RA-2200 PLUS

D type: Enhanced procedure of centering and leveling adjustment
A type: Automated centering and leveling adjustment
Medium-sized roundness measuring systems that can reduce workload of operator.

Rotational accuracy (Radial direction): (0.02 + 3.5H/10000) µm
(H: Probing height in mm)
Maximum load: 30 kg

Product catalog
E15001

High-accuracy Roundness/Cylindricity Measuring System

ROUNDTEST RA-H5200
ROUNDTEST RA-H5200 PLUS

Large roundness measuring systems designed to perform automatic centering and leveling adjustments and high-speed, high-accuracy measurements.

Rotational accuracy (Radial direction): (0.02 + 3.5H/10000) µm
(H: Probing height in mm)
Maximum load: 80 kg

Product catalog
E15011

Roundness/Cylindricity Measuring System

ROUNDTEST RA-1600

The body is compact but still achieves a wide measuring range.
Provides high accuracy comparable to high-end models.

Rotational accuracy (Radial direction): (0.02 + 6H/10000) µm
(H: Probing height in mm)
Maximum load: 25 kg

Product catalog
E15000

Compact Roundness Measuring Instrument

ROUNDTEST RA-120/120P
ROUNDTEST RA-10

Easy-to-operate compact roundness measuring instruments.

Rotational accuracy (Radial direction): (0.04 + 6H/10000) µm
(H: Probing height in mm)
Maximum load: 10 kg, 25 kg

Product catalog
E15008

Hardness Testing Machines

A wide variety of hardness testing machines are available for quality control.
The line-up includes affordable to high-end models that can be selected to meet your application.

Micro Vickers/ Vickers Hardness Testing Machine

These hardness testing machines can be used to test a wide range of workpieces including metal materials and heat-treated parts. An advanced model supporting automated continuous testing is also available to improve productivity.

Micro Vickers Hardness Testing Machine

HM-100

Basic micro Vickers hardness testing machine models for reading indentations visually.

Applicable standards: JIS B7725/ISO 6507-2
Test force: 98.07 - 9,807 mN (10 - 1,000 gf)

Product catalog E17001

Micro Vickers Hardness Testing Machine

HM-210A/220A

Instruments with integrated calculations and an electromagnetic loading mechanism for setting a desired test force.

Applicable standards: JIS B7725/ISO 6507-2
Test force: 98.07 - 9,807 mN (10 - 1,000 gf), 0.4903 - 19,610 mN (0.05 - 2,000 gf)

Product catalog E17001

Micro Vickers Hardness Testing Machine (Automatic Type)

HM-210/220

Reduces person-to-person variation and increases test efficiency by automating measurements of indentations and stage movement.

Applicable standards: JIS B7725/ISO 6507-2
Test force: 98.07 - 9,807 mN (10 - 1,000 gf), 0.4903 - 19,610 mN (0.05 - 2,000 gf)

Vickers Hardness Testing Machine

HV-110A/120A

Easy-to-operate Vickers hardness-testing machines that allow for test force switching on a touch panel.

Applicable standards: JIS B7725/ISO 6507-2
Test force: 9.807 - 490.3 N (1 - 50 kgf), 2.942 - 294.2 N (0.3 - 30 kgf)

Product catalog E17001

Vickers Hardness Testing Machine (Automatic Type)

HV-110/120

Reduces person-to-person variation and increases test efficiency by automating measurements of indentations and stage movement.

Applicable standards: JIS B7725/ISO 6507-2
Test force: 9.807 - 490.3 N (1 - 50 kgf), 2.942 - 294.2 N (0.3 - 30 kgf)

Rebound Type Portable Hardness Tester

HH-411

Compact portable hardness testers with high operability allowing for hardness testing with one touch.

Leeb hardness: 1 to 999 HL

Product catalog
E17001

Portable Hardness Tester

HH-300

Hardness testers for testing sponge, rubber, and plastic materials by simply pressing the probe against the workpiece.

Display: Analog/Digital

Product catalog
E17001

Rockwell Hardness Testing Machine

The line-up includes various models, ranging from a large high-end model that can withstand large and heavy workpieces to a small model that is very affordable.

CNC Rockwell Hardness Testing Machine

HR-610A/620A

Allows a large and heavy workpiece to be tested without being cut into pieces.
A motorized X-axis stage (optional) has been installed to support automation.

Test force: 29.42 - 1,839 N (3 - 187.5 kgf), 9.807 - 2,452 N (1 - 250 kgf)
Maximum load: 100 kg

Product catalog E17011

Video

CNC Rockwell Hardness Testing Machine

HR-620B

A motorized Y-axis stage is included as standard.
A fully-automated Rockwell hardness-testing machine can be built, including the workpiece transfer process.

Test force: 9.807 - 2,452 N (1 - 250 kgf)
Maximum load: 100 kg

Rockwell Hardness Testing Machine

HR-200/300/400

The line-up offers digital display type and analog display type Rockwell hardness-testing machines.

Applicable standards: JIS B7726/ISO 6508-2, ASTM E18-20 (Excludes HR-200)
Test force: 588.4 - 1,471 N (60 - 150 kgf)

Product catalog E17000

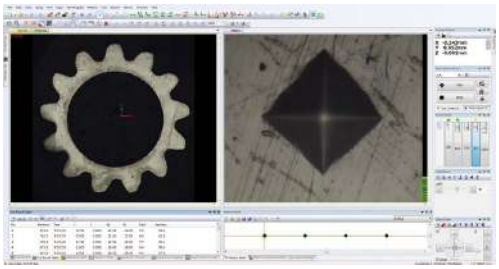
Rockwell Hardness Testing Machine

HR-530/530L

Rockwell hardness-testing machines with a unique structure that allows for testing the hardness of the inner surface of a workpiece without cutting it into pieces.

Applicable standards: JIS B7726/ISO 6508-2, ASTM E18-20
Test force: 588.4 - 1,471 N (60 - 150 kgf)
Maximum load: 20 kg

Product catalog E17001



Software for Hardness Testing

AVPAK

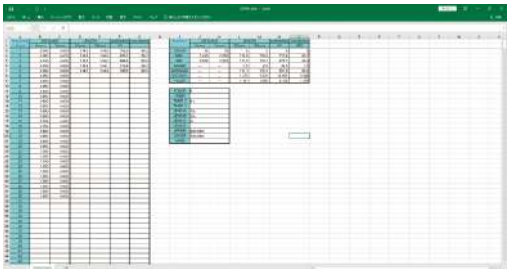
Software for workpiece image capturing, automatic measurement of indentations, automatic continuous testing with a specific pattern, testing machine control for efficient testing of multiple workpieces, result evaluation, and report creation.

Product catalog
E17001

Software for External Control

FORMEio

An automation system can be built by connecting the software to hardness-testing machines. (**HV-110**, **HV-120**, **HM-210**, **HM-220** and **HR-600 Series**)



Data Processing Software for Hardness Testing

EXPAK

Measurement results from a hardness-testing machine can be imported to spreadsheet software.

13

Quick Guide to Precision Measuring Instruments

Micrometers

Calipers

Height Gages

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Quick Guide to Precision Measuring Instruments

You can access our "Quick Guide to Precision Measuring Instruments" catalog pdf file here.
Get useful information about our instrument products, including measuring tools.

Mitutoyo

General Term in Measurement: Quality Control

Quality Control (QC)
Methods and their system for economically producing products or services of a quality that meets customer requirements.

Process Quality Control
Activities to control the manufacturing process, reduce product variation, and keep product variation low. Process improvement and standardization as well as technology accumulation are promoted through these activities.

Statistical Process Control (SPC)
Process quality control through statistical methods.

Population
Population A group of all items that have characteristics to be considered for improving and controlling processes and quality of product. Ordinarily, the population is the group that is going to be handled based on a sample.

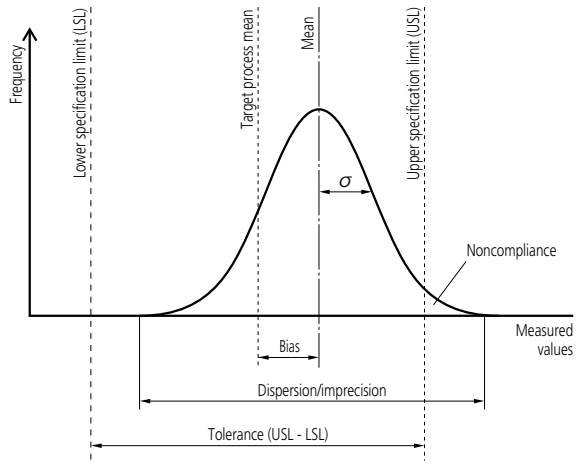
Lot
Collection of product produced under the same conditions.

Sample
An item of product (or items) taken out of the population to investigate its characteristics.

Sample Size
Number of product items in the sample.

Bias
Value calculated by subtracting the true value from the mean of measurement values when multiple measurements are performed.

Dispersion, Imprecision
Variation in the values of a target characteristic in relation to the mean value. Standard deviation is usually used to represent the dispersion of values around the mean.



Histogram
A diagram that divides the range between the maximum and the minimum measurement values into several divisions and shows the number of values (appearance frequency) in each division in the form of a bar graph. This makes it easier to understand the rough average or the approximate extent of dispersion. A diagram indicating a symmetrical bell-shaped distribution shows what is called "normal distribution."

Process Capability
Process-specific performance demonstrated when the following conditions are met:

- The process is sufficiently standardized,
- Any causes of malfunctions are eliminated,
- The process is in a state of statistical control.

The process capability is represented by mean ±3 or 6 when the quality characteristic output from the process shows normal distribution. This indicates standard deviation.

Process Capability Index (PC or Cp)
The index value is calculated by dividing the tolerance of a target characteristic by the process capability (6). The value calculated by dividing the difference between the mean (X) and the standard value by 3 may be used to represent this index in cases of a unilateral tolerance. The process capability index assumes that a characteristic follows the normal distribution.

Note: If a characteristic follows the normal distribution, 99.74 % data is within the range ±3 from the mean.

Bilateral tolerance

$$Cp = \frac{USL-LSL}{6\times\sigma}$$

USL: Upper specification limit
LSL: Lower specification limit

Unilateral tolerance ... If only the upper limit is stipulated

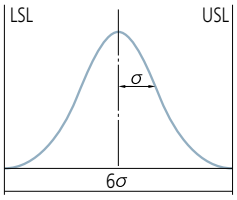
$$Cp = \frac{USL-\bar{X}}{3\times\sigma}$$

Unilateral tolerance ... If only the lower limit is stipulated

$$Cp = \frac{\bar{X}-LSL}{3\times\sigma}$$

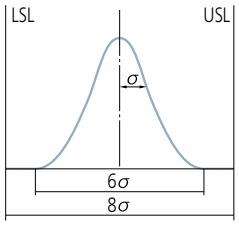
Specific examples of a process capability index (Cp) (bilateral tolerance)

Cp = 1



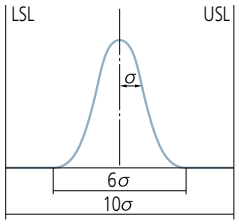
The process capability is barely achieved as the 6 sigma process limits are coincident with the tolerance limits.

Cp = 1.33



The process capability is the minimum value that can be generally accepted as it is no closer than 1 sigma to the tolerance limits.

Cp = 1.67



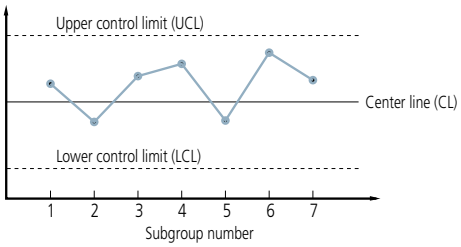
The process capability is sufficient as it is no closer than 2 sigma to the tolerance limits.

Note that Cp only represents the relationship between the tolerance limits and the process dispersion and does not consider the position of the process mean.

Note: A process capability index that takes into account the deviation between the specification center and the process mean is generally called Cpk. It is the upper tolerance (USL minus the mean) divided by 3 (half of process capability) or the lower tolerance (the mean value minus LSL) divided by 3, whichever is smaller.

Control Chart

Used to control the process by separating variations into those due to chance causes in the process and those due to a malfunction. It consists of one center line (CL) and the control limit lines rationally determined above and below it (UCL and LCL). It can be said that the process is in a state of statistical control if all points are within the upper and lower control limit lines without notable trends when the characteristic values that represent the process output are plotted. The control chart is a useful tool for controlling process output, and therefore quality.



Chance Causes

These causes of variation are of relatively low importance. Chance causes are technologically or economically impossible to eliminate even if they can be identified.

X-R Control Chart

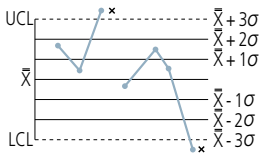
A control chart used for process control that provides the most information on the process. An X-R control chart consists of the following:

- A control chart that uses the mean of each subgroup for control to monitor abnormal bias of the process mean,
- An R control chart that uses the range for control to monitor abnormal variation.

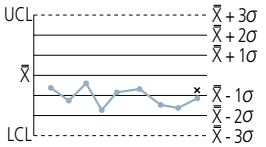
Usually, both charts are used together.

How to Read the Control Chart

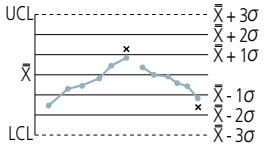
Typical trends of successive point position in the control chart that are considered undesirable are shown below. These determination rules only provide a guideline. Take the process-specific variation into consideration when making determination rules. Assuming that the upper and the lower control limits are 3 away from the center line, divide the control chart into six regions at intervals of 1 to apply the following rules. These rules are applicable to the X control chart and the X control chart. Note that these 'trend rules for action' were formulated assuming a normal distribution.



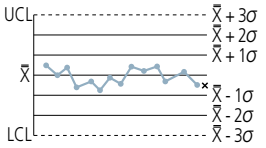
(1) There is a point beyond either of the control limit lines (±3).



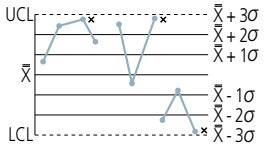
(2) Nine consecutive points are to one side of the center line.



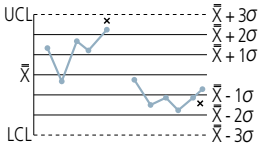
(3) Six points consecutively increase or decrease.



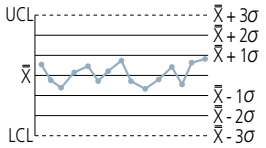
(4) 14 points alternately increase and decrease.



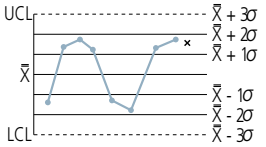
(5) Two of three consecutive points are over ±2 from the center line on either side.



(6) Four of five consecutive points are over ±1 from the center line on either side.



(7) There are 15 consecutive points within ±1 from the center line.



(8) There are eight consecutive points over ±1 from the center line.

Note: This part of 'Quick Guide to Precision Measuring Instruments' (pages 13-3 and 13-4) has been written by Mitutoyo based on its own interpretation of the JIS Quality Control Handbook published by the Japanese Standards Association.

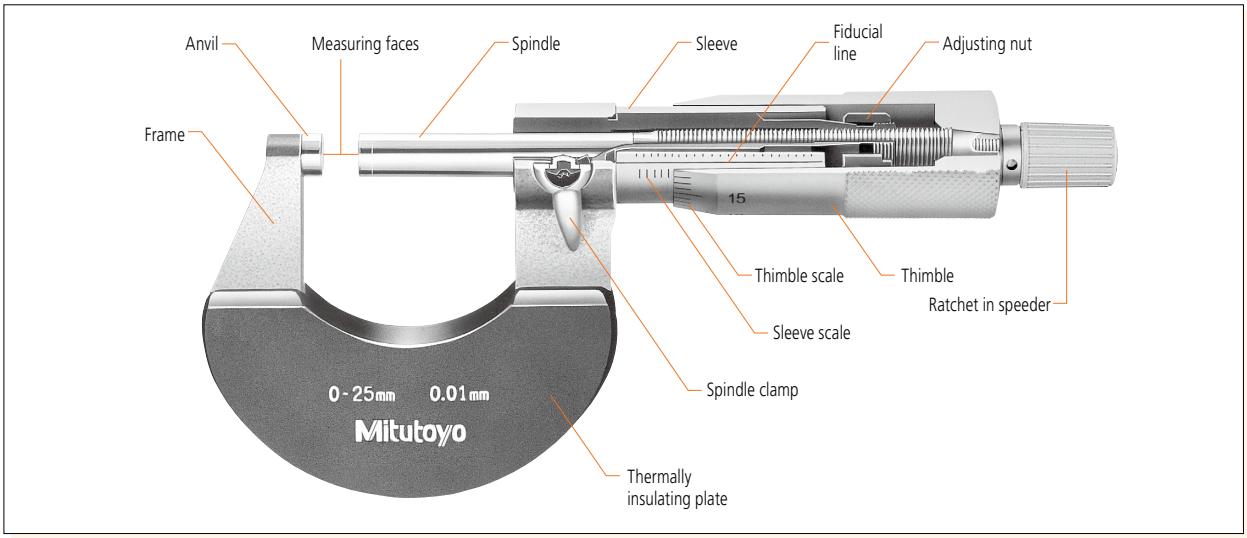
References

- JIS Quality Control Handbook (Japanese Standards Association) Z 8101:1981 Z 8101-1:1999 Z 8101-2:1999 Z 9020:1999 Z 9021:1998

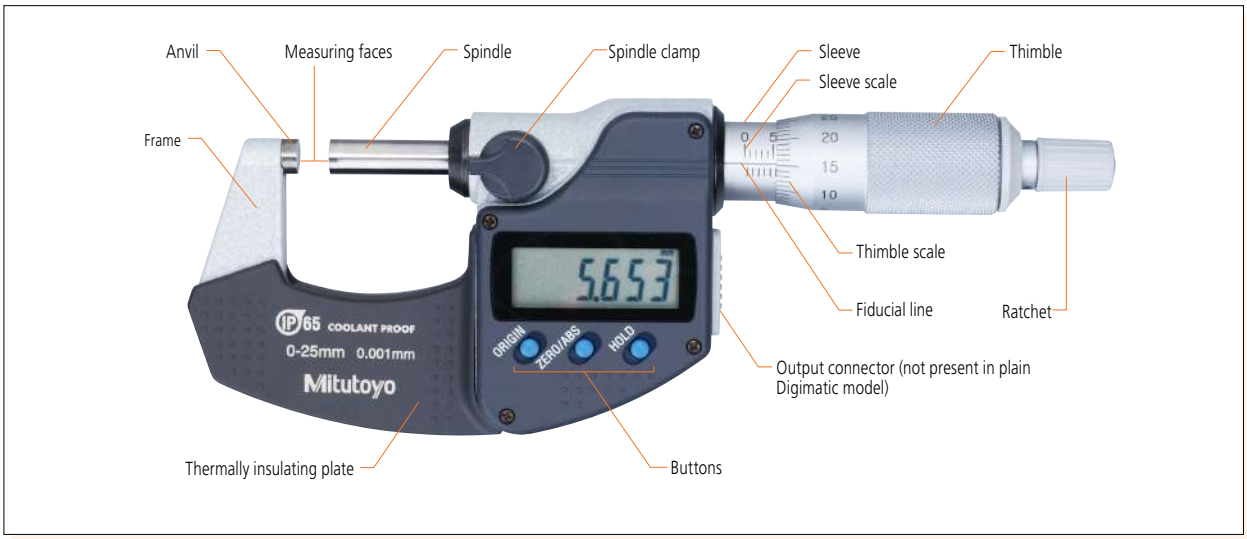
Micrometers

Nomenclature

Standard Analog Outside Micrometer

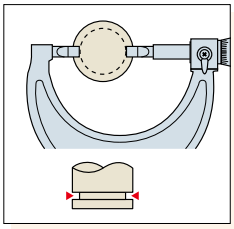


Digimatic Outside Micrometer



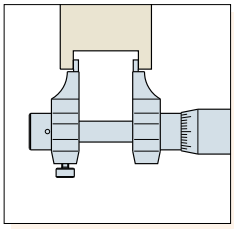
Special Purpose Micrometer Applications

For inside diameter, and narrow groove measurement



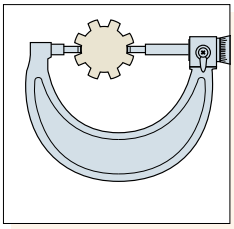
Blade micrometer

For small internal diameter, and groove width measurement



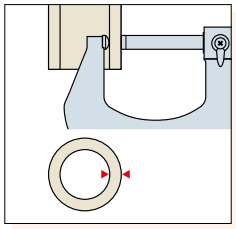
Inside micrometer, caliper type

For splined shaft diameter measurement



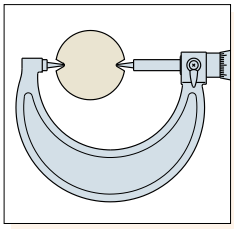
Spline micrometer

For pipe thickness measurement



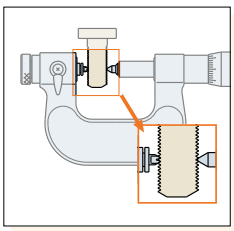
Spherical face micrometer

For root diameter measurement



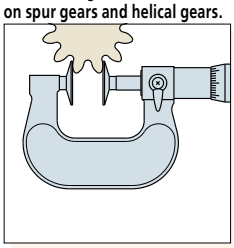
Point micrometer

Screw pitch diameter



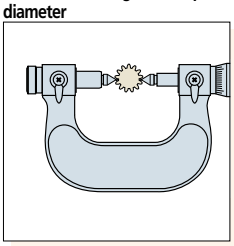
Screw thread micrometer

For root tangent measurement on spur gears and helical gears.



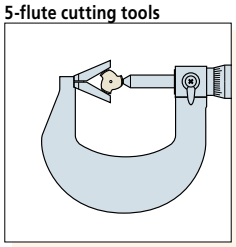
Disc type outside micrometer

Measurement of gear over-pin diameter



Ball tooth thickness micrometer

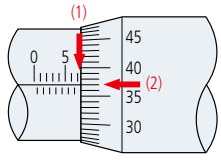
For measurement of 3- or 5-flute cutting tools



V-anvil micrometer

How to Read the Scale

■ Micrometer with standard scale (graduation: 0.01 mm)



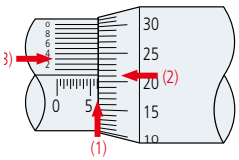
(1) Outer sleeve reading	7. mm
(2) Thimble reading	+ 0.37 mm
Micrometer reading	7.37 mm

Note: 0.37 mm (2) is read at the position where the sleeve fiducial line is aligned to the thimble graduations.

The thimble scale can be read directly to 0.01 mm, as shown above, but may also be estimated to 0.001 mm when the lines are nearly coincident because the line thickness is 1/5 of the spacing between them.

■ Micrometer with vernier scale (graduation: 0.001 mm)

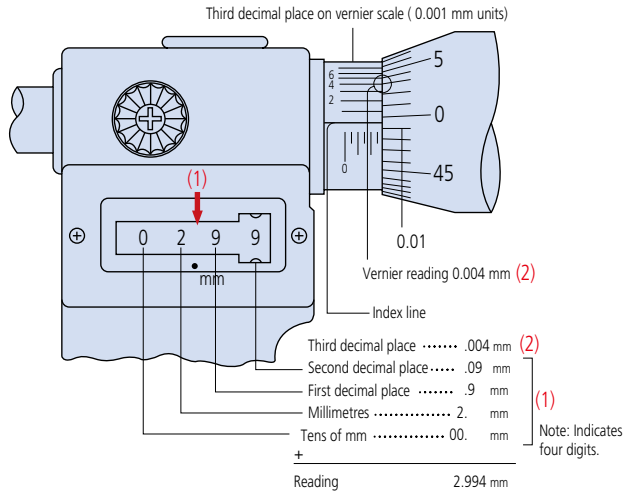
The vernier scale provided above the sleeve index line enables direct readings to be made to within 0.001 mm.



(1) Outer sleeve reading	6. mm
(2) Thimble reading	0.21 mm
(3) Reading from the vernier scale marking and thimble graduation line	+0.003 mm
Micrometer reading	6.213 mm

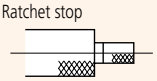
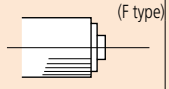
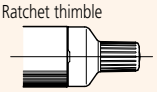
Note: 0.21 mm (2) is read at the position where the index line is between two graduations (21 and 22 in this case). 0.003 mm (3) is read at the position where one of the vernier graduations aligns with one of the thimble graduations.

■ Micrometer with mechanical-digit display (digital step: 0.001 mm)

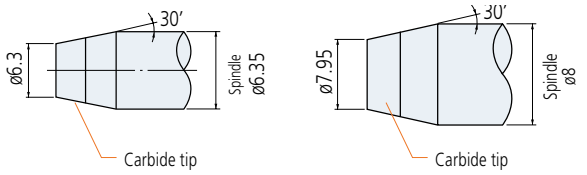


Note: 0.004 mm (2) is read at the position where a vernier graduation line corresponds with one of the thimble graduation lines.

Measuring Force Limiting Device

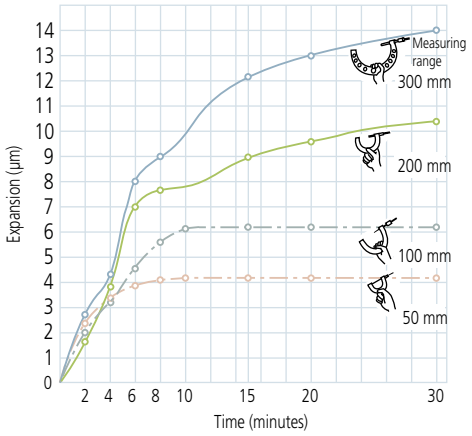
Varieties	Audible in operation	One-handed operation	Remarks
Ratchet stop 	Yes	Unsuitable	Audible clicking operation causes micro-shocks
Friction thimble (F type) 	No	Suitable	Smooth operation without shock or sound
Ratchet thimble 	Yes	Suitable	Audible operation provides confirmation of constant measuring force

Measuring Face Detail



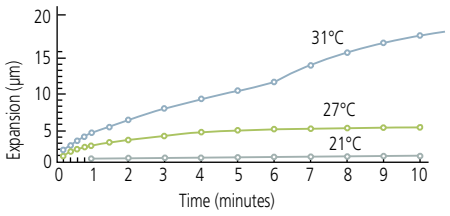
Note: The drawings above are for illustration only and are not to scale

Micrometer Expansion Due to Holding Frame with the Bare Hand



*The above graph shows micrometer frame expansion due to heat transfer from hand to frame when the frame is held in the bare hand which, as can be seen, may result in a significant measurement error due to temperature-induced expansion. When measuring by hand, care must be taken because the reference point will change (note that the graph values are not guaranteed values but experimental values).

Length Standard Expansion with Change of Temperature (for 200 mm Bar Initially at 20 °C)

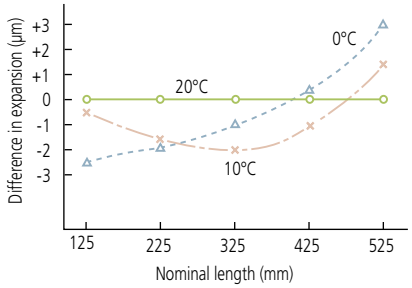


The above experimental graph shows how a particular micrometer standard expanded with time as people whose hand temperatures were different (as shown) held the end of it at a room temperature of 20 °C.

This graph shows that it is important not to set a micrometer while directly holding the micrometer standard but to make adjustments only while wearing gloves or lightly supporting the length standard by its heat insulators.

When performing a measurement, note that it takes time until the expanded micrometer standard returns to the original length.

Difference in Thermal Expansion Between Micrometer and Length Standard



*Values are not guaranteed values but experimental values.

The above graph shows the results for each of the sizes from 125 through 525 mm at each temperature under the following time-series conditions.

1. The micrometer and its standard were left at a room temperature of 20°C for about 24 hours.
2. The start point was adjusted using the micrometer standard after the temperature of the micrometer and the standard stabilized.
3. The micrometer with its standard were left at the temperatures of 0°C and 10°C for about one hour.
4. Measurement of each start point.

This graph shows that both the micrometer and its standard must be left at the same location for at least several hours before adjusting the start point.

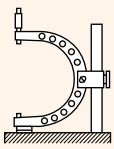
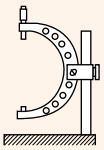
Hooke's Law

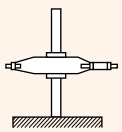
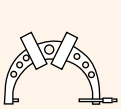
Hooke's law states that strain in an elastic material is proportional to the stress causing that strain, providing the strain remains within the elastic limit for that material.

Effect of Changing Support Method and Orientation

(Unit: µm)

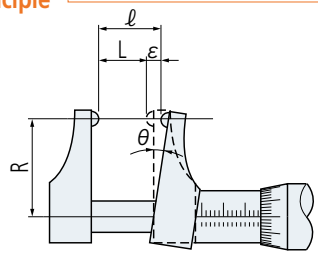
The tables below show how the zero point changes due to differences in support orientation—such "Supported only at the center," "Supported at the center in a lateral orientation," and "Supported by hand downward"—after zero setting in the "Supported at the bottom and center" case. If the start point is not aligned using the same support method and orientation as the actual measurement, the values will change from the positions shown in the table below. Therefore, aligning the start point using the same support method and orientation as the measurement is recommended.

Supporting method	Supported at the bottom and center	Supported only at the center
Attitude / Maximum measuring length (mm)		
325	0	−5.5
425	0	−2.5
525	0	−5.5
625	0	−11.0
725	0	−9.5
825	0	−18.0
925	0	−22.5
1025	0	−26.0

Supporting method	Supported at the center in a lateral orientation.	Supported by hand downward.
Attitude / Maximum measuring length (mm)		
325	+1.5	−4.5
425	+2.0	−10.5
525	−4.5	−10.0
625	0.0	−5.5
725	−9.5	−19.0
825	−5.0	−35.0
925	−14.0	−27.0
1025	−5.0	−40.0

*Values are not guaranteed values but experimental values.

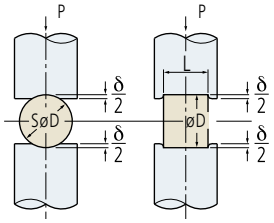
Abbe's Principle



Abbe's principle states that "maximum accuracy is obtained when the scale and the measurement axes are common". This is because any variation in the relative angle (θ) of the moving measuring jaw on an instrument, such as a caliper jaw micrometer, causes displacement that is not measured on the instrument's scale and this is an Abbe error ($\varepsilon = \ell - L$ in the diagram). Spindle straightness error, play in the spindle guide or variation of measuring force can all cause (θ) to vary, and the error increases with R.

Hertz's Formula

Hertz's formula give the apparent reduction in diameter of spheres and cylinders due to elastic compression when measured between plane surfaces. The formula is useful for determining the deformation of a workpiece caused by the measuring force in point and line contact situations.



(a) Sphere between two planes

(b) Cylinder between two planes

Assuming that the material is steel and units are as follows:
Modulus of elasticity: E =205 GPa
Amount of deformation: δ (µm)
Diameter of sphere or cylinder: D (mm)
Length of cylinder: L (mm)
Measuring force: P (N)

a) Apparent reduction in diameter of sphere

$$\delta 1 = 0.82 \sqrt[3]{P^2/D}$$

b) Apparent reduction in diameter of cylinder

$$\delta 2 = 0.094 \times (P/L) \sqrt[3]{1/D}$$

Major Measurement Errors of the Screw Micrometer

Error cause	Maximum possible error	Precautions for eliminating errors	Error that might not be eliminated even with precautions
Micrometer feed error	3 µm	1. Correct the micrometer before use.	±1 µm
Anvil angle error	±5 µm assuming the error of a half angle is 15 minutes	1. Measure the angle error and correct the micrometer. 2. Adjust the micrometer using the same thread gage as the workpiece.	±3 µm expected measurement error of half angle
Due to anvil difference	+10 µm		+3 µm
Influence of measuring force	±10 µm	1. Use a micrometer with a low measuring force if possible. 2. Always use the ratchet stop. 3. Adjust the micrometer using a thread gage with the same pitch.	+3 µm
Angle error of thread gage	±10 µm	1. Perform correction calculation (angle). 2, Correct the length error. 3, Adjust the micrometer using the same thread gage as the workpiece.	+3 µm
Length error of thread gage	$\pm(3+\frac{L}{25})$µm	1. Perform correction calculation. 2, Adjust the micrometer using the same thread gage as the workpiece.	±1 µm
Workpiece thread angle error	JIS 2 grade error of half angle ±229 minutes −91 µm +71 µm	1. Minimize the angle error as much as possible. 2. Measure the angle error and perform correction calculation. 3. Use the three-wire method for a large angle error.	Error of half angle ±8 µ m at ±23 minutes
Cumulative error	(±117+40)µm	Aggregate value of possible errors	+26 µm −12 µm

Screw Pitch Diameter Measurement

Three-wire method

The screw pitch diameter can be measured with the three-wire method as shown in the figure.

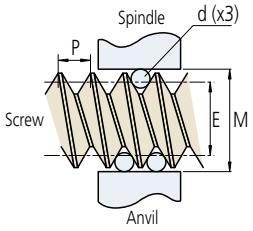
Calculate the pitch diameter (E) with equations (1) and (2).

Metric thread or unified screw (60°)

E=M–3d+0.866025P ..... (1)

Whitworth thread (55°)

E=M–3.16568d+0.960491P ... (2)



d = Wire diameter

E = Screw pitch diameter

M = Micrometer reading including three wires

P = Screw pitch

(Convert inches to millimeters for unified screws.)

Thread type	Optimal wire size at D
Metric thread or unified screw (60°)	0.577P
Whitworth thread (55°)	0.564P

Major Measurement Errors of the Three-wire Method

Error cause	Precautions for eliminating errors	Possible error	Error that might not be eliminated even with precautions
Pitch error (Workpiece)	1. Correct the pitch error $\delta p = \delta E$ 2. Measure several points and adopt their average. 3. Reduce single pitch errors.	Pitch error ±18 µm at 0.02 mm	±3 µm
Error of half angle (Workpiece)	1. Use the optimal wire diameter. 2. No correction is needed.	±0.3 µm	±0.3 µm
Error due to anvil difference	1. Use the optimal wire diameter. 2. Use the wire which has a diameter close to the average at the one wire side.	±8 µm	±1 µm
Wire diameter error	1. Use the predetermined measuring force appropriate for the pitch. 2. Use the predetermined width of measurement edge. 3. Use a stable measuring force.	–3 µm	–1 µm
Cumulative error		In the worst case +20 µm –35 µm	When measured carefully +3 µm –5 µm

One-wire method

The pitch diameter of odd-fluted tap can be measured using the V-anvil micrometer with the one-wire method. Obtain the measured value (M_1) and calculate M with equation (3) or (4).

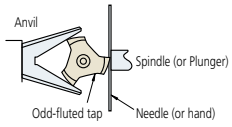
M_1 = Micrometer reading during one-wire measurement

D = Odd-fluted tap diameter

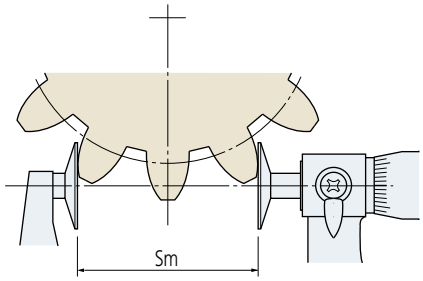
Tap with three flutes : $M = 3M_1 - 2D$ ..... (3)

Tap with five flutes : $M = 2.2360M_1 - 1.23606D$ ..... (4)

Then, assign the calculated M to equation (1) or (2) to calculate the pitch diameter (E).



Root Tangent Length



Formula for calculating a root tangent length (Sm):

$$Sm = m \cos \alpha_0 \{ \pi (Zm - 0.5) + Z \operatorname{inv} \alpha_0 \} + 2Xm \sin \alpha_0$$

Formula for calculating the number of teeth within the root tangent length (Zm):

$Zm' = Z \cdot K(f) + 0.5$ (Zm is the integer closest to Zm'.)

Here, $K(f) = \frac{1}{\pi} \{ \sec \alpha_0 \sqrt{(1 + 2f)^2 - \cos^2 \alpha_0} - \operatorname{inv} \alpha_0 - 2f \tan \alpha_0 \}$

However, $f = \frac{X}{Z}$

inv 20° ≒ 0.014904

inv 14.5° ≒ 0.0055448

m: Module

α_0: Pressure angle

Z: Number of teeth

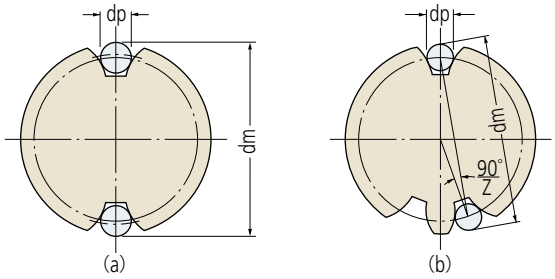
X: Addendum modification coefficient

Sm: Root tangent length

Zm: Number of teeth within the root tangent length

Gear Measurement

Over-pin method



For a gear with an even number of teeth:

$$dm = dp + \frac{dg}{\cos \phi} = dp + \frac{z \cdot m \cdot \cos \alpha_0}{\cos \phi}$$

For a gear with an odd number of teeth:

$$dm = dp + \frac{dg}{\cos \phi} \cdot \cos\left(\frac{90°}{z}\right) = dp + \frac{z \cdot m \cdot \cos \alpha_0}{\cos \phi} \cdot \cos\left(\frac{90°}{z}\right)$$

However,

$$\operatorname{inv} \phi = \frac{dp}{dg} - \frac{X}{2} = \frac{dp}{z \cdot m \cdot \cos \alpha_0} - \left(\frac{\pi}{2z} - \operatorname{inv} \alpha_0\right) + \frac{2 \tan \alpha_0}{z} \cdot X$$

Obtain ø (invø) from the involute function table.

z : Number of teeth

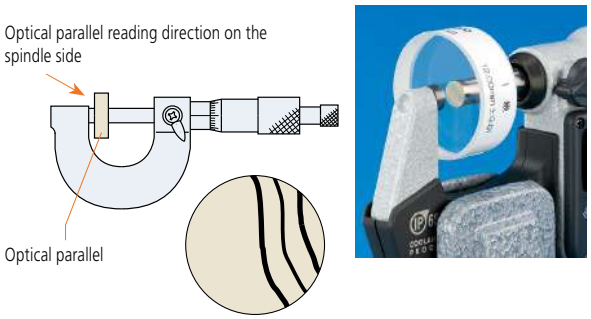
α_0 : Pressure angle teeth

m : Module

X : Addendum modification coefficient

Mitutoyo

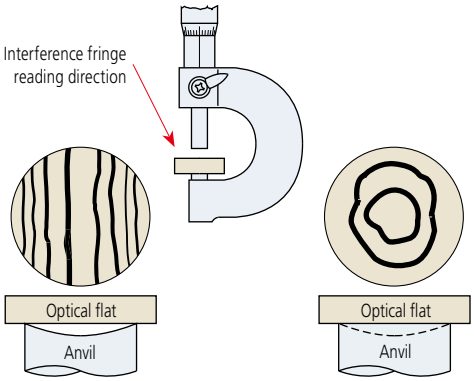
Testing Parallelism of Micrometer Measuring Faces



1. Wring the parallel to the anvil measuring face.
2. Close the spindle on the parallel using standard measuring force and count the number of red interference fringes seen on the measuring face of the spindle in white light.

In the above figure a parallelism of approximately 1 µm is obtained from 0.32 µm x 3=0.96 µm.

Testing Flatness of Micrometer Measuring Faces

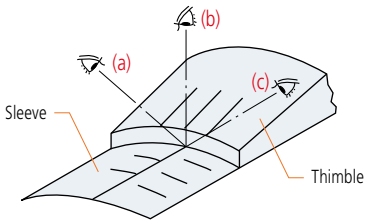


Furrow-like depression
0.32 µm×4=1.28 µm with flatness of approximately 1.3 µm

Mortar-like depression
0.32 µm×2=0.64 µm with flatness of approximately 0.6 µm

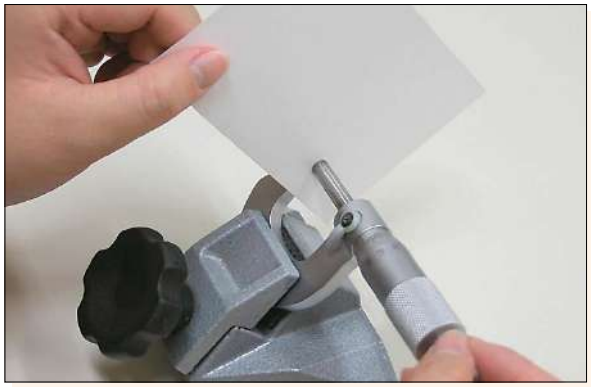
General Notes on Using the Micrometer

1. Carefully check the type, measuring range, accuracy, and other specifications to select the appropriate model for your application.
2. Leave the micrometer and workpiece at room temperature long enough for their temperatures to equalize before making a measurement.
3. Look directly at the fiducial line when taking a reading against the thimble graduations.
   If the graduation lines are viewed from an angle, the correct alignment position of the lines cannot be read due to parallax error.

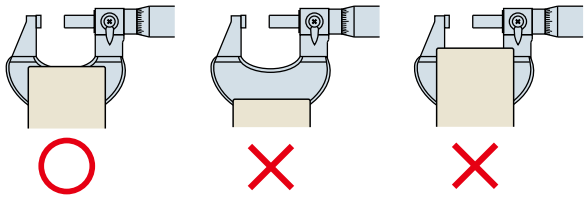


(a) From above the index line | (b) Looking directly at the index line | (c) From below the index line

4. Wipe off t.he measuring faces of both the anvil and spindle with lint-free paper set the start (zero) point before measuring.



5. Wipe away any dust, chips and other debris from the circumference and measuring face of the spindle as part of daily maintenance. In addition, sufficiently wipe off any stains and fingerprints on each part with dry cloth.
6. Use the constant-force device correctly so that measurements are performed with the correct measuring force.
7. When attaching the micrometer onto a micrometer stand, the stand should clamp the center of the micrometer frame.
   Do not clamp with excessive force when attaching.



8. Be careful not to drop or bump the micrometer on anything.
   Do not rotate the micrometer thimble using excessive force.

9. After using the Micrometer for a long period of time or when there is no protective oil film visible, lightly apply anti-corrosion oil by wiping it with a cloth soaked with the oil.

10. Notes on storage:
- Avoid storing the micrometer in direct sunlight.
- Store the micrometer in a ventilated place with low humidity.
- Store the micrometer in a place with little dust.
- Store the micrometer in a case or other container, which should not be kept on the floor.
- Store with the measuring faces open about 0.1 to 1 mm.
- Do not store the micrometer in a clamped state.

Micrometer Performance

JIS B 7502 was revised and issued in 2016 as the Japanese Industrial Standards of the micrometer and "Industrial error" which indicates micrometer performance, was changed to "Indication error".

Full surface contact error is the most important micrometer indication error. The indication error is limited by the maximum permissible error (MPE). In other words, MPE has the same meaning as tolerance. The following describes the standard inspection method including the revised content of JIS 2016.

Maximum Permissible Error of Full Surface Contact Error J MPE [JIS B 7502: 2016]

The full surface contact error of the outside micrometer is an indication error measured by contacting the entire measuring surface with the object to be measured at an arbitrary point in the measuring range.

The full surface contact error can be obtained by adjusting the reference point using a constant pressure device with the minimum measuring length of the micrometer, inserting a grade 0 or 1 gauge block prescribed in JIS B 7506 or an equivalent or higher gauge between the measuring surfaces (Fig. 3), and then subtracting the dimensions of the gage block from the indication value of the micrometer using a constant pressure device.

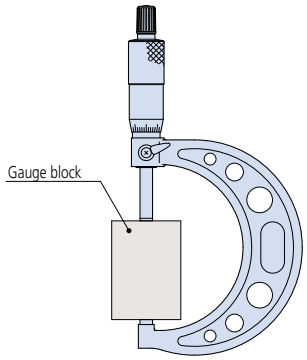


Fig: Measurement of full surface contact error

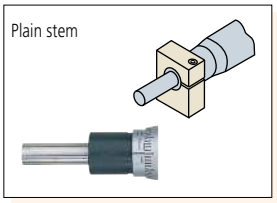
Micrometer Heads

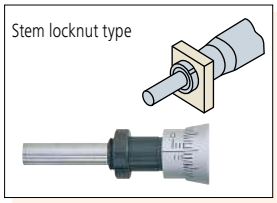
Key Factors in Selection

Key factors in selecting a micrometer head are the measuring range, spindle face, stem, graduations, thimble diameter, etc.

Select the micrometer that best suits your purpose by referring to its particular characteristics.

Stem





- The stem used to mount a micrometer head is classified as a "plain type" or "clamp nut type" as illustrated above. The stem diameter is manufactured to a nominal Metric or Imperial size with an h6 tolerance.
- The installations method have the following features:
  - Clamp nut stem: Allows fast and secure clamping of the linear gage head.
  - Plain stem: Wider range of application with positional adjustment in the axial direction on final installation, but requires a split-fixture clamping arrangement or adhesive fixing.
- General-purpose mounting fixtures are available as optional accessories.

Measuring Faces

Flat face

Spherical face

Anti-rotation device

- A flat measuring face is often specified where a micrometer head is used as a measurement tool.
- When a micrometer head is used as a feed device, a spherical face can minimize errors due to misalignment (Figure A). Alternatively, the flat face and spherical face can be reversed so that the spindle can bear against a sphere, such as a carbide ball (Figure B).
- A non-rotating spindle type micrometer head or one fitted with an antirotation device on the spindle (Figure C) can be used if a twisting action on the workpiece must be avoided.
- If a micrometer head is used as a stop, then a flat face both on the spindle and the face it contacts provides durability.

Figure A

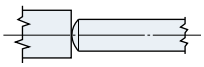


Figure B

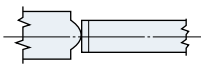
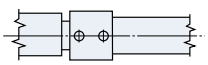
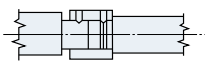


Figure C





Non-Rotating Spindle

A non-rotating spindle type head does not exert a twisting action on a workpiece, which may be an important factor in some applications.

Spindle Thread Pitch

- The standard type head has a 0.5 mm pitch.
- 1 mm-pitch type:
  Quicker to positioning, etc., than the standard type and avoids the possibility of a 0.5 mm reading error. Excellent load-bearing characteristics due to larger screw thread.
- 0.25 mm or 0.1 mm-pitch type
  This type is the best for fine-feed or fine-positioning applications.

Constant-force Device

- A micrometer head fitted with a constant-force device (ratchet or friction thimble) is recommended for measurement applications.
- If using a micrometer head as a stop, or where saving space is a priority, a head without a ratchet is probably the best choice.

Micrometer head with constant-force device

Micrometer head without constant-force device (no ratchet)

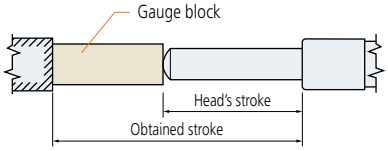
Spindle Clamp

- When using a micrometer head as a stopper, problems caused by loosening can be prevented by using a micrometer head with a spindle clamp. The spindle clamp also prevents the spindle from changing position when the clamp is operated, providing the user with peace of mind.

Measuring Range (Stroke)

- When choosing a measuring range for a micrometer head, allow an adequate margin in consideration of the expected measurement stroke. Six stroke ranges, 5 mm to 50 mm, are available for standard micrometer heads.
- If a long stroke of over 50 mm is required, the concurrent use of a gauge block can extend the effective measuring range. (Figure D)

Figure D



- In this guide, the range (or stroke end) of the thimble is indicated by a dashed line. Consider the thimble as moving within the range of the stroke ends to the position indicated by the line when designing the jig.

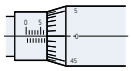
Ultra-fine Feed Applications

- Dedicated micrometer heads are available for manipulator applications, etc., which require ultra-fine feed or adjustment of spindle.

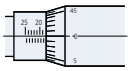
Thimble Diameter

- The diameter of a thimble greatly affects its usability and the "fineness" of positioning. A small-diameter thimble allows quick positioning whereas a large-diameter thimble allows fine positioning and easy reading of the graduations. Some models combine the advantages of both features by mounting a coarse-feed thimble (speeder) on the large-diameter thimble.

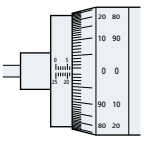
Graduation Styles



Normal graduation style



Reverse graduation style



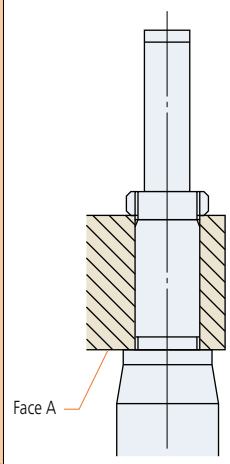
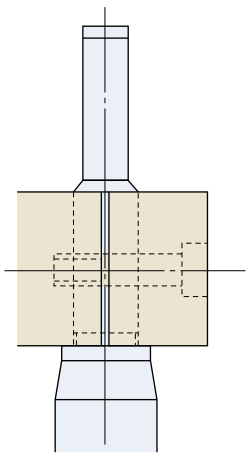
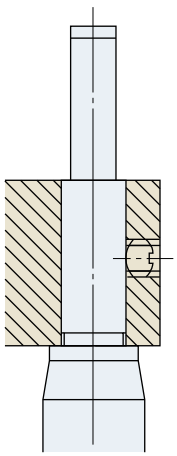
Bidirectional graduation style

- Care is needed when taking a reading from a mechanical micrometer head, especially if the user is unfamiliar with the model.
- The "normal graduation" style, identical to that of an outside mounted micrometer, is the standard. For this style the reading increases as the spindle retracts into the body.
- On the contrary, in the "reverse graduation" style the reading increases as the spindle advances out of the body.
- The "bidirectional graduation style" is intended to facilitate measurement in either direction. The numbers are displayed in black and red in the respective directions for easy reading.
- Micrometer heads with a mechanical or electronic digital display, which allow direct reading of a measurement value, are also available. These types are free from misreading errors. A further advantage is that the electronic digital display type can enable computer-based storage and statistical processing of measurement data.

Guidelines for Self-made Fixtures

A micrometer head should be mounted by the stem. It must be mounted securely and precisely using a clamping method that does not exert excessive compression on the stem. There are three common mounting methods as shown below. Method (3) is not recommended. Adopt methods (1) or (2) wherever possible.

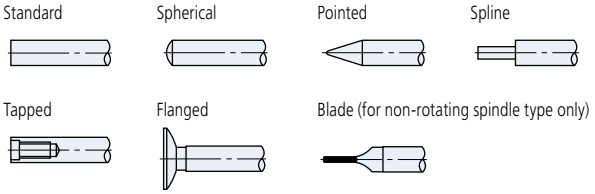
(Unit: mm)

Mounting method / Points to keep in mind	(1) Clamp nut				(2) Split-body clamp				(3) Setscrew clamp			
												
Stem diameter	ø9.5	ø10	ø12	ø18	ø9.5	ø10	ø12	ø18	ø9.5	ø10	ø12	ø18
Mounting hole	G7				G7				H5			
Fitting tolerance (mm)	+0.005 to +0.020		+0.006 to +0.024		+0.005 to +0.020		+0.006 to +0.024		0 to +0.006		0 to +0.008	
Precautions	Care should be taken to make Face A square to the mounting hole. The stem can be clamped without any problem at squareness within 0.16/6.5.				Remove burrs generated on the wall of the mounting hole by the slitting operation.				M3x0.5 or M4x0.7 is an appropriate size for the setscrew. Limit countersinking into stem to 90°x0.5 and be careful not to damage the stem in the process.			

Custom-built Products (Product Example Introductions)

Micrometer heads have applications in many fields of science and industry and Mitutoyo offers a wide range of standard models to meet customers' needs. Mitutoyo can also custom build a head incorporating features better suited to your special application. Please feel free to contact Mitutoyo about the possibilities - even if only one custom-manufactured piece is required.

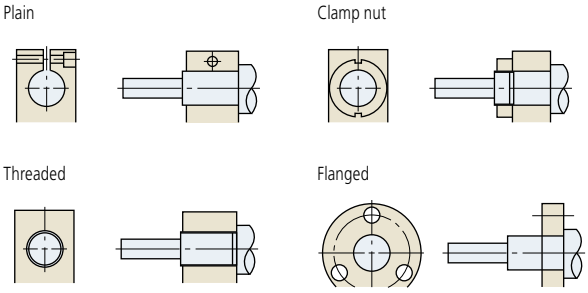
1. Spindle-end types



*A long spindle type is also available. Please consult Mitutoyo for details.

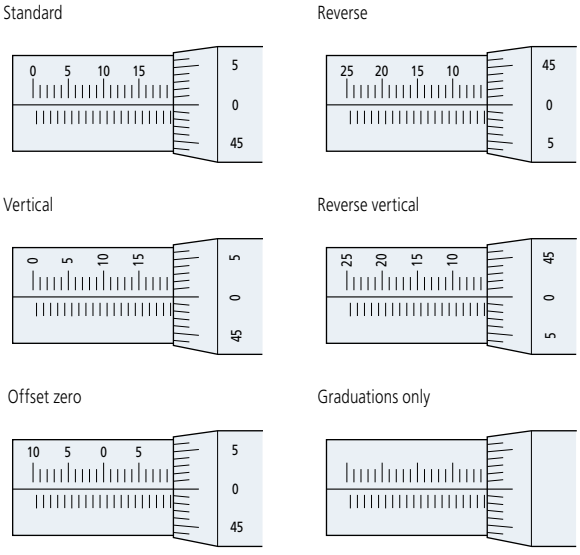
2. Stem types

A custom stem can be manufactured to suit the mounting fixture.



3. Scale graduation schemes

Various barrel and thimble scale graduation schemes, such as reverse and vertical, are available.
Please consult Mitutoyo for ordering a custom scheme not shown here.

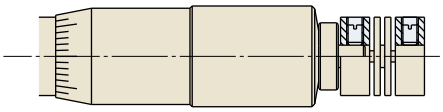


4. Logo engraving

A specific logo can be engraved as required.

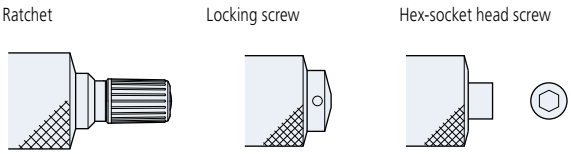
5. Motor Coupling

Couplings for providing motor drive to a head can be designed.



6. Thimble mounting

Thimble mounting methods including a ratchet, setscrew, and hex-socket head screw types are available.



7. Spindle-thread pitch

Pitches of 1 mm for fast-feed applications or 0.25 mm and 0.1 mm for fine-feed can be supplied as alternatives to the standard 0.5 mm. Inch pitches are also supported. Please consult Mitutoyo for details.

8. Lubricant for spindle threads

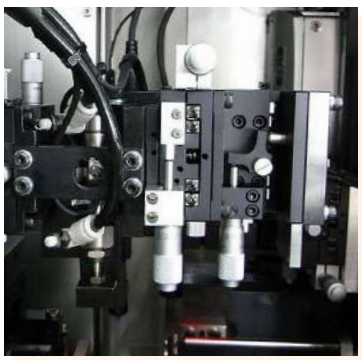
Lubrication arrangements can be specified by the customer.

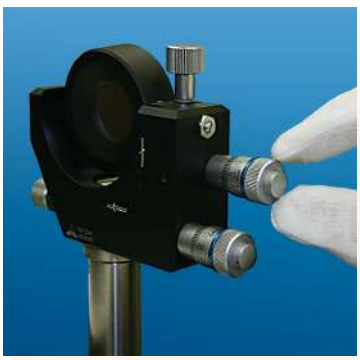
9. All-stainless construction

All components of a head can be manufactured in stainless steel.

10. Simple packaging

Large-quantity orders of micrometer heads can be delivered in simple packaging for OEM purposes.





Maximum Loading Capacity of Micrometer Heads

The maximum loading capacity of a micrometer head depends mainly on the method of mounting. It also depends greatly on the conditions of usage, such whether the loading is static or dynamic or whether the head will be used as a stopper, for example. Therefore the maximum loading capacity of each model cannot be definitively specified. The loading limits recommended by Mitutoyo (at less than 100,000 revolutions if used for measuring within the guaranteed accuracy range) and the results of static load tests using a small micrometer head are given below.

1. Recommended maximum loading limit

		Maximum loading limit
Standard type	Spindle pitch: 0.5 mm	39.2 N ((4 kgf) *
High-functionality type	Spindle pitch: 0.1 mm/0.25 mm	19.6 N (2 kgf)
	Spindle pitch: 0.5 mm	39.2 N (4 kgf)
	Spindle pitch: 1.0 mm	58.8 N (6 kgf)
	Non-rotating spindle	19.6 N (2 kgf)
	MHF micro-fine feed type (with a differential mechanism)	

* Up to approx. 19.6 kgf only for MHT

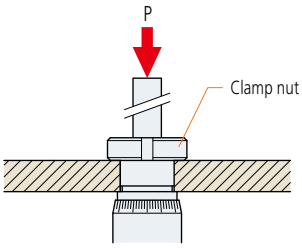
2. Static load test for micrometer heads (using 148-104/148-103 for this test)

(Test method)

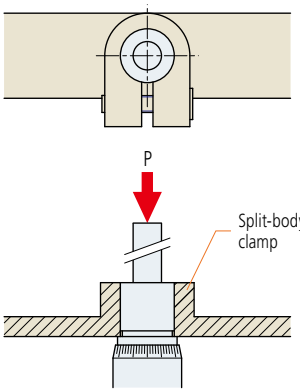
Micrometer heads were set up as shown and the force at which the head was damaged or pushed out of the fixture with a static load was applied in direction P.

(In the tests no account was taken of the guaranteed accuracy range.)

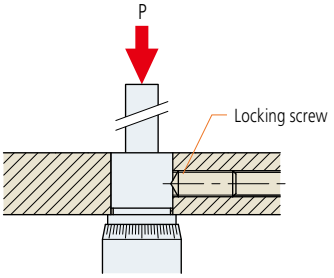
(1) Clamp nut



(2) Split-body clamp

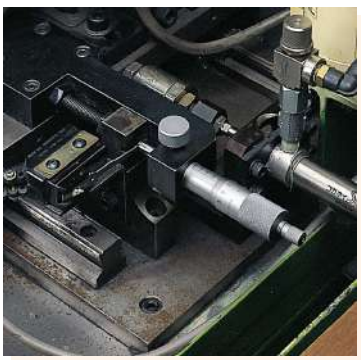


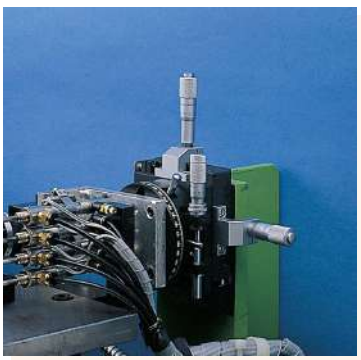
(3) Setscrew clamp



Mounting method	Damaging / dislodging load
(1) Clamp nut	Damage to the main unit will occur at 8.63 to 9.8 kN (880 to 1000 kgf).
(2) Split-body clamp	The main unit will be pushed out of the fixture at 0.69 to 0.98 kN (70 to 100 kgf).
(3) Setscrew clamp	Damage to the setscrew will occur at 0.69 to 1.08 kN (70 to 110 kgf).

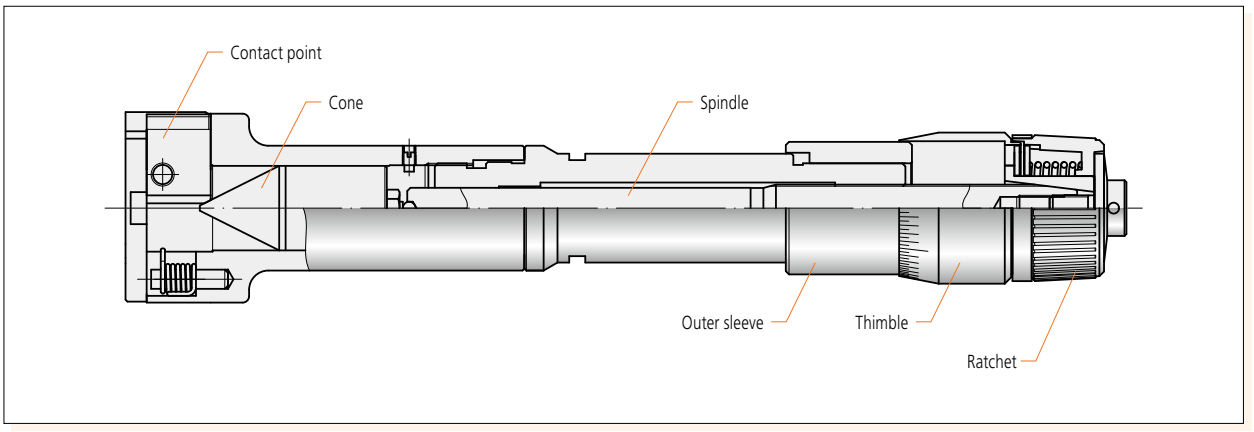
Note: These load values should only be used as an approximate guide.





Inside Measuring Instruments

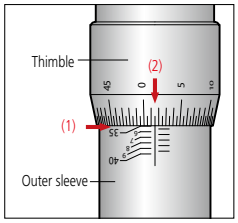
Nomenclature (Holtest)



Taking Readings

Graduation 0.005 mm

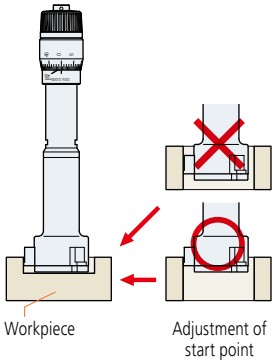
(1) Outer sleeve reading:	35	mm
(2) Thimble reading:	0.015	mm
Holtest reading:	35.015	mm



Changes in Measured Values at Different Measuring Points

When Holtest is used, the measured value differs between measurement across the anvil and the measurement only at the tip of the anvil due to the product mechanism.
Adjust the start point under the same condition before measurement.

When you use the tip of the anvil for measurement, adjust the start point for using the tip of the anvil.

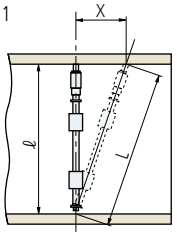


Measurement Error Due to Inside Micrometer Temperature Change

Temperature changes cause measuring tools to produce errors in measurement. When making a measurement by holding an inside micrometer directly in the hand, it is necessary to prevent expansion of the micrometer due to body temperature by holding the thermally insulating plate with gloves, etc.

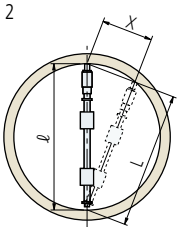
Effect of Misalignment on Accuracy (Inside Micrometer)

Figure 1



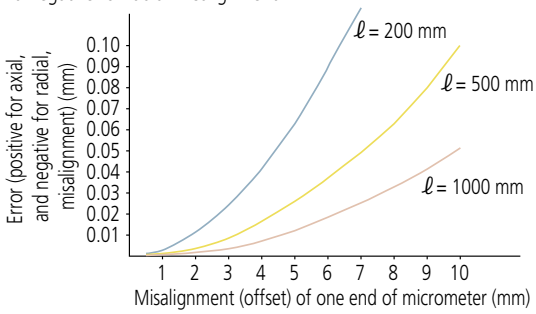
ℓ : Inside diameter to be measured
L: Length measured with axial offset X
X: Offset in axial direction
$\triangle\ell$: Error in measurement
$\triangle\ell = L - \ell$
$= \sqrt{\ell^2 + X^2} - \ell$

Figure 2



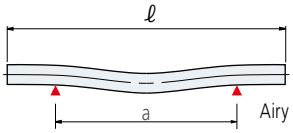
ℓ : Inside diameter to be measured
L: Length measured with axial offset X
X: Offset in axial direction
$\triangle\ell$: Error in measurement
$\triangle\ell = L - \ell$
$= \sqrt{\ell^2 - X^2} - \ell$

If the Inside Micrometer is misaligned in the axial or radial direction by an offset distance X when a measurement is taken, as in Figures 1 and 2, then that measurement will be in error as shown in the graph below (constructed from the formula given above). The error is positive for axial misalignment and negative for radial misalignment.



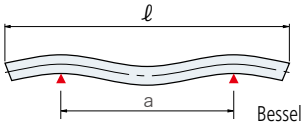
Airy and Bessel Points

When a length standard bar or inside micrometer lies horizontally, supported as simply as possible at two points, it bends under its own weight into a shape that depends on the spacing of those points.



Airy points (a ≒ 0.577ℓ)

The ends of a bar (or micrometer) can be made exactly horizontal by spacing the two supports symmetrically as shown above.

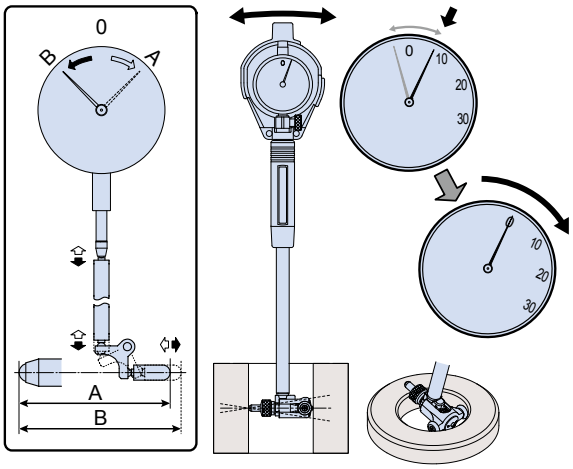


Bessel points (a≒0.559ℓ)

The change in length of a bar (or micrometer) due to bending can be minimized by spacing the two supports symmetrically as shown above.

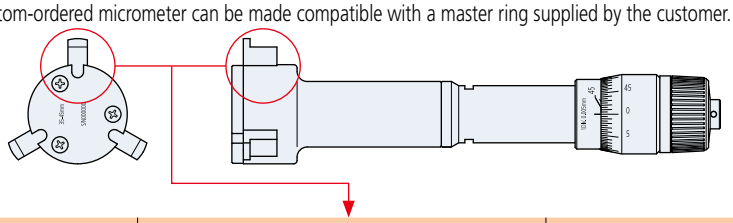
Reference Point Setting (2-point Gages)

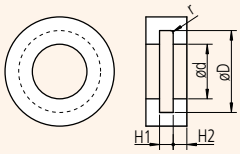
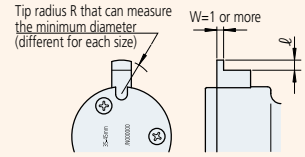
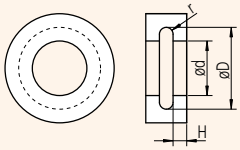
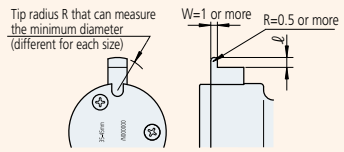
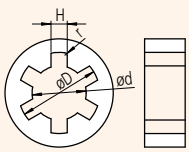
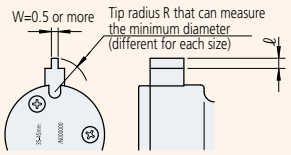
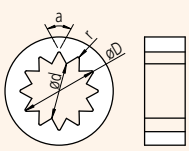
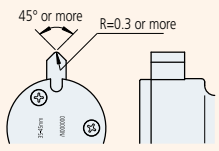
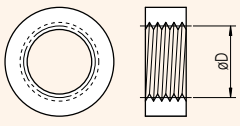
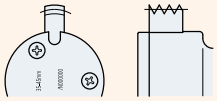
Conduct reference point setting with a ring gage or cylinder master gage. Insert the bore gage into the ring gage, vertically or horizontally swing the bore gage, and set the point where the indicator reads the maximum value as the reference point.



Custom-ordered Products (Holtest / Boremetic)

Mitutoyo can custom-build an inside micrometer best suited to your special application. Please feel free to contact Mitutoyo about the possibilities - even if only one custom-manufactured piece is required. Please note that, depending on circumstances, such a micrometer will usually need to be used with a master setting ring for accuracy assurance. (A custom-ordered micrometer can be made compatible with a master ring supplied by the customer. Please consult Mitutoyo.)



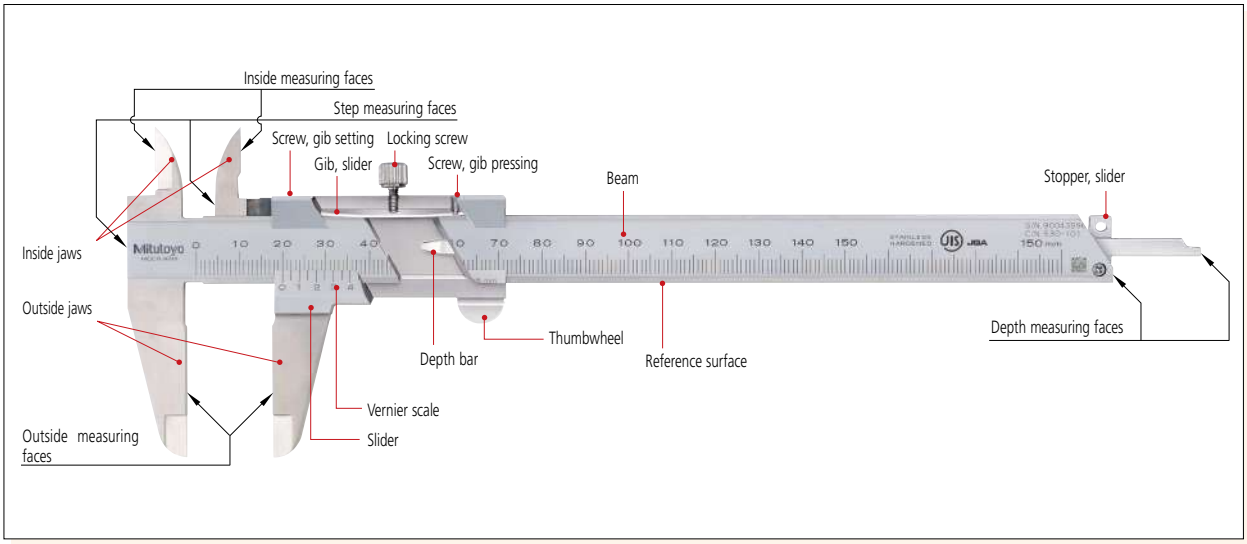
Type	Workpiece profile (example)	Contact point tip profile (example)	Remarks
Square groove			■ Can measure the diameter of variously shaped inside grooves and splines. ■ Minimum measurable groove diameter: Approximately 16 mm (differs depending on the workpiece profile.) ■ Dimension ℓ should be as follows: For W = less than 2 mm: ℓ = less than 2 mm For W = 2 mm or more: ℓ = 2 mm as the standard value which can be modified according to circumstances. ■ The number of splines or serrations is limited to a multiple of 3. ■ Details of the workpiece profile should be provided at the time of placing a custom-order. ■ If your application needs a measuring range different from that of the standard inside micrometer an additional initial cost for the master ring gage will be required.
Round groove			
Spline			
Serration			
Screw			■ Can measure the effective diameter of an internal thread. ■ Measurable internal threads are restricted according to the type, nominal dimension, and pitch of the thread. Please contact Mitutoyo with the specification of the thread to be measured for advice.

*Mitutoyo will manufacture products to accommodate other applications.
*Prices, delivery times, and other details will vary depending on the nature and content of the special order.
*Please contact your nearest Mitutoyo sales office for orders.

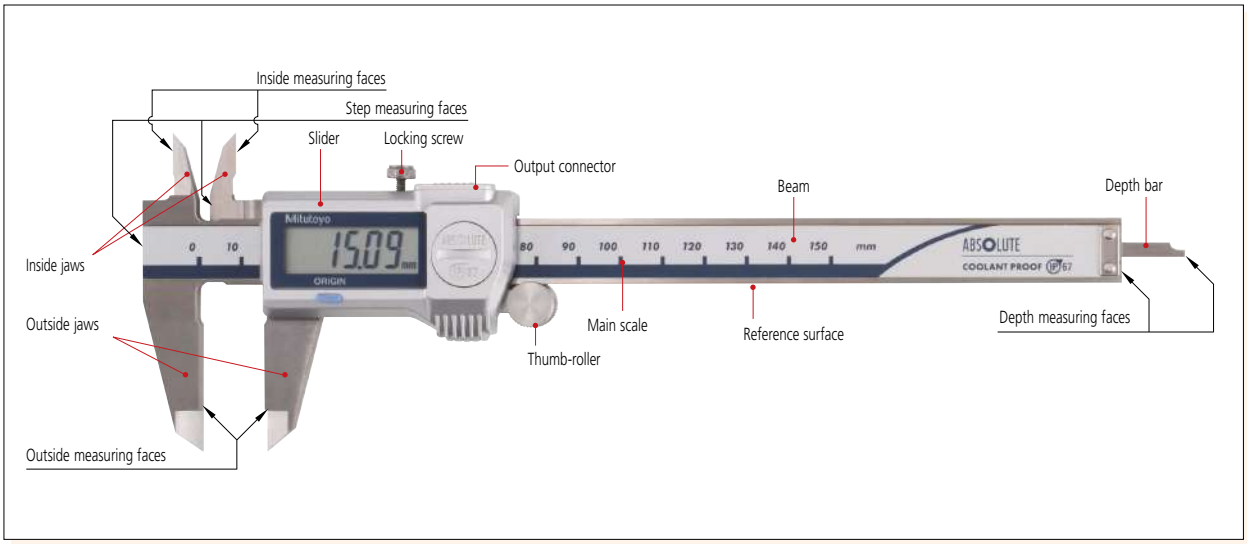
Calipers

Nomenclature

Vernier Caliper

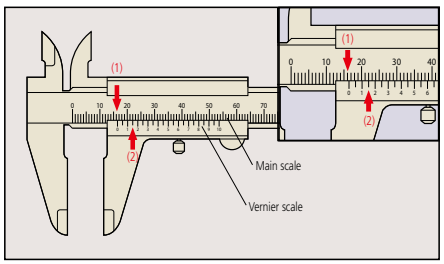


Absolute Digimatic Caliper



Taking Readings

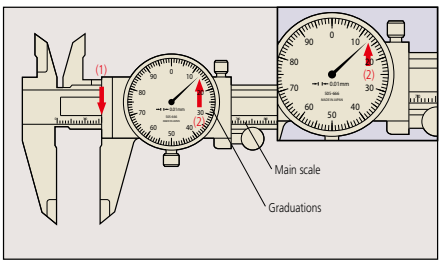
Calipers



Minimum reading: 0.05 mm

(1) Main scale reading:	16	mm
(2) Vernier scale reading:	0.15	mm
Calipers reading:	16.15	mm

Dial Calipers



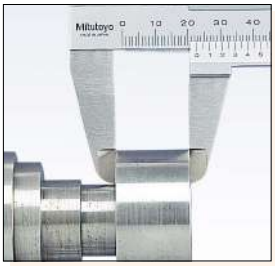
Minimum reading: 0.01 mm

(1) Main scale reading:	16	mm
(2) Graduations reading:	0.13	mm
Dial calipers reading:	16.13	mm

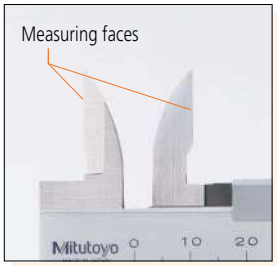
Note: Above left, 0.15 mm (2) is read at the position where a main scale graduation line corresponds with a vernier graduation line.

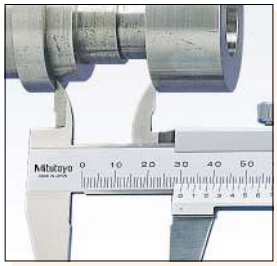
Measurement Examples

Outside measurement

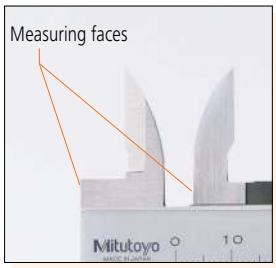


Inside measurement

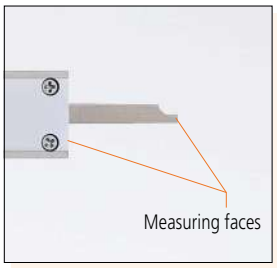




Step measurement

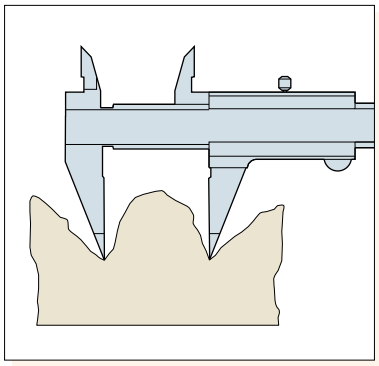


Depth measurement



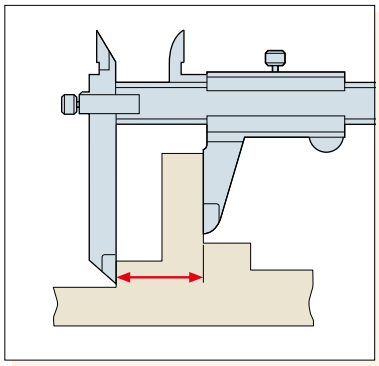
Special Purpose Caliper Applications

For uneven surface measurement



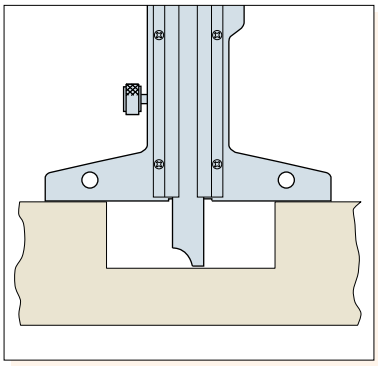
Point jaw type

For stepped feature measurement



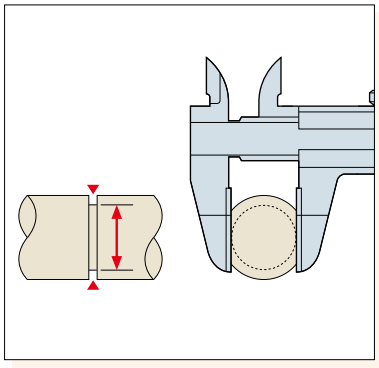
Offset jaw type

For depth measurement



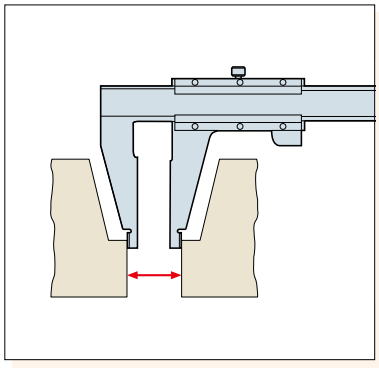
Depth type

For diameter of narrow groove measurement



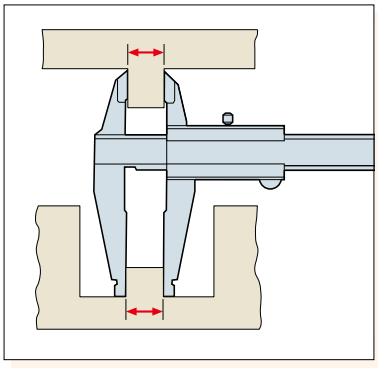
Blade jaw type

Ordinary outside measurement
For inside diameter of stepped hole measurement



Neck-type calipers

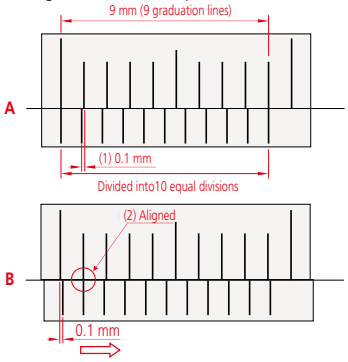
Ordinary outside measurement
For stepped hole measurement



Tube thickness-type calipers

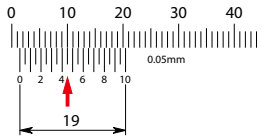
Vernier Scale

This is a short auxiliary scale that enables accurate interpolation between the divisions of a longer scale without using mechanical magnification.
Specifically, n divisions on a vernier scale are the same length as n-1 divisions on the main scale it works with, and n defines the division (or interpolation) ratio.
The example below is for n = 10.
The main scale is graduated in mm, and so the vernier scale is 9 mm (10 divisions) long, the same as 9 mm (9 divisions) on the main scale.
This produces a difference in length of 0.1 mm (1) as shown in figure A (the 1st vernier graduation is aligned with the first main scale graduation). If the vernier scale is slid 0.1 mm to the right as shown in figure B, the 2nd graduation line on the vernier scale moves into alignment with the 2nd line on the main scale (2), and so enables easy reading of the 0.1 mm displacement.



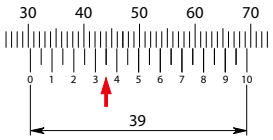
Some early calipers divided 19 divisions on the main scale by 20 vernier divisions to provide 0.05 mm resolution. However, the closely spaced lines proved difficult to read and so, since the 1970s, a long vernier scale that uses 39 main scale divisions to spread the lines is generally used instead, as shown below.

Vernier scale
• 19 mm Vernier scale



Reading: 1.45 mm

(long vernier scale)
• 39 mm vernier scale



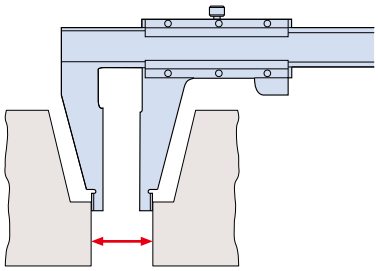
Reading:30.35 mm

Calipers were made that gave an even finer resolution of 0.02 mm. These required a 49-division vernier scale dividing 50 main scale divisions. However, they were difficult to read and are now hard to find since Digital calipers with an easily read display and resolution of 0.01 mm appeared.

About Long Calipers

Steel rules are commonly used when measuring to a limited accuracy. Long Calipers are used for further accuracy than a Steel Rule, but less than a Micrometer. A long caliper is very convenient for its user friendliness but does require some care in use.

- Minimum reading and indication error differ (see Mitutoyo's catalog values for details)
- Pay attention to how the calipers are supported, as measurement errors due to deflection tend to occur.
- When using the inside measuring faces, pay attention to measuring force as the faces are furthest away from the reference surface.
- When using a long-jaw caliper, pay attention to measuring force even when using the outside measuring faces.



Small Hole Measurement with an M-type Caliper

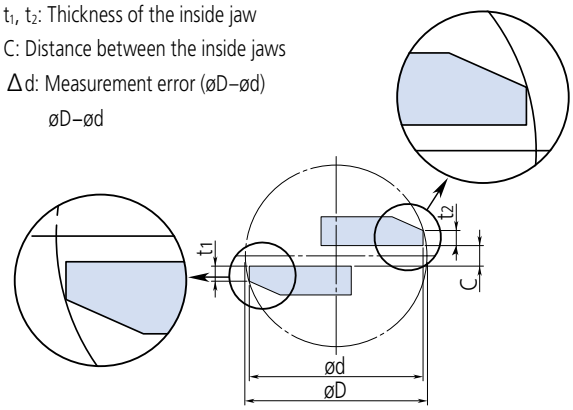
A structural error d occurs when you measure the internal diameter of a small hole.

● True internal diameter (øD: 5 mm)

Unit mm

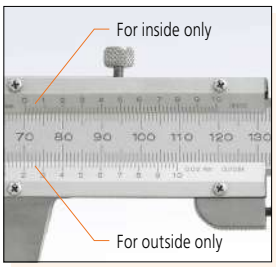
t_1+t_2+C	0.3	0.5	0.7
Δd	0.009	0.026	0.047

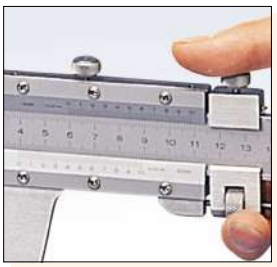
øD : True internal diameter
ød : Measured diameter
t_1, t_2: Thickness of the inside jaw
C: Distance between the inside jaws
Δd: Measurement error (øD–ød)
øD–ød



Inside Measurement with a CM-type Caliper

Because the inside measuring faces of a CM-type caliper are at the tips of the jaws, attention must be given to measuring force. Additionally, the parallelism of the measuring faces and step differences of the jaws are problematic. The radius of curvature of the measuring faces must be less than 1/2 of the combined dimensions of the inside measurement section. In contrast to an M-type caliper, a CM-type caliper cannot measure small holes below the combined measurement size. Mitutoyo CM-type calipers are provided with an extra scale on the slider for inside measurements so they can be read directly without the need for calculation. The elimination of calculations reduces measurement errors.





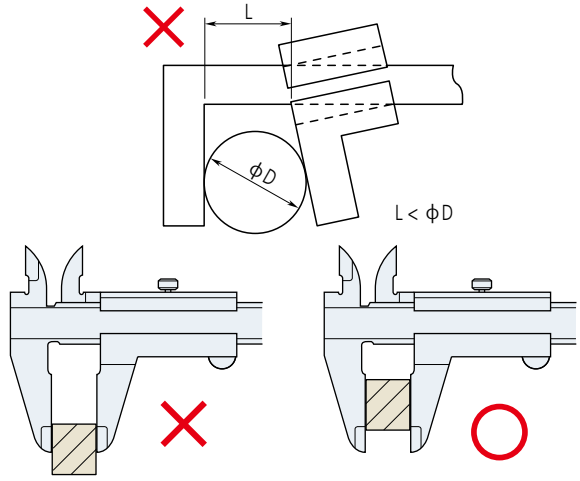
General Notes on Use of Caliper

1. Potential causes of error

The main factors behind caliper errors are:

- Excessive measuring force
- Differential thermal expansion due to a temperature difference between the caliper and workpiece
- Effect of the thickness of the knife-edge jaws and the clearance between these jaws during measurement of the diameter of a small hole
- Graduation accuracy
- Reference edge straightness
- Main scale flatness on the beam
- Squareness of the jaws

There is no problem with the caliper if these error factors are within the indication error.
Handling notes have been added to the JIS so that consumers can appreciate the error factors caused by the structure of the caliper before use. These notes relate to the measuring force and stipulate that "as the caliper does not have a constant-force device, you must measure a workpiece with an appropriate even measuring force.
Take extra care when you measure it with the root or tip of the jaw because a large error could occur in such cases."



2. Inside measurement

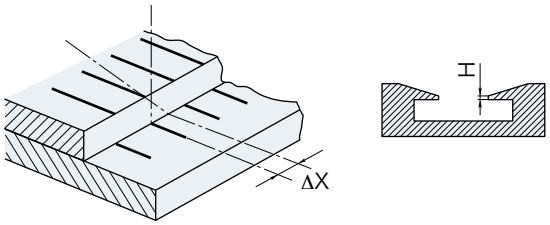
Insert the inside jaw as deeply as possible before measurement.
Read the maximum indicated value during inside measurement.
Read the minimum indicated value during groove width measurement.

3. Depth measurement

Read the minimum indicated value during depth measurement.

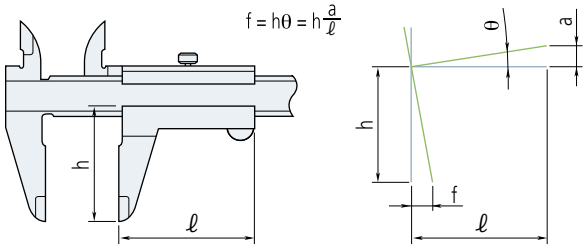
4. Parallax error when reading the scales

Look straight at the vernier graduation line when checking the alignment of vernier graduation lines to the main scale graduation lines.
If you look at a vernier graduation line from an oblique direction, a parallax effect is caused by the difference between the tip of the vernier scale and the main scale. Consequently, the matching position appears to be off by ΔX as shown in the figure below, resulting in a reading error of the measured value. To avoid this error, the JIS stipulates that the step height should be no more than 0.3 mm.



5. Moving Jaw Tilt Error

The guide face provides the basis for the caliper's slider. Consequently, measurement errors result when the face becomes warped, as shown in the figure. This error can be represented by the same calculation formula for errors caused by nonconformance to Abbe's Principle.



Example: Assume that the error slope of the jaws due to tilt of the slider is 0.01 mm in 50 mm and the outside measuring jaws are 40 mm deep, then the error (at the jaw tip) is calculated as (40/50)x0.010 mm = 0.008 mm.
f=40 mm×0.01÷50=0.008 mm
The effects of a guide face that is worn or deformed because it was handled carelessly cannot be ignored.

6. Relationship between accuracy and temperature

The main scale of a caliper is engraved (or mounted on) stainless steel, and although the linear thermal expansion coefficient is equal to that of the most common workpiece material, steel, i.e. (10.2 ±1) $\times 10^{-6}$ / K, note that other workpiece materials, the room temperature and the workpiece temperature may affect measurement accuracy.

7. Handling

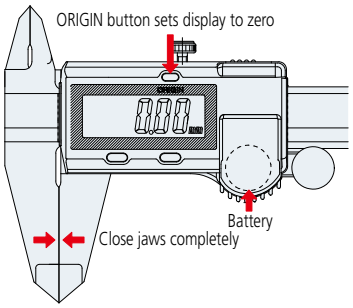
Caliper jaws are sharp, and therefore the instrument must be handled with care to avoid personal injury.
Avoid damaging the scale of a digital caliper and do not engrave an identification number or other information on it with an electric marker pen.
Avoid damaging a caliper by subjecting it to impact with hard objects or by dropping it on a bench or the floor.

8. Maintenance of beam sliding surfaces and measuring faces

Wipe away dust and dirt from the sliding surfaces and measuring faces with a dry soft cloth before using the caliper.

9. Checking and setting the origin before use

Close the jaws and ensure that the vernier scale (or display) reads zero before using the caliper.
When using a Digimatic caliper, reset the origin (ORIGIN button) after replacing the battery.



10. Handling after use

After using the caliper, completely wipe off any water and oil and lightly apply anti-corrosion oil before storage.
Wipe off water from a waterproof caliper as well because it may also rust.

11. Notes on storage:

Avoid direct sunlight, high temperatures, low temperatures, and high humidity during storage.
If a digital caliper will not be used for more than three months, remove the battery before storage.
Do not leave the jaws of a caliper completely closed during storage.

Caliper Performance

Caliper performance specified in the Japanese Industrial Standard JIS B 7507 for calipers was revised in 2016 (JIS B 7507: 2016) to JIS B 7507: 2016: The term "instrumental error" that was used until 1993 was changed to "indication error."

Partial surface contact error is the most important caliper indication error. The indication error is limited by the maximum permissible error (MPE). In other words, MPE has the same meaning as tolerance.

The following describes the standard inspection method including the revised content of JIS 2016.

Maximum Permissible Error E_{MPE} of Partial Measuring Surface Contact Error in a Conventional Caliper [JIS B 7507:2016]

The partial measuring surface contact error of a caliper is an indication error applied to the outside measurement.

Table 1 shows the Maximum Permissible Error E_{MPE} of the indication value of the partial measuring surface contact error.

The maximum permissible error E_{MPE} of an inside measurement can be obtained by measuring the inside dimensions using the inside measuring faces at any position within the measuring range using gauge blocks or an equivalent or higher gauge (**Fig. 1**) and subtracting the gauge dimension from the indicated value of the caliper.

Table 1: Maximum permissible error E_{MPE} of partial measuring face contact of conventional calipers

(Unit: mm)

Measurement length	Scale interval, graduation or resolution	
	0.05	0.02
50 or less	± 0.05	± 0.02
Over 50, 100 or less	± 0.06	± 0.03
Over 100, 200 or less	± 0.07	
Over 200, 300 or less	± 0.08	± 0.04

Note: E_{MPE} includes the measurement error arising from the straightness, flatness and parallelism of the measuring surface.

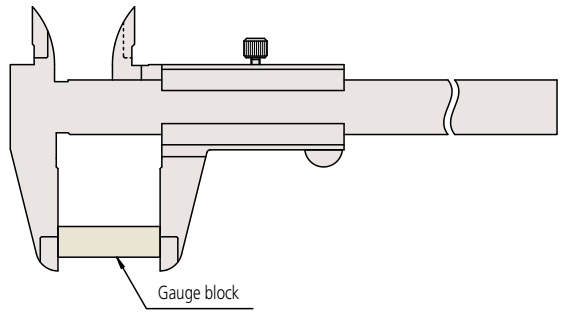


Fig. 1: Determining of partial measuring surface contact error (example)

Maximum Permissible Error of Scale Shift Error S_{MPE} [JIS B 7507: 2016]

The scale shift error in a caliper is an indication error of the inside measurement, depth measurement, etc., if measuring surfaces other than the outside measuring surfaces are used.

The Maximum Permissible Error S_{MPE} of the indication value for inside measurement is given in **Table 1**. The Maximum Permissible Error S_{MPE} of depth measurement is obtained by adding 0.02 mm to a value in **Table 1**.

The maximum permissible error S_{MPE} of an inside measurement can be obtained by measuring the inside dimensions using the inside measuring faces at any position within the measuring range using gauge blocks or an equivalent or higher gauge (**Fig. 2**) and subtracting the gauge dimension from the indicated value of the caliper.

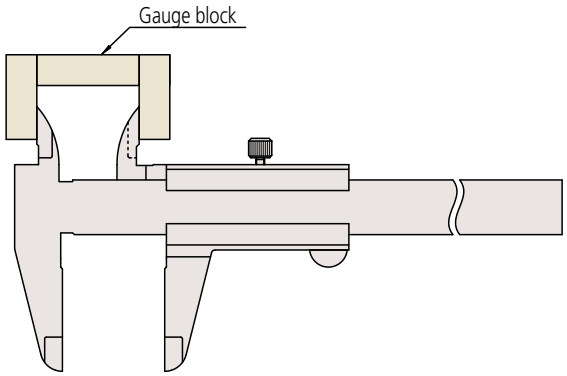


Fig. 2: Determining inside measurement indication error (example)

Partial Surface Contact Error *E* [ISO 13385-1:2019,JIS B 7507:2022]

The partial surface contact error of a caliper is an indication error applied to outside measurement.

The ISO-2019 standard quantifies for each measuring range the testing method and criteria, such as test points, number of tests, and testing arrangement that were previously left to the manufacturers' own criteria. (**Fig. 1, Table 1**)

Fig. 1

Ex.) For a caliper with a measuring range of 150 mm, the revised standard requires five or more test points.

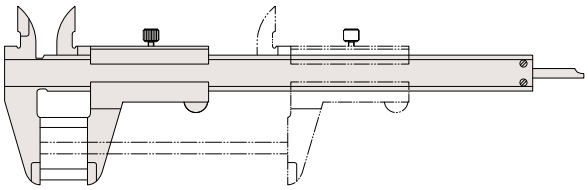


Table 1: Number of partial surface contact error test points

Measuring range (mm)	Minimum number of test points
150	5
300	6
1000	7
1,000 or more	8

Furthermore, the revised standards require testing in 90% or more points within the product measuring range as well as testing at the root and tip of the jaw at the maximum/minimum point. Therefore, it is important to conduct tests following the newly defined standard.

The following is an example of measurement for a 150 mm caliper. To comply with the ISO 13358-1:2019 standard, the minimum number of test points is five for a 150 mm caliper (**Fig. 1**).

Five or more test points are necessary to comply with the ISO 13385-1: 2019 and JIS B7507:2022 standards. These include testing at the maximum and minimum point, as well as at the root and tip of the measuring unit. These test points must add up to a total of five.

Shift Error *S*

The Shift Error for calipers is the error of indication for areas other than the outside measuring face.

In ISO13385-1:2019 and JIS B 7507:2022, all measurement errors other than outside measurement errors (inside, depth, step, and I.D. measurement error) are shift errors. Test points and their number were newly quantified as the type of errors included in the Scale Shift Error were better specified.

(**Fig. 2, 3, Table 2**)

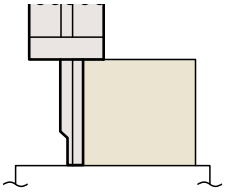


Table 2
Ex.) Step and depth measurement

[ISO 13385-1:2019]

Test numbering	Test point	Reference standard
1	Less than 50 mm	Gauge block

Figure 2: Scale Shift Error measurement example-depth measurement

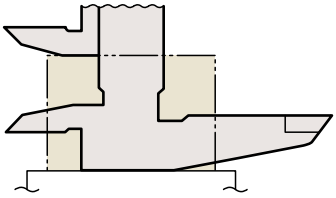


Figure 3: Scale Shift Error measurement example-step measurement

For depth measurement or step measurement, the standard specifically requires one or more test points at less than 50 mm and a testing arrangement using gauge blocks among other items.

(See **Table 3**)

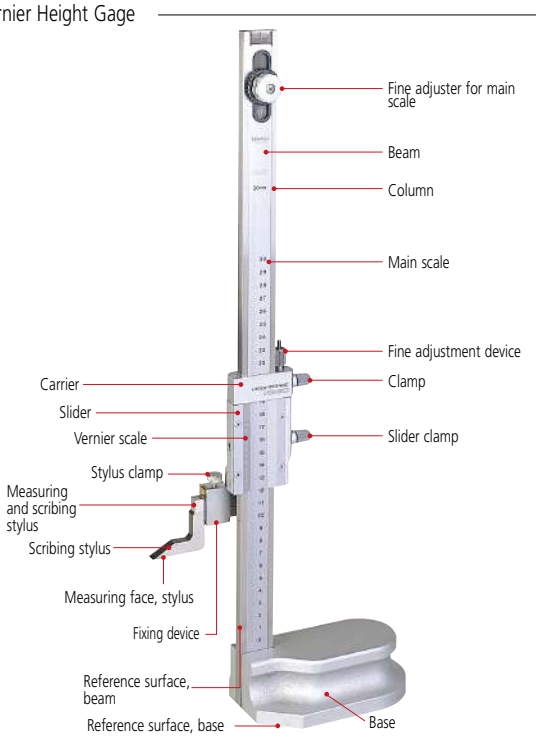
Responses to ISO 13385-1:2019 and JIS B 7507:2022

The ISO standard for calipers, ISO 13385-1, was revised and published as ISO 13385-1:2019 in August 2019. Additionally, the Japanese Industrial Standard JIS B 7507 for calipers was revised based on ISO 13385-1:2019, and published as JIS B 7507:2022 in May 2022. The major point of these revisions is that they specifically quantify the notation and the inspection methods, etc., related to caliper accuracy. This quantification does not affect the quality of calipers manufactured in the past, as they were measured and inspected in an standardized way in line with certain methods and criteria.

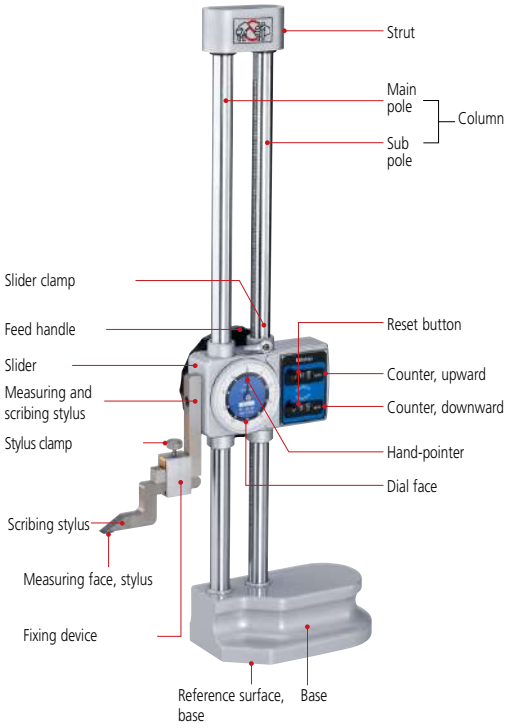
Height Gages

Nomenclature

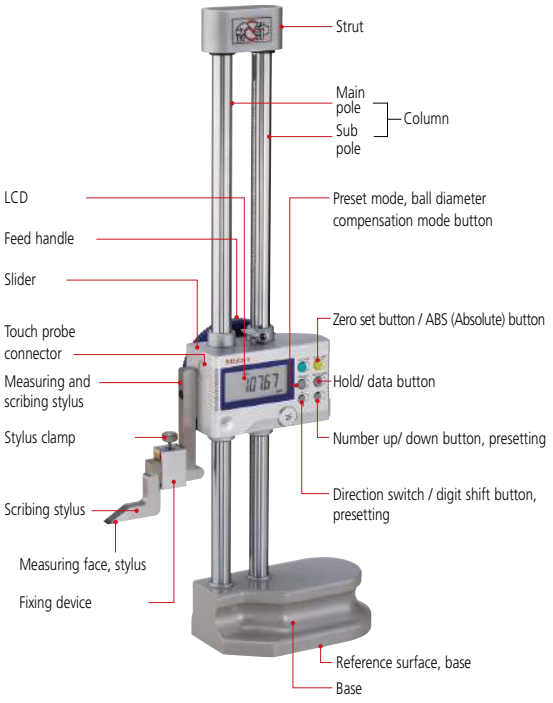
Vernier Height Gage



Mechanical Digit Height Gage



Digimatic Height Gages



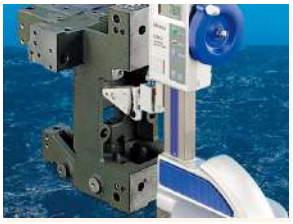
Feed handle

Slider clamping lever

Height Gage Applications with Optional Accessories and Other Measuring Tools

Test indicator attachment

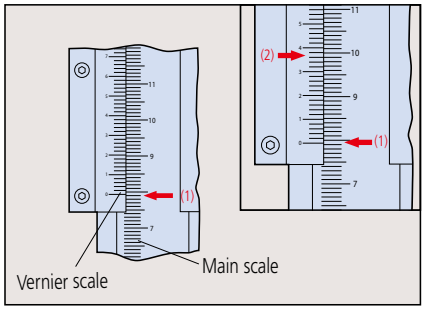
Touch probe attachment


Center probe attachment

Depth gage attachment

Taking Readings

Vernier Height Gage

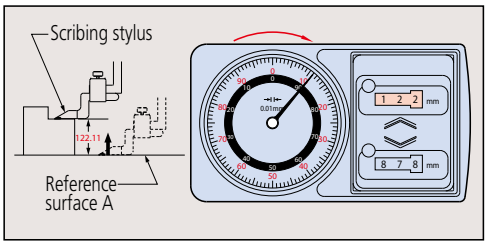


Minimum reading: 0.02 mm

(1) Main scale reading:	79	mm
(2) Vernier scale reading:	0.36	mm
Vernier height gage reading:	79.36	mm

Mechanical Digit Height Gage

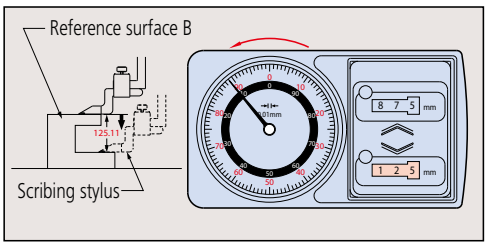
Measuring upwards from a reference surface



(1) Counter reading:	122 mm
(2) Graduations reading:	0.11 mm

Mechanical digit height gage reading: 122.11 mm

Measuring downwards from a reference surface



(1) Counter reading:	125 mm
(2) Graduations reading:	0.11 mm

Mechanical digit height gage reading: 125.11 mm

General Notes on Use of Height Gages

1. Potential causes of error

Given that this height gage is a measuring instrument that does not conform to Abbe's principle, the following error factors are possible.

- Parallax error
- Excessive measuring force
- Differential thermal expansion due to a temperature difference with the workpiece
- Structure of the height gage.

In particular, structure and error factors related to a "reference edge warping" and "scriber installation" described below should be fully understood before use.

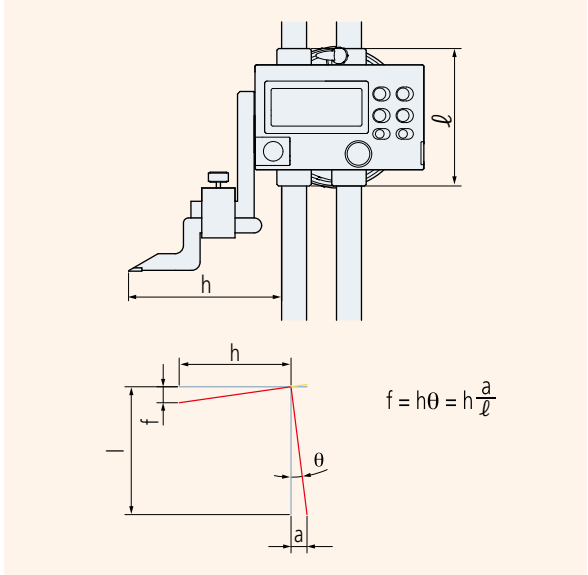
2. Reference edge (column) warping and scriber installation

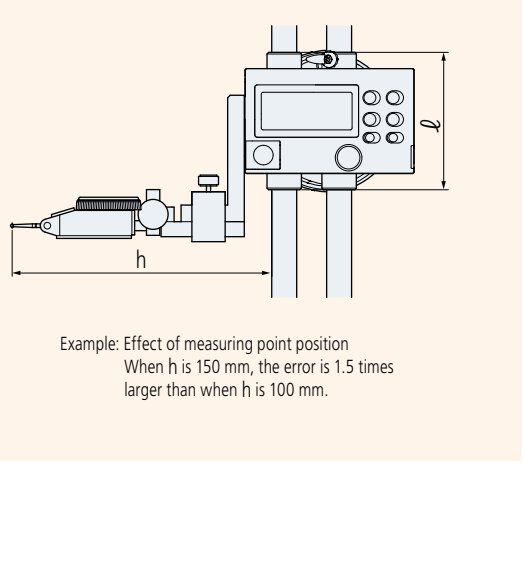
As shown in the following figure, measurement errors result when using the height gage if the reference column, which guides the slider, becomes warped. This error can be represented by the same calculation formula for errors caused by nonconformance to Abbe's Principle.

Here, installing the scriber (or a lever-type dial indicator) requires careful consideration because it affects the size of any error due to a warped reference column by increasing dimension h in the above formula. Specifically, pay attention to the following when installing the scriber.

- Make sure that the dimension h in the following formula is not too large.
- Install the scriber, etc., so that it does not protrude too far forward from the main body.

Be careful when using an optional long scriber or lever-type dial indicator, as the error factor will grow larger.





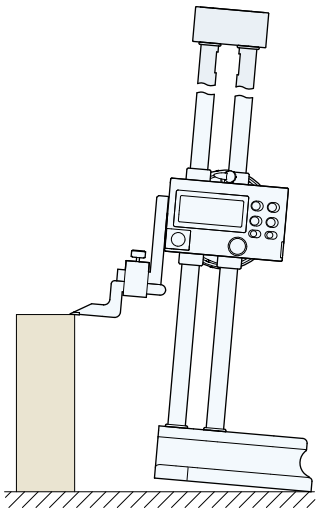
Example: Effect of measuring point position
When h is 150 mm, the error is 1.5 times larger than when h is 100 mm.

3. Lifting of the base from the reference surface

The height gage's slider can be moved with the driving handle and adjustor. After the slider contacts the workpiece, the base may lift from the surface plate if excessive downwards force is used on the slider (measuring force is applied). This results in measurement error.

For accurate setting, move the slider slowly downwards until the scriber is just felt to lightly touch the workpiece.

Always make certain that the surface plate and height gage base reference surface are free of dust or burrs.



4. Error due to inclination of the main scale (column)

According to JIS standards, the perpendicularity of the column reference edge to the base reference surface should be better than

$$(0.01+\frac{L}{1000})\ \text{mm}$$ L indicates the measuring length (unit: mm)

This is not a very onerous specification. For example, the perpendicularity limit allowable is 0.61 mm when L is 600 mm.

This is because this error factor has a small influence and does not change the inclination of the slider, unlike a warped column.

5. Relationship between accuracy and temperature

Height gages are made of several materials. Note that some combinations of workpiece material, room temperature, and workpiece temperature may affect measuring accuracy if this effect is not allowed for by performing a correction calculation.

6. A height gauge scriber tip is very sharp. Handle with care to avoid any personal injury.

7. Do not damage a digital height gage scale by engraving an identification number or other information on it with an electric marker pen.

8. Carefully handle a height gage so as not to drop it or bump it against anything.

Notes on Using the Height Gage

1. Keep the column, which guides the slider, clean. If dust or dirt accumulates on it, sliding becomes difficult, leading to errors in setting and measuring.

2. When scribing, securely lock the slider in position using the clamping arrangements provided.
   It is advisable to confirm the setting after clamping because the act of clamping on some height gages can alter the setting slightly. If this is so, allowance must be made when setting to allow for this effect.

3. Parallelism between the scriber measuring face and the base reference surface should be 0.01 mm or better.
   Check that there are no dust or burrs on the mounting surface when installing the scriber or lever-type dial indicator before measurement. Keep the scriber and other parts securely fixed in place during measurement.

4. If the main scale of the height gage can be moved, move it as required to set the zero point, and securely tighten the fixing nuts.

5. Because of parallax errors, always look at the scale from the front when taking readings.

6. Handling after use

Completely wipe off any water and oil and lightly apply anti-corrosion oil before storage.

7. Notes on storage:

- Avoid direct sunlight, high temperatures, low temperatures, and high humidity during storage.
- If a digital height gage will not be used for more than three months, remove the battery before storage.
- If a protective cover is provided, use the cover during storage to prevent dust from adhering to the column.

Height Gage Performance

JIS B 7517 was revised and issued in 2018 as the Japanese Industrial Standards for height gage, and the "Instrumental error" indicating the performance of a height gage was changed to "Indication error."

Height measurement error is the most important height gage indication error. The indication error is limited by the maximum permissible error (MPE). In other words, MPE has the same meaning as tolerance.

The following describes the standard inspection method including the revised content of JIS 2018.

Maximum Permissible Error of Height Measurement E_{MPE} [JIS B 7517: 2018]

The height measurement error in a height gage is the indication error when the reference edge (column) is perpendicular to the base reference surface and the direction of contact is downward.

Table 1 shows the maximum permissible height measurement error E_{MPE}.

The maximum permissible error E_{MPE} for a height measurement can be obtained by measuring a gauge block, or equivalent, with a height gage on a precision surface plate (**Fig. 1**) and then subtracting the gauge block size from the measured size.

Table 1: Maximum permissible height measurement error E_{MPE} of a conventional height gage

(Unit: mm)

Measurement length	Scale interval, graduation or resolution	
	0.05	0.02 or 0.01
50 or less	± 0.05	± 0.02
Over 50, 100 or less	± 0.06	± 0.03
Over 100, 200 or less	± 0.07	
Over 200, 300 or less	± 0.08	± 0.04
Over 300, 400 or less	± 0.09	
Over 400, 500 or less	± 0.10	± 0.05
Over 500, 600 or less	± 0.11	
Over 600, 700 or less	± 0.12	± 0.06
Over 700, 800 or less	± 0.13	
Over 800, 900 or less	± 0.14	± 0.07
Over 900, 1000 or less	± 0.15	

Note: E_{MPE} includes the measurement error arising from straightness, flatness of the measuring surface and parallelism with the reference surface.

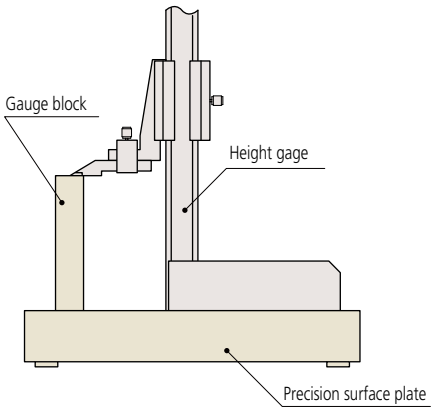


Fig. 1: Determination of height measurement error

Depth Gages

Depth Gage Performance

JIS B 7518 was revised and issued in 2018 as the Japanese Industrial Standards for depth gage, and the "Instrumental error" indicating the performance of a depth gage was changed to "Indication error."

Partial surface contact error is the most important depth gage indication error. The indication error is limited by the maximum permissible error (MPE). In other words, MPE has the same meaning as tolerance.

The following describes the standard inspection method including the revised content of JIS 2018.

Maximum Permissible Error of Depth Measurement E_{MPE} [JIS B 7518: 2018]

The Maximum Permissible Error E_{MPE} of a depth gage is an indication error applied to depth measurement.

Table 1 shows the Maximum Permissible Error E_{MPE} of the indication value of the partial measuring surface contact error.

The maximum permissible error E_{MPE} for a depth measurement can be obtained by measuring the height of two equal length gauge blocks, or equivalent, with a height gage on a precision surface plate (**Fig. 1**) and then subtracting the gauge block size from the measured size.

Table 1: Maximum permissible error E_{MPE} of partial measuring face contact of a conventional depth gage

(Unit: mm)

Measurement length	Scale interval, graduation or resolution	
	0.05	0.02 or 0.01
50 or less	± 0.05	± 0.02
Over 50, 100 or less	± 0.06	± 0.03
Over 100, 200 or less	± 0.07	
Over 200, 300 or less	± 0.08	± 0.04
Over 300, 400 or less	± 0.09	
Over 400, 500 or less	± 0.10	± 0.05
Over 500, 600 or less	± 0.11	

Note: E_{MPE} includes the measurement error arising from straightness, flatness of the measuring surface and parallelism with the reference surface.

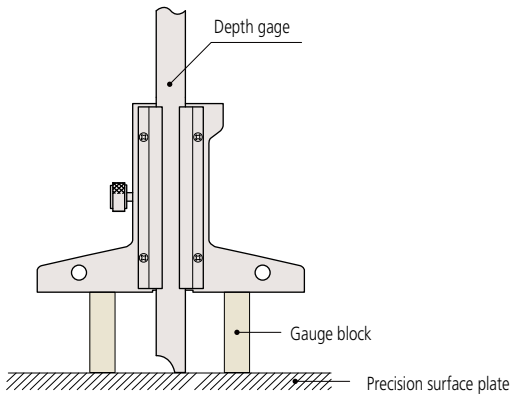
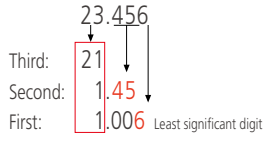


Fig. 1: Measurement of partial measuring surface contact error

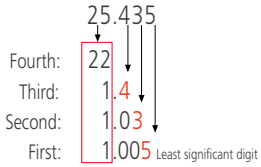
Select Gauge Blocks to be Combined to Make Up the Size Required for the Stack.

(1) Selection, preparation and assembly of a gauge block stack
Select gauge blocks with consideration for the following points:
a. Use the minimum number of blocks whenever possible.
b. Select thick gauge blocks whenever possible.
c. Select the size from the one that has the least significant digit required, and then work back through the more significant digits.

Example: For 23.456 mm



Example: For 25.435 mm



(2) Clean the gauge blocks with an appropriate cleaning agent.
(3) Check the measuring faces for burrs. When inspecting for burrs, use an optical flat as follows:

Fig. 1

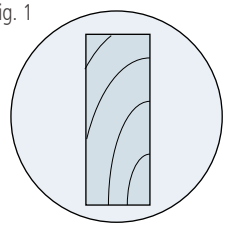
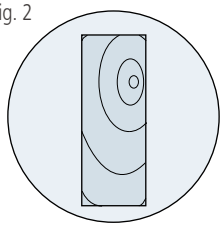


Fig. 2



a. Wipe each measuring face clean.
b. Gently place the optical flat on the gauge block measuring face.
c. Lightly slide the optical flat to check that the interference fringes disappear. (Fig. 1, Fig. 2)
Judgment 1: If no interference fringes appear, it is assumed that there is a large burr or contaminant on the measuring face.
d. Lightly press the optical flat to check that the interference fringes disappear.
Judgment 2: If the interference fringes disappear, no burr exists on the measuring face.
Judgment 3: If some interference fringes remain locally while the flat is gently moved to and fro, a burr exists on the measuring face. If the fringes move along with the optical flat, there is a burr on the optical flat.
e. Remove burrs by referring to the figures.

Fig. 3

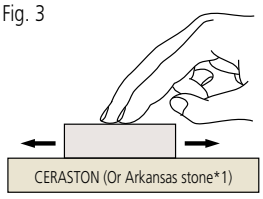
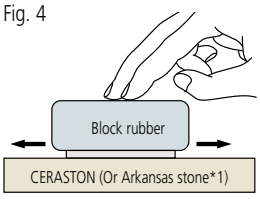
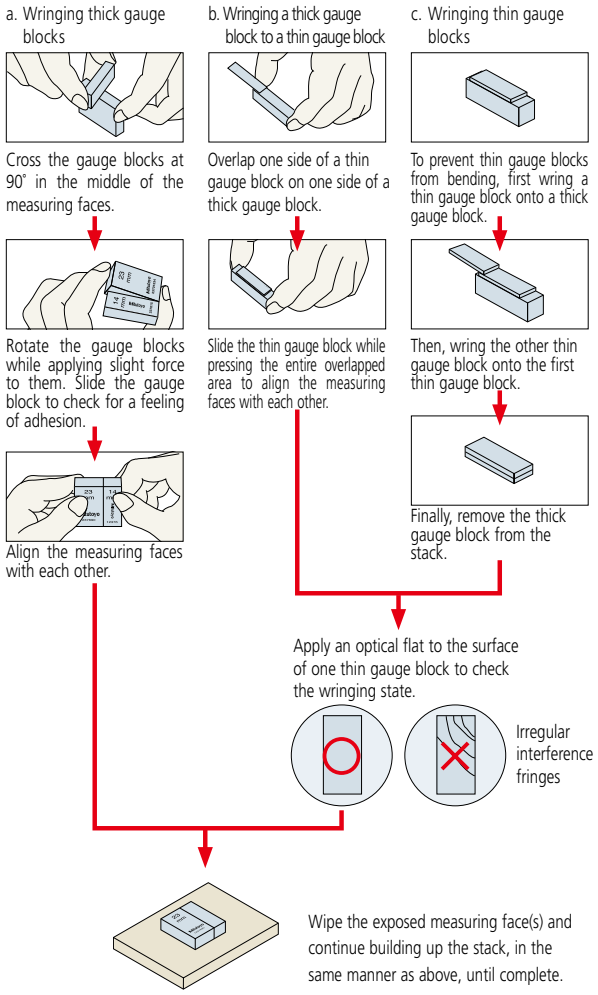


Fig. 4



(1) Wipe any dust and oil films from the gauge block and the Ceraston (or Arkansas stone)*1 using a solvent.
(2) Place the gauge block on the Ceraston (or Arkansas stone)*1 so that the measuring face that has burrs is on the abrasive surface of the stone. While applying light pressure, move the gauge block to and fro about ten times (Fig. 3).
For thin gauge blocks, use a block rubber that makes it easy to apply even pressure (Fig. 4).
(3) Check the measuring face for burrs with an optical flat.
If the burrs have not been removed, repeat step (2). If burrs are too large, they may not be removed with an abrasive stone. Replacement with a new gauge block is recommended when burrs cannot be removed.
*1 Mitutoyo does not offer Arkansas stones.

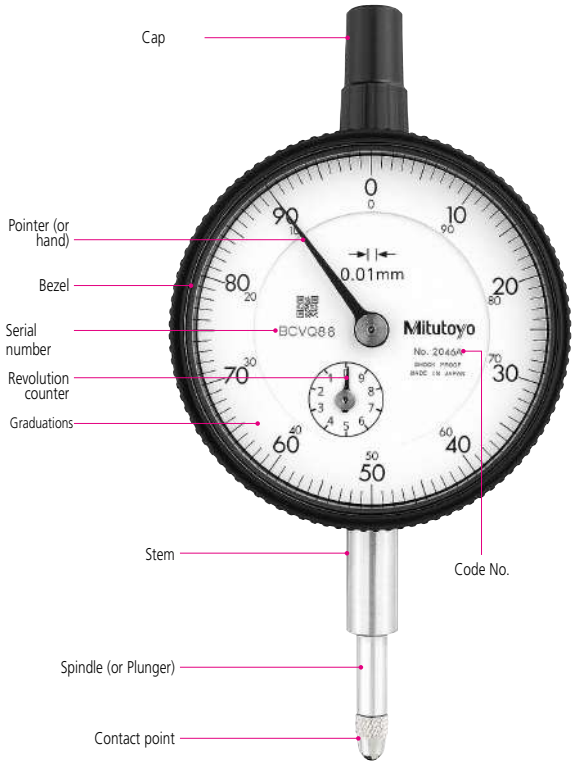
(4) Apply a very small amount of oil to the measuring face and spread it evenly across the face. Wipe the face until the oil film is almost entirely removed. Use grease, spindle oil, Vaseline, or other recommended oils.
(5) Gently overlay the faces of the gauge blocks to be wrung together.
There are three methods to use (a, b and c as shown below) according to the size of blocks being wrung:



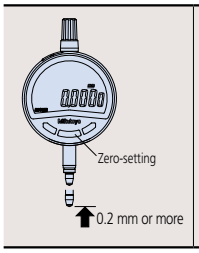
Definition of the Meter
The 17th General Conference of Weights and Measures in 1983 decided on a new definition of the meter unit as the length of the path traveled by light in a vacuum during a time interval of 1/299 792 458 of a second. The gauge block is the practical realization of this unit and as such is used widely throughout industry.

Dial Indicators, Digital Indicators and Test Indicators

Nomenclature



Setting the origin of a digital indicator

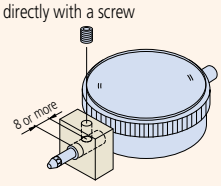
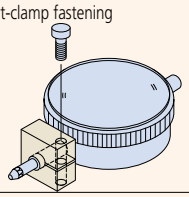
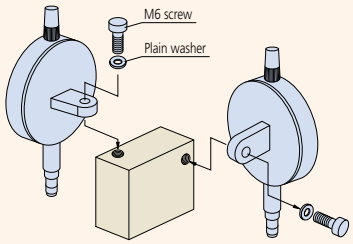


The accuracy specification in the range of 0.2 mm from the end of the stroke is not guaranteed for Digimatic indicators. When setting the zero point or presetting a specific value, be sure to lift the spindle at least 0.2 mm from the end of the stroke.

Care of the spindle

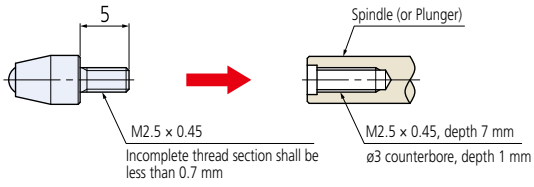
- Do not lubricate the spindle. Doing so might cause dust to accumulate, resulting in a malfunction.
- If the spindle movement is poor, wipe the upper and lower spindle surfaces with a dry or alcohol-soaked cloth. If the movement is not improved by cleaning, contact Mitutoyo for repair.
- Before making a measurement or calibration, confirm that the spindle moves smoothly by moving it upward and downward and check the stability of the zero point.

Dial Indicator and Digital Indicator Mounting

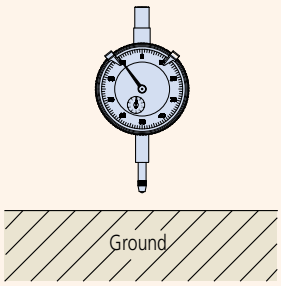
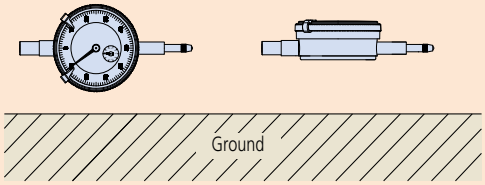
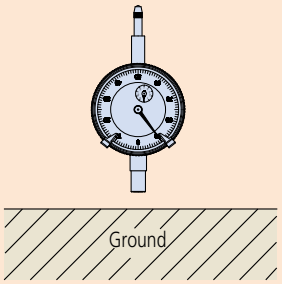
Stem mounting	Method	Clamping the stem directly with a screw 	Clamping the stem by split-clamp fastening 
	Precautions	• Mounting hole tolerance: ø8G7 (+0.005 to 0.02) • Clamping screw: M4 to M6 • Clamping position: 8 mm or more from the lower edge of the stem • Maximum clamping torque: 150 N·cm when clamping with a single M5 screw • Note that excessive clamping torque may adversely affect spindle movement.	• Mounting hole tolerance: ø8G7 (+0.005 to 0.02)
Lug mounting	Method		
	Note	• Lugs can be changed 90° in orientation according to the application. (The lug is set horizontally when shipped.) • Lugs of some Series 1 models (No.1911A-10, 1913A-10 and 1003A), however, cannot be altered to horizontal. • Fix the spindle so that it is perpendicular to the measuring face. A large inclination may cause measurement error.	

Contact Point

- Screw thread is standardized on M2.5 x 0.45 (Length: 5 mm).
- Incomplete thread section at the root of the screw shall be less than 0.7 mm when fabricating a contact point.



Measuring Orientation

Attitude		Remarks
Vertical position (contact point downward)		—
Lateral position (spindle horizontal)		If measurement is performed in the lateral orientation, or upside-down orientation, the measuring force is less than in the vertical orientation. In this case be sure to check the operation and repeatability of the indicator. For guaranteed-operation specifications according to the operating orientation refer to the specific product descriptions in the catalog.
Upside-down position (contact point upward)		

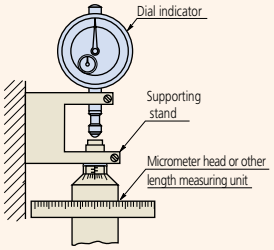
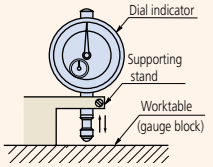
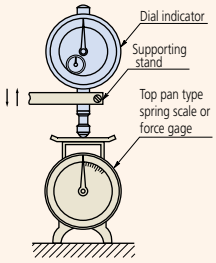
Maximum permissible error

Unit: μ m

		Maximum permissible error (MPE) by measurement characteristics -- dial indicators with bezel dia. 50 mm or larger												Maximum permissible error (MPE) by measurement characteristics --dial indicators with bezel dia. 50 mm or smaller and Back Plunger type dial indicators						
Graduation (mm)		0.01								0.005	0.001			0.01				0.005	0.002	0.001
Measuring range (mm)		1 or less	Over 1 and up to 3	Over 3 and up to 5	Over 5 and up to 10	Over 10 and up to 20	Over 20 and up to 30	Over 30 and up to 50	Over 50 and up to 100	5 or less	1 or less	Over 1 and up to 2	Over 2 and up to 5	1 or less	Over 1 and up to 3	Over 3 and up to 5	Over 5 and up to 10	5 or less	1 or less	1 or less
Retrace error		3	3	3	3	5	7	8	9	3	2	2	3	4	4	4	5	3.5	2.5	2
Repeatability		3	3	3	3	4	5	5	5	3	0.5	0.5	1	3	3	3	3	3	1	1
Indication error	Arbitrary 1/10 revolution	5	5	5	5	8	10	10	12	5	2	2	3.5	8	8	8	9	6	2.5	2.5
	Arbitrary 1/2 revolution	8	8	9	9	10	12	12	17	9	3.5	4	5	11	11	12	12	9	4.5	4
	One revolution	8	9	10	10	15	15	15	20	10	4	5	6	12	12	14	14	10	5	4.5
	Entire measuring range	8	10	12	15	25	30	40	50	12	5	7	10	15	16	18	20	12	6	5

Note 1: The maximum permissible error (MPE) for one-revolution dial indicators does not specify the indication error of an arbitrary 1/2 and 1 revolution.
Note 2: The MPE represents the value at 20 °C, which JIS B 0680 defines as the standard temperature.
Note 3: If the manufacturer has not specified dial indicator's measurement characteristics, the indicator must meet both maximum permissible error (MPE) and measurement force permissible limits (MPL) at any position within the measuring range in any posture.

Dial Indicator Standard B7503 : 2017 (Extract from JIS/Japanese Industrial Standards)

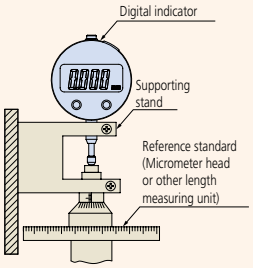
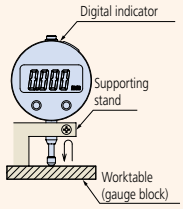
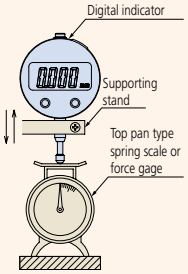
Item		Model	Measuring method (zero-point fixed)	Evaluation method (performance evaluation by moving the zero point)	Measurement examples
Indication error	Indication error over the entire measuring range	One-revolution dial indicator and multi-revolution dial indicator	Set the dial indicator on the supporting stand, and read the indication error[*1] of the next point while gradually retracting the spindle. - Every 1/10 revolution for the first two revolutions[*2] - Every half revolution from two to five revolutions - Every revolution from five to ten revolutions - Every five revolutions from 10 to 50 revolutions - Every ten revolutions after 50 revolutions Next, after retracting the spindle for more than three graduations of the long hand, extend the spindle gradually and read the indication error at the same measurement point in the retract direction.	Obtain the difference between the maximum and the minimum values of indication error of all measurement points in both retract and extend directions.	
	1/10 revolution indication error			During the first two revolutions in both retract and extend directions, obtain the maximum difference of the indication error among the adjacent measurement points per 1/10 revolutions.[*3]	
	1/2 revolution indication error	Multi-revolution dial indicator		During the first five revolutions in both retract and extend directions, obtain the maximum difference of the maximum and the minimum indication errors over the measuring range per 1/2 revolutions.	
	1 revolution indication error			During the first ten revolutions in both retract and extend directions, obtain the maximum difference of the maximum and the minimum indication errors over the measuring range per one revolution.	
Retrace error		One-revolution dial indicator and multi-revolution dial indicator		Obtain the maximum difference of all the measuring points in reference to the indication error at the same measuring point in both forward and backward directions.	
Repeatability		One-revolution dial indicator and multi-revolution dial indicator	Set the dial indicator on the supporting stand, retract the spindle at a desired position within the measuring range. Then, extend the spindle quickly and slowly five times and read each value.	Obtain the maximum difference among five indication values.	
Measuring force			Set the dial indicator on the supporting stand, retract and extend the spindle continuously and gradually, and read the measuring force at the zero and end points.	Obtain the maximum measuring force, the minimum measuring force, and the difference of the measuring force in both retract and extend directions at the same measurement point.	

*1: For how to read the indication error, either read the input quantity of the measuring instrument aligning the long hand to the graduation, or read the indication value of the dial indicator according to the moving amount of the measuring instrument.
*2: With the one-revolution dial indicator, read the indication error per 10 graduations.
*3: With the one-revolution dial indicator, obtain the maximum difference of the indication error in the interval of adjacent 10 graduations.

Mitutoyo's Response to Dial Indicator JIS B 7503:2017

- We guarantee the accuracy of completed products by inspecting them in the vertical posture. Standard-attached inspection certificate includes inspection data.
- We issue paid-for calibration results for horizontal or opposite posture if required.

Digital indicators JIS B 7563 : 2021 (Extract from JIS/Japanese Industrial Standards)

Item.		Measuring method (zero-point fixed)	Evaluation method (performance evaluation by moving the zero point)	Measurement examples
Indication error	Indication error over a portion of the measuring range (in the forward direction)	Set the digital indicator on the supporting stand and read the indication error while gradually retracting the spindle. Next, after retracting the spindle for at least 0.1 mm, extend the spindle gradually and read the indication error at the same measurement point in the retract direction. a) The points of measurement for the partial measuring range shall be at least 6 points (preferably equally spaced) within a range of 50 times the minimum reading from the zero point, including the zero point. b) The points of measurement for the entire measuring range shall consist of 11 or more points (preferably equally spaced), including the zero and end points. c) For how to read the indication error, either read the input quantity of the measuring instrument with the digital indicator value, or read the digital indicator value according to the moving amount of the measuring instrument.	Obtain the difference between the maximum and the minimum values of indication error of all measurement points of the partial measuring range in the forward direction.	
	Indication error over the entire measuring range (in the forward direction) E_{MPE}		Obtain the difference between the maximum and the minimum values of indication error of all measurement points of the entire measuring range in the forward direction. a) Include the measurement points in the partial measuring range when determining the indication error for the entire measuring range.	
	Retrace error H_{MPE}		Obtain the maximum difference in reference to the indication error at the same measuring point in both forward and backward directions for the partial measuring range and entire measuring range.	
Repeatability R_{MPE}		Set the digital indicator on the supporting stand, retract the contact point into any position within the measuring range, and actuate it five times in the backward direction. Move the contact point quickly and slowly and read the indicated value each time.	Obtain the maximum difference among five indication values.	
Measuring force MPL		Set the digital indicator on the supporting stand, retract and extend the spindle continuously and gradually, and read the measuring force at the zero and end points.	Obtain the maximum measuring force, the minimum measuring force, and the difference of the measuring force in both retract and extend directions at the same measurement point.	

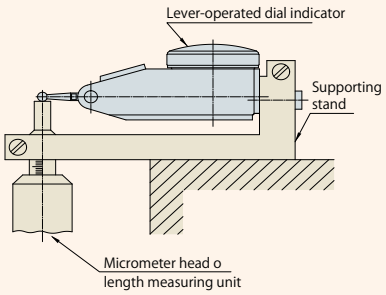
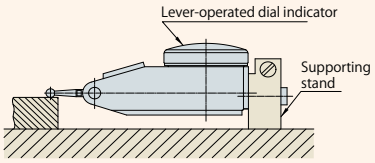
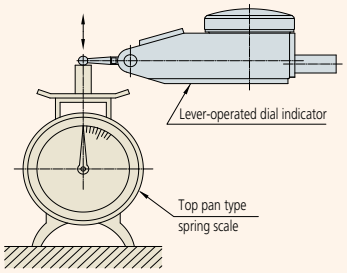
Digital indicator maximum permissible error (MPE)

Characteristic	Minimum reading (mm)	0.01				0.001				0.0005			
	Partial measuring range (mm)	0.5				0.05				0.025			
	Measuring range (mm)	15 or less	Over 15 and up to 30	Over 30 and up to 60	Over 60 and up to 100	15 or less	Over 15 and up to 30	Over 30 and up to 60	Over 60 and up to 100	15 or less	Over 15 and up to 30	Over 30 and up to 60	Over 60 and up to 100
Indication error over a portion of the measuring range (in the forward direction) P_{MPE} (µm)		20		40		3		5		3		5	
Indication error over the entire measuring range (in the forward direction) E_{MPE} (µm)		20		40		3		5		3		5	
Retrace error H_{MPE} (µm)		20				3				3			
Repeatability R_{MPE} (µm)		20				2				2			

Mitutoyo's Response to Digital Indicators JIS B 7563:2021

- We guarantee the accuracy of completed products by inspecting them in the vertical posture. Standard-attached inspection certificate includes inspection data.
- We issue paid-for calibration results for horizontal or opposite posture if required.

Lever-Operated Dial Indicator Standard B7533 : 2015 (Extract from JIS/Japanese Industrial Standards)

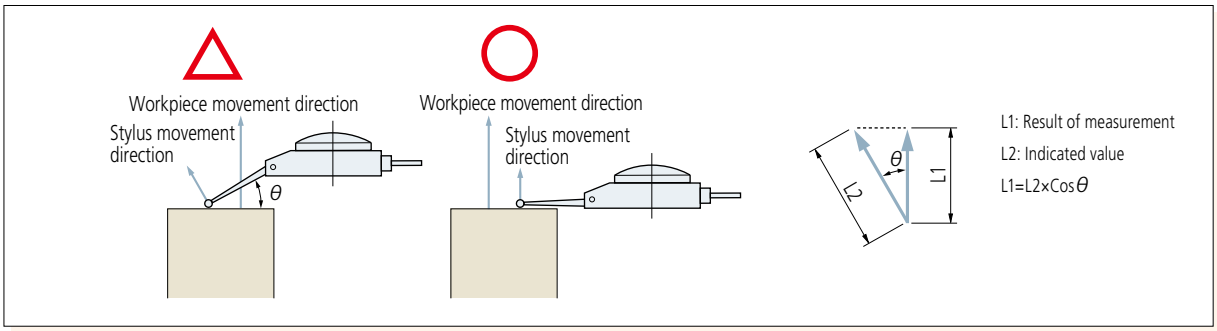
No.	Item.	Measuring method	Measuring point	Evaluation method	Diagram
1	Indication error over the entire measuring range (in the forward direction)	Holding the dial test indicator (lever type), define the reference point at near the contact point resting point where the indication and error of indication is set zero. Then, move the contact point in the forward direction and read the error of indication at each measuring point. Next, after moving the contact point for more than three graduations from the end of the measuring range, move the contact point in the backward direction and read the error of indication at the same measurement point in the forward direction. (The forward direction is the direction against the measuring force to the contact point of the lever-operated dial indicator; the backward direction is the measuring force applied direction.)	Per 10 graduations in the forward and backward direction from the reference point to the end point.	Obtain the difference between the maximum and the minimum values of indication error of all measurement points in the forward direction.	
2	10 graduations indication error			In the forward direction from the reference point to the end point, obtain the maximum difference of the indication error among the adjacent measurement points per 10 graduations.	
3	1 revolution indication error			In the forward direction from the reference point to the end point, obtain the maximum difference of the maximum and the minimum indication errors to be read by the zero-point fixed method over the measuring range per 1 revolution.	
4	Retrace error			Obtain the maximum difference in reference to the indication error at the same measuring point in both forward and backward directions among all the measurement points.	
5	Repeatability	Holding the dial test indicator (lever type) with its stylus parallel with the top face of the measuring stage, move the contact point quickly and slowly five times at a desired position within the measuring range and read the indication at each point.	At arbitrary points within the measuring range	Obtain the maximum difference of the five measured values.	
6	Measuring force	Holding the dial test indicator (lever type), move the contact point in the forward and backward directions continuously and gradually, and read the measuring force in the measuring range.	Reference point and end point within the measuring range	Obtain the maximum and the minimum values in reference to the measuring force.	

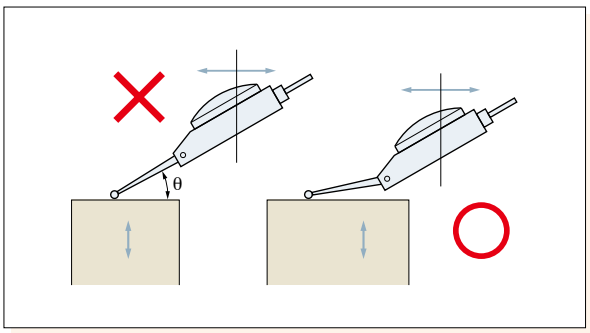
● Maximum permissible error and permissible limits

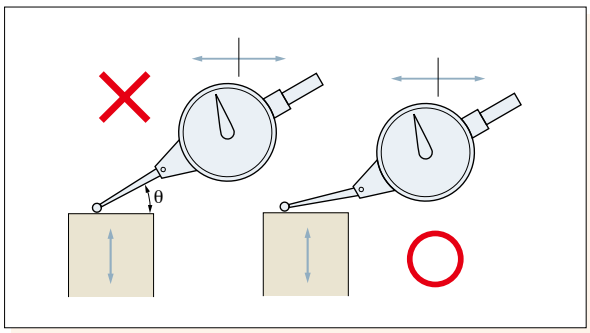
Graduation (mm)		0.001/0.002			0.01			
Revolution		1 revolution	Multi-revolution		1 revolution			Multi-revolution
Measuring range (mm)		0.3 or less	Over 0.3, up to 0.5	Over 0.5, up to 0.6	0.5 or less	Over 0.5, up to 1.0		Over 1.0, up to 1.6
						$L_1 \leqq 35$	$35 < L_1$	
Indication error (μm)	Measuring range (μm)	4	6	7	6	9	10	16
	One revolution	—	5	5	—	—	—	10
	10 scale divisions (μm)	2	2	2	5	5	5	5
Retrace error (μm)		3	4	4	4	4	5	5
Repeatability (μm)		1	1	1	3	3	3	3
Measuring force (N)	Max.	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Min.	0.01	0.01	0.01	0.01	0.01	0.01	0.01

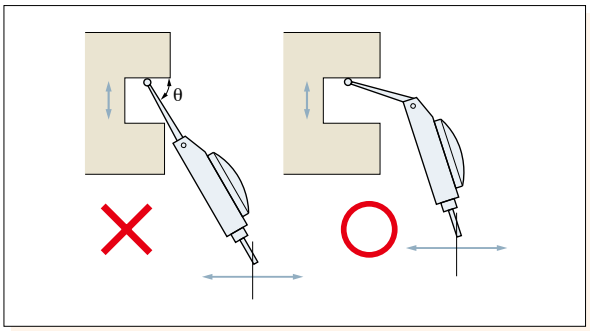
Dial Test Indicators and the Cosine Effect

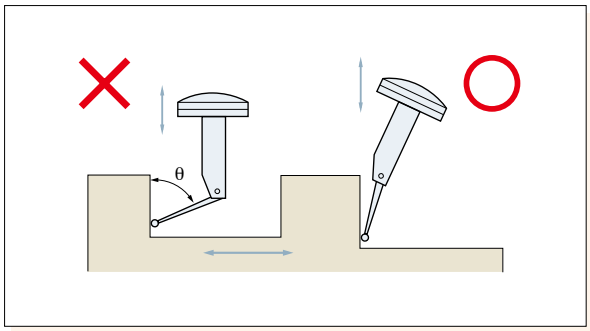
Always minimize the angle between movement directions during use.











When the test indicator's contact point comes into contact with the measuring face, an error will occur depending on the angle. When bringing the contact point into contact with the measuring face, set the angle θ shown in the figure as small as possible. The measured value will vary depending on the value of θ. Correct the measured value from the θ value according to the table.

Result of measurement = indicated value x compensation value

Compensating for a non-zero angle

Angle	Compensation value
10°	0.98
20°	0.94
30°	0.87
40°	0.77
50°	0.64
60°	0.50

Examples

If a 0.002 mm measurement is indicated on the dial at various values of θ, the result of measurements are:

θ=10° 0.002 mm×0.98=0.00196 mm
θ=20° 0.002 mm×0.94=0.00188 mm
θ=30° 0.002 mm×0.87=0.00174 mm

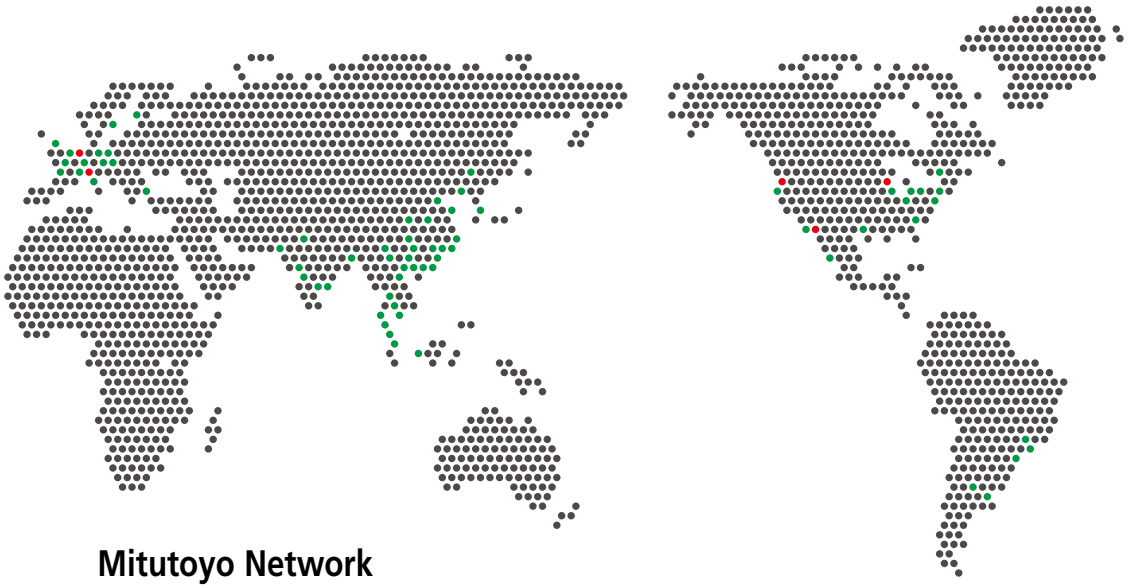
- Mitutoyo's Response to Lever-operated Dial Indicator B 7533 : 2015

We guarantee the accuracy of completed products as follows.

- Vertical, tilted, and perpendicular: We perform inspections with the dial face up.
- Horizontal: We perform inspections with the dial face in a vertical posture.
  Standard-attached inspection certificate includes inspection data.
- We issue paid-for calibration results for other postures not mentioned above if required.

14

Network Service



Mitutoyo Network

M³ Solution Center

Measuring instruments that include a certificate of inspection

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Our website

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Global network spanning 30 countries · region worldwide.

Following the establishment of MTI Corporation (U.S.) in 1963, Mitutoyo has been expanding its market throughout the world. Currently, the company has R&D, manufacturing, sales, and engineering service bases in 30 countries・region, as well as network of distributors in more than 60 countries. Mitutoyo maintains its rock-solid status as a leading global manufacturer providing services tailored to each regional society.

Network Service

Please see the detail for Japan and Global locations or network.

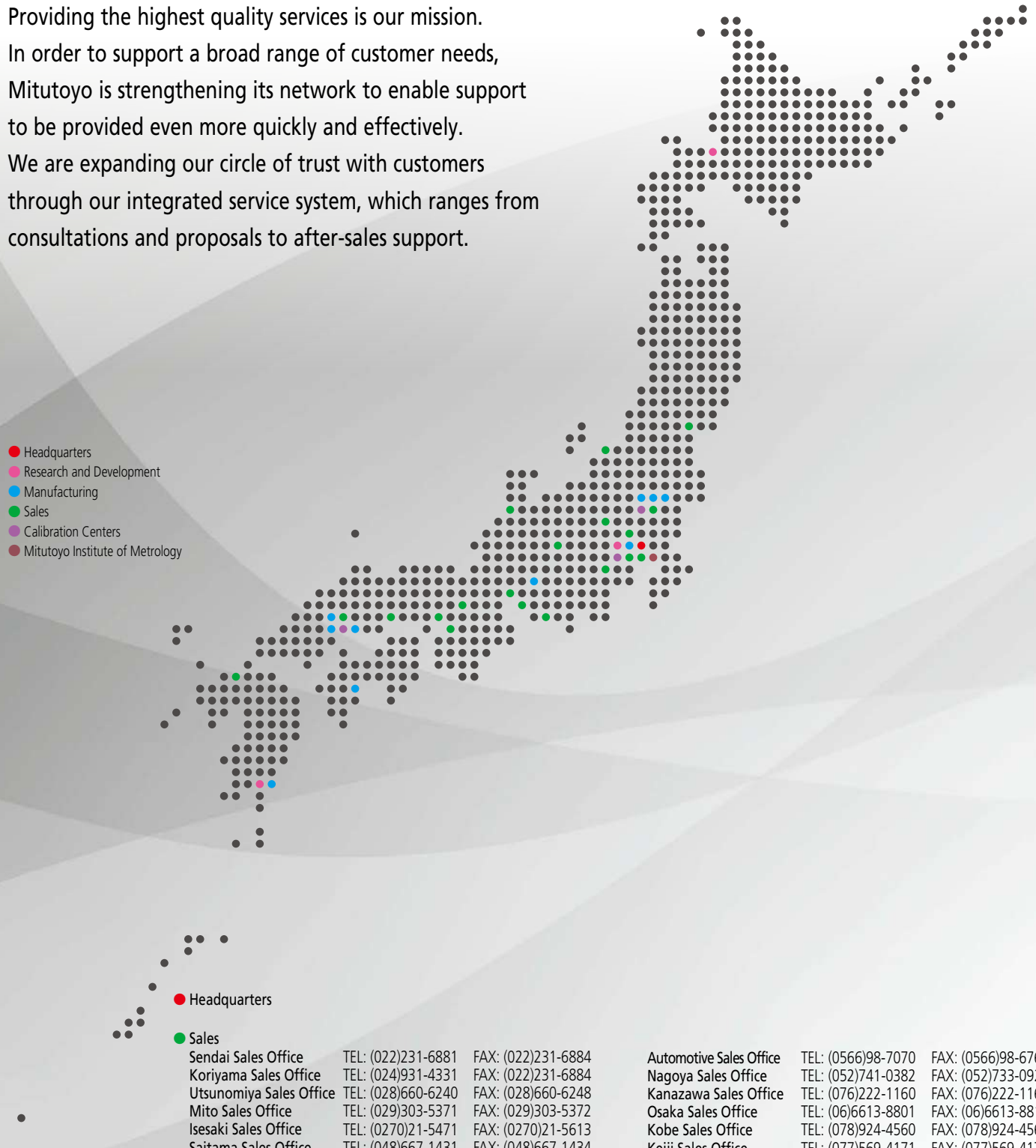
Global

Japan

Network Service

Network Service

Providing the highest quality services is our mission.
In order to support a broad range of customer needs, Mitutoyo is strengthening its network to enable support to be provided even more quickly and effectively.
We are expanding our circle of trust with customers through our integrated service system, which ranges from consultations and proposals to after-sales support.



Network Service

● Headquarters

● Sales

Sendai Sales Office	TEL: (022)231-6881	FAX: (022)231-6884
Koriyama Sales Office	TEL: (024)931-4331	FAX: (022)231-6884
Utsunomiya Sales Office	TEL: (028)660-6240	FAX: (028)660-6248
Mito Sales Office	TEL: (029)303-5371	FAX: (029)303-5372
Isesaki Sales Office	TEL: (0270)21-5471	FAX: (0270)21-5613
Saitama Sales Office	TEL: (048)667-1431	FAX: (048)667-1434
Niigata Sales Office	TEL: (025)281-4360	FAX: (025)281-4367
Kawasaki Sales Office	TEL: (044)813-1611	FAX: (044)813-1610
Tokyo Sales Office	TEL: (03)3452-0481	FAX: (044)813-1610
Atsugi Sales Office	TEL: (046)259-6400	FAX: (046)259-6404
	Fuji Resident Office TEL: (0545)55-1677	
Suwa Sales Office	TEL: (0266)53-6414	FAX: (0266)58-1830
	Ueda Resident Office TEL: (0268)26-4531	
Hamamatsu Sales Office	TEL: (053)464-1451	FAX: (053)464-1683
Anjo Sales Office	TEL: (0566)98-7070	FAX: (0566)98-6761
Automotive Sales Office	TEL: (0566)98-7070	FAX: (0566)98-6761
Nagoya Sales Office	TEL: (052)741-0382	FAX: (052)733-0921
Kanazawa Sales Office	TEL: (076)222-1160	FAX: (076)222-1161
Osaka Sales Office	TEL: (06)6613-8801	FAX: (06)6613-8817
Kobe Sales Office	TEL: (078)924-4560	FAX: (078)924-4562
Keiji Sales Office	TEL: (077)569-4171	FAX: (077)569-4172
Okayama Sales Office	TEL: (086)242-5625	FAX: (086)242-5653
Hiroshima Sales Office	TEL: (082)427-1161	FAX: (082)427-1163
Fukuoka Sales Office	TEL: (092)411-2911	FAX: (092)473-1470
Sensing Sales Section	TEL: (044)813-8236	FAX: (044)822-8140
Seismic Monitoring Section	TEL: (044)455-5021	FAX: (044)822-8140

Kawasaki
(Headquarters/Kawasaki Plant)

Utsunomiya

Small Tool Plant/Microcord Plant

Kiyohara Plant

Nakatsugawa

Nakatsugawa plant

Hiroshima

Kure Plant

Shiwa Plant

Kure Plant/Shiwa Plant (Gohara)

Kochi

Kochi plant

Miyazaki

Miyazaki plant

Sendai Sales Office

Utsunomiya Sales Office

Suwa Sales Office

Anjo Sales Office

Osaka Sales Office

Hiroshima Sales Office

Fukuoka Sales Office

● Calibration Centers

Utsunomiya Calibration Center	TEL: (028) 656-1432	FAX: (028) 656-8443
Kawasaki Calibration Center	TEL: (044) 813-8214	FAX: (044) 813-8223
Hiroshima Calibration Center	TEL: (0823) 70-3820	FAX: (0823) 70-3833

M³ Solution Centers

UTSUNOMIYA	TEL: (028)656-1607	FAX: (028)656-9624
TOKYO	TEL: (044)813-1611	FAX: (044)813-1610
SUWA	TEL: (0266)53-6414	FAX: (0266)58-1830
ANJO	TEL: (0566)98-7070	FAX: (0566)98-6761
OSAKA	TEL: (06)6613-8801	FAX: (06)6613-8817
HIROSHIMA	TEL: (082)427-1161	FAX: (082)427-1163

● Mitutoyo Institute of Metrology

Kawasaki	TEL: (044) 822-4124	FAX: (044) 822-4000

● Research and Development

Kawasaki Research and Development Center	TEL: (044) 822-4137	FAX: (044) 822-4127

● Manufacturing

Kawasaki Plant	TEL: (044) 822-4132	FAX: (044) 844-9835
Small Tool Plant	TEL: (028) 656-1111	FAX: (028) 656-2164
Microcord Plant	TEL: (028) 656-1111	FAX: (028) 656-4720
Kiyohara Plant	TEL: (028) 667-4811	FAX: (028) 667-4810
Nakatsugawa Plant	TEL: (0573) 68-8201	FAX: (0573) 68-8210
Kure Plant	TEL: (0823) 71-6111	FAX: (0823) 74-4104
Shiwa Plant	TEL: (082) 433-2077	FAX: (082) 433-2695
Kure Plant/Shiwa Plant (Gohara)	TEL: (0823) 77-1721	FAX: (0823) 77-1724
Kochi Plant	TEL: (0887) 52-8181	FAX: (0887) 52-9451
Miyazaki Plant	TEL: (0985) 86-2591	FAX: (0985) 86-0827

M³ Solution Center

Mcube

M³ Solution Center

M³ = Mitutoyo, Measurement, Metrology

Specialists in each field meet each customer's needs in detail

In order to meet the precise needs of customers, Mitutoyo has built a domestic sales network. Along with strengthening the company's ability to rapidly and accurately satisfy customer needs, the company has also built an extensive after-sales network. Mitutoyo has also created its M³ Solution Centers that are specifically designed to address measurement-related challenges from customers. Here, effective solutions to out-of-the-ordinary requirements can be found through demonstrations of the company's products and latest technology, in combination with consultations with Mitutoyo's metrology experts.

Network Service

M³ Solution Center (U.S.A.)

M³ Solution Center Ingolstadt (Germany)

Mitutoyo Canada Inc. (Canada)

M³ Solution Center TOULOUSE (France)

Through M³ Solution Centers across the world, we offer optimum measuring solutions to our customers.

In recent years, as the reduction of lead times has become a major theme in manufacturing in the category of large measuring equipment such as coordinate measuring machines, including car body CMMs and form measuring instruments, demand for CNC machines (computer numerical control automated measuring machines) has been rising. Moreover, along with a similar increase in demand for 3D CAD, non-contact measurement using laser sensor probes has become common for 3D measuring machines. By providing M³ Solution Centers in various locations across the world, Mitutoyo is in a position to offer its technologies in hardware, software, sensor, automatic control, handling system fields, along with various types of tools combined with third-party technology to answer customers' issues relating to advanced measurements.

A network spanning Japan, Asia, Europe, and America provides solutions to all kinds of problems on a global basis.

Our mission is to provide optimum solutions tailored to the measurement-related needs of our customers in a speedy and accurate manner. In order to effectively respond to the various requests and tasks given to us by customers all around the world, Mitutoyo has set up M³ Solution Centers that promote our measuring technologies to a worldwide audience.
Our collaborative network, which spans Japan, Asia, Europe, and America, allows us to respond to needs on a global basis.

M³ Solution Center Taichung (Taiwan)

M³ Solution Center (Singapore)

MSA Technical Center (India)

M³ Solution Center (South Korea)

Measuring instruments that include a certificate of inspection

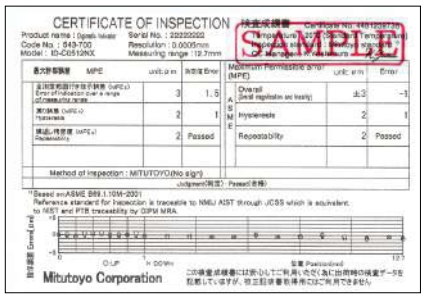
As part of quality assurance, Mitutoyo will attach data at the time of factory shipment*1 to the products listed in page 14-10.*2
Also, if calibration of the measuring instrument is requested at the time of purchase, we will issue, at a separate charge, an inspection certificate that proves traceability with the reference gage. If you wish to request calibration, please contact your local Mitutoyo sales office.

*1 For some products whose purchase date cannot be identified, the inspection data at the time of factory shipment cannot be used in the inspection certificate. For details, please contact your local Mitutoyo sales office.
*2 The products are listed in the series name. There are some models that will not be accompanied with an inspection certificate.

- For the details of the inspection items to be included in the inspection certificate, please contact your local Mitutoyo sales office.
- If you have a request on inspection items, contact your local Mitutoyo sales office.

Ratchet Thimble Micrometer
102-701

IP67 ABSOLUTE Coolant Proof Caliper
500-702-20



ABSOLUTE Digimatic Indicator ID-C
543-700 / 543-700B

Products Name		Page
Gauge Blocks	Gauge Blocks with a Calibrated Coefficient of Thermal Expansion	01-7
	ZERO CERA Blocks (Ultra-low Thermal Expansion)	01-8
	Metric/Inch Rectangular Gauge Block Sets	01-9 to 01-12
	Micrometer Inspection Gauge Block Sets	01-13 to 01-14
	Individual Metric/Inch Rectangular Gauge Blocks	01-15 to 01-18
	Metric/Inch Square Gauge Block Sets	01-23 to 01-24
	Individual Metric/Inch Square Gauge Blocks	01-25 to 01-26
	Step Master	01-30
	Gauge Block Comparator GBCD-100A	01-34
	Gauge Block Comparator GBCD-250	01-35
Height Masters, Check Masters	Height Master	01-37
	Digital Height Master	01-38
	Riser Blocks	01-39
	Universal Height Master	01-41
	Check Master	01-42
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	Working Standard Scales	01-44
	High Precision Square	01-45
	Black Granite Surface Plates	01-51 to 01-52
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	High-speed and High-accuracy Digimatic Micrometer QuantuMike	02-5 to 02-6
	Coolant Proof Micrometers	02-7 to 02-8
	Digimatic Outside Micrometers	02-10
	Outside Micrometers	02-16
	Ratchet Thimble Micrometer	02-17
	Outside Micrometers	02-18 to 02-19
Calipers	IP67 ABSOLUTE Coolant Proof Caliper	04-3 to 04-4
	ABSOLUTE Digimatic Caliper	04-5 to 04-8
	Dial Caliper	04-14
High Precision Height Measuring Tools	Linear Height	05-3 to 05-4
	QM-Height	05-5 to 05-6
Caliper/Height Gage Checker	CERA Caliper Checker	05-16
Depth Gages	Depth Micro Checker	06-6

Products Name		Page
Digimatic Indicators	High-performance ABS Digimatic Indicator ID-FNX	07-3 to 07-4
	ABSOLUTE Digimatic Indicator ID-CNX	07-5 to 07-6
	ABSOLUTE Digimatic Indicator ID-N/B	07-7 to 07-8
	ABSOLUTE Digimatic Indicator ID-SX2	07-9 to 07-10
	ABSOLUTE Digimatic Indicator ID-U	07-11 to 07-12
	ABSOLUTE Digimatic Indicator ID-CAX (Peak-Value Hold Type)	07-13 to 07-14
	ABSOLUTE Digimatic Indicator ID-CGX (Bore Gage Type)	07-15 to 07-16
	ABSOLUTE Digimatic Indicator ID-CRX (Calculation Type)	07-17 to 07-19
	ABSOLUTE Digimatic Indicator ID-CJX (Signal Output Function Type)	07-20 to 07-21
	Digimatic Indicator ID-H	07-22 to 07-23
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Dial Test Indicators	Dial Test Indicators	07-75 to 07-82
Indicator Calibration	i-Checker	07-87
	UDT-2 Calibration Tester	07-88
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	Holtest	08-7 to 08-10
	Holtest (Type II)	08-11 to 08-12
	ABSOLUTE Boremetic	08-13 to 08-16
	CERA Inside Micro Checker	08-30
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Linear Gages	High-accuracy/resolution Linear Gage LGH	11-3
Linear Scales	Linear Scales ST Series	11-10
	Linear Scales AT Series	11-11 to 11-12
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	CONTRACER	12-22
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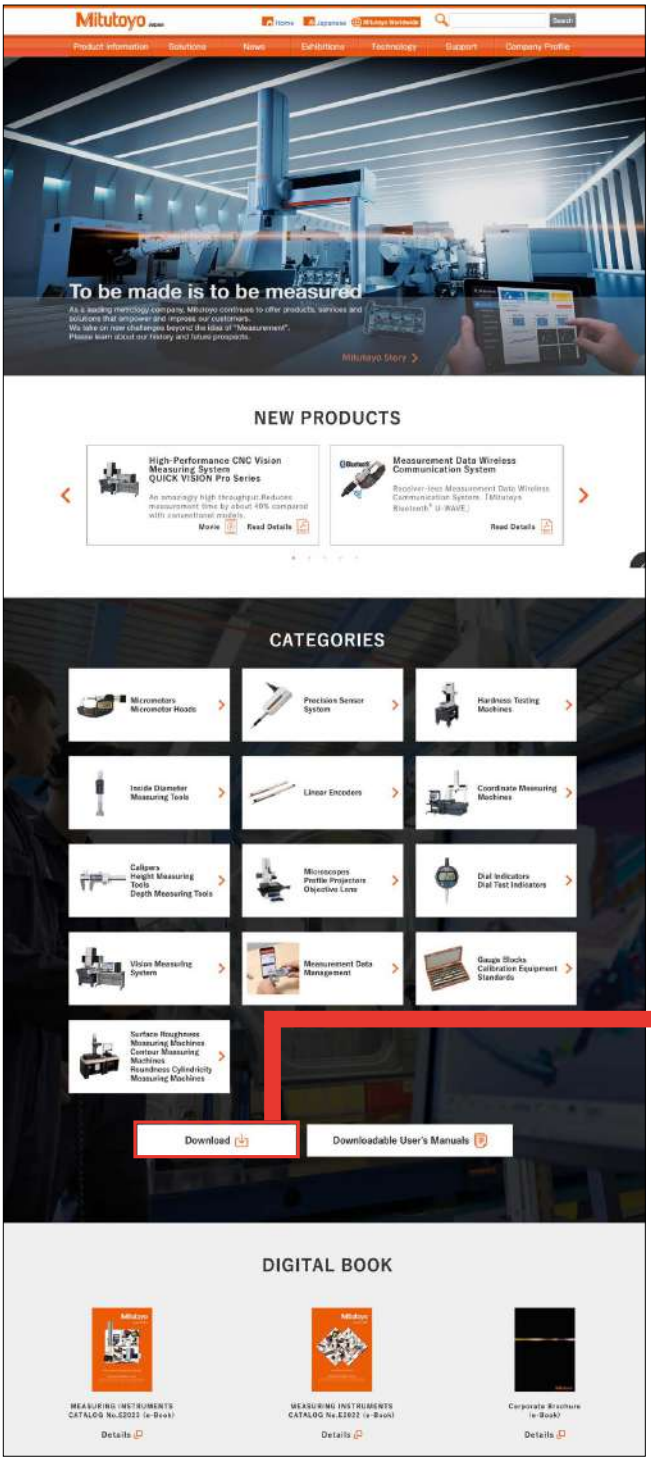
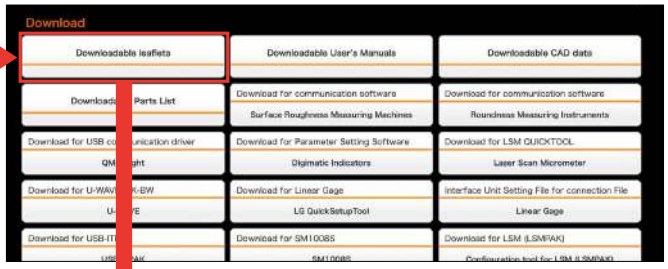
Hardness Testing Machines	Micro Vickers Hardness Testing Machine	12-25
	Vickers Hardness Testing Machine	12-25, 12-26
	Rockwell Hardness Testing Machine	12-27

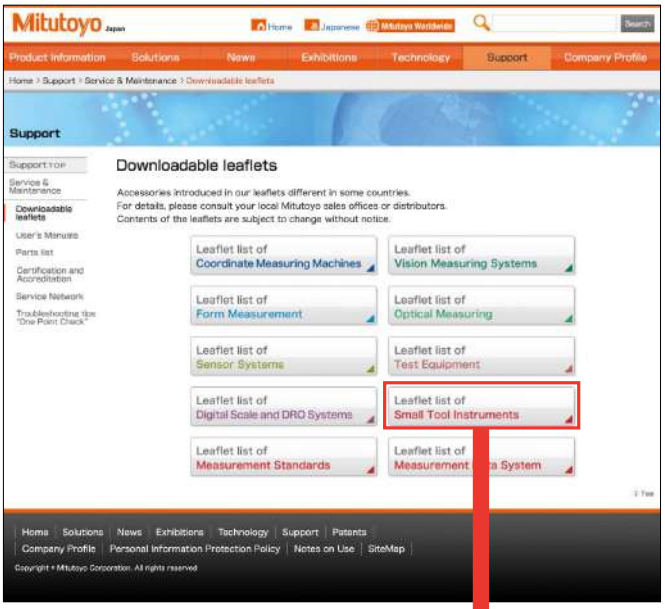
Note: Some products mentioned above will not be accompanied with an inspection certificate as standard.

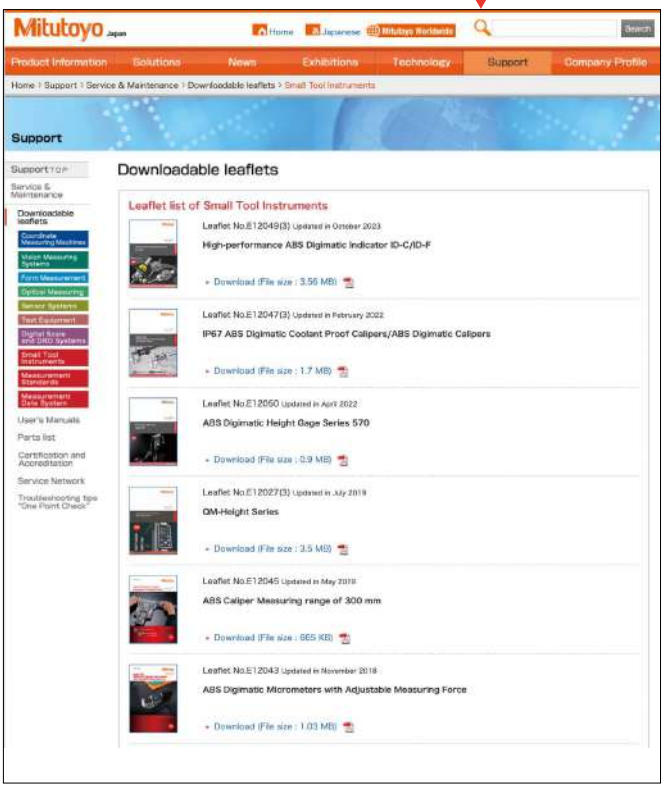
Download service on Mitutoyo website

Download of the catalog is available from the top page of the Mitutoyo website by the following procedure:







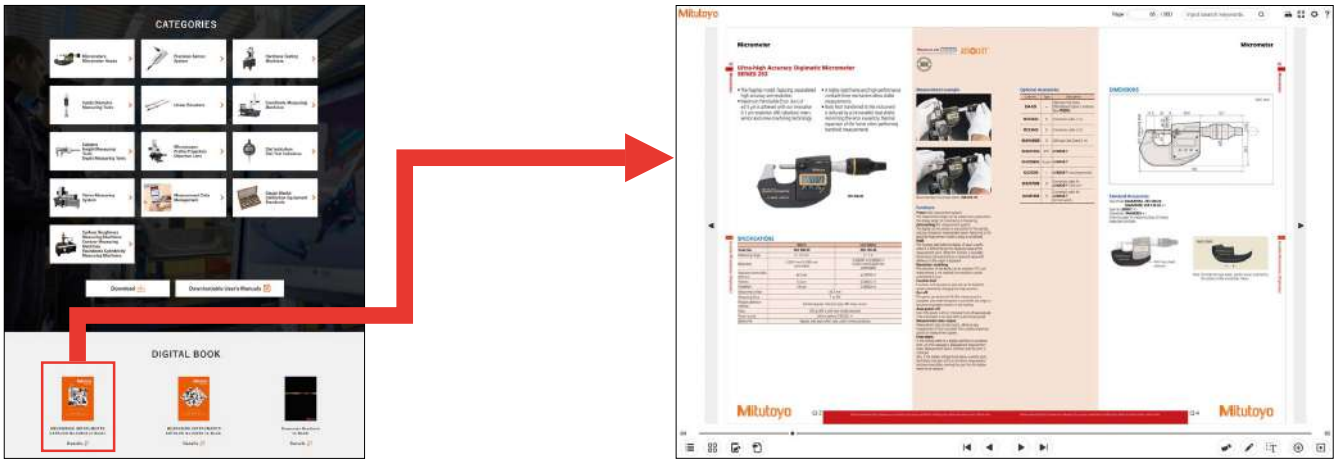


If you are interested in any of our products listed in the General Catalog, please contact your local Mitutoyo sales office or visit our website.
Also, the catalog can be downloaded in PDF format (partially excluded) at our website. (See the above image.)

URL: https://www2.mitutoyo.co.jp/eng/

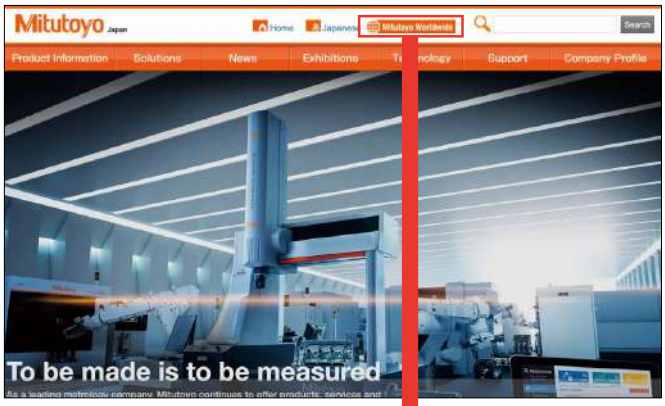
Online catalog

Mitutoyo Measuring Instruments Catalog is available on our website. You can look through all pages of the catalog on your screen as though turning pages of a book.



Note: For the latest information of the products listed in the catalog, please refer to our website.

MITUTOYO Worldwide

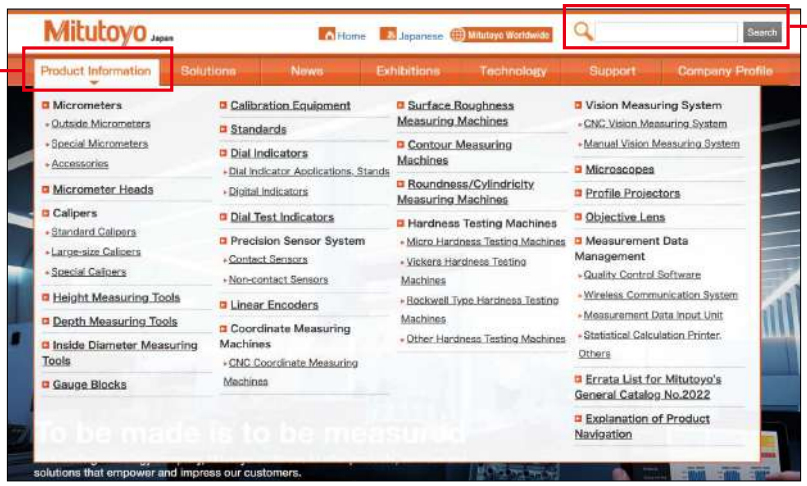


This page will guide you to each Mitutoyo local corporation.

Introduction to our website and product pages

Product pages on our website

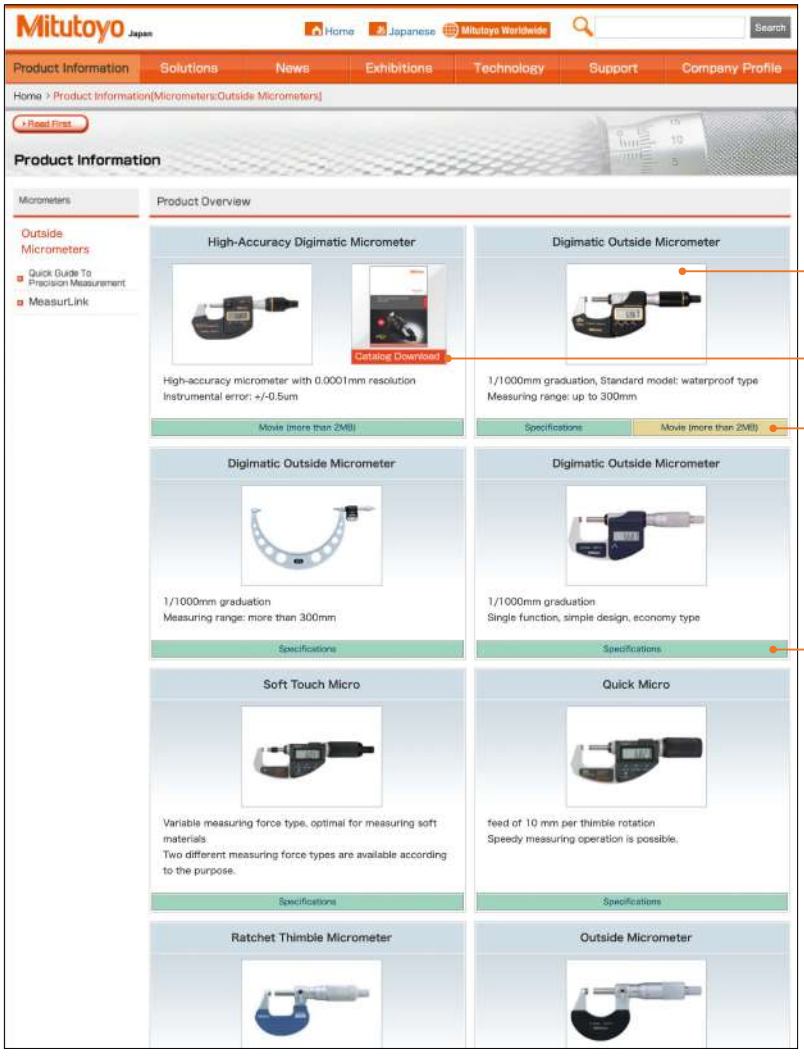
The content of this general catalog is also available on our website.



Product Infomation

"Search" function

Landing page on our website



Picture of external appearance

Catalog Download

Movie

Specifications

Product Information

In the Spirit of Mitutoyo

To become a complete man, one must acquire Wisdom, Benevolence and Valor. With Wisdom only, one tends to be cold. Benevolence alone makes one weaker. With valor only, one may reach beyond his capabilities. When the three qualities are combined, however, one will become a complete man. Similarly, success in enterprise lies in the knowledge of Heaven, Earth and Man. Business will succeed only when these factors, "heavensent" chances, natural opportunities, and harmony of man are present. Without even one factor, success is remote. In Buddhism, Butsu (Buddha), Po (Doctrine) and So (Priest) are three principle treasures for its promotion of the teaching. In Christianity, God, Bible and Minister.
The word MITUTOYO signifies three abundances. "Mitsu" means three, while "Toyo" stands for a state of abundance. The name MITUTOYO was selected, with a sincere wish to see more complete men, to create a prosperous enterprise and to introduce righteous religion to all, along with the lasting wish for a peaceful world and fulfillment of meaningful life.

Mitutoyo Corporation

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