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.





Riser block

515-322

Digital Height Master SERIES 515



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
Marc	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" (stagger			
Micrometer adjustment	1"			
Micrometer feed	.02	.5 "		
Block pitch accuracy	±50)µin		
Parallelism of blocks	40	µin		
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

	1		
Order No.	515-374 515-376		515-378
Range (H)	10 < H ≤ 310mm	10 < H ≤ 310mm 10 < H ≤ 460mm	
Graduation		0.001mm	
Block step	20	mm (staggere	ed)
Micrometer adjustment		20mm	
Micrometer feed		0.5mm/rev	
0 <h≤310mm< td=""><td colspan="3">±1.5µm</td></h≤310mm<>	±1.5µm		
BIOCK DITCH 310 < H ≤ 450mm	—	±2.5	ōμm
450 < H ≤ 610mm	—	_	±3.5µm
Parallelism 0 < H ≤ 310mm		2.0µm	
of blocks $310 < H \le 610$ mm	—	2.5	μm
Feed error	±2.0)μm	2.5µm
Retrace error	2.0µm 2.5µr		2.5µm
Mass	9.5kg 13.6kg 16kg		
* The block accuracy and	the parallelism	of blocks are ba	ased on main

unit installation surface, which does not include the retrace error.



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



Reading



(A) Height A (1) Scale (2) Counter (3) Thimble

280. mm 5.67 mm 0.000mm 285.670mm

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

Technical Data

Display: Battery Battery life: LCD SR44 (2 pcs.), **938882** 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) Low voltage, Counting value composition error Alarm:

Optional Accessories

515-111 515-120	Auxiliary block kit for bore gage (mm) 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	515-379			
Range (H)	.5″ < H ≤ 12″	.5″ < H ≤ 18″	.5″ < H ≤ 24″		
Graduation	.00001 "				
Block step		1" (staggered)		
Micrometer adjustment	1"				
Micrometer feed	.025"/rev				
0 <h≤12"< td=""><td colspan="4">±100µin</td></h≤12"<>	±100µin				
BIOCK DITCH 12" < H ≤ 18"	— ±100µin				
18" < H ≤ 24"	—	—	±150µin		
Parallelism 0 <h≤12"< td=""><td></td><td>50µin</td><td></td></h≤12"<>		50µin			
of blocks 12" < H ≤ 18"	—	100)µin		
Feed error	±10	100µin			
Retrace error	100)µin	100µin		
Mass	9.5kg 13.6kg 16kg		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 IX for details.



Height Master SERIES 515 — Optional accessories

Riser Blocks SERIES 515

515-113

Metric

515-117

515-118

515-114

12″

24″

SPECIFICATIONS

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



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



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)

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	1			
Order No.	Height	Accuracy	Variation in length	Mass
515-116	6″	±20µin	20µin	5.7kg

±40µin

±80µin

515-115

Variation

30µin

40µin

Mass

			Inch	
Mass			Order No.	Model
		515-11	515-119	Universal Height Master, Height Master (515-310)
	5.7kg		515-120	Digital Height Master (515-375/377/379)
	11.8kg		515-121	Height Master (515-311)
	27.9kg			





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.



515-520



Single-row 10mm blocks (movable)





SPECIFICATIONS

Metric	I			
Order No.	515-520 515-523			
Range (H)	5 < H ≤ 610mm	5 < H ≤ 1010mm		
Graduation	0.00	1mm		
Block step	10mm (st	taggered)		
Micrometer adjustment	20mm			
Micrometer feed	0.5m	m/rev		
0 <h≤310mm< td=""><td colspan="3">±1.5µm</td></h≤310mm<>	±1.5µm			
BIOCK PILCH 310 < H ≤ 610mm	±2.5µm			
610 < H ≤ 1010mm	— ±3.5µm			
Parallelism 0 < H ≤ 610mm	1.5	μm		
of blocks $610 < H \le 1010$ mm	—	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					
Ord	ler No.	515-512	515-510	515-513	
Rar	nge (H)	.2″ < H ≤ 18.2″	.2″ < H ≤ 24.2″	.2″ < H ≤ 40.2″	
Gra	duation		.00001"		
Blo	ck step		5" (staggered)	
Micromet	er adjustment	1"			
Micror	neter feed	.025"/rev			
0 <h≤12"< td=""><td colspan="3">±50µin</td></h≤12"<>		±50µin			
BIOCK DITCU-	12″ < H ≤ 24″	— ±100		0µin	
accuracy -	$24'' < H \leq 40''$			±150µin	
Parallelism	H ≤ 24″		60µin		
of blocks	$24'' < H \leq 40''$	_	. 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.



Riser block



An inspection certificate is supplied as standard. Refer to page IX 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.





SPECIFICATIONS Motric

0	rder No.	515-720	515-721	515-722	515-723	515-724
Range (H)		300 mm	450 mm 600 mm 1000 mm 1500 n			1500 mm
Block step)		10mm			
	H ≤ 310 mm			±2.5 μm		
Block pitch	310 < H ≤ 610 mm	—		±3.5	5μm	
accuracy	accuracy $610 < H \le 1010 \text{ mm}$ $1010 < H \le 1510 \text{ mm}$		—	—	±5.0) µm
			_	—	—	±8.0 µm
	H ≤ 310 mm		12µm			
Parallelism	310< H ≤ 610 mm	—	15µm			
blocks	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

Inch					
Order No.		515-710	515-711	515-712	515-713
Range (H)		12"	18"	24"	40"
Block step		.5	5"		
	Η≤12″		±10	0µin	
BIOCK DITCH	12″ < H ≤ 24″	—	±150µin		
accuracy	24″ <h≤40″< td=""><td>—</td><td colspan="3">— ±200µin</td></h≤40″<>	—	— ±200µin		
D (Η≤12″		50	µin	
Parallelism of	12″ <h≤24″< td=""><td>—</td><td></td><td>60µin</td><td></td></h≤24″<>	—		60µin	
DIOCKS	$24'' < H \leq 140''$	—	—	80	µin
Mass		7 kg	10 kg	13 kg	22 kg
	11 1	1.1	1 1	L I' (

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 IX for details.



Using in horizontal orientation

Optional Accessories

Supporting base **601167**: Supporting base for vertical operation



High Accuracy Check Master SERIES 515

to the main unit installation surface. 2) Supplied with a wooden storage case as standard.

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



orientation

orientation

Single-row 10mm (5") blocks

SPECIFICATIONS

INIELII							
Order No.		515-740/ 515-760*	515-741/ 515-761*	515-742/ 515-762*	515-743/ 515-763*	515-744/ 515-764*	
Pange (R)		300 mm	450 mm	600 mm	1000 mm	1500 mm	
Block st	ер			10mm			
H ≤ 310 mm			±1.2 μm				
Block pitch	310 < H ≤ 610 mm	_	— ±1.8μm				
accuracy	$610 < H \le 1010 \text{ mm}$	—	_	—	±2.5	ōμm	
	1010 < H ≤ 1510 mm	_	_	—	—	±4.0µm	
Parallelism	H ≤ 450 mm	1.0µm					
of	450 < H ≤ 1010 mm	—	—		1.5µm		
blocks	1010 < H ≤ 1510 mm	—	_	—	—	2.0µm	
Mass		3.6 kg	5.4 kg	7.2 kg	12 kg	18 kg	
Coramic 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/ 515-731/ 515-732/ 515-733/ 515-734/ 515-750*515-751*515-752*515-753*515-754* Order No. Pange (R) 12" 18" 24" 40" Block step .5' $H \le 12''$ ±50µin Block pitch $12'' < H \le 24''$ ±70µin accuracy 24" < H ≤ 40" ±100µin ±158µin 40" < H ≤ 60" $\mathsf{H} \leq 18''$ 40µin Parallelism of blocks 18" < H ≤ 40" 60µin $40'' < H \le 60''$ 80uin 7.2 kg 12 kg 18 kg 3.6 kg 5.4 kg

Mass 3. * Ceramic Check Master

515-742

Notes: 1) The block accuracy and the parallelism of blocks are relative to the main unit installation surface.



E-38

515-740

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 IX for details.

Technical Data

Accuracy (at 20°C): (0.5+L/1000)µm, L = Measured length (mm) Material: Low expansion glass Thermal expansion coefficient: (0.00±0.02)x10⁻⁶/K Graduation: 1mm Graduation line thickness: 4µm Mass: 0.75kg (250mm), 1.8kg (500mm)

182-501

182-502

SPECIFICATIONS

meane					
Order No.	Range	Length	Width	Thickness	
182-501-50	2E0mm	200mm	20mm	10mm	
182-501-60*	23011111	20011111	2011111		
182-502-50	500mm	520mm	20mm	20mm	
182-502-60*	JUUIIII	55011111	10000		

* with English JCSS certificate.

DIMENSIONS







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

Technical Data Accuracy (at 20°C).

Accuracy (at 20 C).	. (1.
	L =
Glass material:	So
Thermal expansion	coeffi
Graduation:	0.1
	0.1

(1.5+2L/1000)µm, Measured length (mm) dium glass cient: (8±1)x10⁻⁶/K Imm (thickness: 20µm) 0.5mm (thickness: 50µm) 1mm (thickness: 100µm)

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

wietric	I					
Order No.	Range	Graduation	Length	Inspection pitch	Graduation line thickness	Length
182-511-10	50mm		75mm	5mm		0.23kg
182-512-10	100mm	0.1mm	125mm		20.00	0.24kg
182-513-10	150mm	0.111111	175mm	10mm	Ζυμπ	0.25kg
182-514-10	200mm		225mm	TOMIN		0.26kg
182-521-10	100mm		130mm			0.27kg
182-522-10	200mm	0.5mm	230mm	20mm		0.32kg
182-523-10	300mm		330mm		50µm	0.57kg
182-524-10	400mm		430mm			0.71kg
182-525-10	500mm		530mm			0.86kg
182-531-10	250mm		280mm			0.55kg
182-532-10	500mm	1mm	530mm	25mm	100um	1.22kg
182-533-10	750mm	111111	780mm	2,511111	τουμπ	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



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: 1000mm

SPECIFICATIONS

Metric	High accuracy model				
Order No.*	Nominal length Straightness*1 Size (L x W x H)				
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	11-309 1300mm 1.5µm 1340 x 45 x				
+ C			1 1 1 244	207/0	

 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 50m		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 (Ancs) 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 311-322 440 x 35 x 50mm 1.8kg 16" 12uin 311-325 20µin 3kg 28 740 x 35 x 50mm 311-327 40' 40µin 1040 x 45 x 80mm 8kg 311-329 50" 1340 x 45 x 80mm 10kg 60µin

 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

Double faced model

.* Nominal length Straightness*1

12µin

20µin

40uin

60µin

16

28

40'

50

Size (L x W x H) Mass

3.2kg

5.5kg

8kg

10kg

440 x 45 x 80mm

740 x 45 x 80mm

1040 x 45 x 80mm

1340 x 45 x 80mm

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).



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



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

*Suffix Number for Inspection

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

Cross section

(High accuracy model, ultra-high accuracy model)



F

		-	_

Double faced model

Inch

SPECIFICATIONS

Metric	Double faced model
--------	--------------------

Order No.*	Nominal length	Straightness*1	Size (L x W x H)	Mass	Order No
311-352	400mm	0.3µm	440 x 45 x 80mm	3.2kg	311-362
311-355	700mm	0.5µm	740 x 45 x 80mm	5.5kg	311-365
311-357	1000mm	1.0µm	1040 x 45 x 80mm	8kg	311-367
311-359	1300mm	1.5µm	1340 x 45 x 80mm	10kg	311-369

* 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).

*Suffix Number for Inspection

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

Lapped surface

Cross section

(Double faced model)





An inspection certificate is supplied as standard. Refer to page IX 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.



O

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

E-42

* **311-113** is supplied with a removable handle.



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.
 Sliding force: Approx. 2 to 5N
- High accuracy perpendicularity and straightness measurement can be performed by prior setting to a master square using the built-in instrument squareness adjustment mechanism.







311-225

Vertica

travel

6"

10"

18"

Inch

Order No.

311-216*

311-226*

311-246

311-245

Squareness Straightness

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

80µin

100µin

120µin

240µin

360µin

SPECIFICATIONS

Order No.	Vertical travel	Squareness	Straightness	Dimension (W×D×T)	Mass
311-215*	150mm	3µm	2µm	180×200×420mm	13.7Kg
311-225*	250mm	6µm	2.5µm	180×200×520mm	16.2Kg
311-245	450mm	9µm	3.5µm	220×220×720mm	24Kg

 $\ensuremath{^{\ast}}$ 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.





Unit: mm

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



Standard Accessories

Mass

13.7Kg

16.2Kg

24Kg

(W×D×T)

180x200x420mm

180×200×520mm

140µin 220×220×720mm

513-405: Test indicator (Metric)
513-403: Test indicator (Inch)
902053: Clamp
601477: 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



F



Technical Data

Square head: Used to set the rule at 90 degrees or 45 Center head: workpieces

degrees to an edge of a workpiece. Used to locate centers of round 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.



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



Length Standards Brought to You by Mitutoyo

Steel Rules SERIES 182

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



182-105

$\frac{1}{2} + \frac{1}{2} + \frac{1}$

182-202

182-302

SPECIFICATIONS

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

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

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

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

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

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

Inch/Metric _ Semi-Flexible Rules				
Order No.	Graduations*	Range	Width	
182-302		6"/150mm	.51"	
	1			

102-302			
182-303	1/16", 1/32",	8"/200mm	.51"
182-305	1/64",	12"/300mm	.59"
182-307	1mm, 0.5mm	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.



SPECIFICATIONS Metric

Order No.	Range	Composition of leaves	Remarks
184-313S	0.05	28 leaves: 0.05 - 0.15mm by 0.01mm, 0.2 - 1mm by 0.05mm	—
184-303S	0.05 - 111111	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 10000	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	0.02.05mm	13 leaves: 0.03 - 0.1mm by 0.01mm, 0.2 - 0.5mm by 0.1mm, 0.15mm	—
184-3025	0.05 - 0.511111	13 leaves: 0.03 - 0.1mm by 0.01mm, 0.2 - 0.5mm by 0.1mm, 0.15mm	Long leaf



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.





Mitu ND. 18

188-101

SPECIFICATIONS

Metric	1		
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
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
186-110 186-902 186-105 186-106 186-107	0.4 - 6mm 0.5 - 13mm 1 - 7mm 7.5 - 15mm 15.5 - 25mm	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 26 leaves: 0.5 - 13mm by 0.5mm 34 leaves: 1 - 3mm by 0.25mm 3.5 - 7mm by 0.5mm 32 leaves: 7.5 - 15mm by 0.5mm 30 leaves: 15.5 - 20mm by 0.5mm, 21 - 25mm by 1mm	90° ar 90° ar 180° ar 180° ar 180° ar

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.

Thread Pitch Gages SERIES 188

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



SPECIFICATIONS

Metric Scre	Aetric 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, 111/ 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.
Accuracy:
Repeatability:
Resolution:
Battery:
Battery life:

±2' (±0.03°) 1' (0.01°) Lithium Battery

Function Presetting

-360° to +360° 2,000 hours

Digital Universal Protractor SERIES 187

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

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





Technical Data

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

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'



SPECIFICATIONS

Metric				Inch	1	
Order No.	Blade length	Remarks		Order No.	Blade length	Remarks
187-901	150, 300mm	w/60°, 45°, 30° edges		187-902	6", 12"	w/60°, 45°, 30° edges
187-907	150mm	w/60°, 45° edges		187-904	6"	w/60°, 45° edges
187-908	300mm	w/60°, 45° edges		187-906	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.

CDECIEICATIONS

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



Mitutoyo

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

	Pango		
Spring divider	Outside spring calipers	Inside spring calipers	Kange
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



Technical Data

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

960-603





960-703



Technical Data

Micrometer head range: Graduation: Dial indicator range: ±0.1mm or ±.005" Maximum workpiece length: 100mm or 4" Mass:

25mm or 1" 0.001mm or .0001" 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.
- ø8mm (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



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

Mitutoy

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±1°C, Humidity 58±2%)



An inspection certificate is supplied as standard. Refer to page IX 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 Ne	Size		Elata and	Mass	Stand (Option) Order No.		L.		
Order No.	W×D×h	d	W	FIGULESS	IVIdSS	Normal type	with safty frame	with caster	П
517-401				2µm					
517-301	300×300×100mm	240mm	240mm	3µm	27kg	—	—	—	—
517-101				5µm					
517-411	-	240mm	390mm	2µm	40kg	_	_	_	_
517-311	450×300×100mm			3µm					
517-111				6µm					
517-414	COO 450 400	270	500mm	2.5µm	80kg 5	517-203	517-203R 517-203CR	543 000 60	755 - 775mm* ¹
517-314	600×450×100mm	370mm		4μm				517-203CR	
517-114				8μm 2 Fum					
517-405	600v600v120mm	F00	500mm	Z.5µIII	140kg	517-20	517-204R 517-204CR	E17 204CD	755 - 775mm* ¹
517-505	000x000x15011111	50011111		Sum	140kg			517-204CK	
517-405		/20mm	630mm	Зит	146kg 54		517-205R	517-205CR	755 - 775mm*1
517-305	750×500×130mm			5µm		517-205			
517-105	, , , , , , , , , , , , , , , , , , , ,	12011111		9um					
517-407				3um					
517-307	1000×750×150mm	630mm	700mm	6µm	337kg	517-206	517-206R	517-206CR	755 - 775mm* ¹
517-107				12µm					
517-409				3.5µm					
517-309	1000×1000×150mm	700mm	700mm	7µm	450kg	517-207	517-207R	517-207CR	735 - 775mm* ¹
517-109				13µm					
517-413	_	700mm	1100mm	4µm	900kg	517-208	517-208R 517-208CR		735 - 775mm* ¹
517-313	313 1500×1000×200mm			8µm				517-208CR	
517-113				16µm					
517-410		700mm	1500mm	4.5µm	1500kg	517-209	543 0000	543 000 CD	735 - 775mm* ¹
517-310	2000×1000×250mm			9.5µm			517-209R	517-209CR	
517-110				19µm					
517-410	517-416 517-316 2000×1500×300mm	1100mm	1500mm	5µm	2700kg	517-210	517-210R	E17 210CD	735 - 775mm* ¹
517 116				20um				517-210CK	
517-317				11um					
517-117	2000×2000×350mm	1500mm	1500mm	22µm	4200kg	—	—	—	700 - 706mm* ¹
517-318		0×400mm 1100mm	2000mm	12.5um	- 5400kg -				700 - 706mm* ¹
517-118	3000×1500×400mm			25um		—	—		
517-319	2000 2000 500	2000 500 4500	2000 1	13.5µm	00001				700 700
517-119	3000×2000×500mm	1500mm	2000mm	27µm	9000kg	—	—	_	700 - 706mm*1

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 \times D \times H)		
06447174	517-317	2000 y 2000 y 250mm		
00AA11/4	517-117	2000 × 2000 × 53011111		
0644775	17-318	2000 y 1500 y 400mm		
00AA1175	517-118	5000 x 1500 x 40011111		
06AAY176	517-319	2000 x 2000 x 500mm		
	517-119	3000 × 2000 × 30011111		

Block platform for supporting legs

Block platform for auxiliary legs







Ε