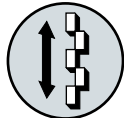


Reference Gages

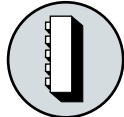
Length Standards Brought to You by Mitutoyo

Height Master SERIES 515

- Height Master is a bestselling product with a name that has become the industry term for height reference instruments.



Staggered 20mm blocks (movable)



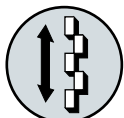
Vertical orientation



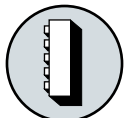
Riser block

515-322

Digital Height Master SERIES 515



Staggered 20mm blocks (movable)



Vertical orientation



Riser block

515-374

SPECIFICATIONS

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

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

Inch		
Order No.	515-310	515-311
Range (H)	.2" < H ≤ 12.2"	.2" < H ≤ 12.2"
Graduation	.00001"	
Block step	.5" (straight)	1" (staggered)
Micrometer adjustment	1"	
Micrometer feed	.025"	
Block pitch accuracy	±50μin	
Parallelism of blocks	40μin	
Feed error	±40μin	
Retrace error	40μin	
Mass	23kg	

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

- Equipped with a data output port that enables incorporation into measurement networking and statistical process control systems. (Refer to Page A-3 for details.)



SPECIFICATIONS

Metric			
Order No.	515-374	515-376	515-378
Range (H)	10 < H ≤ 310mm	10 < H ≤ 460mm	10 < H ≤ 610mm
Graduation	0.001mm		
Block step	20mm (staggered)		
Micrometer adjustment	20mm		
Micrometer feed	0.5mm/rev		
Block pitch accuracy	0 < H ≤ 310mm	±1.5μm	
	310 < H ≤ 450mm	±2.5μm	
	450 < H ≤ 610mm	±3.5μm	
Parallelism of blocks	0 < H ≤ 310mm	2.0μm	
	310 < H ≤ 610mm	2.5μm	
Feed error	±2.0μm		2.5μm
Retrace error	2.0μm		2.5μm
Mass	9.5kg	13.6kg	16kg

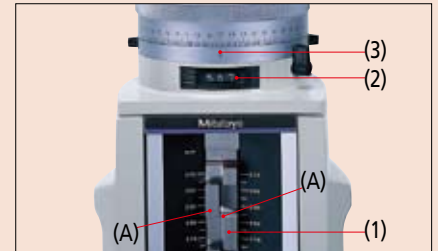
* The block accuracy and the parallelism of blocks are based on main unit installation surface, which does not include the retrace error.



An inspection certificate is supplied as standard. Refer to page X for details.



Reading



(A) Height A

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



An inspection certificate is supplied as standard. Refer to page X for details.

Technical Data

Display:	LCD
Battery:	SR44 (2 pcs.), 938882
Battery life:	Approx. 1.8 years under normal use

Function

Zero setting, Presetting, ABS/INC switching, Data hold, Data output, Auto power off, inch/mm conversion (inch/mm models)
Alarm: Low voltage, Counting value composition error

Optional Accessories

515-111:	Auxiliary block kit for bore gage (mm)
515-120:	Auxiliary block kit for bore gage (inch)
—:	Riser block (see page E-36.)
959149:	SPC cable (1m)
959150:	SPC cable (2m)

Inch			
Order No.	515-375	515-377	515-379
Range (H)	.5" < H ≤ 12"	.5" < H ≤ 18"	.5" < H ≤ 24"
Graduation	.00001"		
Block step	1" (staggered)		
Micrometer adjustment	1"		
Micrometer feed	.025"/rev		
Block pitch accuracy	0 < H ≤ 12"	±100μin	
	12" < H ≤ 18"	±100μin	
	18" < H ≤ 24"	±150μin	
Parallelism of blocks	0 < H ≤ 12"	50μin	
	12" < H ≤ 18"	100μin	
Feed error	±100μin		100μin
Retrace error	100μin		100μin
Mass	9.5kg	13.6kg	16kg

* The block accuracy and the parallelism of blocks are based on main unit installation surface, which does not include the retrace error.



An inspection certificate is supplied as standard. Refer to page X for details.



Height Master SERIES 515 — Optional accessories

Riser Blocks SERIES 515

- These riser blocks are designed to increase the measurable height.
- They can also be used on Square Master models **311-215** and **311-225**.



515-113

515-114

515-115

Auxiliary Block Kit SERIES 515 – for Bore Gage

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



515-112

SPECIFICATIONS

Metric				
Order No.	Height	Accuracy	Variation in length	Mass
515-113	150mm	±0.6µm	0.6µm	5.7kg
515-114	300mm	±1.0µm	0.8µm	11.8kg
515-115	600mm	±2.0µm	1.0µm	26.8kg

Inch				
Order No.	Height	Accuracy	Variation in length	Mass
515-116	6"	±20µin	20µin	5.7kg
515-117	12"	±40µin	30µin	11.8kg
515-118	24"	±80µin	40µin	27.9kg

SPECIFICATIONS

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

Inch	
Order 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)

Reference Gages

Length Standards Brought to You by Mitutoyo

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 model **515-322**.



515-520

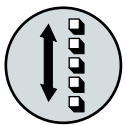
SPECIFICATIONS

Metric			
Order No.	515-520	515-523	
Range (H)	5 < H ≤ 610mm	5 < H ≤ 1010mm	
Graduation	0.001mm		
Block step	10mm (staggered)		
Micrometer adjustment	20mm		
Micrometer feed	0.5mm/rev		
Block pitch accuracy	0 < H ≤ 310mm	±1.5μm	
	310 < H ≤ 610mm	±2.5μm	
	610 < H ≤ 1010mm	—	±3.5μm
Parallelism of blocks	0 < H ≤ 610mm	1.5μm	
	610 < H ≤ 1010mm	—	2μm
Feed error	±1.2μm	±1.5μm	
Retrace error	1.2μm	1.5μm	
Mass	4.2kg	63.5kg	

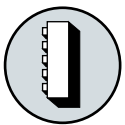
Notes: 1) The block accuracy and the parallelism of blocks are relative to the main unit installation surface.
2) Supplied with a wooden storage case as standard.

Inch			
Order No.	515-512	515-510	515-513
Range (H)	2" < H ≤ 18.2"	2" < H ≤ 24.2"	2" < H ≤ 40.2"
Graduation	.00001"		
Block step	.5" (staggered)		
Micrometer adjustment	1"		
Micrometer feed	.025"/rev		
Block pitch accuracy	0 < H ≤ 12"	±50μin	
	12" < H ≤ 24"	—	±100μin
	24" < H ≤ 40"	—	±150μin
Parallelism of blocks	H ≤ 24"	60μin	
	24" < H ≤ 40"	—	80μin
Feed error	±40μin	±60μin	
Retrace error	40μin	60μin	
Mass	4.2kg	63.5kg	63.5kg

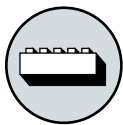
Notes: 1) The block accuracy and the parallelism of blocks are relative to the main unit installation surface.
2) Supplied with a wooden storage case as standard.



Single-row 10mm blocks (movable)



Vertical orientation



Horizontal orientation



Riser block



An inspection certificate is supplied as standard. Refer to page X for details.

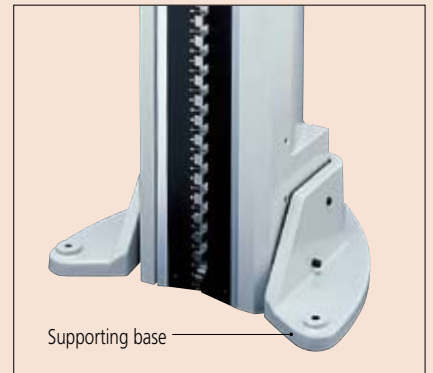


Using in horizontal orientation

Optional Accessories

Supporting base

No.900574 (Dedicated for the Universal Height Master. Provided for **515-523** and **515-513** as standard.)
Stable vertical orientation is available.

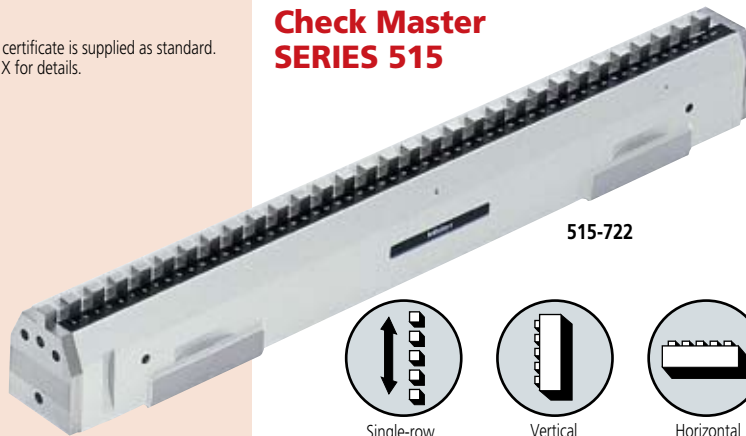


Supporting base



An inspection certificate is supplied as standard. Refer to page X for details.

Check Master SERIES 515



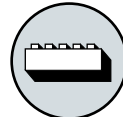
515-722



Single-row
10mm (5") blocks



Vertical
orientation



Horizontal
orientation

- Designed to check the accuracy of table movements of machine tools and calibrate CMMs.
- Can be used in either vertical or horizontal orientation



515-724

515-723

515-722

SPECIFICATIONS

Metric		515-720	515-721	515-722	515-723	515-724
Order No.		515-720	515-721	515-722	515-723	515-724
Range (H)		300 mm	450 mm	600 mm	1000 mm	1500 mm
Block step		10mm				
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

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

Inch		515-710	515-711	515-712	515-713
Order No.		515-710	515-711	515-712	515-713
Range (H)		12"	18"	24"	40"
Block step		.5"			
Block pitch accuracy	H ≤ 12"	±100 μm			
	12" < H ≤ 24"	—	—	±150 μm	
	24" < H ≤ 40"	—	—	±200 μm	
Parallelism of blocks	H ≤ 12"	50 μm			
	12" < H ≤ 24"	—	—	60 μm	
	24" < H ≤ 40"	—	—	80 μm	
Mass		7 kg	10 kg	13 kg	22 kg

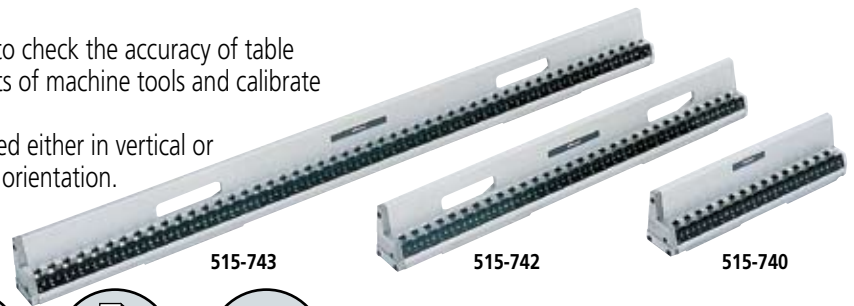
Notes: 1) The block accuracy and the parallelism of blocks are relative to the main unit installation surface.
2) Supplied with a wooden storage case as standard.



An inspection certificate is supplied as standard. Refer to page X for details.

High Accuracy Check Master SERIES 515

- Designed to check the accuracy of table movements of machine tools and calibrate CMMs.
- Can be used either in vertical or horizontal orientation.



515-743

515-742

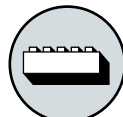
515-740



Single-row
10mm (5") blocks



Vertical
orientation



Horizontal
orientation

SPECIFICATIONS

Metric		515-740/515-760*	515-741/515-761*	515-742/515-762*	515-743/515-763*	515-744/515-764*
Order No.		515-740/515-760*	515-741/515-761*	515-742/515-762*	515-743/515-763*	515-744/515-764*
Range (R)		300 mm	450 mm	600 mm	1000 mm	1500 mm
Block step		10mm				
Block pitch accuracy	H ≤ 310 mm	±1.2 μm				
	310 < H ≤ 610 mm	—	—	±1.8 μm		
	610 < H ≤ 1010 mm	—	—	—	±2.5 μm	
	1010 < H ≤ 1510 mm	—	—	—	—	±4.0 μm
Parallelism of blocks	H ≤ 450 mm	1.0 μm				
	450 < H ≤ 1010 mm	—	—	1.5 μm		
	1010 < H ≤ 1510 mm	—	—	—	2.0 μm	
	Mass	3.6 kg	5.4 kg	7.2 kg	12 kg	18 kg

* Ceramic Check Master

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

Inch		515-730/515-750*	515-731/515-751*	515-732/515-752*	515-733/515-753*	515-734/515-754*
Order No.		515-730/515-750*	515-731/515-751*	515-732/515-752*	515-733/515-753*	515-734/515-754*
Range (R)		12"	18"	24"	40"	60"
Block step		.5"				
Block pitch accuracy	H ≤ 12"	±50 μm				
	12" < H ≤ 24"	±70 μm				
	24" < H ≤ 40"	±100 μm				
Parallelism of blocks	40" < H ≤ 60"	±158 μm				
	H ≤ 18"	40 μm				
	18" < H ≤ 40"	60 μm				
40" < H ≤ 60"	80 μm					
Mass		3.6 kg	5.4 kg	7.2 kg	12 kg	18 kg

* Ceramic Check Master

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



Using in horizontal orientation

Optional Accessories

Supporting base
601167: Supporting base for vertical operation



Supporting base

Reference Gages

Length Standards Brought to You by Mitutoyo

Standard scales SERIES 182 — Made of Low Expansion Glass

- Standard scales can be used as a traceable standard of length for calibrating measuring instruments.
- These scales are manufactured using Mitutoyo's high-definition lithography technology in an underground scale manufacturing facility dedicated to the production of high-accuracy, high-quality line standards. They are considered top-grade length standards.



An inspection certificate is supplied as standard. Refer to page X for details.

Technical Data

Accuracy (at 20°C): $(0.5+L/1000)\mu\text{m}$,
 L = Measured length (mm)
 Material: Low expansion glass
 Thermal expansion coefficient: $(0.00\pm 0.02)\times 10^{-6}/\text{K}$
 Graduation: 1mm
 Graduation line thickness: 4 μm
 Mass: 0.75kg (250mm), 1.8kg (500mm)

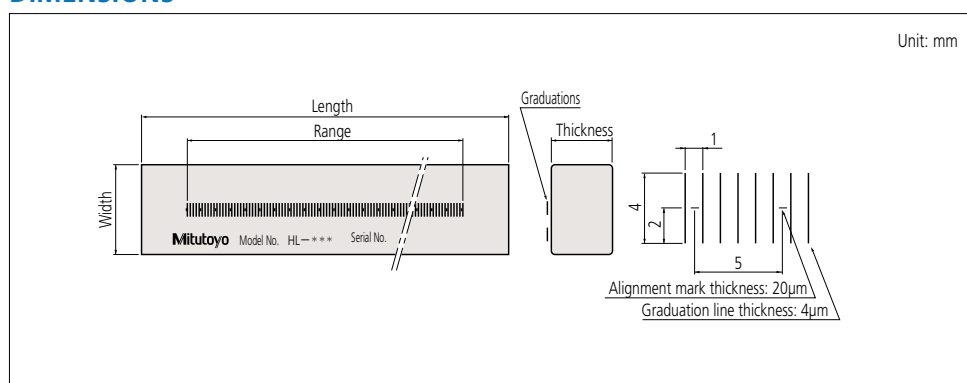
SPECIFICATIONS

Metric

Order No.	Range	Length	Width	Thickness
182-501-50	250mm	280mm	20mm	10mm
182-501-60*				
182-502-50	500mm	530mm	30mm	20mm
182-502-60*				

* with English JCSS certificate.

DIMENSIONS





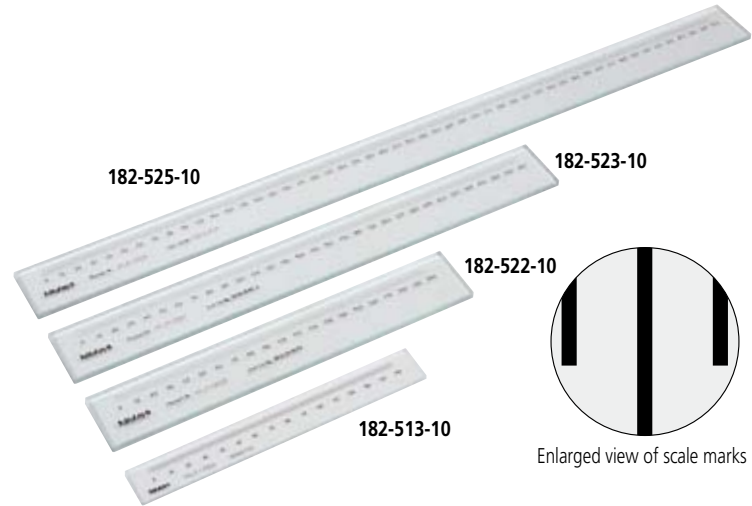
An inspection certificate is supplied as standard. Refer to page X for details.

Technical Data

Accuracy (at 20°C): $(1.5+2L/1000)\mu\text{m}$,
 L = Measured length (mm)
 Glass material: Sodium glass
 Thermal expansion coefficient: $(8\pm 1)\times 10^{-6}/\text{K}$
 Graduation:
 0.1mm (thickness: 20 μm)
 0.5mm (thickness: 50 μm)
 1mm (thickness: 100 μm)

Working Standard Scales SERIES 182

- Ideal for checking magnification accuracy of profile projectors and microscopes, and the table feeding accuracy of measuring equipment.
- These scales are manufactured using high-accuracy lithographic technologies. Mitutoyo has developed these technologies at the dedicated underground facility which was custom-built to produce highly accurate scales. Various sizes are available for each type to suit the application.

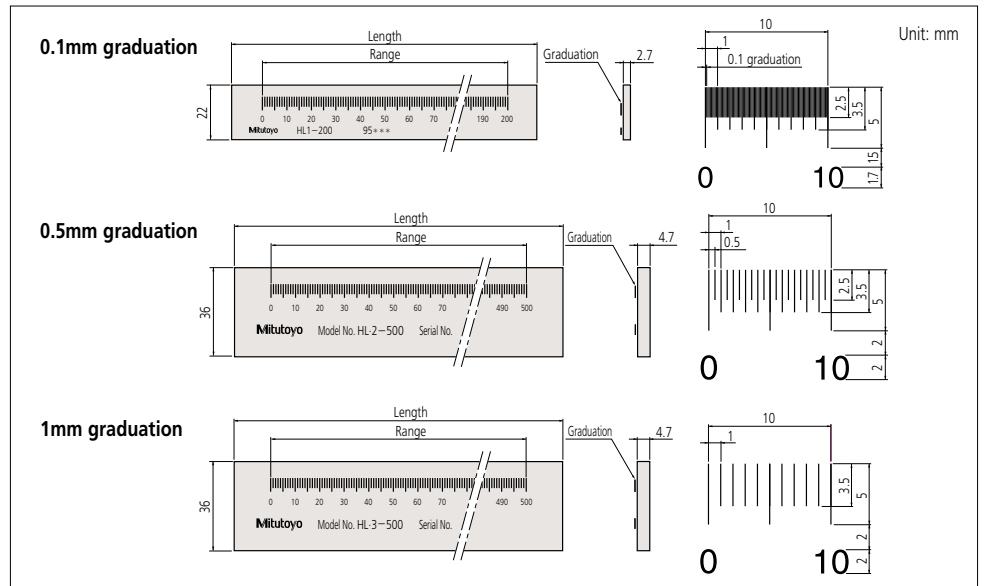


SPECIFICATIONS

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

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

DIMENSIONS



Reference Gages

Length Standards Brought to You by Mitutoyo

CERA Straight Master SERIES 311 — Straightness Measuring Gage

- The CERA Straight Master is a gage used for inspecting the straightness of travel of moving elements on equipment such as machine tools, CMMs, form measuring machines and semiconductor-related equipment.
- Precision lapped reference surfaces achieve higher accuracy than conventional models.
- Alumina ceramic construction achieves high resistance to abrasion and little secular

change.

- Three types (high accuracy, ultra-high accuracy and double faced models) are available to suit the majority of applications. The double faced model has two reference faces for checking straightness in two orthogonal directions.



Effective length: 700mm



Effective length: 1000mm

SPECIFICATIONS

Metric	High accuracy model			
Order No.*	Nominal length	Straightness*1	Size (L x W x H)	Mass
311-302	400mm	0.3µm	440 x 35 x 50mm	1.8kg
311-305	700mm	0.5µm	740 x 35 x 50mm	3kg
311-307	1000mm	1.0µm	1040 x 45 x 80mm	8kg
311-309	1300mm	1.5µm	1340 x 45 x 80mm	10kg

* Carrying handles (4pcs) are provided as standard for **311-307/9**.
Note: Straightness is measured within the specified range with the instrument supported at the Bessel points to minimize deflection (0.2232 x overall length from each end).

Metric	Ultra-high accuracy model			
Order No.*	Nominal length	Straightness*1	Size (L x W x H)	Mass
311-332	400mm	0.2µm	440 x 35 x 50mm	1.8kg
311-335	700mm	0.4µm	740 x 35 x 50mm	3kg
311-337	1000mm	0.5µm	1040 x 45 x 80mm	8kg
311-339	1300mm	0.7µm	1340 x 45 x 80mm	10kg

* Carrying handles (4pcs) are provided as standard for **311-337/9**.
Note: Straightness is measured within the specified range with the instrument supported at the Bessel points to minimize deflection (0.2232 x overall length from each end).

Inch	High accuracy model			
Order No.*	Nominal length	Straightness*1	Size (L x W x H)	Mass
311-322	16"	12µin	440 x 35 x 50mm	1.8kg
311-325	28"	20µin	740 x 35 x 50mm	3kg
311-327	40"	40µin	1040 x 45 x 80mm	8kg
311-329	50"	60µin	1340 x 45 x 80mm	10kg

* Carrying handles (4pcs) are provided as standard for **311-327/9**.
Note: Straightness is measured within the specified range with the instrument supported at the Bessel points to minimize deflection (0.2232 x overall length from each end).

Inch	Ultra-high accuracy model			
Order No.*	Nominal length	Straightness*1	Size (L x W x H)	Mass
311-342	16"	8µin	440 x 35 x 50mm	1.8kg
311-345	28"	16µin	740 x 35 x 50mm	3kg
311-347	40"	20µin	1040 x 45 x 80mm	8kg
311-349	50"	28µin	1340 x 45 x 80mm	10kg

* Carrying handles (4pcs) are provided as standard for **311-347/9**.
Note: Straightness is measured within the specified range with the instrument supported at the Bessel points to minimize deflection (0.2232 x overall length from each end).



Double faced model

SPECIFICATIONS

Metric	Double faced model			
Order No.*	Nominal length	Straightness*1	Size (L x W x H)	Mass
311-352	400mm	0.3µm	440 x 45 x 80mm	3.2kg
311-355	700mm	0.5µm	740 x 45 x 80mm	5.5kg
311-357	1000mm	1.0µm	1040 x 45 x 80mm	8kg
311-359	1300mm	1.5µm	1340 x 45 x 80mm	10kg

* Fixings for carrying handles are not provided.
Note: Straightness is measured within the specified range with the instrument supported at the Bessel points to minimize deflection (0.2232 x overall length from each end).

Inch	Double faced model			
Order No.*	Nominal length	Straightness*1	Size (L x W x H)	Mass
311-362	16"	12µin	440 x 45 x 80mm	3.2kg
311-365	28"	20µin	740 x 45 x 80mm	5.5kg
311-367	40"	40µin	1040 x 45 x 80mm	8kg
311-369	50"	60µin	1340 x 45 x 80mm	10kg



An inspection certificate is supplied as standard. Refer to page X for details.



Standard accessories

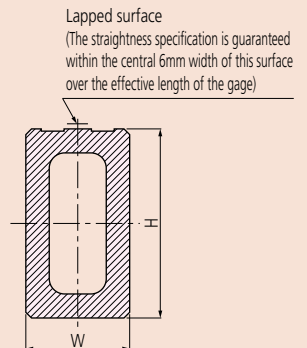
- User's manual
- Wooden case
- Support blocks (ceramic): 3pcs.
- Chamois leather
- Gloves

*Suffix Number for Inspection Certificate and Calibration Certificate

Suffix No.	Certificate provided
-20	Inspection Certificate
-22	Calibration Certificate

Cross section

(High accuracy model, ultra-high accuracy model)

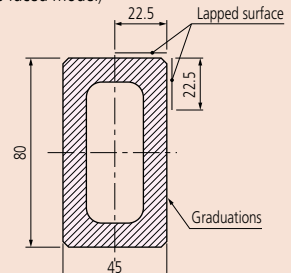


*Suffix Number for Inspection Certificate and Calibration Certificate

Suffix No.	Certificate provided
-20	Provided with Inspection Certificate
-22	Provided with Calibration Certificate

Cross section

(Double faced model)





An inspection certificate is supplied as standard. Refer to page X for details.

Technical Data

Reference surface
 Perpendicularity tolerance: 1µm
 Straightness tolerance: 1µm
 Front/back faces
 Perpendicularity tolerance: 5µm
 Straightness tolerance: 5µm
 Dedicated wooden case is provided.

High Precision Square SERIES 311

- The High Precision Square is a gage used for inspecting the travel straightness and axial perpendicularity of moving elements on equipment such as machine tools, CMMs, form measuring machines and semiconductor-related equipment.
- Four precision-lapped reference surfaces are provided.
- Better than 1µm/300mm straightness and perpendicularity of each (four) reference surface. In addition, front and back faces are accurate to better than 5µm/300mm.



311-111



311-112



311-113

SPECIFICATIONS

Metric		
Order No.	Dimension (W x L x T)	Mass
311-111	90 x 110 x 25mm	1.5kg
311-112	160 x 210 x 25mm	5.0kg
311-113	260 x 310 x 30mm	14.0kg

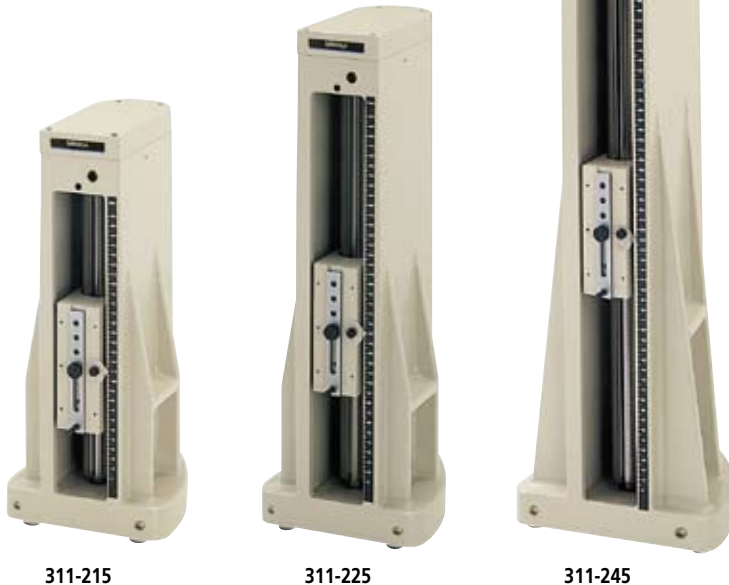
* 311-113 is supplied with a removable handle.

Reference Gages

Length Standards Brought to You by Mitutoyo

Square Master SERIES 311 — Squareness / Straightness Measuring

- Squareness (perpendicularity) and straightness measurements can be performed accurately and efficiently by just moving a lever.
- High accuracy perpendicularity and straightness measurement can be performed by prior setting to a master square using the built-in instrument squareness adjustment mechanism.
- Sliding force: Approx. 2 to 5N



SPECIFICATIONS

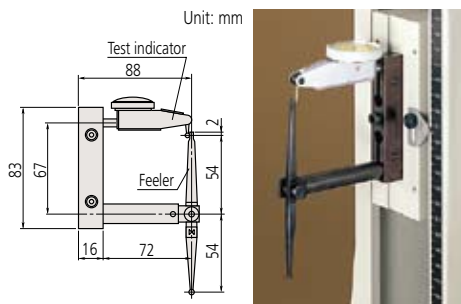
Metric					
Order No.	Vertical travel	Squareness	Straightness	Dimension (WxDxT)	Mass
311-215*	150mm	3 μ m	2 μ m	180x200x420mm	13.7Kg
311-225*	250mm	6 μ m	2.5 μ m	180x200x520mm	16.2Kg
311-245	450mm	9 μ m	3.5 μ m	220x220x720mm	24Kg

* Riser blocks to extend the height of Square Masters can be used.

Optional accessory

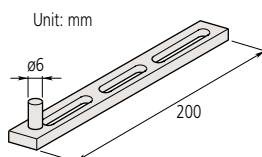
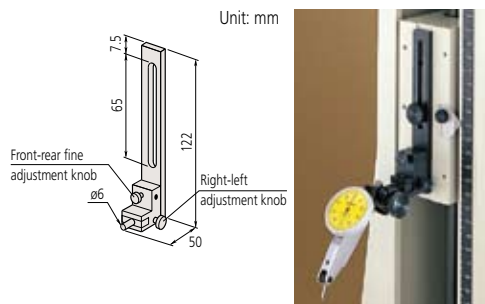
900565: Feeler

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



No.900571: Adjustable holder

Enables easy adjustment of indicator position.



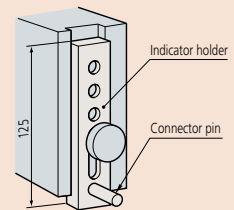
No.900551: Extension holder

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

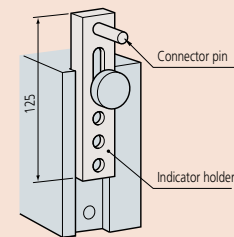


Mounting the indicator holder

Example 1



Example 2



Standard Accessories

513-405: Test indicator (Metric)

513-403: Test indicator (Inch)

902053: Clamp

601471: Indicator holder

538616: Allen wrench (3mm)

Note: Inspection certificate is not attached. Contact your local Mitutoyo sales office.

Optional accessory

900571: Adjustable holder

900551: Extension holder

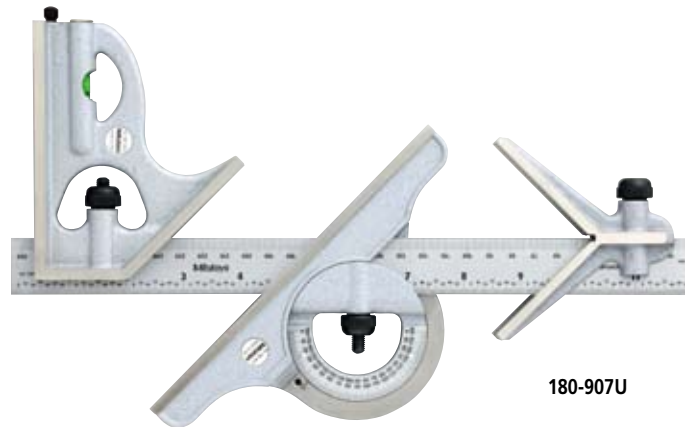
900565: Feeler

Technical Data

- Square head: Used to set the rule at 90 degrees or 45 degrees to an edge of a workpiece.
- Center head: Used to locate centers of round workpieces
- Protractor head: Used to set the rule at a desired angle to an edge of a workpiece. Also used for measuring angles.

Combination Square Set SERIES 180

- Three heads are attachable to the stainless steel rule (blade), allowing versatile measurements on various types of workpieces.



180-907U

SPECIFICATIONS

Metric		
Combination Square Sets		
Order No.	Size	Graduation
180-910U*	300mm	1mm, 0.5mm

* 180-910U consists of blade, square head (180-102U), center head (180-202U) and protractor head (180-301U).

Inch/Metric		
Combination Square Sets		
Order No.	Size	Graduation
180-907U*	12"/300mm	1/32", 1/64", 1mm, 0.5mm

* 180-907U consists of blade, square head (180-102U), center head (180-202U) and protractor head (180-301U).

Heads (Individual)

Order No.	Description	Remarks
180-102U	Square head	For 300mm (12"), 450mm (18"), 600mm (24") blades
180-202U	Center head	For 300mm (12"), 450mm (18"), 600mm (24") blades
180-301U	Protractor head	For 300mm (12"), 450mm (18"), 600mm (24") blades

Reference Gages

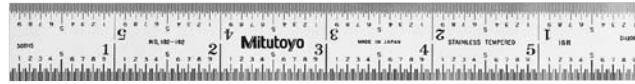
Length Standards Brought to You by Mitutoyo

Steel Rules SERIES 182

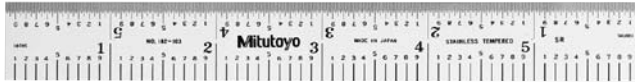
- Clear graduations on satin-chrome finish.
- Stainless tempered.



182-101



182-102



182-103



182-105



182-201



182-202



182-205



182-302

SPECIFICATIONS

Metric Wide Rigid Rules

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

Inch/Metric Wide Rigid Rules

Order No.	Graduations	Range	Width
182-105	1/32", 1/64", 1mm, 0.5mm	6"/150mm	.75"
182-125		12"/300mm	.98"
182-145		18"/450mm	1.18"
182-165		24"/600mm	1.18"
182-106	1/50", 1/100", 1mm, 0.5mm	6"/150mm	.75"
182-126		12"/300mm	.98"
182-107	1/10", 1/100", 1mm, 0.5mm	6"/150mm	.75"
182-108		12"/300mm	.98"

Inch Wide Rigid Rules

Order No.	Graduations	Range	Width
182-101	1/8", 1/16", 1/32", 1/64"	6"	.75"
182-121		12"	.98"
182-141		18"	0.71"
182-161		24"	1.18"
182-102	1/50", 1/100", 1/32", 1/64"	6"	.75"
182-122		12"	.98"
182-142		18"	1.18"
182-162		24"	1.18"
182-103	1/10", 1/100", 1/32", 1/64"	6"	.75"
182-123		12"	.98"
182-143		18"	1.18"
182-163		24"	1.18"
182-104	1/10", 1/50", 1/32", 1/64"	6"	.75"
182-124		12"	.98"

Metric Fully-Flexible Rules

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

Inch/Metric Fully-Flexible Rules

Order No.	Graduations	Range	Width
182-205	1/32", 1/64", 1mm, 0.5mm	6"/150mm	.47"
182-225		12"/300mm	.47"
182-245		18"/450mm	.75"
182-265		24"/600mm	.75"
182-206	1/50", 1/100", 1mm, 0.5mm	6"/150mm	.47"
182-226		12"/300mm	.47"
182-207	1/10", 1/100", 1mm, 0.5mm	6"/150mm	.47"
182-208		12"/300mm	.47"

Inch Fully-Flexible Rules

Order No.	Graduations	Range	Width
182-201	1/8", 1/16", 1/32", 1/64"	6"	.47"
182-221		12"	.47"
182-241		18"	1.18"
182-261		24"	.75"
182-202	1/50", 1/100", 1/32", 1/64"	6"	.47"
182-222		12"	.47"
182-242		18"	.75"
182-262		24"	.75"
182-203	1/10", 1/100", 1/32", 1/64"	6"	.47"
182-223		12"	.47"
182-243		18"	.75"
182-263		24"	.75"
182-204	1/10", 1/50", 1/32", 1/64"	6"	.47"
182-224		12"	.47"

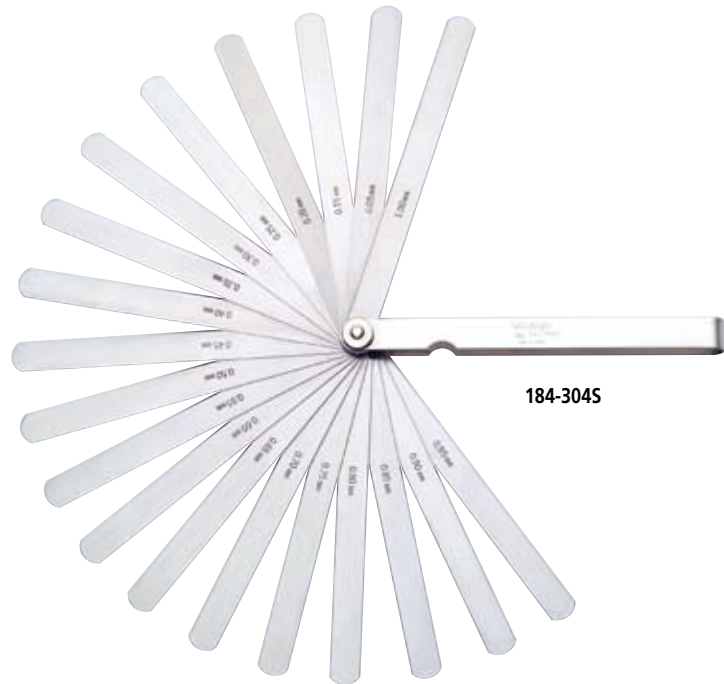
Inch/Metric Semi-Flexible Rules

Order No.	Graduations*	Range	Width
182-302	1/16", 1/32", 1/64", 1mm, 0.5mm	6"/150mm	.51"
182-303		8"/200mm	.51"
182-305		12"/300mm	.59"
182-307		20"/500mm	.59"
182-309		40"/1000mm	.59"

* Engraved on the front side only.

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.



184-304S

SPECIFICATIONS

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

DIMENSIONS

Unit: mm

Order 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

Reference Gages

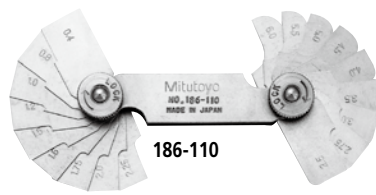
Length Standards Brought to You by Mitutoyo

Radius Gages SERIES 186

- 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.



186-105



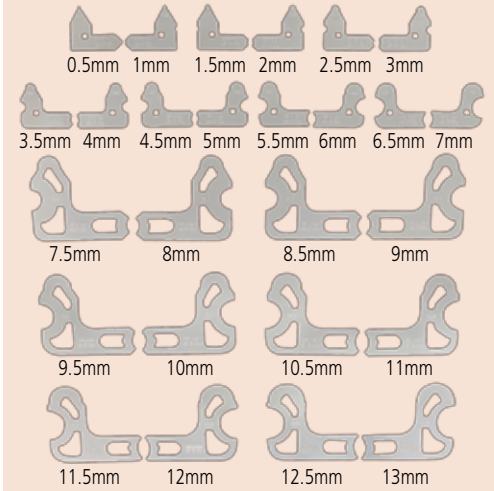
186-110

SPECIFICATIONS

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

Inch			
Order No.	Range	Composition of leaves	Remarks
186-103	1/32" - 17/64"	16 leaves: 1/32" - 17/64" by 64ths	90° arc
186-101	1/32" - 1/4"	15 leaves: 1/32" - 1/4" by 64ths	180° arc
186-102	17/64" - 1/2"	16 leaves: 17/64" - 1/2" by 64ths	180° arc
186-104	9/32" - 33/64"	16 leaves: 9/32" - 33/64" by 64ths	90° arc
186-901*	1/64" - 1/2"	25 leaves: 1/64" - 17/64" by 64ths, 9/32" - 1/2" by 32nds	—

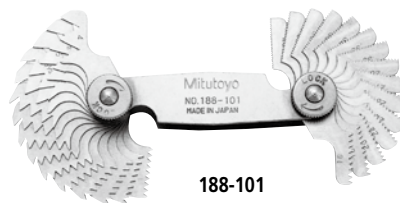
* Each gage has five measuring locations.



Composition of leaves for 186-902

Thread Pitch Gages SERIES 188

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



188-101

SPECIFICATIONS

Metric Screw Pitch Gages

Order No.	Range	Composition of leaves
188-130	0.35 - 6mm	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, 6mm and 60° angle gage
188-122	0.4 - 7mm	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, 7mm
188-121	0.4 - 7mm	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, 7mm

Unified Screw Pitch Gages

Order No.	Range	Composition of leaves
188-111	4 - 42 TPI	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. It consists of 188-122 (Metric) and 188-111 (Unified).

Metric and Unified Screw Pitch Gage Set

Order No.	Range	Composition of leaves
188-151	0.4 - 7mm/4 - 42 TPI	51 leaves: Set of 188-122 and 188-111

Whitworth Screw Pitch Gages

Order No.	Range	Composition of leaves
188-101	4 - 42 TPI	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

Technical Data

Range: -360° to +360°
 Accuracy: ±2' (±0.03°)
 Repeatability: 1'
 Resolution: 1' (0.01°)
 Battery: Lithium Battery
 Battery life: 2,000 hours

Function

Presetting

Digital Universal Protractor SERIES 187

- 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.

SPECIFICATIONS

Order No.	Blade length	Remarks (standard accessory)
187-501	150mm	Height gage holder (950750)
187-502	300mm	Height gage holder (950750)
187-551	6"	Height gage holder (950749)
187-552	12"	Height gage holder (950749)

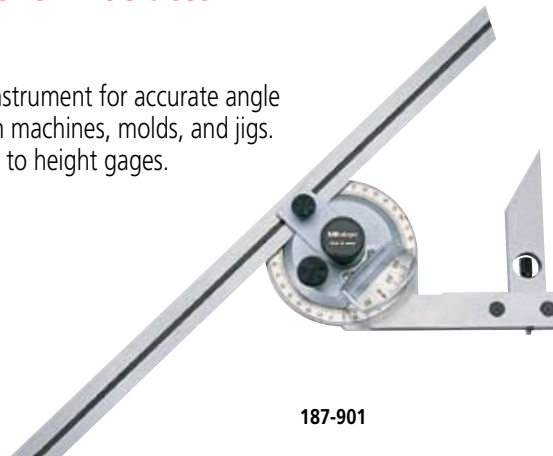


187-501



Universal Bevel Protractor SERIES 187

- High-precision instrument for accurate angle measurement on machines, molds, and jigs.
- Can be attached to height gages.
- Graduation: 5'



187-901

SPECIFICATIONS

Metric		
Order No.	Blade length	Remarks
187-901	150, 300mm	w/60°, 45°, 30° edges
187-907	150mm	w/60°, 45° edges
187-908	300mm	w/60°, 45° edges

Inch		
Order No.	Blade length	Remarks
187-902	6", 12"	w/60°, 45°, 30° edges
187-904	6"	w/60°, 45° edges
187-906	12"	w/60°, 45° edges

Technical Data

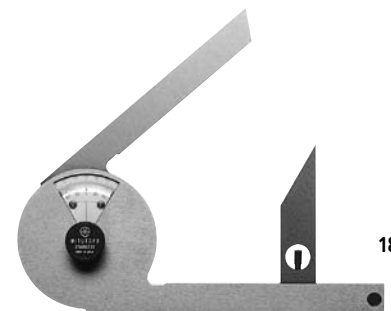
Range: 90° x 4 (360°)
 Graduation: 5 min. (0° - 90° - 0°)
 Blade edge angle: 30° and 60°
 Mass: 260g

Bevel Protractor SERIES 187

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

SPECIFICATIONS

Order No.	Blade length	Remarks
187-201	137mm	w/60°, 30° edges



187-201

Reference Gages

Length Standards Brought to You by Mitutoyo

Spring Dividers and Calipers SERIES 950

FEATURES

- Spring Divider — Fully hardened and tempered joints, spring, washers and divider points.
- Outside Spring Caliper — Contact ends fully rounded to give good contact with a workpiece.
- Inside Spring Caliper — Ends fully rounded to give good contact with a workpiece.



950-212
Spring divider



950-222
Outside spring calipers



950-232
Inside spring calipers

SPECIFICATIONS

Order No.			Range
Spring divider	Outside spring calipers	Inside spring calipers	
950-212	950-222	950-232	6" (150mm)
950-213	950-223	950-233	8" (200mm)

Precision Levels SERIES 960

- High-precision longitudinal and transverse vials make it possible to check or level surfaces.

SPECIFICATIONS

Order No.	Sensitivity	Dimensions (W x D x H)
960-603	0.02mm/m	200 x 44 x 38.2mm
960-703	0.02mm/m	200 x 44 x 200mm

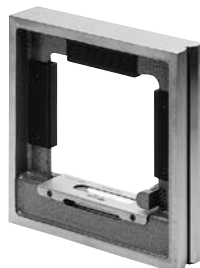
Technical Data

Accuracy of graduations: ± 0.7 DIV (960-603),
 ± 0.3 DIV (960-703)

960-603



960-703



Technical Data

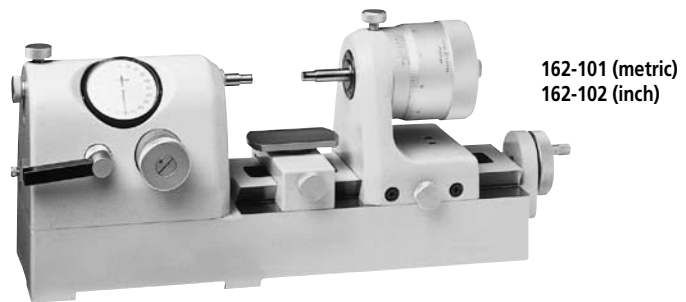
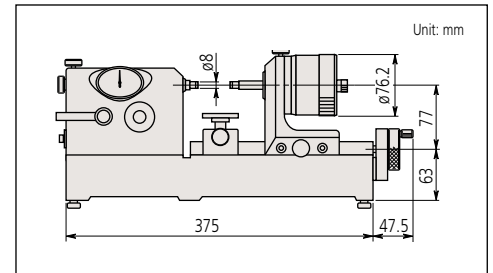
Micrometer head range: 25mm or 1"
Graduation: 0.001mm or .0001"
Dial indicator range: $\pm 0.1\text{mm}$ or $\pm .005''$
Maximum workpiece length: 100mm or 4"
Mass: 15kg

Bench Micrometer SERIES 162

FEATURES

- 25mm/1" stroke micrometer head (Graduation: 0.001mm/.0001") is provided.
- Retractable anvil with dial indicator for high accuracy inspection of mass-produced parts.
- Anvil measuring force is variable.
- Adjustable workpiece stage height.
- Dial Indicator is shockproof.
- $\varnothing 8\text{mm}$ (or 3/8") stem probe from the Mitutoyo Mu-Checker can be attached for higher precision measurement if required.

Dimensions

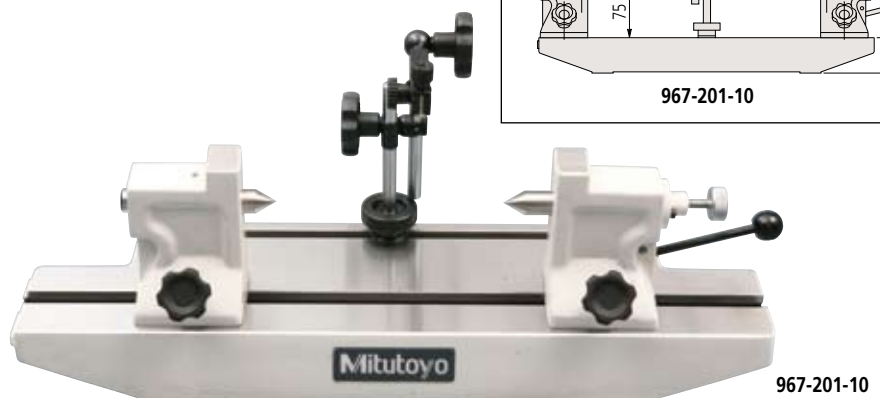
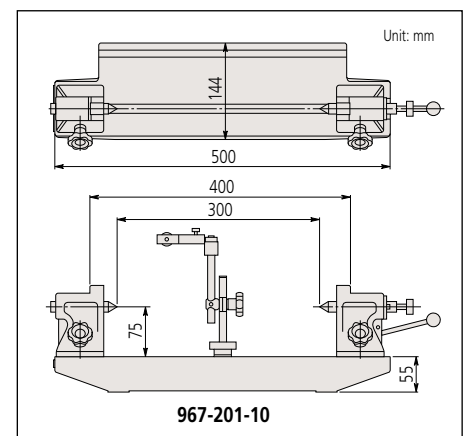


Bench Centers SERIES 967

FEATURES

- Used with a dial test indicator (optional), these Bench Centers provide precision measurement of concentricity on cylindrical workpieces.
- With an indicator clamp. (Holding stem diameter: 8mm)

Dimensions



Technical Data

Maximum workpiece length: 300mm
Maximum workpiece dia.: 150mm
Mass: 13kg

Reference Gages

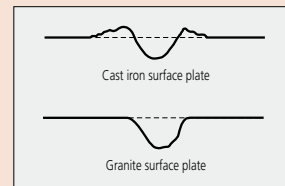
Length Standards Brought to You by Mitutoyo

Black Granite Surface Plates SERIES 517

- Natural granite is free from deterioration or dimensional change over time.
 - Granite surface plates have significant advantages over cast iron surface plates: Twice as hard as cast iron. Non-magnetic. Low thermal expansion.
 - Free from wringing, 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 workpieces 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, etc. (Recommended environment: Temperature $20\pm 1^{\circ}\text{C}$, Humidity $58\pm 2\%$)



An inspection certificate is supplied as standard. Refer to page X for details.



Custom-made Granite Products

Mitutoyo can manufacture granite products to your design (such as main structural components of semiconductor instruments and process machinery).



Grinding CMM granite tables on a large grinding machine

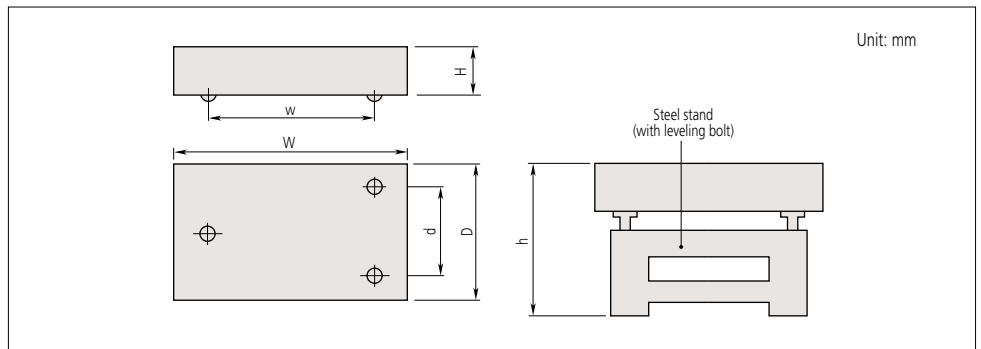
SPECIFICATIONS

Order No.	Size			Flatness	Mass	Stand (Option) Order No.			h
	WxDxh	d	w			Normal type	with safety frame	with caster	
517-401	300x300x100mm	240mm	240mm	2μm	27kg	—	—	—	—
517-301				3μm					
517-101				5μm					
517-411	450x300x100mm	240mm	390mm	2μm	40kg	—	—	—	—
517-311				3μm					
517-111				6μm					
517-414	600x450x100mm	370mm	500mm	2.5μm	80kg	517-203	517-203R	517-203CR	755 - 775mm*1
517-314				4μm					
517-114				8μm					
517-403	600x600x130mm	500mm	500mm	2.5μm	140kg	517-204	517-204R	517-204CR	755 - 775mm*1
517-303				5μm					
517-103				8μm					
517-405	750x500x130mm	420mm	630mm	3μm	146kg	517-205	517-205R	517-205CR	755 - 775mm*1
517-305				5μm					
517-105				9μm					
517-407	1000x750x150mm	630mm	700mm	3μm	337kg	517-206	517-206R	517-206CR	755 - 775mm*1
517-307				6μm					
517-107				12μm					
517-409	1000x1000x150mm	700mm	700mm	3.5μm	450kg	517-207	517-207R	517-207CR	735 - 775mm*1
517-309				7μm					
517-109				13μm					
517-413	1500x1000x200mm	700mm	1100mm	4μm	900kg	517-208	517-208R	517-208CR	735 - 775mm*1
517-313				8μm					
517-113				16μm					
517-410	2000x1000x250mm	700mm	1500mm	4.5μm	1500kg	517-209	517-209R	517-209CR	735 - 775mm*1
517-310				9.5μm					
517-110				19μm					
517-416	2000x1500x300mm	1100mm	1500mm	5μm	2700kg	517-210	517-210R	517-210CR	735 - 775mm*1
517-316				10μm					
517-116				20μm					
517-317	2000x2000x350mm	1500mm	1500mm	11μm	4200kg	—	—	—	700 - 706mm*1
517-117				22μm					
517-318	3000x1500x400mm	1100mm	2000mm	12.5μm	5400kg	—	—	—	700 - 706mm*1
517-118				25μm					
517-319	3000x2000x500mm	1500mm	2000mm	13.5μm	9000kg	—	—	—	700 - 706mm*1
517-119				27μm					

* With leveling bolt.

*1 Distance from the bottom of the large granite plate block mount to the granite plate top surface.

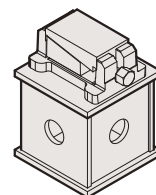
DIMENSIONS



SPECIFICATIONS: Stand

Block mount	Applicable surface plate	
Order No.	Order No.	Size (W × D × H)
06AAY174	517-317	2000 × 2000 × 350mm
	517-117	
06AAY175	517-318	3000 × 1500 × 400mm
	517-118	
06AAY176	517-319	3000 × 2000 × 500mm
	517-119	

Block platform for supporting legs



Block platform for auxiliary legs

