New Products

Ultra Low Expansion Ceramic Gauge Blocks (ZERO CERA Block)

Refer to page E-6 for details.

Gauge Block Comparator GBCD-100A

Refer to page E-31 for details.

Digital Height Master

Refer to page E-35 for details.

High Precision Square

Refer to page E-43 for details.

Gauge Blocks

Gauge Block

Height Master & Reference Gages

Height Master

Granite Surface Plates

INDEX

E

E

E

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

Features and Accuracies

Features of Mitutoyo Gauge Blocks

Mitutoyo offers 3 types of gauge block for use as length standards: rectangular steel, rectangular ceramic (CERA Blocks) and square steel gauge blocks. In addition, rectangular and square protection blocks (1mm and 2mm for each) are available in tungsten carbide. Mitutoyo gauge blocks are recognized to be of the highest quality both here in Japan and abroad, and are available in various grades to meet every need in respect of working conditions, environment and application.

Accuracy

As a world-leading precision measuring equipment manufacturer, Mitutoyo is certified by the Japanese government as an accredited calibration laboratory, which means that the accuracy of its gauge blocks is guaranteed through traceability to the Metrology Management Center of the National Institute of Advanced Industrial Science and Technology (AIST).

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 of Steel Blocks

High-carbon high-chrome steel is employed to satisfy a variety of the material characteristics required for gauge blocks. Our advanced heat treatment technology for steel blocks, which involves repeated temperature cycling, simultaneously achieves excellent abrasion resistance and minimizes any change in length over time.

CERA Blocks

CERA blocks are made of a ceramic material with a superior surface finish, created by Mitutoyo's ultra-precision machining techniques, that provides a premium quality block with significant advantages:

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. Abrasion Resistant
CERA Blocks have 10 times the abrasion resistance of steel gauge blocks.

Abrasion loss data
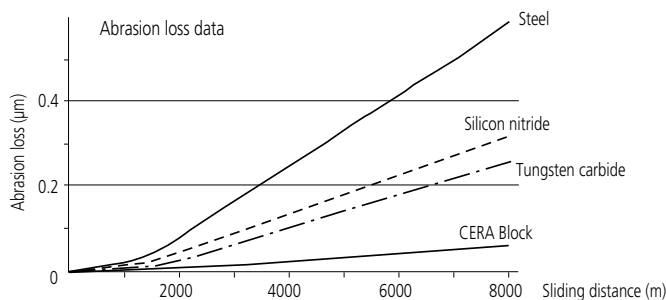
4. Dimensionally Stable
CERA Blocks are free from dimensional change over time.

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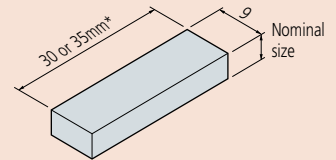
7. High Wringing Force
Superior flatness and surface finish provides maximum wringing force.

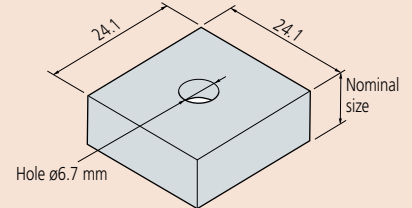## Classification of Gauge Blocks by Shape

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

Rectangular gauge blocks

30 or 35mm*

9

Nominal size

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

Square gauge blocks

24.1

24.1

Nominal size

Hole ø6.7 mm

Grade and Application

Grade 2:
These gauge blocks are intended for shop floor use to set and calibrate fixtures as well as precision instruments.

Grade 1:
This grade is used within an inspection area to verify the accuracy of plug and snap gages as well as for setting electronic measuring devices.

Grade 0:
These higher accuracy gauges are intended for use within a controlled environment by skilled inspection staff. Mainly used as reference standards for setting high precision measuring equipment and for the calibration of lower grade gauge blocks.

Grade K:
Gauge blocks of this accuracy are intended for use within a temperature controlled inspection room or calibration laboratory. They should be used as masters with certificates against other gauge blocks which are calibrated by comparison.

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 = 45.6785mm

• For a 1mm-based gauge block set (112 pcs.)

```
        1.0005
        1.008
        1.17
       17.5
 + )   25
       45.6785mm
```

• For a 2mm-based gauge block set (112 pcs.)

```
        2.0005
        2.008
        2.17
       14.5
 + )   25
       45.6785mm
```

* Regarding the method for wringing, refer to "Quick Guide to Precision Measuring Instruments" on page E-33.

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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.
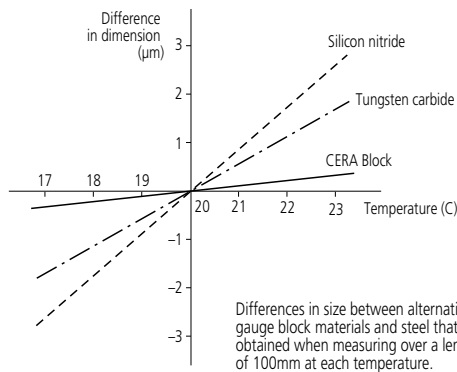
Grade and Application

The following table can be used to select the gauge block grade according to usage (specified by DIN861, 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

8. Superior Material Characteristics of CERA Block

Property \ Material	CERA Block (ZrO^2)	Steel (Fe)	Tungsten Carbide (WC-Co)	Silicon nitride (Si^{3}N^4)
Hardness (HV)	**1350**	800	1650	1500
Coefficient of thermal expansion (10^{-6}/K)	**9.3±0.5**	10.8±0.5	5.5±1.0	2
Flexural strength by 3-point bending (MPa)	**1270**	1960	1960	580
Fracture toughness K1c (MPa•m$^{1/2}$)	**7**	120	12	6.5
Young's modulus x10^{-4} (MPa)	**20.6**	20.6	61.8	28.4
Poisson's ratio	**0.3**	0.3	0.2	0.3
Specific gravity	**6.0**	7.8	14.8	3.2
Thermal conductivity (W/m•k)	**2.9**	54.4	79.5	16.7

* 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 in the environment of severe temperature change.

9. Closest Expansion Coefficient to Steel

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 100mm 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 x 24.1mm 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.

E

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

ACCURACY SPECIFICATIONS: JIS B 7506-2004 (JAPAN)

(at 20°C)

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

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

ACCURACY SPECIFICATIONS: BS 4311: Part 1: 1993 (UK)

(at 20°C)

Nominal length (inch)		Grade K			Grade 0		
		Tolerance on deviation of measured central length	Parallelism	Flatness	Tolerance on deviation of measured central length	Parallelism	Flatness
over 0	up to 0.4	±5µin	2µin	2µin	±5µin	4µin	4µin
over 0.4	up to 1	±6µin	2µin	2µin	±6µin	4µin	4µin
over 1	up to 2	±8µin	3µin	2µin	±8µin	4µin	4µin
over 2	up to 3	±10µin	3µin	2µin	±10µin	5µin	4µin
over 3	up to 4	±12µin	3µin	2µin	±12µin	5µin	4µin

Nominal length (inch)		Grade 1			Grade 2		
		Tolerance on deviation of measured central length	Parallelism	Flatness	Tolerance on deviation of measured central length	Parallelism	Flatness
over 0	up to 0.4	±10µin	6µin	6µin	±20µin	12µin	10µin
over 0.4	up to 1	±12µin	6µin	6µin	±25µin	12µin	10µin
over 1	up to 2	±15µin	7µin	6µin	±30µin	12µin	10µin
over 2	up to 3	±20µin	7µin	6µin	±40µin	14µin	10µin
over 3	up to 4	±25µin	8µin	6µin	±50µin	14µin	10µin

ACCURACY SPECIFICATIONS: BS 4311: Part 1: 1993 (UK)

(at 20°C)

Nominal length (mm)		Grade K			Grade 0		
		Tolerance on deviation of measured central length	Parallelism	Flatness	Tolerance on deviation of measured central length	Parallelism	Flatness
over 0	up to 10	±0.12µm	0.05µm	0.05µm	±0.12µm	0.10µm	0.10µm
over 10	up to 25	±0.15µm	0.05µm	0.05µm	±0.15µm	0.10µm	0.10µm
over 25	up to 50	±0.20µm	0.06µm	0.05µm	±0.20µm	0.10µm	0.10µm
over 50	up to 75	±0.25µm	0.06µm	0.05µm	±0.25µm	0.12µm	0.10µm
over 75	up to 100	±0.30µm	0.07µm	0.05µm	±0.30µm	0.12µm	0.10µm

Nominal length (mm)		Grade 1			Grade 2		
		Tolerance on deviation of measured central length	Parallelism	Flatness	Tolerance on deviation of measured central length	Parallelism	Flatness
over 0	up to 10	±0.25µm	0.16µm	0.15µm	±0.50µm	0.30µm	0.25µm
over 10	up to 25	±0.30µm	0.16µm	0.15µm	±0.60µm	0.30µm	0.25µm
over 25	up to 50	±0.40µm	0.18µm	0.15µm	±0.80µm	0.30µm	0.25µm
over 50	up to 75	±0.50µm	0.18µm	0.15µm	±1.00µm	0.35µm	0.25µm
over 75	up to 100	±0.60µm	0.20µm	0.15µm	±1.20µm	0.35µm	0.25µm

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

Nominal length (inch)		Grade K		Grade 00		Grade 0		Grade 1		Grade 2	
		Limit deviations of length at any point	Tolerance for the variation in length	Limit deviations of length at any point	Tolerance for the variation in length	Limit deviations of length at any point	Tolerance for the variation in length	Limit deviations of length at any point	Tolerance for the variation in length	Limit deviations of length at any point	Tolerance for the variation in length
	up to .05	±12µin	2µin	±4µin	2µin	±6µin	4µin	±12µin	6µin	±24µin	12µin
over .05	up to .4	±10µin	2µin	±3µin	2µin	±5µin	4µin	±8µin	6µin	±18µin	12µin
over .45	up to 1	±12µin	2µin	±3µin	2µin	±6µin	4µin	±12µin	6µin	±24µin	12µin
over 1	up to 2	±16µin	2µin	±4µin	2µin	±8µin	4µin	±16µin	6µin	±32µin	12µin
over 2	up to 3	±20µin	2µin	±5µin	3µin	±10µin	4µin	±20µin	6µin	±40µin	14µin
over 3	up to 4	±24µin	3µin	±6µin	3µin	±12µin	5µin	±24µin	8µin	±48µin	14µin
over 4	up to 5	±32µin	3µin	±8µin	3µin	±16µin	5µin	±32µin	8µin	±64µin	16µin
over 5	up to 6	±32µin	3µin	±8µin	3µin	±16µin	5µin	±32µin	8µin	±64µin	16µin
over 6	up to 7	±40µin	4µin	±10µin	4µin	±20µin	6µin	±40µin	10µin	±80µin	16µin
over 7	up to 8	±40µin	4µin	±10µin	4µin	±20µin	6µin	±40µin	10µin	±80µin	16µin
over 8	up to 10	±48µin	4µin	±12µin	4µin	±24µin	6µin	±48µin	10µin	±104µin	18µin
over 10	up to 12	±56µin	4µin	±14µin	4µin	±28µin	7µin	±56µin	10µin	±112µin	20µin
over 12	up to 16	±72µin	5µin	±18µin	5µin	±36µin	8µin	±72µin	12µin	±144µin	20µin
over 16	up to 20	±88µin	6µin	±20µin	6µin	±44µin	10µin	±88µin	14µin	±176µin	24µin
over 20	up to 24	±104µin	6µin	±25µin	6µin	±52µin	10µin	±104µin	16µin	±200µin	28µin
over 24	up to 28	±120µin	7µin	±30µin	7µin	±60µin	12µin	±120µin	18µin	±240µin	28µin
over 28	up to 32	±136µin	8µin	±34µin	8µin	±68µin	12µin	±136µin	20µin	±260µin	32µin
over 32	up to 36	±152µin	8µin	±38µin	8µin	±76µin	14µin	±152µin	20µin	±300µin	36µin
over 36	up to 40	±160µin	10µin	±40µin	10µin	±80µin	16µin	±168µin	24µin	±320µin	40µin

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

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

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

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

* Only for 100mm type

Inspection Certificate

For details, please refer to Leaflet No.
E4334 "Gauge Block with calibrated
coefficient of thermal expansion".

For details, please refer to Leaflet No.
E4331 "ZERO CERA BLOCK"

Gauge Blocks with a Calibrated Coefficient of Thermal Expansion

- Mitutoyo offers top-level gauge blocks (steel and ceramic) which are superior to K class blocks, with their quality supported by Mitutoyo's best technologies.

- Features an accurately calibrated thermal expansion coefficient measured with a proprietary double-faced interferometer (DFI).
- Each gauge block is calibrated for length on a highly accurate gauge block interferometer (GBI) system.
- Available as rectangular gauge blocks in the range 100 to 500mm.

SPECIFICATIONS

Metric Blocks with CTE		
Order No. (steel)*	Order No. (CERA)*	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		
Order No. (steel)*	Order No. (CERA)*	Length (inch)
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/ASME/ISO
Uncertainty of thermal expansion coefficient	0.035×10^{-6}/K (k = 2)
Uncertainty of length measurement	30nm (k = 2), for 100mm block

* 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.

ZERO CERA Blocks

- Thermal expansion in the temperature range 20±1℃ less than 1/500 that of steel $(0\pm0.02\times10^{-6}$/K(20℃))
- Almost no secular change both in dimension and coefficient of thermal expansion

- Complementary ultra-low thermal expansion and high specific rigidity (Young's modulus/specific gravity)

SPECIFICATIONS

Metric Blocks			
Order No.			Length (mm)
JIS/ISO/DIN	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 operates a policy of continuous improvement that aims to provide the customer with the benefit of the latest technological advances.
Therefore the company reserves the right to change any or all aspects of any product specification without notice.

E-6

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

Metric Rectangular Gauge Block Sets
SERIES 516

• Mitutoyo provides a wide selection of boxed sets of gauge blocks to meet the various needs of industry. Selecting the best set, or sets, to acquire usually depends on the accuracy required by the target applications, the level of convenience desired (larger sets offer more combination possibilities) and the environmental conditions in which they will be used.

Steel 1mm 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 0.001mm Step Block Sets

Steel 9-block set

Steel 9-block set

Steel 18-block set

Steel Long Block Sets
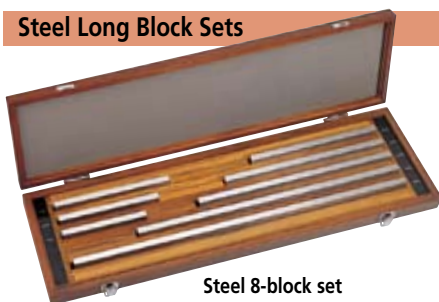
Steel 8-block set

Steel Wear Block Sets

Steel 2-block set

Steel Thin Block Sets

Steel 9-block set

Note: Details of the contents of any particular set are given on page E-9.

CERA 1mm 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 0.001mm Step Block Sets

CERA 9-block set

CERA 9-block set

CERA 18-block set

CERA Long Block Sets

CERA 8-block set

Unit:mm

Length

$9^{+0.05}_{-0.2}$

2-ø10

L×0.211

$35^{-0}_{-0.3}$

25±0.5

Airy line

25±0.5
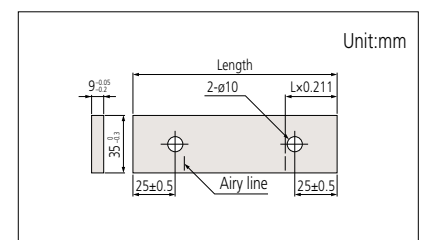
CERA Wear Block Sets

CERA 2-block set

Wear block

15 mm

Mitutoyo

Wear block
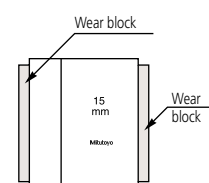
Note: Details of the contents of any particular set are given on page E-10.

Mitutoyo

E

Gauge Blocks

Length Standards Brought to You by Mitutoyo

SPECIFICATIONS

1mm Base Block Sets

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

* Suffix Number (■) for Selecting Standard and Certificate Provided

ISO/DIN/JIS

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	O	—
6	O	O

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

ASME

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	O	—
6	O	O

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	O	—
6	O	O

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

Inspection Certificate
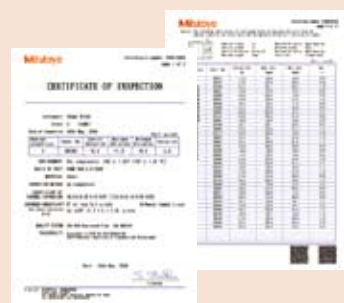
SPECIFICATIONS

0.001mm Step Block Set

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

Long Block Sets

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

Wear Block Sets

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

Inch Block Sets

Blocks per set	Order No.		Standard / grade available and Suffix No.*			Blocks included in set		
	Steel	CERA	ISO/DIN/JIS	ASME	BS	Size	Step	Qty.
82	516-548	516-556	—	K: -■6	—	.10005		1
	516-905	516-305	—	00: -■6	—	.1001 – .1009	.0001	9
	516-906	516-306	—	0: -■6	0: -■1	.101 – .149	.001	49
	516-907	516-307	—	1: -■6	1: -■1	.05 – .95	.05	19
	516-908	516-308	—	2: -■6	2: -■1	1 - 4	1	4
81	516-549	516-557	—	K: -■6	—	.1001 – .1009	.0001	9
	516-901	516-301	—	00: -■6	—	.101 – .149	.001	49
	516-902	516-302	—	0: -■6	0: -■1	.05 – .95	.05	19
	516-903	516-303	—	1: -■6	1: -■1	1 - 4	1	4
	516-904	516-304	—	2: -■6	2: -■1			
49	—	—	—	—	—	.1001 – .1009	.0001	9
	—	—	—	—	—	.101 – .109	.001	9
	516-910	—	—	—	0: -■1	.01 – .19	.01	19
	516-911	—	—	—	1: -■1	.2 - .9	.1	8
	516-912	—	—	—	2: -■1	1 - 4	1	4
35	516-550	516-558	—	K: -■6	—	.10005		1
	516-913	516-313	—	00: -■6	—	.1001 – .1009	.0001	9
	516-914	516-314	—	0: -■6	0: -■1	.101 – .109	.001	9
	516-915	516-315	—	1: -■6	1: -■1	.11 – .19	.01	9
	516-916	516-316	—	2: -■6	2: -■1	.1 - .3	.1	3
						.5, 1, 2, 4		4

Thin Block Sets

Blocks per set	Order No.		Standard / grade available and Suffix No.*			Blocks included in set		
	Steel	CERA	ISO/DIN/JIS	ASME	BS	Size	Step	Qty.
28	516-551	—	—	K: -■6	—	.02005		1
	516-917	—	—	00: -■6	—	.0201 – .0209	.0001	9
	516-918	—	—	0: -■6	—	.021 – .029	.001	9
	516-919	—	—	1: -■6	—	.01 – .09	.01	9
	516-920	—	—	2: -■6	—			
10	516-926	—	—	0: -■6	0: -■1	.005 - .050	.005	10
	516-927	—	—	1: -■6	1: -■1			
	516-928	—	—	—	2: -■1			

Long Block Sets

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

Wear Block Sets

| Blocks per set	Order No.		Standard / grade available and Suffix No.*			Blocks included in set		
	Carbide	CERA	ISO/DIN/JIS	ASME	BS	Size	Step	Qty.
2	516-809	516-836	—	0: -■6	—	.05		2
	516-808	516-837	—	1: -■6	—			
2	516-805	516-834	—	0: -■6	—	.1		2
	516-804	516-835	—	1: -■6	—			

E

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

Micrometer Inspection Gauge Block Sets
SERIES 516

• Dedicated gauge block sets for micrometer inspection.
Sets **516-106/7/8** and **516-322/3** are recommended for checking instrumental errors in micrometers due to the choice of block sizes ensuring that the instrument is checked through a full rotation of the spindle over the range 0-25 mm (or 0-1").
Sets **516-115/6/7**, **516-165/6** and **516-177** contain blocks in 25 mm (or 1") steps for aiding inspection of large micrometers in conjunction with one of the abovementioned sets.
Sets **516-580/1/2**, **516-390/1/2** are dedicated to the QuantuMike with its 2mm/rev spindle feed.

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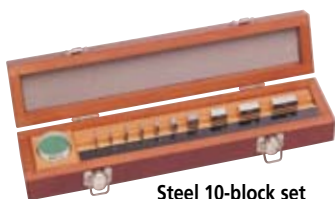
Steel

Steel 10-block set

Steel 10-block set

Steel 8-block set

Steel 10-block set

CERA

CERA 10-block set
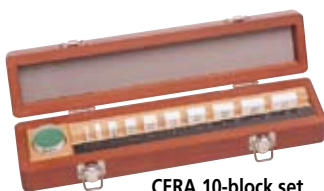
CERA 10-block set

CERA 8-block set

CERA 10-block set

Micro Checker

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

516-607
(The gauge blocks are optional.)

Gauge Block Sets for Micrometer Inspection

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

(516-132/3/4/5/6/7)

SPECIFICATIONS

Metric	Micro Checker (holder only)
Order No.	**516-607**
Applicable gauge block set	**516-106, 516-107, 516-108, 516-156, 516-157, 516-158**
Applicable gauge block size (mm)	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25

Inch	Micro Checker (holder only)
Order No.	**516-608**
Applicable gauge block set	**516-921, 516-922, 516-923, 516-321, 516-322, 516-323**
Applicable gauge block size (inch)	.105, .210, .315, .420, .5, .605, .710, .815, .920, 1

E

*Suffix Number (■) for Selecting Standard and Certificate Provided

ISO/DIN/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	Order No. Steel	Order No. CERA	ISO/DIN/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, 50mm, Cerastone, Optical parallels (t = 12mm, 25mm)
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, 25mm, Optical parallel (t = 12mm)
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, 25mm
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, 25mm
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, 25mm, Optical parallel (t = 12mm)
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, 25mm, Micro Checker, Optical parallel (t = 12mm)
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, 25mm, Micro Checker, Optical parallel (t = 12mm)
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, 200mm

Inch Block Sets

Blocks per set	Order No. Steel	Order No. CERA	ISO/DIN/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	.087, .189, .307, .409, .472, .598, .669, .772, .890, 1″
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	.105, .210, .315, .420, .500, .605, .710, .815, .920, 1″, Optical parallel (t = .5″)
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	.105, .210, .315, .420, .500, .605, .710, .815, .920, 1″, Micro checker, Optical parallel (t = .5″)
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	— — — — —	.0625, .100, .125, .200, .250, .300, .500, 1, 2″, Optical parallel (t = .5″)
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	— — — — —	.0625, .100, .125, .200, .250, .300, .500, 1, 2″, Micro Checker, Optical parallel (t = .5″)
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	— — — — —	.0625, .100, .125, .200, .250, .300, .500, 1, 2″
8	516-126 516-127	516-176 516-177	— —	0: -■6 1: -■6	— —	1, 2, 3, 4, 5, 6, 7, 8″

SERIES 516 – Caliper Inspection Gauge Block Sets

SPECIFICATIONS

Metric Block Sets

Blocks per set	Order No. Steel	Order No. CERA	ISO/DIN/JIS	ASME	BS	Blocks included in set
5	— —	— 516-174	— 2: -10	— —	— —	5 pcs.: 10.3, 24.5, 50, 75, 100mm, Ceramic plain jaws, Holder (250mm), Glove
4	516-526 516-527	516-566 516-567	1: -10 2: -10	— —	— —	4 pcs.: 10, 30, 50, 125mm, Setting ring (ø4mm, ø10mm), Pin gage (ø10mm), Glove
3	516-124 516-125	516-150 516-151	1: -10 2: -10	— —	— —	3 pcs.: 30, 41.3, 131.4mm, Setting ring (ø4mm, ø25mm), Glove
2	516-122 516-123	516-172 516-173	1: -10 2: -10	— —	— —	2 pcs.: 41.3, 131.4mm, Setting ring (ø20mm), Glove

E

Mitutoyo operates a policy of continuous improvement that aims to provide the customer with the benefit of the latest technological advances.
Therefore the company reserves the right to change any or all aspects of any product specification without notice.

E-12

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

Individual Metric Rectangular Gauge Blocks

- If using only one length repeatedly, it is a good idea to purchase individual gauge blocks.
- Nominal sizes which are not included in the chart below can be supplied custom-made on request.
- Each Grade K gauge block to ISO/DIN/JIS, BS or ASME standard is supplied with a Certificate of Calibration which certifies that the gauge block was calibrated by interferometry.

PROPRIETARY INSPECTION CERTIFICATE An inspection certificate is attached as standard. Refer to page IX for details.

*Suffix Number (-■■■) for Selecting Standard and Certificate Provided

ISO/DIN/JIS

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

ASME

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

BS

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

Inspection Certificate

SPECIFICATIONS

Metric Blocks

Length (mm)	Order No.* Steel	Order No.* CERA	Length (mm)	Order No.* Steel	Order No.* CERA	Length (mm)	Order No.* Steel	Order No.* CERA
0.1	611821	—	0.53	611894	—	0.96	611937	—
0.11	611860	—	0.54	611895	—	0.97	611938	—
0.12	611861	—	0.55	611896	—	0.98	611939	—
0.13	611862	—	0.56	611897	—	0.99	611940	—
0.14	611863	—	0.57	611898	—	0.991	611551	613551
0.15	611822	—	0.58	611899	—	0.992	611552	613552
0.16	611864	—	0.59	611900	—	0.993	611553	613553
0.17	611865	—	0.6	611901	—	0.994	611554	613554
0.18	611866	—	0.61	611902	—	0.995	611555	613555
0.19	611867	—	0.62	611903	—	0.996	611556	613556
0.2	611823	—	0.63	611904	—	0.997	611557	613557
0.21	611868	—	0.64	611905	—	0.998	611558	613558
0.22	611869	—	0.65	611906	—	0.999	611559	613559
0.23	611870	—	0.66	611907	—	1	611611	613611
0.24	611871	—	0.67	611908	—	1.0005	611520	613520
0.25	611824	—	0.68	611909	—	1.001	611521	613521
0.26	611872	—	0.69	611910	—	1.002	611522	613522
0.27	611873	—	0.7	611911	—	1.003	611523	613523
0.28	611874	—	0.71	611912	—	1.004	611524	613524
0.29	611875	—	0.72	611913	—	1.005	611525	613525
0.3	611825	—	0.73	611914	—	1.006	611526	613526
0.31	611876	—	0.74	611915	—	1.007	611527	613527
0.32	611877	—	0.75	611916	—	1.008	611528	613528
0.33	611878	—	0.76	611917	—	1.009	611529	613529
0.34	611879	—	0.77	611918	—	1.01	611561	613561
0.35	611826	—	0.78	611919	—	1.02	611562	613562
0.36	611880	—	0.79	611920	—	1.03	611563	613563
0.37	611881	—	0.8	611921	—	1.04	611564	613564
0.38	611882	—	0.81	611922	—	1.05	611565	613565
0.39	611883	—	0.82	611923	—	1.06	611566	613566
0.4	611827	—	0.83	611924	—	1.07	611567	613567
0.41	611884	—	0.84	611925	—	1.08	611568	613568
0.42	611885	—	0.85	611926	—	1.09	611569	613569
0.43	611886	—	0.86	611927	—	1.1	611570	613570
0.44	611887	—	0.87	611928	—	1.11	611571	613571
0.45	611828	—	0.88	611929	—	1.12	611572	613572
0.46	611888	—	0.89	611930	—	1.13	611573	613573
0.47	611889	—	0.9	611931	—	1.14	611574	613574
0.48	611890	—	0.91	611932	—	1.15	611575	613575
0.49	611891	—	0.92	611933	—	1.16	611576	613576
0.5	611506	613506	0.93	611934	—	1.17	611577	613577
0.51	611892	—	0.94	611935	—	1.18	611578	613578
0.52	611893	—	0.95	611936	—	1.19	611579	613579

Mitutoyo

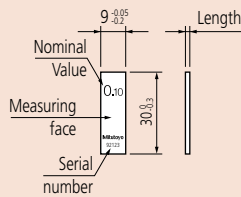## Dimensions

Unit: mm

Nominal length:
0.1mm - 5.5mm
(.004" - .25")

Nominal Value
Measuring face
Serial number
0.10
30 0/-0.3
9 -0.05/-0.2
Length

Nominal length:
6mm - 10mm
(.3" - .4")

9 -0.05/-0.2
Length
30 0/-0.3
6.5
Nominal Value
Measuring face
Serial number

Nominal length:
10.3mm - 100mm
(.45" - 4")

9 -0.05/-0.2
Length
35 0/-0.3
24.5
Nominal Value
Measuring face
Serial number

Nominal length 125mm - 1000mm (5" - 20")

Length
9 -0.05/-0.2
35 0/-0.3
x0.211
x0.211
Nominal Value
2-Ø10
125 mm
Measuring face
Airy line
Serial number
25±0.5
25±0.5

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

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

Individual Metric Rectangular Gauge Blocks

SPECIFICATIONS

Inch Block

Length (inch)	Order No.* Steel	Order No.* CERA
.004	611304	—
.005	611305	—
.006	611306	—
.007	611307	—
.008	611308	—
.009	611309	—
.01	611310	—
.011	611311	—
.012	611312	—
.013	611313	—
.014	611314	—
.015	611315	—
.016	611316	—
.017	611317	—
.018	611318	—
.019	611319	—
.02	611320	—
.02005	611240	—
.0201	611231	—
.0202	611232	—
.0203	611233	—
.0204	611234	—
.0205	611235	—
.0206	611236	—
.0207	611237	—
.0208	611238	—
.0209	611239	—
.021	611321	—
.022	611322	—
.023	611323	—

Length (inch)	Order No.* Steel	Order No.* CERA
.024	611324	—
.025	611325	—
.026	611326	—
.027	611327	—
.028	611328	—
.029	611329	—
.03	611330	—
.031	611331	—
.03125 (1/32)	611101	613103
.032	611332	—
.033	611333	—
.034	611334	—
.035	611335	—
.036	611336	—
.037	611337	—
.038	611338	—
.039	611339	—
.04	611340	—
.041	611341	—
.042	611342	—
.043	611343	—
.044	611344	—
.045	611345	—
.046	611346	—
.046875 (3/64)	611102	613104
.047	611347	—
.048	611348	—
.049	611349	—
.05	611105	613105
.06	611106	—

Length (inch)	Order No.* Steel	Order No.* CERA
.0625	611303	613303
.07	611107	—
.078125 (5/64)	611103	613100
.08	611108	—
.09	611109	—
.09375 (3/32)	611104	613101
.1	611191	613191
.100025	611111	613110
.10005	611135	613135
.100075	611112	613111
.1001	611121	613121
.1002	611122	613122
.1003	611123	613123
.1004	611124	613124
.1005	611125	613125
.1006	611126	613126
.1007	611127	613127
.1008	611128	613128
.1009	611129	613129
.101	611141	613141
.102	611142	613142
.103	611143	613143
.104	611144	613144
.105	611145	613145
.106	611146	613146
.107	611147	613147
.108	611148	613148
.109	611149	613149
.109375 (7/64)	611110	613102

*Suffix Number (-■■■) for Selecting Standard and Certificate Provided

ASME

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

BS

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

E

Mitutoyo

Dimensions

Unit: mm

Nominal length:
0.1mm - 5.5mm
(.004" - .25")

Nominal length:
6mm - 10mm
(.3" - .4")
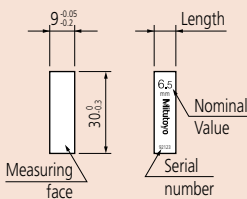
Nominal length:
10.3mm - 100mm
(.45" - 4")
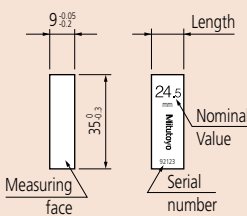
Nominal length 125mm - 1000mm (5" - 20")

SPECIFICATIONS

Inch Block

Length (inch)	Order No.* Steel	Order No.* CERA	Length (inch)	Order No.* Steel	Order No.* CERA	Length (inch)	Order No.* Steel	Order No.* CERA
.11	611150	613150	.139	611179	613179	.605	611211	613211
.111	611151	613151	.14	611180	613180	.65	611216	613216
.112	611152	613152	.141	611181	613181	.7	611197	613197
.113	611153	613153	.142	611182	613182	.710	611220	613220
.114	611154	613154	.143	611183	613183	.75	611217	613217
.115	611155	613155	.144	611184	613184	.8	611198	613198
.116	611156	613156	.145	611185	613185	.815	611226	613226
.117	611157	613157	.146	611186	613186	.85	611218	613218
.118	611158	613158	.147	611187	613187	.9	611199	613199
.119	611159	613159	.148	611188	613188	.920	611227	613227
.12	611160	613160	.149	611189	613189	.95	611219	613219
.121	611161	613161	.15	611115	613115	1	611201	613201
.122	611162	613162	.16	611116	613116	2	611202	613202
.123	611163	613163	.17	611117	613117	3	611203	613203
.124	611164	613164	.18	611118	613118	4	611204	613204
.125	611165	613165	.19	611119	613119	5	611205	613205
.126	611166	613166	.2	611192	613192	6	611206	613206
.127	611167	613167	.21	611221	613221	7	611207	613207
.128	611168	613168	.25	611212	613212	8	611208	613208
.129	611169	613169	.3	611193	613193	10	611222	613222
.13	611170	613170	.315	611209	613209	12	611223	613223
.131	611171	613171	.35	611213	613213	16	611224	613224
.132	611172	613172	.375 (3/8)	611113	613112	20	611225	613225
.133	611173	613173	.4	611194	613194			
.134	611174	613174	.420	611210	613210			
.135	611175	613175	.45	611214	613214			
.136	611176	613176	.5	611195	613195			
.137	611177	613177	.55	611215	613215			
.138	611178	613178	.6	611196	613196			

Inch Wear Blocks

Length (inch)	Order No.* Tungsten carbide
.05	612105
.1	612191

E

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

Rectangular Gauge Blocks Accessories
SERIES 516

- To expand the range of rectangular gauge block (steel and CERA) applications, Mitutoyo offers the gauge block accessories set. By assembling the items in the set, together with gauge blocks, you can easily and quickly build up a precision gage.

516-601
(22 pcs)

516-602
(14 pcs)

SPECIFICATIONS

Item Description	Item Order No.	Set		Qty
		22 pcs **516-601**	14 pcs **516-602**	
Holder	**619002**	—	◯	1 pc.
	619003	◯	◯	
	619004	◯	◯	
	619005	◯	◯	
Base	**619009**	◯	◯	
Half round jaw	**619010**	◯	◯	One pair (2pcs)
	619011	◯	◯	
	619012	◯	◯	
	619013	◯	—	
	619014	◯	—	
Plain jaw	**619018**	◯	—	
Scriber point	**619019**	◯	◯	1 pc.
Center point	**619020**	◯	◯	
Tram point	**619021**	◯	—	One pair (2pcs)
Triangular straight edge	**619022**	◯	◯	1 pc.
	619023	◯	—	

* Only 1 pc is supplied for each Order No. However, half round jaw, plain jaw, and tram point are supplied in a pair. (2 pcs).

Mitutoyo

Gaging a bore using a pair of half round jaws and a holder

Marking a workpiece using the base, a holder and the scriber point

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

Holder

Thickness = 15mm
Width = 29.5mm

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

Finished surfaces

619004 ℓ = 15 - 160mm
619005 ℓ = 20 - 250mm
Used to clamp a stack of gauge blocks and jaws (or scriber point, etc.) together to form a gage

Clamp

Finished surfaces   Adapter   Finished surfaces

Base   619009

Finished surface

35±0.0008

Holder mount

Flatness tolerance of the finished surface 0.5µm
Flatness tolerance of the bottom surface   1µm

Half round jaw

Type I

9

C
B
Measuring face
A   D
Finished surface

Flatness tolerance of the finished surface 0.5µm

Type II

9

C
B
Measuring face
A   D
Finished surface

Unit: mm

Order No.	Type	Size	A	B	C	D
619010*[1]	I	2	2±0.0005	5.5	40	7.5
619011*[1]		5	5±0.0005	14	45	7.5
619012*[1]		8	8±0.0005	20	50	8.5
619013*[1]	II	12	12±0.0005	25	75	13
619014*[1]		20	20±0.0005	25	125	20

Plain jaw (B type)   619018*[1]

20
9
25°
160
Measuring and finished surface

Flatness tolerance of the finished surface 1µm

Scriber point   619019

50
8.5
9
Finished surface

Flatness tolerance of the finished surface 0.5µm

Center point   619020

Finished surface   60°
8.5
9
50

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

Tram point   619021*[1]

Finished surface   30°
8.5
9
50

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

Triangular straight edge

16
19.5
60°
16 (**619022**)
19.5 (**619023**)

L
100mm (**619022**)
160mm (**N619023**)

Straightness tolerance of the edge 1.2µm

*[1] Qty: One pair (2 pcs)

E

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

Accessories for Rectangular Gauge Blocks over 100mm SERIES 516

- Specially designed for long gauge blocks over 125mm which have two coupling holes on the body: coupling of two long gauge blocks and attachment of jaws is possible.
- These accessories can also be used for CERA blocks.

516-605
(14 pcs)

SPECIFICATIONS

Set Order No.	Individual Item Order No.	Item 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.
	619013	Half round jaw	One pair (2pcs)
	619018	Plain jaw	
	619019	Scriber point	1 pc.

* Only 1 pc is supplied for each Order No. However, half round jaw, plain jaw, and tram point are supplied in a pair. (2 pcs.)
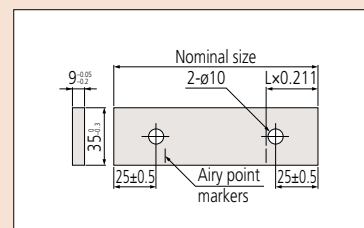
Coupling holes in long gauge blocks

Connector A   619031
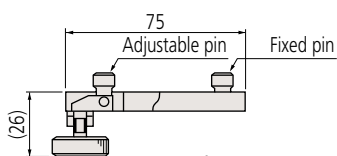
Used for directly coupling two long gauge blocks.

Connectors B and C
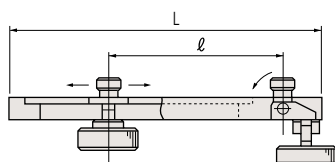
Adapter **619036**

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

Used for clamping jaws to the ends of one or more long gauge blocks in conjunction with adapters (619036). The length ℓ is highly adjustable to accommodate the variable length of a stack of regular gauge blocks that would be wrung to one of the long gauge blocks to achieve the required gaging size.

Use of B-type connectors in gage construction

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

Connector D   619034

40
65.5
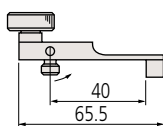
Used for attaching a long gauge block directly to the base.

Connector E   619035

ℓ
210
ℓ = 70 - 175mm
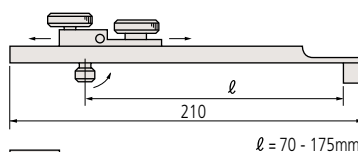
Used for attaching a long gauge block to the base over a stack of regular gauge blocks wrung between the base and long gauge block. The length ℓ is highly adjustable to accommodate the variable length of the stack.
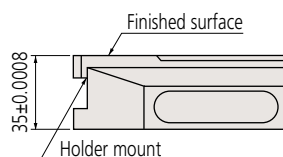
Adapter **619036** (1pc.)

Base   619009

Finished surface
35 ± 0.0008
Holder mount

Flatness tolerance of the finished surface   0.5μm
Flatness tolerance of the bottom surface   1μm

Plain jaw   619018*2

25°
20
9
160
Measuring and finished surface
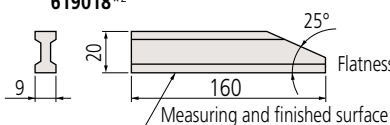
Flatness tolerance of the finished surface 1μm

Half round jaw   619013*2

25
9
Measuring face
12 ± 0.0005mm
13
Finished surface
75
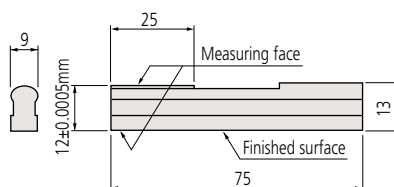
Flatness tolerance of the finished surface   0.5μm

Scriber point   619019

50
8.5
9
Finished surface
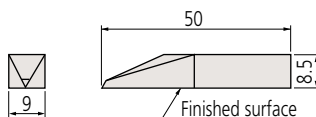
Flatness tolerance of the finished surface 0.5μm

Assortment of accessories for gauge blocks

For inside and outside measurement inspection of 300 to 1000 mm (every 100mm) gauge blocks, select the appropriate combination of a rectangular gauge block and an accessory.

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

*1 Provided with adapters (2 pcs)
*2 2 pcs/set

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

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

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

• Square gauge block sets have several unique characteristics (refer to page E-4 for details.). A wide choice is provided to best match the target applications: sets containing from 2 to 112 blocks are available.

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 2-block set

Long block set

Steel 8-block set

The wear to a frequently used square gauge block set can be drastically reduced by using tungsten-carbide wear blocks on the ends of a stack. There are two available, of nominal dimension 1mm and 2mm. These blocks are much more wear-resistant than steel blocks, and they also absorb most of the wear that would otherwise occur to the blocks in the set due to contact, and therefore maximize the set's longevity. Wear blocks are relatively inexpensive so can be readily discarded when no longer serviceable. To achieve maximum protection, the same face of each wear block should always be wrung to a set block, so the opposite, wearing, face never touches a set block.

*Suffix Number (■) for Selecting Standard and Certificate Provided

ISO/DIN/JIS

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	O	—
6	O	O

ASME

Suffix No.	Inspection Certificate	Calibration Certificate JCSS
1	O	—

Inspection Certificate

SPECIFICATIONS

Metric Block Sets

Blocks per set	Order No. Steel	Order No. CERA	Standard / grade available ISO/DIN/JIS	Standard / grade available ASME	Blocks included in set Size	Blocks included in set Step	Blocks included in set 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	Order No. Steel	Order No. CERA	Standard / grade available ISO/DIN/JIS	Standard / grade available ASME	Blocks included in set Size	Blocks included in set Step	Blocks included in set 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	Order No. Steel	Order No. CERA	Standard / grade available ISO/DIN/JIS	Standard / grade available ASME	Blocks included in set Size	Blocks included in set Step	Blocks included in set 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	Order No. Steel	Order No. CERA	Standard / grade available ISO/DIN/JIS	Standard / grade available ASME	Blocks included in set Size	Blocks included in set Step	Blocks included in set Qty.
81	516-401	516-201	—	00:-■6	.1001 - .1009	.0001	9
	516-402	516-202	—	0: -■6	.101 - .149	.001	49
	516-403	516-203	—	1: -■6	.05 - .95	.05	19
	516-404	516-204	—	2: -■6	1 - 4	1	4
36	516-421	516-221	—	00:-■6	.05"		1
	516-422	516-222	—	0: -■6	.1001 - .1009	.0001	9
	516-423	516-223	—	1: -■6	.101 - .109	.001	9
	516-424	516-224	—	2: -■6	.11 - .19	.01	9
	—	—	—	—	.1 - .5	.1	5
	—	—	—	—	1, 2, 4	1	3
28	516-417	—	—	00:-■6	.02005		1
	516-418	—	—	0: -■6	.0201-.0209	.0001	9
	516-419	—	—	1: -■6	.021-.029	.001	9
	516-420	—	—	2: -■6	.010-.090	.01	9
	—			—			

Inch Long Block Sets

Blocks per set	Order No. Steel	Order No. CERA	Standard / grade available ISO/DIN/JIS	Standard / grade available ASME	Blocks included in set Size	Blocks included in set Step	Blocks included in set 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	Order No. Carbide	Order No. CERA	Standard / grade available ISO/DIN/JIS	Standard / grade available ASME	Blocks included in set Size	Blocks included in set Step	Blocks included in set Qty.
2	516-824	516-846	—	0: -■0	.05	—	2
	516-825	516-847	—	1: -■0			
2	516-826	516-844	—	0: -■0	.1	—	2
	516-827	516-845	—	1: -■0			

E

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

- Purchase of individual metric square gauge blocks is economic if only specific sizes are heavily used.
- Please add the suffix number representing the national standard and grade required at the end of the Order No. when ordering these items.
- Special sizes that are not included in the charts can be supplied custom-made on request.

*Suffix Number (-■■■) for Selecting Standard and Certificate Provided

ISO/DIN/JIS

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

ASME

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

Inspection Certificate

SPECIFICATIONS

Metric Blocks

Length (mm)	Order No.* Steel	Order No.* CERA	Length (mm)	Order No.* Steel	Order No.* CERA	Length (mm)	Order No.* Steel	Order No.* CERA
0.5	614506	—	1.33	614593	—	13	614623	—
1	614611	—	1.34	614594	—	13.5	614653	—
1.0005	614520	—	1.35	614595	—	14	614624	—
1.001	614521	—	1.36	614596	—	14.5	614654	—
1.002	614522	—	1.37	614597	—	15	614625	—
1.003	614523	—	1.38	614598	—	15.5	614655	—
1.004	614524	—	1.39	614599	—	16	614626	—
1.005	614525	—	1.4	614600	—	16.5	614656	—
1.006	614526	—	1.41	614601	—	17	614627	—
1.007	614527	—	1.42	614602	—	17.5	614657	—
1.008	614528	—	1.43	614603	—	18	614628	—
1.009	614529	—	1.44	614604	—	18.5	614658	—
1.01	614561	—	1.45	614605	—	19	614629	—
1.02	614562	—	1.46	614606	—	19.5	614659	—
1.03	614563	—	1.47	614607	—	20	614672	—
1.04	614564	—	1.48	614608	—	20.5	614660	—
1.05	614565	—	1.49	614609	—	21	614631	—
1.06	614566	—	1.5	614641	—	21.5	614661	—
1.07	614567	—	1.6	614516	—	22	614632	—
1.08	614568	—	1.7	614517	—	22.5	614662	—
1.09	614569	—	1.8	614518	—	23	614633	—
1.1	614570	—	1.9	614519	—	23.5	614663	—
1.11	614571	—	2	614612	—	24	614634	—
1.12	614572	—	2.5	614642	—	24.5	614664	—
1.13	614573	—	3	614613	—	25	614635	—
1.14	614574	—	3.5	614643	—	30	614673	—
1.15	614575	—	4	614614	—	40	614674	—
1.16	614576	—	4.5	614644	—	50	614675	—
1.17	614577	—	5	614615	—	60	614676	—
1.18	614578	—	5.5	614645	—	75	614801	—
1.19	614579	—	6	614616	—	100	614681	—
1.2	614580	—	6.5	614646	—	125	614802	—
1.21	614581	—	7	614617	—	150	614803	—
1.22	614582	—	7.5	614647	—	175	614804	—
1.23	614583	—	8	614618	—	200	614682	—
1.24	614584	—	8.5	614648	—	250	614805	—
1.25	614585	—	9	614619	—	300	614683	—
1.26	614586	—	9.5	614649	—	400	614684	—
1.27	614587	—	10	614671	—	500	614685	—
1.28	614588	—	10.5	614650	—			
1.29	614589	—	11	614621	—			
1.3	614590	—	11.5	614651	—			
1.31	614591	—	12	614622	—			
1.32	614592	—	12.5	614652	—			

Metric Wear Blocks

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

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

*Suffix Number (-■■■) for Selecting Grade and Certificate Provided

ASME

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

Inspection Certificate

Dimensions

Nominal length: 0.5mm - 4.5mm
(.010" - .19")   Unit: mm

Length

24.1±0.1
6.7±0.1 On both sides

Nominal Value
0.010
Measuring face
Serial number
24.1±0.1
Mitutoyo
92123
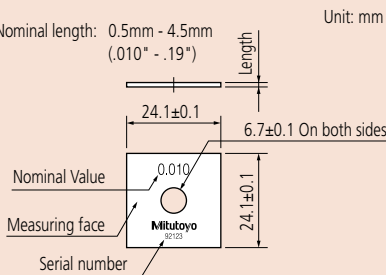
Nominal length: 5mm - 14.5mm
(.02" - .450")

Length
77±2°
ø9.3

Nominal Value
.200 Mitutoyo 92123
Serial number

24.1±0.1
6.7±0.1
24.1±0.1
Measuring face
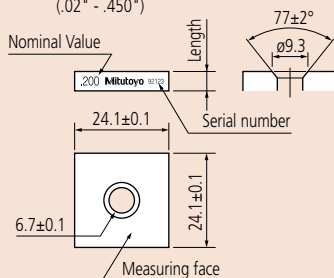
Nominal length: 15mm - 500mm
(.500" - 20")

Nominal Value
77±2°
ø9.3
1
IN
Length
Serial number
Mitutoyo 92123

24.1±0.1
6.7±0.1
24.1±0.1
Measuring face
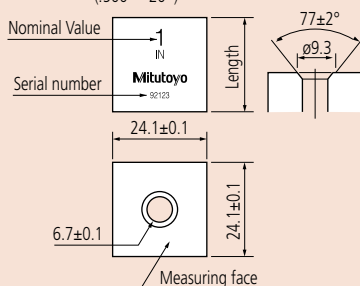
SPECIFICATIONS

Inch Blocks

Length (inch)	Order No.* Steel	Order No.* CERA
.01	614310	—
.02005	614240	—
.0201	614231	—
.0202	614232	—
.0203	614233	—
.0204	614234	—
.0205	614235	—
.0206	614236	—
.0207	614237	—
.0208	614238	—
.0209	614239	—
.02	614320	—
.021	614321	—
.022	614322	—
.023	614323	—
.024	614324	—
.025	614325	—
.026	614326	—
.027	614327	—
.028	614328	—
.029	614329	—
.03	614330	—
.03125 (1/32)	614301	—
.04	614340	—
.046875 (3/64)	614302	—
.05	614105	616105
.06	614106	—
.0625	614303	616303
.07	614107	—
.078125 (5/64)	614304	—
.08	614108	—
.09	614109	—
.09375 (3/32)	614305	—
.1	614191	616191
.100025	614307	—
.10005	614135	616135
.100075	614308	—
.1001	614121	616121
.1002	614122	616122
.1003	614123	616123
.1004	614124	616124
.1005	614125	616125
.1006	614126	616126
.1007	614127	616127
.1008	614128	616128
.1009	614129	616129
.101	614141	616141
.102	614142	616142
.103	614143	616143
.104	614144	616144
.105	614145	616145

Length (inch)	Order No.* Steel	Order No.* CERA
.106	614146	616146
.107	614147	616147
.108	614148	616148
.109	614149	616149
.109375 (7/64)	614306	—
.11	614150	616150
.111	614151	616151
.112	614152	616152
.113	614153	616153
.114	614154	616154
.115	614155	616155
.116	614156	616156
.117	614157	616157
.118	614158	616158
.119	614159	616159
.12	614160	616160
.121	614161	616161
.122	614162	616162
.123	614163	616163
.124	614164	616164
.125	614165	616165
.126	614166	616166
.127	614167	616167
.128	614168	616168
.129	614169	616169
.13	614170	616170
.131	614171	616171
.132	614172	616172
.133	614173	616173
.134	614174	616174
.135	614175	616175
.136	614176	616176
.137	614177	616177
.138	614178	616178
.139	614179	616179
.14	614180	616180
.141	614181	616181
.142	614182	616182
.143	614183	616183
.144	614184	616184
.145	614185	616185
.146	614186	616186
.147	614187	616187
.148	614188	616188
.149	614189	616189
.15	614115	616115
.16	614116	616116
.17	614117	616117
.18	614118	616118
.19	614119	616119
.2	614192	616192

Length (inch)	Order No.* Steel	Order No.* CERA
.25	614212	616212
.3	614193	616193
.35	614213	616213
.375 (3/8)	614309	—
.4	614194	616194
.45	614214	616214
.5	614195	616195
.55	614215	616215
.6	614196	616196
.65	614216	616216
.7	614197	616197
.75	614217	616217
.8	614198	616198
.85	614218	616218
.9	614199	616199
.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 (inch)	Order No.* Tungsten carbide
.05	615105
.1	615191

E

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

Square Gauge Block Accessories Set

• To expand the application of square gauge blocks, Mitutoyo offers the Gauge Block Accessories Set. Square gauge blocks have a much broader range of application than rectangular gauge blocks due to the central clamping hole. Also, the accessories included in the set are sold individually depending on the application.

516-611
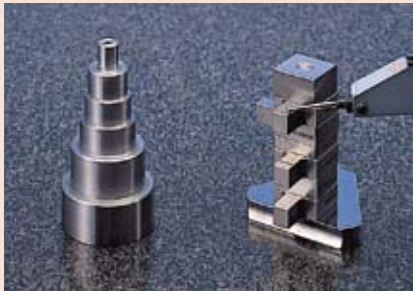
SPECIFICATIONS

Metric

Order No. 516-611	Included in set	Quantity Supplied
619070	Half round jaw	2 pcs.
619071	Half round jaw	
619072	Plain jaw	
619073	Center point	1 pc.
619054	Scriber point	
619074	Base	
619057	Flat head screw	2 pcs.
619058	Flat head screw	
619059	Slotted head nut	
619060	Adjustable tie rod	
619061	Adjustable tie rod	
619062	Tie rod	1 pc.
619063	Tie rod	
619064	Tie rod	
619065	Tie rod	
619056	Stud	2 pcs.
619066	Knurled head screw	

Inch

Order No. 516-612	Included in set	Quantity Supplied
619050	Half round jaw	2 pcs.
619051	Half round jaw	
619052	Plain jaw	
619053	Center point	1 pc.
619054	Scriber point	
619055	Base	
619057	Flat head screw	2 pcs.
619058	Flat head screw	
619059	Slotted head nut	
619060	Adjustable tie rod	
619061	Adjustable tie rod	
619062	Tie rod	1 pc.
619063	Tie rod	
619064	Tie rod	
619065	Tie rod	
619056	Stud	2 pcs.
619066	Knurled head screw	

* 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 Order No. indicates only 1 set.

E

Half round jaw
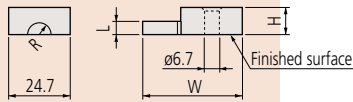
Order No.	R	L	W	H
619070	1.95mm	2mm	33.6mm	5.3mm
619071	4.95mm	5mm	39.9mm	10.3mm

• Flatness tolerance 0.5µm
• Parallelism tolerance of L 0.5µm
• Tolerance of L ±0.5µm

Plain jaw 619072
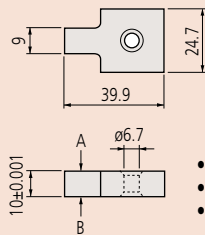
• Flatness tolerance 0.12µm
• Parallelism tolerance 0.12µm
• A and B are finished surfaces

Center point 619073
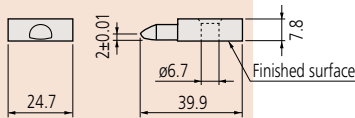
• Flatness tolerance 0.5µm

Adjustable tie rod
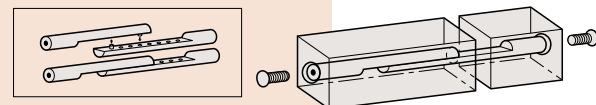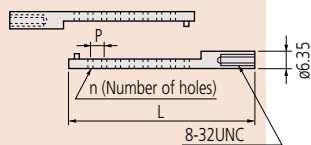
Order No.	L	P	n
619060	124.5mm	6.35mm	14
619061	86.5mm	6.35mm	8

Scriber point 619054
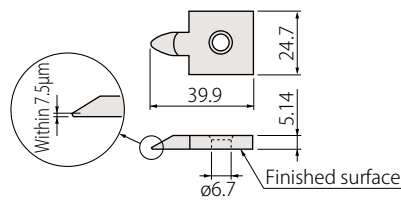
Base 619074
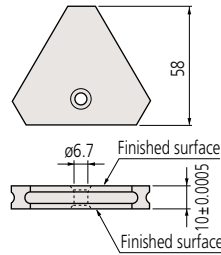
• Parallelism tolerance 1.5µm
• Flatness tolerance 1.5µm (The surface within 1.5mm of edge is excluded)

Flat head screw
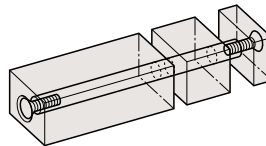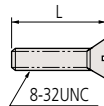
Order No.	L
619057	31.6mm
619058	15.8mm

Tie rod

Order No.	L
619065	19mm
619064	38mm
619063	57mm
619062	76mm

Stud 619056
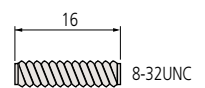
Slotted head nut 619059
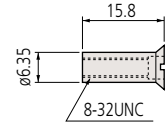
Knurled head screw 619066
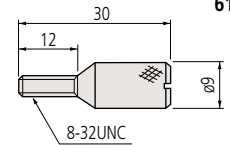
•Contraction caused by the clamping force
The minimum recommended torque to be applied to the clamping screws is approximately 600mN/m. The chart below shows the approximate length contraction of a 100mm gauge stack using typical torque values.

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

Accessories used for combining square gauge blocks

Order No.	Included in set	21/30	36/43	34/43	41/50	45/60	58/72	64/79	72/88	77/91	82/97	91/107	95/109	109/125	117/135	130/150	148/169	121/180	167/184	143/210	160/255	205/270	180/285	223/288	240/345	258/363	295/445	375/520
619059	Slotted head nut	1	1		1																							
619058	Flat head screw	1		2	1	2	1	2		1	2		1		1		2					2						
619057			1				1		2	1		2	1	2	1	2	2		2	2		2	2	2	2	2	2	2
619056	Stud				1								1	1	1		1		1			1		1	1	1	1	2
619065	Tie rod			1	1									1	1													
619064						1	1		1							1												
619063								1		1		1								1								
619062										1		1	1	1	1	1	1			1								
619061	Adjustable tie rod																				2		2		2		2	2
619060																						2		2		2	2	2

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Gauge Blocks

Length Standards Brought to You by Mitutoyo

Step Master
SERIES 516

- Step Master is a gauge providing 4 small increments in height (steps) constructed from an assembly of 5 highly accurate steel or ceramic blocks.
- Each step is defined as the difference in height between the center of adjacent blocks, measured to a resolution of 0.01µm by using an interferometer with an accuracy tolerance of ±0.20µm.
- Steel and ceramic types are available to suit the application.
- Height differences are measured between the centers of adjacent steps.

Ceramic type
516-498
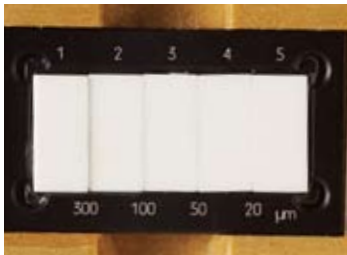
Ceramic type
516-499

SPECIFICATIONS

Steel type

Order 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

Ord er 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	

◯◯◯ - ◯◯◯ -**64**: Provided with Calibration Certificate
◯◯◯ - ◯◯◯ -**84**: Provided with Calibration Certificate and Traceability System Chart

DIMENSIONS

Unit: mm
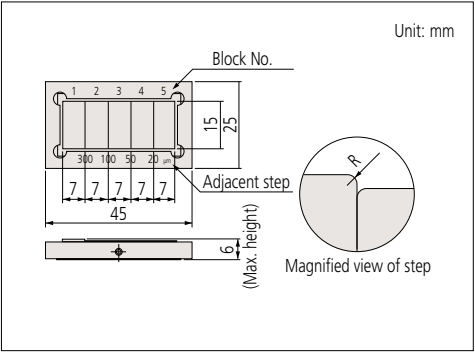
Custom-made Blocks & Gages

- Mitutoyo can manufacture Gauge Blocks and reference gages to your size and design.
- Nominal size range
  · 0.1mm to 1000mm (steel)
  · 0.5mm to 500mm (ceramic)
- Nominal size increment
  · 0.0005mm (up to 100mm)
  · 0.001mm (over 100mm)
- Cross section (same as the standard product)
  · Nominal length of 10mm or less: 30 x 9mm
  · Nominal length of more than 10mm: 35 x 9mm
  · Square types are also available.

- Special ultra-low expansion ceramic types are also available.
- Gauge Blocks and reference gages to your specifications (section dimensions) are available, including precision spacers which normally absorb much time and effort to manufacture in-house.
- Special processing including boring, step gaging and special marking are available. Consult us for details.

Typical examples of custom-made gauge blocks and reference gages.
Please enquire for price and delivery times for your particular requirements.
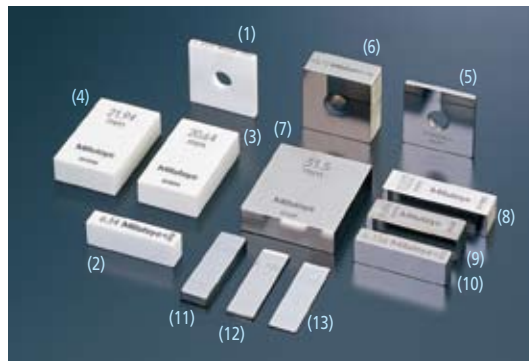
Ceramic
(1) Square gauge block (2.1005mm)
(2) Rectangular gauge block (6.34mm)
(3) Rectangular gauge block (20.64mm)
(4) Rectangular gauge block (21.94mm)

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

Ceramic reference plate
(50 x 50 x 10mm)
(flatness 0.3μm)

Cylinder reference block for depth micrometer
(ø60 x 150mm)

Ceramic stepped block
(30 x 18 x 5mm, step: 0.15mm)

Steel long rectangular block
(15 x 10 x 200mm)

Ceramic square block
(24.1 x 24.1 x 12.3mm)
(No-hole version of square gauge block)

Steel cylindrical block
(ø13.08 x 12mm)

Steel square block
(9 x 9 x 6mm)

Steel thin rectangular block (30 x 6 x 2.1mm)

Steel thin rectangular block (30 x 6 x 1.9mm)

E

Mitutoyo

Gauge Blocks

Length Standards Brought to You by Mitutoyo

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, etc.

516-650

*Order No. 516-650E; 516-650
Tools and accessories included:

1. Anti-corrosion oil (**600001**)
   (100ml, spray can)
   Used for both steel and tungsten-carbide gauge blocks.

2. Ceraston (**601645**)
   (both sides finished by lapping)

3. Optical flat (**158-117**)
   (ø45, 12mm thickness, JIS Grade 3)
   Used to check the wringing of thin gauge blocks and for the presence of burrs.

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

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

6. Cleaning paper (**600006**)
   (lens paper, 82 x 304mm, 500 pcs)
   Used for wiping off rust preventive oil and contamination. Lint free.

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

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

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

* **516-650E**: Excluding anti-corrosive oil (**600001**)
516-650: including anti-corrosive oil (**600001**) is for domestic sales only.
In the case of an order from overseas, place an order for
516-650E : excluding anti-corrosive oil, and order anti-corrosive oil (**600001**) separateiy.

Recommendation for regular calibration

Gauge blocks are often used to define a company's standard of length for manufacturing and as such must be reliable. This means that they need regular calibration to verify accuracy. (The problem of damage or corrosion should be addressed during use and blocks seriously affected must be discarded immediately.) The frequency of calibration depends on the tolerance requirements of the work, the amount of use and conditions under which the gage blocks are used. The most economical cycle for any particular set of gauge blocks is best determined by studying the calibration history. The list below indicates timings for a typical initial calibration cycle for the various grades of block.

Application	Cycle	Grade (reference)
Reference	1 - 2	K
Standard	2	K or 0
Inspection	2	0 or 1
Shop floor	0.5 - 1	1 or 2

As an accredited calibration laboratory, Mitutoyo offers a traceable calibration service for customers' gauge blocks. Our regular calibration service features:
- Gauge blocks manufactured by any maker can be calibrated.
- Cleansing 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.

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Application example

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.
- Can be used both for steel gauge blocks and CERA blocks.

- Excellent in the ease of removing burrs and durability compared with Arkansas stones.
- Both sides can be used.

601644
150 (W) ×50 (D) ×20 (H) mm

601645
100 (W) ×25 (D) ×12 (H) mm

Removing burrs

Figure 1

CERASTON (Or Arkansas stone*¹)

Figure 2

Rubber

CERASTON (Or Arkansas stone*¹)
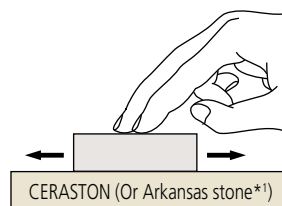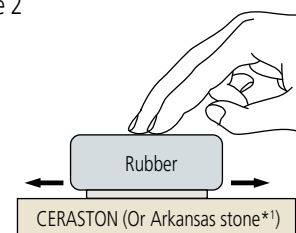
(1) Wipe any dust and oil films from the gauge block and the Ceraston (or Arkansas stone) using a solvent.
(2) Place the gauge block on the Ceraston so that the measuring face that has burrs is on the abrasive surface of the stone. While applying light pressure, move the gauge block to and fro about ten times (Fig. 1). Use a block rubber 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.

Note: The abrasive surface of a Ceraston must be made flat by lapping it from time to time. After lapping the Ceraston, the lapping powder must be completely removed from the surface to prevent the surface of the gauge block from being scratched.
*1 Mitutoyo does not offer Arkansas stones.

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Gauge Blocks
Length Standards Brought to You by Mitutoyo

Automatic Gauge Block Interferometer GBI
(Interference fringe analyzing processing)
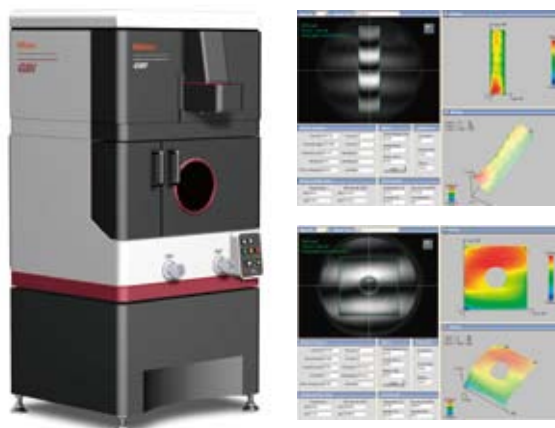
- Automatic primary-level measuring instrument for gauge block lengths between 0.1mm and 250mm using optical interference. GBI is a Twyman-Green interferometer which employs the method of multiple wavelength coincidence to calibrate lengths more accurately.
- The GBI automatically detects the distribution of interference fringes with a CCD camera and processes the data. Measurement of parallelism and flatness is provided as well as lengths based on the phase shift method and the interference fringe analysis software.
- The intensity and wavelength of the He-Ne laser light sources are highly stable. This allows highly accurate and repeatable measurement.
- Both the refractive index of air and the thermal expansion of gauge blocks are automatically compensated for by computer which is linked to a thermometer, hygrometer and barometer.

SPECIFICATIONS

Metric

Range	Measuring Uncertainty (Coverage range factor k = 2)	Number of gauge blocks that can be mounted on the measuring table	Light sources	Operating conditions
0.1mm - 250mm	$0.025\mu m + 0.2 \times 10^{-6} L$ L = Gauge block length (mm)	12	632.8nm frequency-stabilized He-Ne laser 543.5nm frequency-stabilized He-Ne laser	20±0.5°C Under mild temperature change without direct exposure to cold or warm air

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

- GBCD-100A measures the length of rectangular gauge blocks in the size range 0.5mm to 100mm. It automatically compares a test block with an appropriate reference gauge block.
- The compensation result is not affected by the warp of thinner gauge blocks due to the use of upper and lower gaging heads (dual-head system).
- Measurement configuration: 1 cycle of automatic comparison measurement with a standard gauge block.

- Compensation master for gauge block comparator

Special bridge-type block

516-145-E2

SPECIFICATIONS

Metric

Range	Resolution	Accuracy in narrow range (20°C)	Upper gage head		
			Type	Measuring force	Contact point
0.5mm - 100mm	0.00001mm (0.01µm)	$\pm(0.03+0.3L/1000)\mu m^*$ L = Gauge block length (mm)	Mu-Checker	1N (100gf)	Carbide contact point of radius of 20mm

Lower gaging head			Operating conditions
Type	Measuring force	Contact point	
Mu-Checker	0.6N (60gf)	Carbide contact point of radius 5mm	Temperature: 20°C ±1°C Humidity: 58%RH ±15%RH

* Uncertainty of measurement at the 95% confidence level (not including the calibration error of the reference gauge block).
Note: To denote your AC power cable add the following suffixes to the order No.: **A** for UL/CSA, **D** for CEE, **DC** for CCC, **E** for BS, **K** for KC, **No suffix** is required for JIS/100V

E

- Measuring capability: Rectangular Gauge Blocks; Square Gauge Blocks (requires dedicated holder - optional accessory)
- Measuring method: Differential measurement between upper and lower gaging heads (dual head system)

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

SPECIFICATIONS

Metric

Range	Resolution	Accuracy (Confidence level 95%) Comparison measurement of the same nominal length	Accuracy (Confidence level 95%) Dimensional deviations between standard gauge block and measurement gauge block: ±3mm
0.1mm - 250mm	0.00001mm (0.01μm)	±(0.03+0.3L/1000)μm* L = Gauge block length (mm)	±(0.03+0.3L/1000)μm* L = Gauge block length (mm)

Upper gage head			Lower gaging head			Operating conditions
Type	Measuring force	Contact point	Type	Measuring force	Contact point	
Laser Hologage	0.7N	Carbide contact point of radius 20mm	Laser Hologage	0.2N	Carbide contact point of radius 5mm	Temperature: 20°C ±1°C Humidity: 58%RH ±15%RH

* Uncertainty of measurement at the 95% confidence level (not including the calibration error of the reference gauge block).
Note: To denote your AC power cable add the following suffixes to the order No.: **A** for UL/CSA, **D** for CEE, **DC** for CCC, **E** for BS, **K** for KC, **No suffix** is required for JIS/100V

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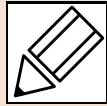
■ Definition of the Meter

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.

■ Selection, Preparation and Assembly of a Gauge Block Stack

Select gauge blocks to be combined to make up the size required for the stack.
(1) Take the following things into account when selecting gauge blocks.
    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.
(2) Clean the gauge blocks with an appropriate cleaning agent.
(3) Check the measuring faces for burrs by using an optical flat as follows:
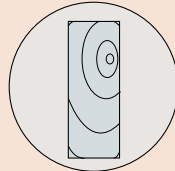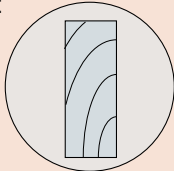
    a. Wipe each measuring face clean.
    b. Gently place the optical flat on the gauge block measuring face.
    c. Lightly slide the optical flat until interference fringes appear.
      Judgment 1: If no interference fringes appear, it is assumed that there is a large burr or contaminant on the measuring 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, if any, from the measuring face using a flat, fine-grained abrasive stone.
(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 removed.) Grease, spindle oil, vaseline, etc., are commonly used.

(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:

a. Wringing thick gauge blocks
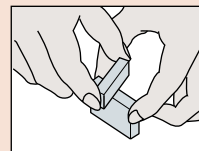
Cross the gauge blocks at 90° in the middle of the measuring faces.
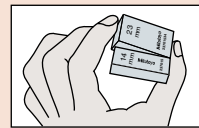
Rotate the gauge blocks while applying slight force to them. You will get a sense of wringing by sliding the blocks.
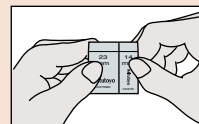
Align the measuring faces with each other.

b. Wringing a thick gauge block to a thin gauge block
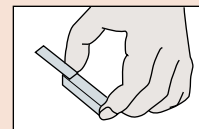
Overlap one side of a thin gauge block on one side of a thick gauge block.
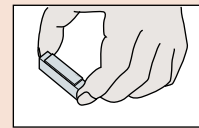
Slide the thin gauge block while pressing the entire overlapped area to align the measuring faces with each other.

c. Wringing thin gauge blocks
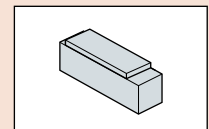
To prevent thin gauge blocks from bending, first wring a thin gauge block onto a thick gauge block.
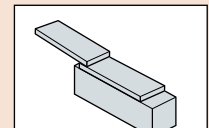
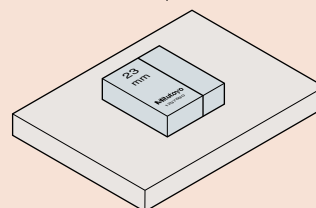Then, wring the other thin gauge block onto the first thin gauge block.
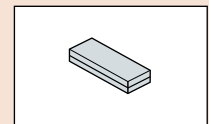
Finally, remove the thick gauge block from the stack.

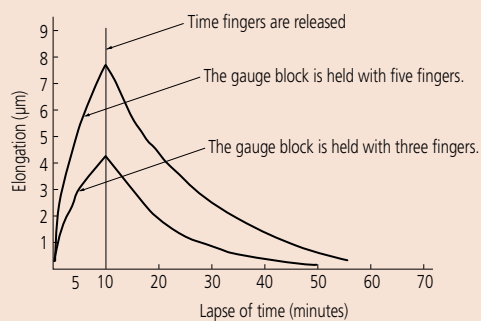Apply an optical flat to the surface of one thin gauge block to check the wringing state.

○
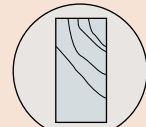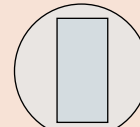
✗ Irregular interference fringes

Wipe the exposed measuring face(s) and continue building up the stack, in the same manner as above, until complete.

■ Thermal Stabilization Time

The following figure shows the degree of dimensional change when handling a 100mm steel gauge block with bare hands.


Time fingers are released

The gauge block is held with five fingers.

The gauge block is held with three fingers.

Elongation (μm)

Lapse of time (minutes)

Mitutoyo

Reference Gages

Length Standards Brought to You by Mitutoyo

Height Master
SERIES 515

- Height Master is a bestselling product whose name is the generic term for height reference instruments.
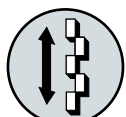
Staggered 20mm blocks (movable)
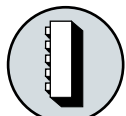
Vertical orientation
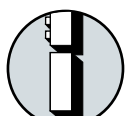
Riser block

515-322

Digital Height Master
SERIES 515
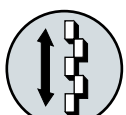
Staggered 20mm blocks (movable)
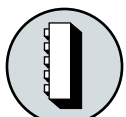
Vertical orientation

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.)

Reading

(A) Height A

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

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)

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

Inch

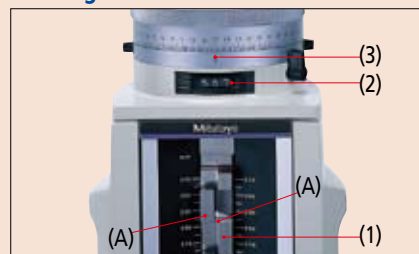| Order No.		515-375	515-377	515-379
Range (H)		.5″ < H ≤ 12″	.5″ < H ≤ 18″	.5″ < H ≤ 24″
Graduation		.00001″		
Block step		1″ (staggered)		
Micrometer adjustment		1″		
Micrometer feed		.025″/rev		
Block pitch accuracy	0<H≤12″	±100µin		
	12″ < H ≤ 18″	—	±100µin	
	18″ < H ≤ 24″	—	—	±150µin
Parallelism 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.

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

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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**)

E

Mitutoyo

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**.

PROPRIETARY INSPECTION CERTIFICATE — Mitutoyo guarantees the product quality

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

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.
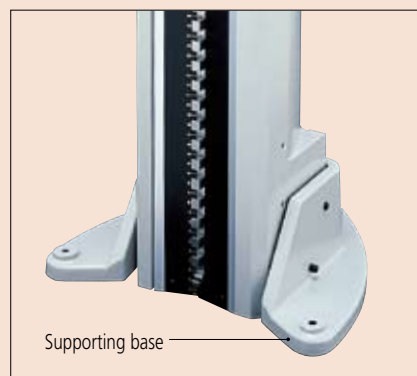2) Supplied with a wooden storage case as standard.

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.
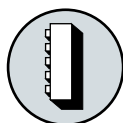2) Supplied with a wooden storage case as standard.

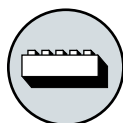Using in horizontal orientation

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
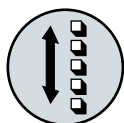
Single-row 10mm blocks (movable)
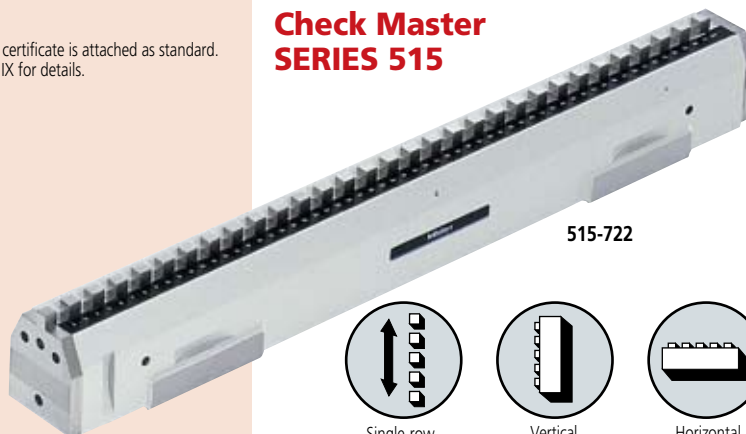
Vertical orientation

Horizontal orientation

Riser block

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Mitutoyo operates a policy of continuous improvement that aims to provide the customer with the benefit of the latest technological advances. Therefore the company reserves the right to change any or all aspects of any product specification without notice.

An inspection certificate is attached as standard. Refer to page IX for details.
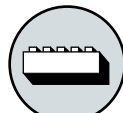
Check Master SERIES 515

515-722

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

Single-row 10mm (.5") blocks

Vertical orientation

Horizontal orientation

515-724   **515-723**   **515-722**

SPECIFICATIONS

Metric

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	12µm				
	310 < H ≤ 610 mm	—	15µm			
	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

Order No.		515-710	515-711	515-712	515-713
Range (H)		12"	18"	24"	40"
Block step		.5"			
Block pitch accuracy	H ≤ 12"	±100µin			
	12" < H ≤ 24"	—	±150µin		
	24" < H ≤ 40"	—	—	±200µin	
Parallelism of blocks	H ≤ 12"	50µin			
	12" < H ≤ 24"	—	60µin		
	24" < H ≤ 140"	—	—	80µin	
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.
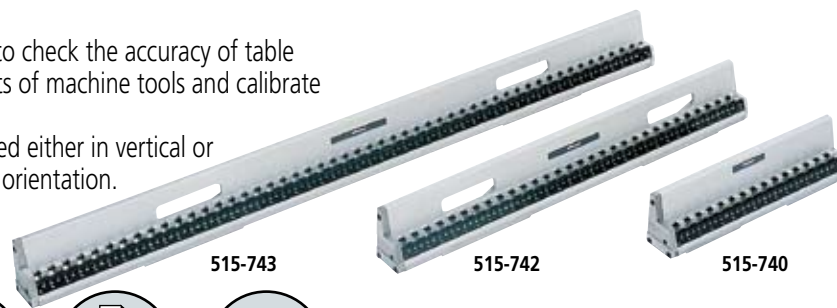2) Supplied with a wooden storage case as standard.

An inspection certificate is attached as standard. Refer to page IX for details.
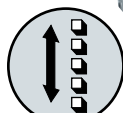
High Accuracy Check Master SERIES 515

- Designed to check the accuracy of table movements of machine tools and calibrate CMMs.
- Can be used either in vertical or horizontal orientation.
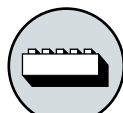
515-743   **515-742**   **515-740**

Single-row 10mm (5") blocks

Vertical orientation

Horizontal orientation

Using in horizontal orientation

Optional Accessories
Supporting base
601167: Supporting base for vertical operation

Supporting base

SPECIFICATIONS

Metric

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	—	±1.8µm			
	610 < H ≤ 1010 mm	—	—	—	±2.5µm	
	1010 < H ≤ 1510 mm	—	—	—	—	±4.0µm
Parallelism of blocks	H ≤ 450 mm	1.0µm				
	450 < H ≤ 1010 mm	—	—	—	1.5µm	
	1010 < H ≤ 1510 mm	—	—	—	—	2.0µm
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

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"	±50µin				
	12" < H ≤ 24"	±70µin				
	24" < H ≤ 40"	±100µin				
	40" < H ≤ 60"	±158µin				
Parallelism of blocks	H ≤ 18"	40µin				
	18" < H ≤ 40"	60µin				
	40" < H ≤ 60"	80µin				
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.

E

Mitutoyo

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.

PROPRIETARY INSPECTION CERTIFICATE

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

Technical Data

Accuracy (at 20°C): $(0.5+L/1000)\mu m$, L = Measured length (mm)
Material: Low expansion glass
Thermal expansion coefficient: $(0.00\pm0.02)\times10^{-6}$/K
Graduation: 1mm
Graduation line thickness: 4μm
Mass: 0.75kg (250mm), 1.8kg (500mm)

182-501

182-502

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
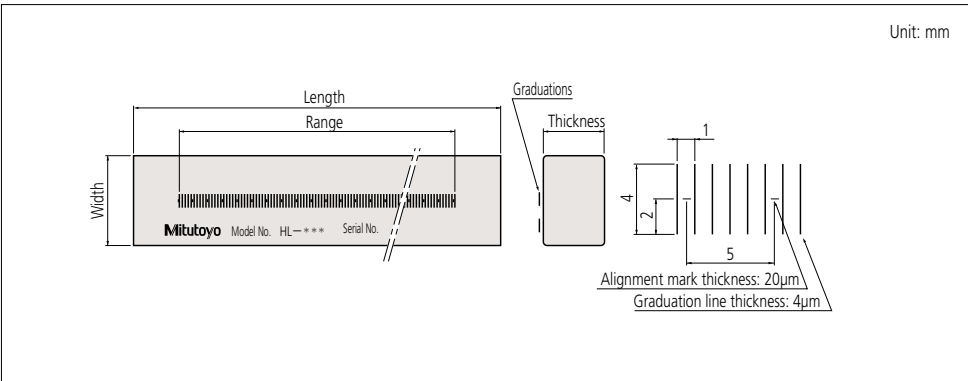
Unit: mm

Length
Range
Width
Graduations
Thickness

Mitutoyo   Model No.   HL—＊＊＊   Serial No.

1
4
2
5

Alignment mark thickness: 20μm
Graduation line thickness: 4μm

E

Mitutoyo

Technical Data

Accuracy (at 20°C): $(1.5+2L/1000)\mu m$,
L = Measured length (mm)
Glass material: Sodium glass
Thermal expansion coefficient: $(8\pm1)\times10^{-6}$/K
Graduation: 0.1mm (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.
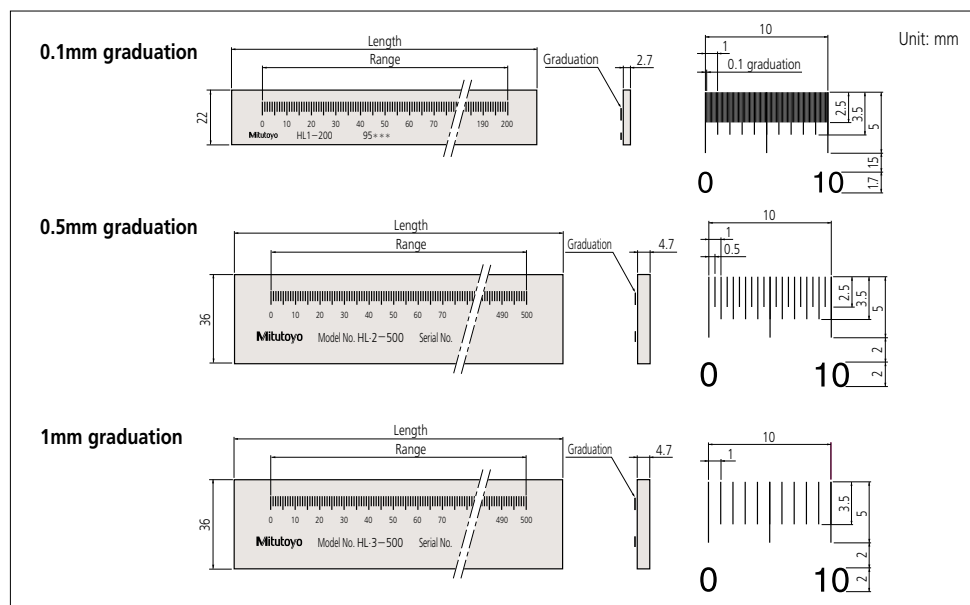
182-525-10
182-523-10
182-522-10
182-513-10
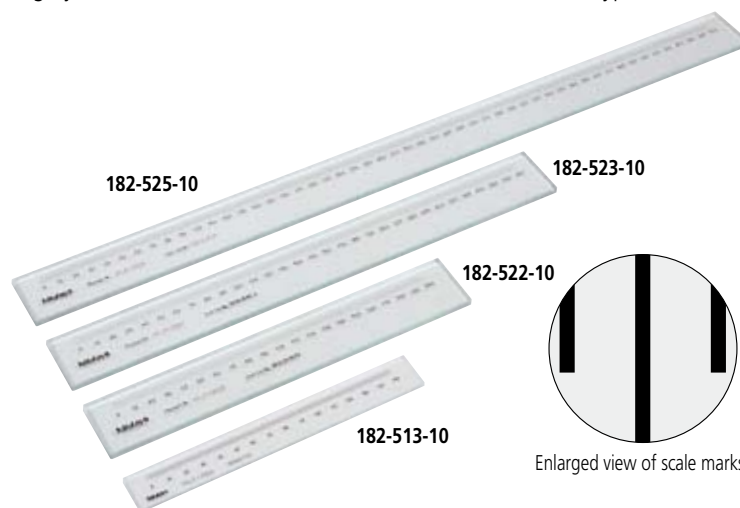
Enlarged view of scale marks

SPECIFICATIONS

Metric

Order No.	Range	Graduation	Length	Inspection pitch	Graduation line thickness	Length
182-511-10	50mm	0.1mm	75mm	5mm	20μm	0.23kg
182-512-10	100mm		125mm	10mm		0.24kg
182-513-10	150mm		175mm			0.25kg
182-514-10	200mm		225mm			0.26kg
182-521-10	100mm	0.5mm	130mm		50μm	0.27kg
182-522-10	200mm		230mm	20mm		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	100μm	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

Unit: mm

0.1mm graduation

Length
Range
Graduation 2.7
22
0 10 20 30 40 50 60 70 190 200
Mitutoyo   HL1−200   95***
10
1
0.1 graduation
2.5
3.5
5
0   10
1.7 15

0.5mm graduation

Length
Range
Graduation 4.7
36
0 10 20 30 40 50 60 70 490 500
Mitutoyo   Model No. HL-2−500   Serial No.
10
1
0.5
2.5
3.5
5
0   10
2 2

1mm graduation

Length
Range
Graduation 4.7
36
0 10 20 30 40 50 60 70 490 500
Mitutoyo   Model No. HL-3−500   Serial No.
10
1
3.5
5
0   10
2 2

Mitutoyo

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

Application

PROPRIETARY INSPECTION CERTIFICATE — An inspection certificate is attached 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 Calibration Certificate

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

Cross section
(High accuracy model, ultra-high accuracy model)

Lapped surface
(The straightness specification is guaranteed within the central 6mm width of this surface over the effective length of the gage)

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).
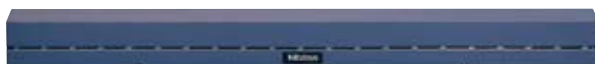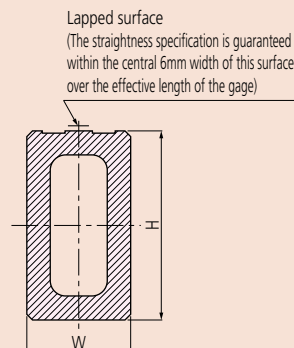
Inch — High accuracy model

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).

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 — 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

*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)

22.5 Lapped surface
22.5
80
45
Graduations

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

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

* 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).

Precision Square
SERIES 916

916-213
Standard type

916-402
with stand

916-102
Beveled-edge type

SPECIFICATIONS

Order No.	Size (W×D×T)	Squareness	
		Outside	Inside
Standard type			
916-211	50 x 4 x 40mm	6µm	12.5µm
916-212	75 x 50 x 4mm	6.5µm	14µm
916-213	100 x 70 x 4mm	7µm	15µm
916-214	150 x 100 x 5.5mm	8µm	17.5µm
916-215	200 x 130 x 5.5mm	9µm	20µm
916-216	250 x 165 x 8mm	10µm	22.5µm
916-217	300 x 200 x 8mm	11µm	25µm
916-218	400 x 250 x 10mm	13µm	30µm
with stand			
916-401	75 x 50 x 4mm	6.5µm	14µm
916-402	100 x 70 x 4mm	7µm	15µm
916-403	150 x 100 x 4mm	8µm	17.5µm
916-404	200 x 130 x 4mm	9µm	20µm
916-405	250 x 165 x 5.5mm	10µm	22.5µm
916-406	300 x 200 x 5.5mm	11µm	25µm
916-407	400 x 250 x 8mm	13µm	30µm
Standard type			
916-100	50 x 40mm	2.5µm	6µm
916-101	75 x 50mm	3µm	6.5µm
916-102	100 x 70mm	3µm	7µm
916-103	150 x 100mm	3.5µm	8µm
916-104	200 x 130mm	4µm	9µm

* Third dimension: measuring surface width

E

Mitutoyo

Reference Gages

Length Standards Brought to You by Mitutoyo

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.

An inspection certificate is attached 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.

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.

E

Square Master
SERIES 311 — Squareness / Straightness Measuring

Mounting the indicator holder

Example 1

Indicator holder
Connector pin
125

Example 2

Connector pin
125
Indicator holder

- 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

311-215   311-225   311-245

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

SPECIFICATIONS

Metric

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

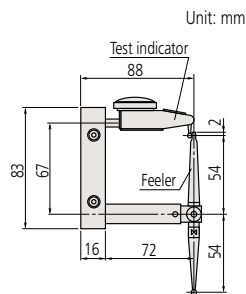* Riser blocks to extend the height of Square Masters can be used.

Inch

Order No.	Vertical travel	Squareness	Straightness	Dimension (W×D×T)	Mass
311-216*	6"	120μin	80μin	180×200×420mm	13.7Kg
311-226*	10"	240μin	100μin	180×200×520mm	16.2Kg
311-246	18"	360μin	140μin	220×220×720mm	24Kg

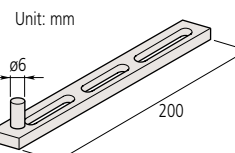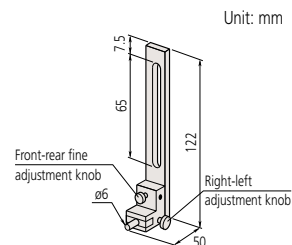* Riser blocks to extend the height of Square Masters can be used.

Optional accessory

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

Unit: mm

Test indicator
88
83
67
2
54
Feeler
16   72
54

No.900571: Adjustable holder
Enables easy adjustment of indicator position.

Unit: mm

7.5
65
122
Front-rear fine adjustment knob
ø6
Right-left adjustment knob
50

Unit: mm

ø6
200

No.900551: Extension holder
Measurement position can be extended by using this 200mm length holder instead of the indicator holder.

E

Mitutoyo

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±1°C, Humidity 58±2%)

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

Cast iron surface plate

Granite surface plate
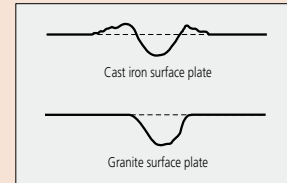
1000 x 750mm

600 x 600mm

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 W×D×h	Size d	Size w	Flatness	Mass	Stand (Option) Order No. Normal type	with safty frame	with caster	h
517-401	300×300×100mm	240mm	240mm	2µm	27kg	—	—	—	—
517-301				3µm					
517-101				5µm					
517-411	450×300×100mm	240mm	390mm	2µm	40kg	—	—	—	—
517-311				3µm					
517-111				6µm					
517-414	600×450×100mm	370mm	500mm	2.5µm	80kg	517-203	517-203R	517-203CR	755 - 775mm*1
517-314				4µm					
517-114				8µm					
517-403	600×600×130mm	500mm	500mm	2.5µm	140kg	517-20	517-204R	517-204CR	755 - 775mm*1
517-303				5µm					
517-103				8µm					
517-405	750×500×130mm	420mm	630mm	3µm	146kg	517-205	517-205R	517-205CR	755 - 775mm*1
517-305				5µm					
517-105				9µm					
517-407	1000×750×150mm	630mm	700mm	3µm	337kg	517-206	517-206R	517-206CR	755 - 775mm*1
517-307				6µm					
517-107				12µm					
517-409	1000×1000×150mm	700mm	700mm	3.5µm	450kg	517-207	517-207R	517-207CR	735 - 775mm*1
517-309				7µm					
517-109				13µm					
517-413	1500×1000×200mm	700mm	1100mm	4µm	900kg	517-208	517-208R	517-208CR	735 - 775mm*1
517-313				8µm					
517-113				16µm					
517-410	2000×1000×250mm	700mm	1500mm	4.5µm	1500kg	517-209	517-209R	517-209CR	735 - 775mm*1
517-310				9.5µm					
517-110				19µm					
517-416	2000×1500×300mm	1100mm	1500mm	5µm	2700kg	517-210	517-210R	517-210CR	735 - 775mm*1
517-316				10µm					
517-116				20µm					
517-317	2000×2000×350mm	1500mm	1500mm	11µm	4200kg	—	—	—	700 - 706mm*1
517-117				22µm					
517-318	3000×1500×400mm	1100mm	2000mm	12.5µm	5400kg	—	—	—	700 - 706mm*1
517-118				25µm					
517-319	3000×2000×500mm	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

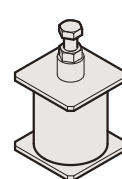Unit: mm

Steel stand (with leveling bolt)
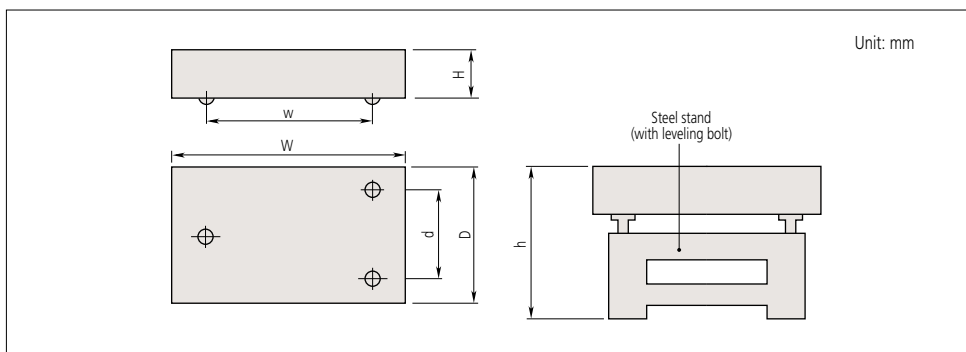
SPECIFICATIONS: Stand

Block mount Order No.	Applicable surface plate Order No.	Size (W × D × H)
06AAY174	517-317	2000 × 2000 × 350mm
	517-117	
06AAY175	17-318	3000 × 1500 × 400mm
	517-118	
06AAY176	517-319	3000 × 2000 × 500mm
	517-119	

Block platform for supporting legs
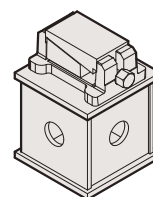
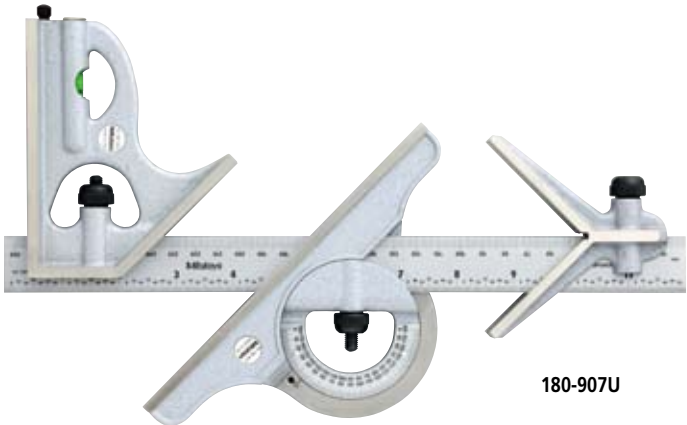**Block platform for auxiliary legs**

Mitutoyo

Reference Gages

Length Standards Brought to You by Mitutoyo

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

E

Steel Rules
SERIES 182

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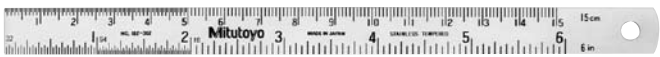- Stainless tempered.

182-101

182-201

182-102

182-202

182-103

182-205

182-105

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	1/10", 1/50", 1mm, 0.5mm	6"/150mm	.75"

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	1/10", 1/50", 1mm, 0.5mm	6"/150mm	.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.

E

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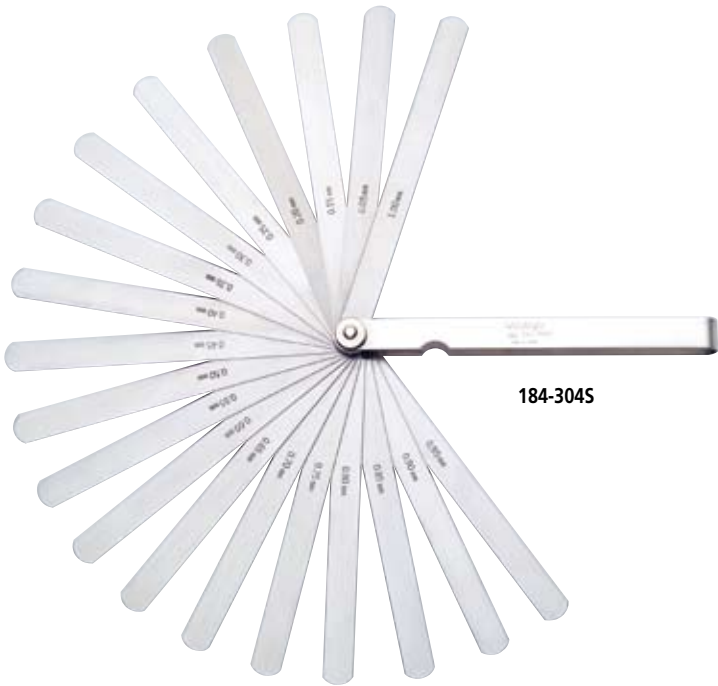
Reference Gages

Length Standards Brought to You by Mitutoyo

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

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

E

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.
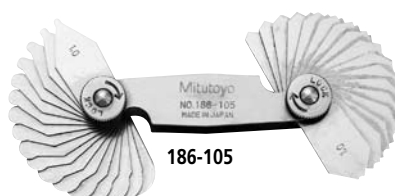
186-105
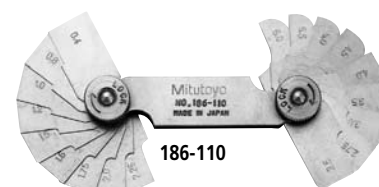
186-110

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
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.

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

E

Mitutoyo

Reference Gages
Length Standards Brought to You by Mitutoyo

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

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

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'
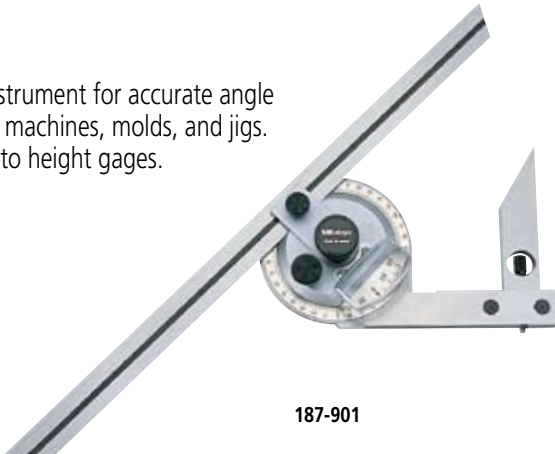
187-901

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

Bevel Protractor
SERIES 187

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

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

SPECIFICATIONS

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

187-201

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.

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

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

960-603

**960-703**

E
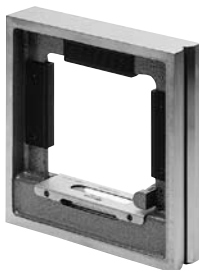
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Reference Gages

Length Standards Brought to You by Mitutoyo

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

Unit: mm

ø8

ø76.2

77

63

375

47.5

162-101 (metric)
162-102 (inch)
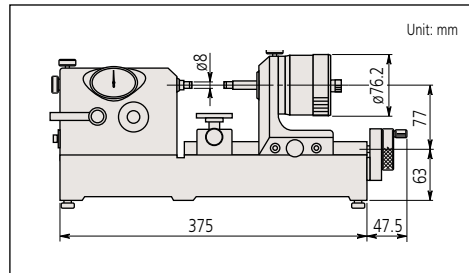
Technical Data

Micrometer head range: 25mm or 1"
Graduation: 0.001mm or .0001"
Dial indicator range: ±0.1mm or ±.005"
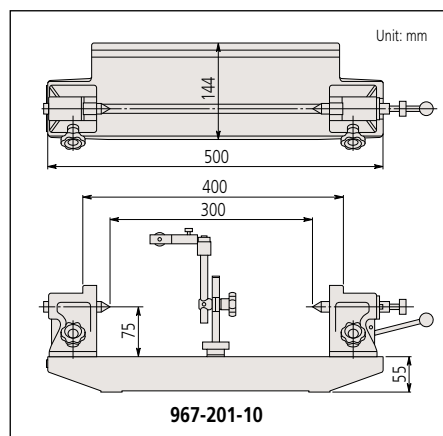Maximum workpiece length: 100mm or 4"
Mass: 15kg
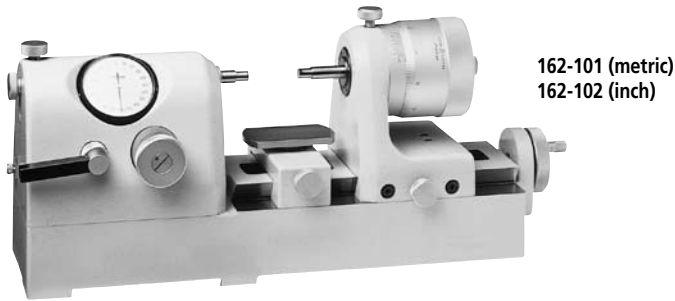
Bench Centers
SERIES 967

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

Unit: mm

144

500

400

300

75

55

967-201-10

967-201-10

Technical Data

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

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E

E-54

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