

Calibrating Measuring Instruments Reference Gages and Calibration Instruments

Small Tool Instruments
and Data Management



INDEX

Here is an introduction to a quick reference of reference gages that can be used as calibration standards and inspection tools available from Mitutoyo as appropriate for maintaining the accuracy of precision measuring tools and instruments.

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1 Differential Type Automatic Gauge Block Comparator GBCD-100A



A highly sensitive instrument for calibrating working gauge blocks with lengths between 0.5mm and 100mm by mechanical comparison with reference gauge blocks.



2 CERA-Inside Micro-Checker



This fixture provides fast, accurate and convenient zero point setting of inside micrometers. Choose 300mm or 600mm capacity models.



3 Setting Rings



These highly accurate rings for setting inside diameter measuring instruments are available in nominal sizes from $\phi 1,0\text{mm}$ to $\phi 300\text{mm}$ in steel or ceramic.



4 CERA Caliper Checker



This fixture provides fast, accurate and convenient calibration of calipers and height gages. Choose 300mm or 600mm capacity models.



5 Indicator Tester i-Checker



Capable of calibrating practically any type of mechanical or electronic indicator or gage with unsurpassed accuracy and convenience.



6 Digital Height Master



The name of this best-selling instrument has become generic for height standards, with a choice of 300mm, 450mm and 600mm capacity models.



7 Black Granite Surface Plates



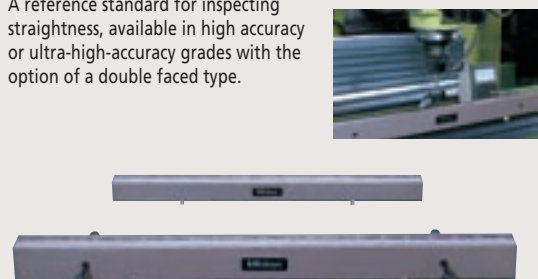
Precision machined from the highest grade of solid black granite to provide the best combination of easy sliding, even wearing and thermal stability available.



8 CERA Straight Master



A reference standard for inspecting straightness, available in high accuracy or ultra-high-accuracy grades with the option of a double faced type.



Reference Gages, Calibration Instruments and Inspection Tools Required for Periodic Inspections

Mitutoyo, as the manufacturer of a comprehensive range of precision measuring tools and instruments, offers the reference gages, calibration instruments and inspection tools necessary for performing the periodic inspections so necessary to ensure your measuring equipment is maintained in best operating condition.



Gauge Blocks

Automatic Gauge Block Interferometer GBI

GBI Interference fringe analyzing processing

- Patent registered in Japan
- 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

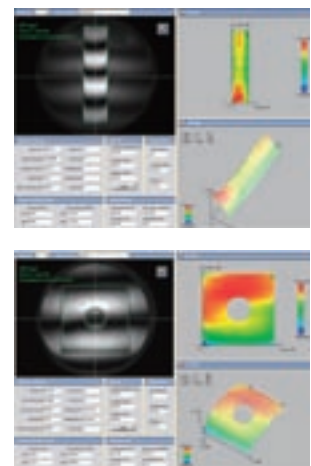
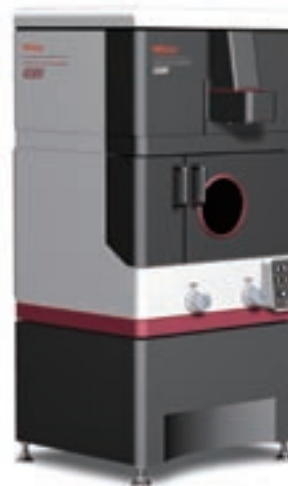
Measurement target	Rectangular gauge blocks	
Measuring range	Up to 250mm	
Measuring uncertainty at the 95% confidence level	0.025 μ m+0.2 \times 10 ⁻⁶ L L: Gauge block length (μ m)	
Number of Gauge blocks that can be mounted on the measuring table	12 pcs.	
Light sources	632.8nm frequency-stabilized He-Ne laser 543.5nm frequency-stabilized He-Ne laser	
Operating temperature	20°C \pm 0.5°C Under mild temperature change without direct exposure to cold or warm air	
Operating humidity	58% \pm 15%RH	
Dimension (WxDxH)	Main unit	680x1530x1470mm
	Electronic rack	572x600x1585mm
	Electronic stand	600x400x835mm
Main unit mass	600kg	
Power supply	AC100V - 120V, 200 - 240V \pm 10%, 50/60Hz	
Power consumption	Reference value 1000W *It differs depends on the customer required specifications.	

Standard Configuration

- Interferometer main unit
- Electronic unit rack (equipped with thermometer, hygrometer, barometer, etc.)
- Electronic unit installation table (laser power source)
- Personal computer (with LCD monitor)
- Printer
- Data processing software

Standard Accessories

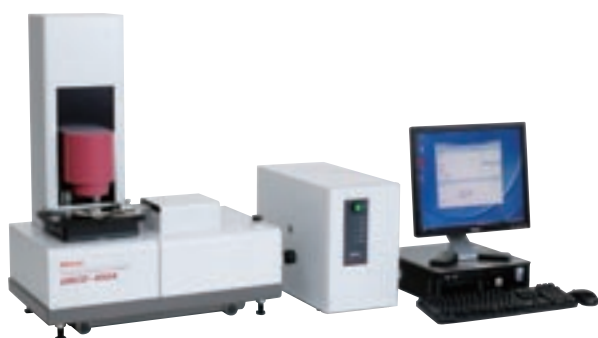
- Rotary stage 1 piece
- Platen (representing the reference plane for determining gauge block length)
 - Steel: 12 pieces
 - Ceramic: 12 pieces
- PC installation table and chair
- Standard resistor for calibrating temperature measurement bridge
- Wringing deformation correction jig



Differential Type Automatic Gauge Block Comparator

GBCD-100A

- 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).



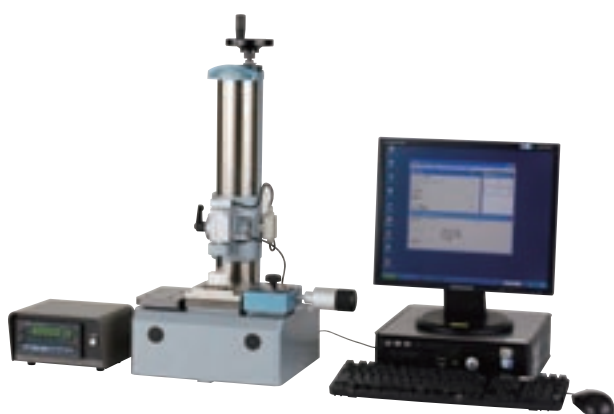
Specifications

Measurement target	Rectangular gauge blocks square gauge blocks
Gauge block length	0.5mm - 100mm
Measurement method	Differential measurement with upper and lower gaging head (dual-head system)
Resolution	0.01μm
Measurement configuration	1 cycle of automatic comparison measurement with a standard gauge block.
Upper gaging head Measuring force Contact point	High accuracy electronic micrometer 1N Carbide contact point of curvature radius 20mm
Lower gaging head Measuring force Contact point	High accuracy electronic micrometer 0.6N Carbide contact point of curvature radius 5mm
Accuracy (at the 95% confidence level)	±(0.03+0.3L/1000)μm L: Gauge block length (mm) (Excluding uncertainty of reference gauge block length and influence of ambient temperature)
Air requirement	0.4MPa
Operating temperature	20°C±1°C (Under mild temperature change without direct exposure to cold or warm air)
Operating humidity	58%±15%RH
Power supply	AC100V - 120V, 200 - 240V±10%, 50/60Hz
Power consumption (excluding PC)	400W

Differential Type Manual Gauge Block Comparator

GBCD-250

- Patent registered in Japan
- Measuring capability: Rectangular Gauge Blocks; Square Gauge Blocks (requires dedicated holder - optional accessory)



Specifications

Measurement target	Rectangular gauge blocks square gauge blocks (Optional dedicated holder set is used)
Gauge block length	0.1mm - 250mm
Measurement method	Differential measurement with upper and lower gaging head (dual-head system)
Effective resolution	0.01μm
Upper gaging head Measuring force Contact point	Laser Hologage 0.7N Carbide contact point of curvature radius 20mm
Lower gaging head Measuring force Contact point	Laser Hologage 0.2N Carbide contact point of curvature radius 5mm
Accuracy (at the 95% confidence level) [Length must be the same for both the reference gauge block and the one to be calibrated]	±(0.03+0.3L/1000)μm L: Gauge block length (mm) (Excluding uncertainty of reference gauge block length and influence of ambient temperature)
Accuracy (at the 95% confidence level) [With the reference gauge block of length difference within ±3mm]	±(0.06+0.3L/1000)μm L: Gauge block length (mm) (Excluding uncertainty of reference gauge block length and influence of ambient temperature)
Operating temperature	20°C±1°C (Under mild temperature change without direct exposure to cold or warm air)
Operating humidity	58%±15%RH
Power supply	AC100V - 120V, 200 - 240V±10%, 50/60Hz
Power consumption (excluding PC)	8.4W at maximum



Calibration Instruments

Series 516

Micrometer Inspection Gauge Block Set

- Steel and ceramic-type gauge blocks are offered.
- For more information, refer to Catalog No.E12014 "Gauge Blocks".



103-piece set (steel)



103-piece set (ceramic)



Long gauge block set

Specifications

Type	Steel		Ceramic		Blocks per set
	Order No.	Accuracy	Order No.	Accuracy	
1mm base sets	516-937-30	Grade K	516-337-30	Grade K	112
	516-938	Grade 0	516-338	Grade 0	
	516-939	Grade 1	516-339	Grade 1	
	516-940	Grade 2	516-340	Grade 2	
	516-941-30	Grade K	516-341-30	Grade K	103
	516-942	Grade 0	516-342	Grade 0	
	516-943	Grade 1	516-343	Grade 1	
	516-944	Grade 2	516-344	Grade 2	
	516-949-30	Grade K	516-349-30	Grade K	76
	516-950	Grade 0	516-350	Grade 0	
516-951	Grade 1	516-351	Grade 1		
516-952	Grade 2	516-352	Grade 2		
516-953-30	Grade K	516-353-30	Grade K	56	
516-954	Grade 0	516-354	Grade 0		
516-955	Grade 1	516-355	Grade 1		
516-956	Grade 2	516-356	Grade 2		
516-957-30	Grade K	516-357-30	Grade K	47	
516-958	Grade 0	516-358	Grade 0		
516-959	Grade 1	516-359	Grade 1		
516-960	Grade 2	516-360	Grade 2		
516-994-30	Grade K	516-394-30	Grade K	46	
516-995	Grade 0	516-395	Grade 0		
516-996	Grade 1	516-396	Grade 1		
516-997	Grade 2	516-397	Grade 2		
516-128-30	Grade K	516-178-30	Grade K	34	
516-129	Grade 0	516-179	Grade 0		
516-130	Grade 1	516-180	Grade 1		
516-131	Grade 2	516-181	Grade 2		
516-965-30	Grade K	516-365-30	Grade K	32	
516-966	Grade 0	516-366	Grade 0		
516-967	Grade 1	516-367	Grade 1		
516-968	Grade 2	516-368	Grade 2		
0.001mm step block sets	516-973-30	Grade K	516-373-30	Grade K	18
	516-974	Grade 0	516-374	Grade 0	
	516-975	Grade 1	516-375	Grade 1	
	516-976	Grade 2	516-376	Grade 2	
516-981-30	Grade K	516-381-30	Grade K	9	
516-982	Grade 0	516-382	Grade 0		
516-983	Grade 1	516-383	Grade 1		
516-984	Grade 2	516-384	Grade 2		
516-985-30	Grade K	516-385-30	Grade K	9	
516-986	Grade 0	516-386	Grade 0		
516-987	Grade 1	516-387	Grade 1		
516-988	Grade 2	516-388	Grade 2		
Long block set	516-702	Grade 0	516-732	Grade 0	8
	516-703	Grade 1	516-733	Grade 1	
	516-704	Grade 2	516-734	Grade 2	
Thin block sets	516-990	Grade 0			9
	516-991	Grade 1			
	516-992	Grade 2			

*Mitutoyo offers some gauge blocks other than the above table, such as West Block Sets and Inch Block Sets.

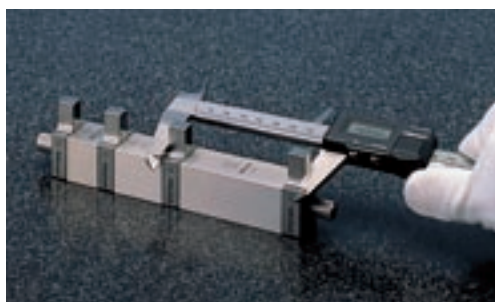
Calibration Instruments

Series 516 Square Gauge Block Sets

- The gauge blocks have a square measurement surface of 24.1x24.1mm and a $\phi 6.7$ mm through hole at the center to improve ease-of-use and for use in a wide range applications.



112-piece set



- These gauge blocks can be wrung to one another and can be used for making tools and dedicated gages.
- Gauge blocks can be joined using the optional tie rod, screws, and nuts.
- For more information, refer to Catalog No.E12014 "Gauge Blocks".

Specifications

Block Sets

Order No.	Accuracy	Blocks per set
516-438	Grade 0	112
516-439	Grade 1	
516-440	Grade 2	
516-442	Grade 0	103
516-443	Grade 1	
516-444	Grade 2	
516-450	Grade 0	76
516-451	Grade 1	
516-452	Grade 2	
516-458	Grade 0	47
516-459	Grade 1	
516-460	Grade 2	
516-466	Grade 0	32
516-467	Grade 1	
516-468	Grade 2	

Wear Block Sets

516-820	Grade 0	2
516-821	Grade 1	
516-822	Grade 0	2
516-823	Grade 1	

*Mitutoyo offers gauge blocks other than the above table, such as Long Block Sets and those Inch Block Sets.

Series 516 Individual Square Gauge Blocks

Rectangular Gauge Blocks (0.1 - 1000mm)

CERA Blocks (0.5 - 500mm)

Square Gauge Blocks (0.5 - 500mm)

- The availability of individual gauge blocks enables damaged or worn blocks to be easily replaced so that a complete set may be economically restored to grade standard.
- For more information, refer to Catalog No.E12014 "Gauge Blocks".
- When ordering individual gauge blocks please ensure that the suffix number indicating the accuracy class required is specified*.



*Accuracy grades are indicated by the appropriate suffix as below:

-013: Grade K

-02: Grade 0

-03: Grade 1

-04: Grade 2



Calibration Instruments

Series 516

Gauge Blocks with Calibrated Coefficient of Thermal Expansion

- Mitutoyo offers top-quality gauge blocks (steel and ceramic), superior to K class blocks due to their advanced manufacturing 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			Inch Blocks with CTE		
Order No. (steel)*	Order No. (CERA)*	Length (mm)	Order No. (steel)*	Order No. (CERA)*	Length (inch)
611681	613681	100	611204	613204	4
611802	613802	125	611205	613205	5
611803	613803	150	611206	613206	6
611804	613804	175	611207	613207	7
611682	613682	200	611208	613208	8
611805	613805	250	611222	613222	10
611683	613683	300	611223	613223	12
611684	613684	400	611224	613224	16
611685	613685	500	611225	613225	20

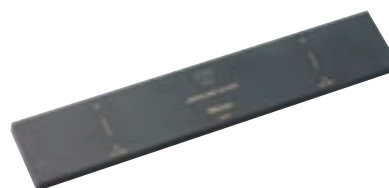
Grade	K class in JIS/ASME/ISO
Uncertainty of thermal expansion coefficient	$0.035 \times 10^{-6}/K$ ($k = 2$)
Uncertainty of length measurement	30nm ($k = 2$), for 100mm block

- * 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.
- For more information, refer to Catalog No.E4334 "Gauge Block with calibrated coefficient of thermal expansion".

Series 516

ZERO CERA Blocks

- Thermal expansion in the temperature range $20 \pm 1^\circ C$ less than 1/500 that of steel ($0 \pm 0.02 \times 10^{-6}/K(20^\circ C)$)
- 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			Length (mm)
JIS/ISO/DIN	Order No. BS	Order No. 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

- * An inspection certificate and a JCSS calibration certificate are supplied as standard.
- For more information, refer to Catalog No.E4331 "ZERO CERA BLOCK".

Calibration Instruments

Series 516 Accessory set for Gauge Blocks

- To expand the variety of rectangular gauge block applications, Mitutoyo offers the Gauge Block Accessories Set. By assembling the items in the set, you can build up various precision measuring setups with gauge blocks easily and quickly.

Specifications

Order No.	Description
516-601	22-piece set for rectangular gauge block
516-602	14-piece set for rectangular gauge block
516-605	For long rectangular gauge block (over 125mm)
516-611	For square gauge block

- For more information, refer to Catalog No.E12014 "Gauge Blocks".



Rectangular gauge block accessory set



Square gauge block accessory set

Series 516 Maintenance kit for Gauge Blocks

- Maintenance kit for gauge blocks includes all the necessary maintenance tools for removing burrs and contamination, and applying anti-corrosion treatment after use, etc.
- For more information, refer to Catalog No.E12014 "Gauge Blocks".

Set Order No.516-650

Contents
Anti-corrosion oil (100ml, spray can)
Ceraston
Optical flat
Tweezers
Blower brush
Cleaning paper (500 pcs.)
Artificial leather mat (B4 size)
Reagent bottle (polyethylene container, 100ml)
Gloves



Series 516 Ceraston

- 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.

Order No.601644 [150(W)×50(D)×20(H)mm]

Order No.601644 [100(W)×25(D)×12(H)mm]



Calibration Instruments
Calibration Instruments
Outside Micrometers
Inside Micrometers
Hottest/Boremic
Bore Gages
Depth Micrometers
Calipers
Height Gages
Dial Indicators
Dial Test Indicators
Electronic Micrometers
Coordinate Measuring Machines
Profile Projectors/Measuring Microscopes
Measuring Table

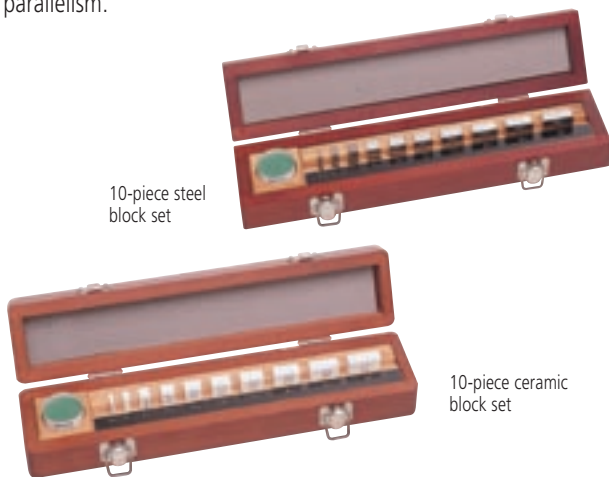


Outside Micrometers

Series 516

Gauge Block Set for Micrometer Inspection

- Either set of gauge blocks can be used for measurement of outside micrometer errors, measurement surface flatness, and parallelism.



10-piece steel block set

10-piece ceramic block set

- 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.

Specifications

Steel		Ceramic		Blocks per set	Remarks
Order No.	Accuracy	Order No.	Accuracy		
516-103	Grade 0	516-152	Grade 0	10	For outside micrometer 0 - 25mm
516-101	Grade 1	516-153	Grade 1		
		516-154	Grade 2		
516-977-30*1	Grade K	516-378	Grade 0	10	
516-978	Grade 0	516-379	Grade 1		
516-979	Grade 1	516-380	Grade 2		
516-980	Grade 2				
516-106	Grade 0	516-156	Grade 0	10	Supports JIS B 7502/1994
516-107	Grade 1	516-157	Grade 1		
516-108	Grade 2	516-158	Grade 2		
516-580	Grade 0	516-390	Grade 0	10	Dedicated for QuantuMike
516-581	Grade 1	516-391	Grade 1		
516-582	Grade 2	516-392	Grade 2		
516-111	Grade 0	516-161	Grade 0	16	For outside micrometer 0 - 50mm
516-112	Grade 1	516-162	Grade 1		
516-113	Grade 2	516-163	Grade 2		
516-115	Grade 0	516-165*1	Grade 0	8	For outside micrometer 0 - 200mm by 25mm pitch
516-116	Grade 1	516-166*1	Grade 1		
516-117	Grade 2	516-167*1	Grade 2		

- Mitutoyo offers Inch Block Sets as well. For more information, refer to Catalog No.E12014 "Gauge Blocks".

*1: Made-to-order

Series 157

Optical Parallels

- Designed to inspect parallelism and flatness of measuring faces of micrometers.
- Each set consists of 4 sizes to aid in testing parallelism at various angular positions of the micrometer spindle.
- Outside diameter is $\varnothing 30\text{mm}$



Specifications

Order No.	Application	Thickness (mm)	Flatness (μm)	Parallelism (μm)
157-903	Outside micrometer (for 0 - 25mm)	12.00, 12.12 12.25, 12.37	0.1	0.2
157-904	Outside micrometer (for 25 - 50mm)	25.00, 25.12 25.25, 25.37	0.1	0.2

* Parallelism for outside micrometer for 50mm or longer model is measured together with the gauge block.

Series 158

Optical Flats

- Used for inspecting the flatness of very flat surface.



Specifications

Order No.	Thickness (mm)	Outside Diameter (mm)	Parallelism (μm)
158-117	12	$\varnothing 45$	0.2
158-118			0.1
158-119	15	$\varnothing 60$	0.2
158-120			0.1

Gauge Blocks
 Calibration Instruments
 Outside Micrometers
 Inside Micrometers
 Holetest/Boremic
 Bore Gages
 Depth Micrometers
 Calipers
 Height Gages
 Dial Indicators
 Dial Test Indicators
 Electronic Micrometers
 Coordinate Measuring Machines
 Profile Projectors/Measuring Microscopes
 Measuring Table



Outside Micrometers

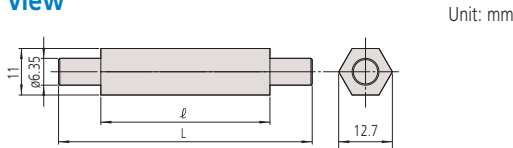
Series 167

Micrometer Standards

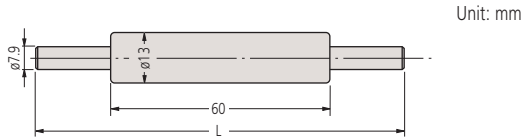
- These micrometer standards are used for the zero point setting of outside micrometers (over 50mm).



Accuracy • Flatness of measuring faces: 0.3μm • Parallelism between measuring faces: 2.0μm
External view



Order No.	Length (mm) L	Tolerance (μm)	ℓ (mm)	Diameter (mm)
167-101	25	±1.5	18	ø6.35
167-102	50	±2.0	40	
167-103	75	±2.5	40	



Order No.	Length (mm) L	Tolerance (μm)	Diameter (mm)
167-104	100	±3	ø7.9
167-105	125	±3.5	
167-106	150	±4	
167-107	175	±4.5	

Series 167

Micrometer Standards for Screw Thread Micrometers

- Used for accurately setting screw thread micrometers at the start or end of the measuring range.

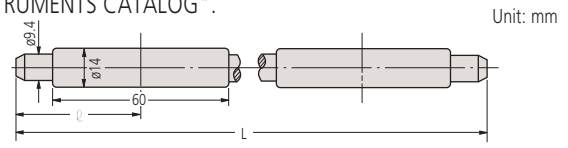


Specifications

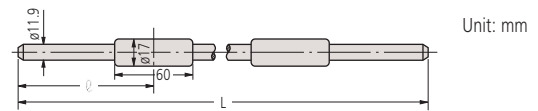
Order No.	Accuracy	Length (mm)
Metric (unified) θ=60°		
167-261	±4μm	25
167-262	±5μm	50
167-263	±6μm	75
167-264	±7μm	100
θ=55°		
167-272	±4μm	25
167-273	±5μm	50
167-274	±6μm	75
167-275	±7μm	100

* Mitutoyo offers other models with the length up to 275mm by 25mm pitch. Inch models are also available.

- Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".



Order No.	Length (mm) L	Tolerance (μm)	ℓ (mm)	Diameter (mm)
167-108	200	±5.0	47	ø9.4
167-109	225	±5.5	47	
167-110	250	±6.0	52	
167-111	275	±6.5	57	
167-112	300	±7	64	
167-113	325	±7.5	69	
167-114	350	±8	74	
167-115	375	±8.5	80	
167-116	400	±9	85	
167-117	425	±9.5	90	
167-118	450	±10	95	
167-119	475	±10.5	101	



Order No.	Length (mm) L	Tolerance (μm)	ℓ (mm)	Diameter (mm)
167-120	500	±11	106	ø11.9
167-121	525	±11.5	112	
167-122	550	±12	117	
167-123	575	±12.5	122	
167-124	600	±13	128	
167-125	625	±13.5	133	
167-126	650	±14	138	
167-127	675	±14.5	142	
167-128	700	±15	147	
167-129	725	±15.5	153	
167-130	750	±16	158	
167-131	775	±16.5	164	
167-132	800	±17	170	
167-133	825	±17.5	175	
167-134	850	±18	180	
167-135	875	±18.5	185	
167-136	900	±19	191	
167-137	925	±19.5	196	
167-138	950	±20	201	
167-139	975	±20.5	207	
167-140	1000	±21	211	

* Mitutoyo offers other models with the length up to 2000mm by 25mm pitch. Inch models are also available.

Series 167

Micrometer Standards for V-Anvil Micrometers

- Specially designed for accurately setting of V-anvil micrometers.



Specifications

Order No.	Accuracy	ø mm
167-327	±2μm	5
167-328	±2μm	10
167-329	±2μm	25
167-330	±3μm	40
167-331	±3μm	55
167-332	±3μm	70
167-333	±3μm	85

*Inch models are also available.



Outside Micrometers

Series 156

Micrometer Stands

- Designed to allow benchtop use of hand micrometers or other gages which have frames suitable for gripping by the clamp.

Specifications

Order No.	Type	Micrometer ranges
156-101-10	Adjustable angle type	15 - 100mm (.6"-4")*
156-105-10	Fixed angle type	25 - 50mm (1"-2")
156-102	Vertical type	100 - 300mm (4"-12")
156-103	Vertical type	325 - 1000mm (13"-40")

* Items that cannot be mounted on these stands (Order No. 406-253-30, 323-253-30, 331-254-30, 342-254-30, 342-264-30, 369-253-30, 422-232-30, 422-233-30, etc.)
 • Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".



Inside Micrometers

Series 515

CERA Inside Micro-Checker

- Enables efficient setting and inspection of calipers and height gages.
- 10mm gauge blocks are arranged at 25mm intervals to efficiently check the zero point of a tubular inside micrometer.

Specifications

Order No.	Zero point setting range	Accuracy
515-585	25 - 300	±(1+L/150)μm L: Length to check (mm)
515-586	25 - 600	

* Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".
 * Inch models are also available.



Color-Coded Ratchet

- Ratchet in a choice of seven colors for use in instrument identification control schemes: red, blue, yellow, green, brown, black and gray.
- Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".

Specifications

Order No.	Color	Material	Range for outside micrometers
951588	Gray	Steel	For digital type 0 - 300mm (Cannot be used for analog types)
950700			For analog type 0 - 300mm
950701			For analog type 300 - 1000mm
985056	Black	Plastic	For analog type 0 - 300mm
985061	Red		
985081	Blue		
985071	Yellow		
985076	Green		
985066	Brown		
04GZA241	Gray		For 0 - 300mm (Cannot be used for analog types)
04GZA239			For analog type 0 - 300mm
04GZA243			For analog type 300 - 1000mm

Color-Coded Speeder

04GAA260	Gray
301708	Black
301709	Red
301710	Brown
301711	Yellow
301712	Green
301713	Blue



Micrometer Oil

- Special lubricant for micrometers.

Order No.207000 (Content: 30mL)



207000

Gauge Blocks
Calibration Instruments
Outside Micrometers
Inside Micrometers
Holetest/Boremic
Bore Gages
Depth Micrometers
Calipers
Height Gages
Dial Indicators
Dial Test Indicators
Electronic Micrometers
Coordinate Measuring Machines
Profile Projectors/
Measuring Microscopes
Measuring Table



Holtest/Borematic/Bore Gages

Series 177 Setting Rings

- Setting rings are used for zero point adjustment of cylinder gages, Holtests, inside micrometers, etc. Selection of appropriate sized rings allows use for calibration as well as zero point adjustment.



177-146

177-147

177-300

177-429

177-432

Specifications

Steel Setting Rings

Order No.	Size (mm)	Order No.	Size (mm)
177-220	ø1.0	177-177	ø16.0
177-222	ø1.1	177-133	ø17.0
177-225	ø1.2	177-285	ø18.0
177-227	ø1.3	177-286	ø20.0
177-230	ø1.4	177-139	ø25.0
177-236	ø1.75	177-288	ø30.0
177-239	ø2.0	177-140	ø35.0
177-242	ø2.25	177-290	ø40.0
177-208	ø2.5	177-178	ø45.0
177-246	ø2.75	177-146	ø50.0
177-248	ø3.0	177-292	ø60.0
177-250	ø3.25	177-314	ø62.0
177-252	ø3.5	177-147	ø70.0
177-255	ø3.75	177-316	ø75.0
177-204	ø4.0	177-294	ø80.0
177-257	ø4.5	177-318	ø87.0
177-205	ø5.0	177-148	ø90.0
177-263	ø5.5	177-296	ø100
177-267	ø6.0	177-298	ø125
177-271	ø6.5	177-300	ø150
177-275	ø7.0	177-302	ø175
177-125	ø8.0	177-304	ø200
177-279	ø9.0	177-306	ø225
177-126	ø10.0	177-308	ø250
177-284	ø12.0	177-310	ø275
177-132	ø14.0	177-312	ø300

* Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".
* Inch models are also available.

CERA Setting Rings

Order No.	Size (mm)
177-418	ø4.0
177-420	ø6.0
177-423	ø8.0
177-424	ø10.0
177-425	ø12.0
177-427	ø16.0
177-429	ø20.0
177-430	ø25.0
177-431	ø30.0
177-432	ø35.0
177-433	ø40.0
177-434	ø45.0

Accuracy

Size of Setting rings (mm)	Tolerance (μm)	Roundness/Cylindricity (μm)
1 - 45	±10	1.0
Over 45 - 60	±20	
Over 60 - 90		1.5
Over 90 - 100		2.0
Over 100 - 150	±20	2.5
Over 150 - 225		3.0
Over 225 - 300		3.0

* Actual diameter is marked in 0.001 mm increments.
* Cylindricity is defined as per JIS B 0621 Definitions and designations of geometrical deviations, Section 4.4 "Cylindricity." Cylindricity is measured using three cross-sections between the top and bottom face of a ring, namely, close to the face near each sides and the center.

Series 515 Bore Gage Checker

- The Bore Gage Checker allows easy setting of dial bore gages with ranges of 18mm (.7") through 400mm (16") using gauge blocks.



Specifications

Order No.	Accuracy	Applicable range
515-590	CCG-400	18 - 400mm (.7" - 16")

- Calibration Instruments
- Calibration Instruments
- Outside Micrometers
- Inside Micrometers
- Holtest/Borematic
- Bore Gages
- Depth Micrometers
- Calipers
- Height Gages
- Dial Indicators
- Dial Test Indicators
- Electronic Micrometers
- Coordinate Measuring Machines
- Profile Projectors/Measuring Microscopes
- Measuring Table



Dial Indicators/Dial Test Indicators/Bore Gages/Lever Head

Series 170

i-Checker

- i-Checker is specially designed to calibrate dial indicators, dial test indicators, and other electronic comparison gage heads.
- Inspection can be performed 2.5 times faster compared to the previous model.
- This instrument achieves the highest accuracy in its class (Mitutoyo survey, February 2016) and therefore guarantees ultra-reliable inspection results.
- Digital indicators equipped with a data output function are checked very efficiently due to spindle positioning at the inspection points and recording of measurement results being under fully automatic control.
- Analog type indicators are inspected in semi-automatic mode with the pointer of the indicator being manually adjusted at each measuring point with automatic transfer of inspection results and movement to the next measuring point.



Specifications

Measuring range	100mm
Resolution	0.01μm
Accuracy (20°C)	Main unit in the vertical position (0.1+0.4L/100) μm L=Measured length (mm)
Feed speed	Max. 10mm/s
Drive method	Motor drive, semi-automatic, fully automatic only for Indicator with SPC data output
Measuring unit	Linear encoder
Measurement method	Semi-automatic measurement Fully automatic measurement (only when using an indicator equipped with data output function) *1
Dimensions (Width X Depth X Height)	169x205.5x559.5mm
Mass	20kg
Applied standards	ISO, JIS, JMAS, ANSI, ASME, DIN, VDI/VDE/DGQ*2
Power supply	AC100V - 240V±10%, 50/60Hz
Power consumption (excluding PC)	40W at maximum

*1: Automatic measurement requires the indicator's connection cable.

*2: The latest standards including ISO 9493-2010, JIS B 7533-2015 (related gage: TI), DIN 878-2006 (related gage: DG) are applied.

* Some of indicators require optional stem diameter or attachment for mounting. For details, please contact your nearest Mitutoyo sales office.

• For more information, refer to Catalog No.E12034 "i-Checker".



Inspection using analog type indicator



Inspection using digital type indicator

Dial Indicators/Dial Test Indicators/Bore Gages/Lever Head

Color-coded Spindle Caps

- 9 color-coded spindle caps are available for dial indicators.
- Colored caps can be used with both standard-type and compact dial indicators with a measuring range of 10mm or less.
- These caps cannot be mounted on some indicators of the back plunger type, adjustable hand type, lever, double face type, ultra-small type, etc.



Color	Standard	Waterproof
Black	193051	193595
White	193051W	193595W
Red	193051R	193595R
Green	193051G	193595G
Blue	193051B	193595B
Yellow	193051Y	193595Y
Orange	193051D	193595D
Pink	193051P	193595P
Dark blue	193051S	193595S

* This accessory is not applicable to 1003T, 1911T-10, 1913T-10, 1923T-10, 1925T-10 and 2971TB to 2978TB.

Series 170, 521 Calibration Tester

170-102-10

- UDT-2 is the accuracy tester for 0.01mm resolution/graduation dial indicators, dial test indicators and bore gages.
 - Measuring range is 25mm.
 - For calibration of bore gages, use the optional stand for bore gage inspection (No.12AAK824).*
 - Stem mounting hole: $\varnothing 6, \varnothing 8\text{mm}$ (Metric) $\varnothing 1/4", \varnothing 3/8"$ (Inch)
- * Can be used for the inspection of bore gages 511 series standard type and with micrometer head up to 400mm.

521-103/521-105

- The Calibration Tester is specially designed to calibrate short range dial indicators, dial test indicators, and electronic gage heads.
- Measuring range is 1mm for 521-103 and 5mm for 521-105.

Specifications

Order No.	Graduation	Accuracy (μm)	Retrace error (μm)	Range (μm)
170-102-10	0.001mm	± 1	0.5	0 - 25
521-103	0.0002mm	± 0.2	0.2	0 - 1
521-105	0.0002mm	± 0.8	0.8	0 - 5

• Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".
* Inch models are also available.



Calibration Instruments
Calibration Instruments
Outside Micrometers
Inside Micrometers
Hollist/Borematic
Bore Gages
Depth Micrometers
Calipers
Height Gages
Dial Indicators
Dial Test Indicators
Electronic Micrometers
Coordinate Measuring Machines
Profile Projectors/Measuring Microscopes
Measuring Table



Coordinate Measuring Machines (Machine tools/Precision measuring instruments/Semiconductor equipment)

Reference standards for inspecting the travel straightness and axial perpendicularity of moving elements on equipment such as machine tools, CMMs, precision measuring instruments and semiconductor-related equipment. Standards for inspecting positioning accuracy are also available. These standards can also be incorporated in instruments for measuring straightness or perpendicularity.

Series 311

CERA Straight Master

- The CERA Straight Master is a reference standard used for inspecting the straightness of travel of moving elements on equipment.
- Precision lapped reference surfaces achieve higher accuracy than conventional models. Also, 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.

Specifications (High accuracy model)

Order No.	311-302	311-305	311-307	311-309
Effective length	400mm	700mm	1000mm	1300mm
Straightness	0.3µm	0.5µm	1.0µm	1.5µm
Mass	1.8kg	3.0kg	8.0kg	10.0kg

Specifications (Double faced model)

Order No.	311-352	311-355	311-357	311-359
Effective length	400mm	700mm	700mm	1300mm
Straightness	0.3µm	0.5µm	1.0µm	1.5µm
Mass	3.2kg	5.5kg	8.0kg	10.0kg

• Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".
* Inch models are also available.

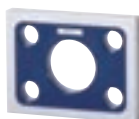
Series 311

High Precision Square

- The UM is a reference standard for inspecting straightness and perpendicularity, with all 4 faces finished by ultra-precision lapping technology, allowing use as reference planes.
- The product lineup offers a choice of three models as shown in the table.



311-111



311-112



311-113



Application



High accuracy / Ultra-high accuracy model



Double faced model

Specifications (Ultra-high accuracy model)

Order No.	311-332	311-335	311-337	311-339
Effective length	400mm	700mm	1000mm	1300mm
Straightness	0.2µm	0.4µm	0.5µm	0.7µm
Mass	1.8kg	3.0kg	8.0kg	10.0kg

*Suffix Number for Inspection Certificate and Calibration Certificate

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

Specifications

Order No.	Dimension (mm) W×L×T	Reference faces		Side faces		Mass (kg)
		Perpendicularity (µm)	Straightness (µm)	Perpendicularity (µm)	Parallelism (µm)	
311-111	90×110×25	1	1	5	5	1.5
311-112	160×210×25	1	1	5	5	5.0
311-113	260×310×30	1	1	5	5	14.0

* 311-113 is supplied with a removal handle.

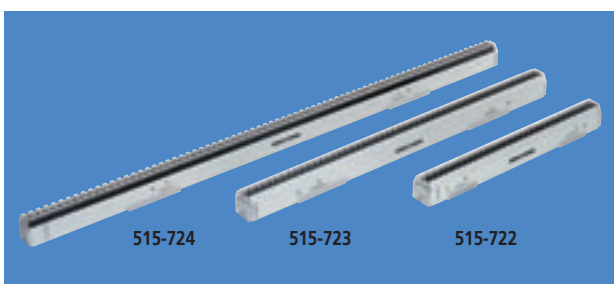
* Made-to-order

Gauge Blocks
Calibration Instruments
Outside Micrometers
Inside Micrometers
Holetest/Boremic
Bore Gages
Depth Micrometers
Calipers
Height Gages
Dial Indicators
Dial Test Indicators
Electronic Micrometers
Coordinate Measuring Machines
Profile Projectors/Measuring Microscopes
Measuring Table

Coordinate Measuring Machines (Machine tools/Precision measuring instruments/Semiconductor equipment)

Series 515
Check Master

- Designed to check the accuracy of table movements of machine tools and calibrate CMMs.



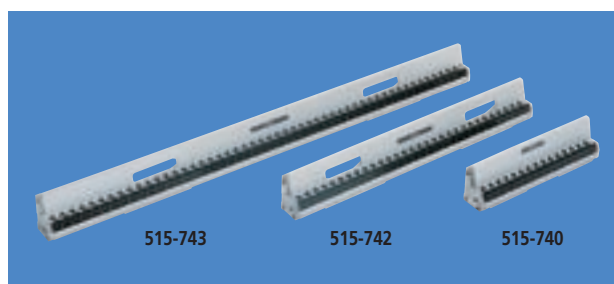
Specifications

Order No.	515-720	515-721	515-722	515-723	515-724
Range	300mm	450mm	600mm	1000mm	1500mm
Block pitch accuracy	H ≤ 310mm ±2.5μm				
	310 < H ≤ 610mm		±3.5μm		
	610 < H ≤ 1010mm		±5.0μm		
	1010 < H ≤ 1510mm		±8.0μm		
Parallelism of blocks	H ≤ 310mm 1.2μm				
	310 < H ≤ 610mm		1.5μm		
	610 < H ≤ 1010mm		-		2.0μm
	1010 < H ≤ 1510mm		-		2.5μm
Mass	7kg	10kg	13kg	22kg	30kg

* Inch models are also available.

Series 515
High Accuracy Check Master

- High accuracy and lightweight models. Ceramic Check Masters are also available.



Specifications

Order No.	515-740	515-741	515-742	515-743	515-744
Range	300mm	450mm	600mm	1000mm	1500mm
Block pitch accuracy	H ≤ 310mm ±1.2μm				
	310 < H ≤ 610mm		±1.8μm		
	610 < H ≤ 1010mm		±2.5μm		
	1010 < H ≤ 1510mm		±4.0μm		
Parallelism of blocks	H ≤ 450mm 1.0μm				
	450 < H ≤ 1010mm		1.5μm		
	1010 < H ≤ 1510mm		-		2.0μm
Mass	3.6kg	5.4kg	7.2kg	12kg	18kg

* Ceramic Check Master is also available upon customer's request (made-to-order).
 • Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".
 * Inch models are also available.

Series 515
Height Master

- Height Master is a bestselling product with a name that has become the industry term for height reference instruments.
- 20mm gauge blocks are mounted on left and right double-row steps, always providing upper and lower measuring planes with the same size increment.

Specifications

Order No.	Range (mm)	Resolution (mm)	Remarks
515-322	5 - 310	0.001	Standard
515-374	10 - 310	0.001	Digital
515-376	10 - 460		
515-378	10 - 610		

* Riser Blocks (for increasing the measurable height) are available as optional accessories.

Unit: μm

Item	Order No.	515-322	515-374	515-376	515-378
Block pitch accuracy	H ≤ 310mm ±1.5				
	310 < H ≤ 450mm		±2.5		
	310 < H ≤ 610mm		-		±3.5
Parallelism of blocks	H ≤ 310mm 1 2				
	310 < H ≤ 610mm		-		2.5
Feed error		±1.0	±2		±2.5

• Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".
 * Inch models are also available.



Calibration Instruments
 Calibration Instruments
 Outside Micrometers
 Inside Micrometers
 Holes/Boremic
 Bore Gages
 Depth Micrometers
 Calipers
 Height Gages
 Dial Indicators
 Dial Test Indicators
 Electronic Micrometers
 Coordinate Measuring Machines
 Profile Projectors/Measuring Microscopes
 Measuring Table

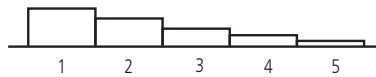


Profile Projectors/Measuring Microscopes

Series 516

Step Master

- 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.



Steel type
516-199



Ceramic type
516-499

Specifications

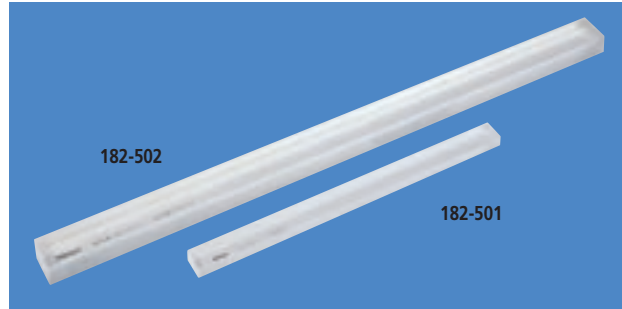
Material	Steel									
Order No.	516-198					516-199				
Material	Ceramic									
Order No.	516-498					516-499				
Block No.	1	2	3	4	5	1	2	3	4	5
Cumulative step (μm)	0	10	15	17	18	0	300	400	450	470
Step value between adjacent blocks (μm)	10	5	2	1		300	100	50	20	

- Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".

Series 182

Standard Scales (made-to-order)

- Glass-made Standard Scales which are considered top-grade length standards.
- Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".

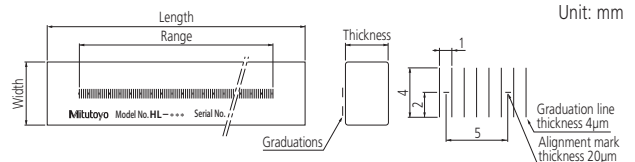


Specifications

Order No.	182-501-50/182-501-60*	182-502-50/182-502-60*
Range (mm)	250	500
Length (mm)	280	530
Width (mm)	20	30
Thickness (mm)	10	20
Material	Low expansion glass	
Thermal expansion coefficient/K	(0.00±0.02)×10 ⁻⁶	
Graduation line width (μm)	4	
Graduation (mm)	1	
Accuracy (20°C) (μm)	0.5+L/1000 L=Measured length between two lines (mm)	

* A calibration certificate produced by a standard scale automatic calibration system is supplied for 182-501-60 and 182-502-60.

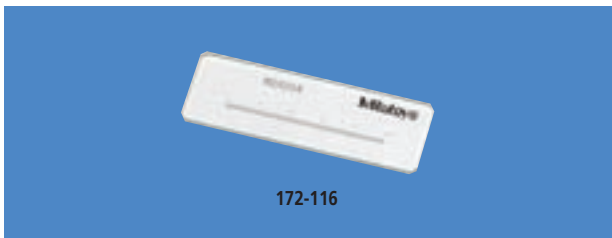
Dimensions



Series 172

Standard Scales

- The glass-made Standard Scales are used for measuring profile projectors directly.



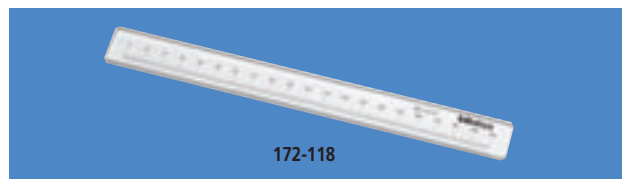
Specifications

Order No.	Length	Graduation	Accuracy
172-116	50mm	0.1mm	(3+5L/1000)μm
172-330	80mm		L=Measured length (mm)

Series 172

Reading Scales

- The glass-made Standard Scales are used for checking magnification accuracy of the profile projectors.
- The Reading Scales are specially designed for inspecting the magnified image of a standard scale on the projection screen.



Specifications

Order No.	Length	Graduation	Accuracy
172-118	200mm	0.5mm	(15+15L/1000)μm
172-161	300mm		L=Measured length (mm)
172-329	600mm		

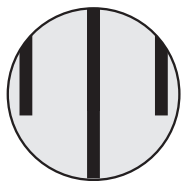
Gauge Blocks
Calibration Instruments
Outside Micrometers
Inside Micrometers
Holetest/Boremic
Bore Gages
Depth Micrometers
Calipers
Height Gages
Dial Indicators
Dial Test Indicators
Electronic Micrometers
Coordinate Measuring Machines
Profile Projectors/Measuring Microscopes
Measuring Table



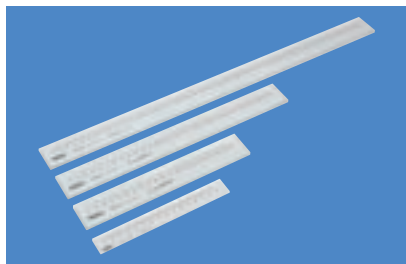
Profile Projectors/Measuring Microscopes

Series 182 Working Standard Scales (made-to-order)

- Ideal for checking the table feeding accuracy of measuring equipment and the semiconductor production equipment.
- Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".

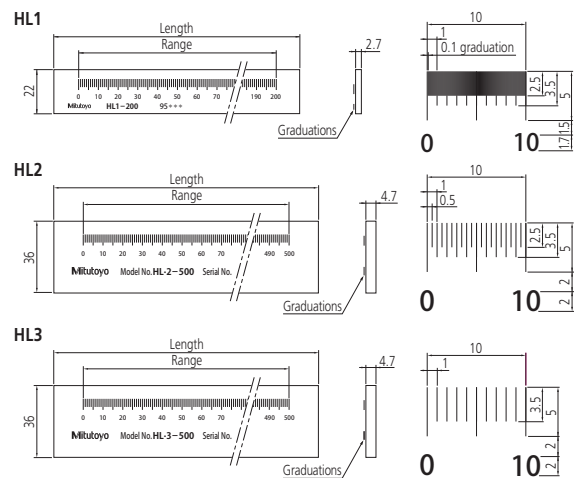


Enlarged view of scale marks 100X



Dimensions

Unit: mm



Specifications

Order No.	182-511-30	182-512	182-513-30	182-514-30	182-521-30	182-522-30	182-523-30	182-524-30	182-525-30	182-531-30	182-532-30	182-533-30	182-534-30
Range (mm)	50	100	150	200	100	200	300	400	500	250	500	750	1000
Length (mm)	75	125	175	225	130	230	330	430	530	280	530	780	1030
Thermal expansion coefficient/K	8.5×10^{-6}												
Graduation line width (μm)	20						50				100		
Material	Soda-lime glass												
Accuracy (20°C) (μm)	$0.5 + 2L/1000$ L=Measured length between two lines (mm)												

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

- Calibration Instruments
- Calibration Instruments
- Outside Micrometers
- Inside Micrometers
- Holtest/Borematic
- Bore Gages
- Depth Micrometers
- Calipers
- Height Gages
- Dial Indicators
- Dial Test Indicators
- Electronic Micrometers
- Coordinate Measuring Machines
- Profile Projectors/Measuring Microscopes
- Measuring Table

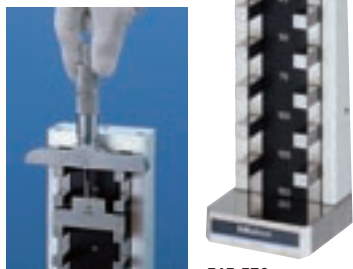


Depth Micrometers

Series 515

Depth Micro-Checker

- The Depth Micro-Checker is designed to check and help set the range-end points of a depth micrometer.



515-570

Specifications

Order No.	Zero point setting range (mm)	Anvil block accuracy
515-570	0 - 150	±(1+L/150)μm L: Length to check (mm)
515-571	0 - 300	

- * Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".
- * Inch models are also available.



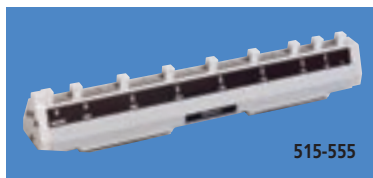
Calipers and Height Gages

Series 515

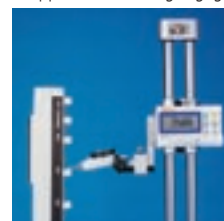
CERA Caliper Checker

- Enables calibration for inside/outside jaws of calipers and height gages.

Application for height gage



515-555



Specifications

Order No.	Range (mm)	Block pitch accuracy (μm)	Parallelism of blocks (μm)
515-555	20 - 300	±5	2
515-556-2	20 - 600	±5, ±7 (range 350 - 600mm)	2, 4 (range 350 - 600mm)

- * Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".
- * Inch models are also available.



Measuring Table

Series 517

Black Granite Surface Plates

- This is used for a reference surface plate in the height and perpendicularity measurements and layout work.



1000x750mm

600x600mm

Standard steel stand/block stage

Order No.	Target plate
517-203	Steel stand for 600 x 450
517-204	Steel stand for 600 x 600
517-205	Steel stand for 750 x 500
517-206	Steel stand for 1000 x 750
517-207	Steel stand for 1000 x 1000
517-208	Steel stand for 1500 x 1000
517-209	Steel stand for 2000 x 1000
517-210	Steel stand for 2000 x 1500
06AAY174	Block stage for 2000 x 2000
06AAY175	Block stage for 3000 x 1500
06AAY176	Block stage for 3000 x 2000

- * Stands with drop prevention device and with caster wheel are available.
- * Please also refer to Catalog No.E2016 "MEASURING INSTRUMENTS CATALOG".
- * While the appearance of the natural stone measuring table varies according to the source, the high stability for which this material is known can be relied upon.

Specifications

Order No.	Grade	W x D x h (mm)	Flatness (μm)
517-401	00	300 x 300 x 100	2
517-301	0		3
517-101	1		5
517-411	00	450 x 300 x 100	2
517-311	0		3
517-111	1		6
517-414	00	600 x 450 x 100	2.5
517-314	0		4
517-114	1		8
517-403	00	600 x 600 x 130	2.5
517-303	0		5
517-103	1		8
517-405	00	750 x 500 x 130	3
517-305	0		5
517-105	1		9
517-407	00	1000 x 750 x 150	3
517-307	0		6
517-107	1		12
517-409	00	1000 x 1000 x 150	3.5
517-309	0		7
517-109	1		13
517-413	00	1500 x 1000 x 200	4
517-313	0		8
517-113	1		16
517-410	00	2000 x 1000 x 250	4.5
517-310	0		9.5
517-110	1		19
517-416	00	2000 x 1500 x 300	5
517-316	0		10
517-116	1		20
*	00	2000 x 2000 x 350	5.5
517-317	0		11
517-117	1		22
*	00	3000 x 1500 x 400	6.5
517-318	0		12.5
517-118	1		25
*	00	3000 x 2000 x 500	7
517-319	0		13.5
517-119	1		27

- * Contact to your nearest Mitutoyo sales office.
- * High accuracy, large size and special dimensions models are also available upon customer's request (made-to-order).

Gauge Blocks
 Calibration Instruments
 Outside Micrometers
 Inside Micrometers
 Hole/Slot/Boremic
 Bore Gages
 Depth Micrometers
 Calipers
 Height Gages
 Dial Indicators
 Dial Test Indicators
 Electronic Micrometers
 Coordinate Measuring Machines
 Profile Projectors/ Measuring Microscopes
 Measuring Table

➤ Maintaining and Stabilizing Fundamental Technologies in Industry

Traceability of the accuracy of measuring instruments put its basis on calibration standards and instruments that are traceable to nationally or internationally recognized standards. Here is an introduction to our accredited calibration laboratories that guarantee traceability of Mitutoyo's manufacturing, sales and service activities conducted worldwide.

	Page
Worldwide Accredited Calibration Laboratories	22
Scope of End-standard Calibration	23
Conformance to CE Marking	23
Traceability System to National Standard	24



Certificate of JCSS accredited laboratory (Mitutoyo Utsunomiya Measurement Standards Calibration Center in Japan)



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



Certificate of DAkkS accredited laboratory (Mitutoyo Messgeräte in Germany)



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



Certificate of EMA accredited laboratory (Mitutoyo Mexicana in Mexico)



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



Certificate of NABL accredited laboratory (Mitutoyo South Asia in India)

Worldwide Accredited Calibration Laboratories

Being nationally accredited calibration laboratories, Mitutoyo conducts calibration services at various parts of the globe to help customers implement and maintain the traceability of accuracy of their precision measuring tools and instruments. Scope of calibration service at each of our 16 accredited calibration laboratories is shown below.

Calibration: A set of operations which establishes, under specified conditions, the relationship between values indicated by measuring instrument or system, or values represented by a material measure or a reference material, and the corresponding known values realized by standards. (VIM, 1993)

The ISO/IEC 17025 Accreditation List of Mitutoyo

Country	Department of Accreditation	Scope	Scope of Calibration Service	Accreditation Body	Accreditation No.	Accredited Date
Japan	Miyazaki Plant	Length	Gauge Block, Step Gage, etc.	IA Japan/NITE (JCSS)	0030	1994-05-02
	Utsunomiya Measurement Standards Calibration Center	Length	Wavelength of 633nm He-Ne Laser	IA Japan/NITE (JCSS)	0031	2005-11-01
			Standard Scale			1998-05-06
		Temperature	Platinum Resistance Thermometer, Thermometer with Indicator			2005-11-01
	Kawasaki Calibration Center	Force	Force-Probing Instrument	IA Japan/NITE (JCSS)	0086	2005-09-01
	Hiroshima Calibration Center	Length	Caliper, Micrometer, Dial Indicator, etc.	IA Japan/NITE (JCSS)	0109	2002-04-11
Hardness		Rockwell Hardness Reference Block, Rockwell Hardness Testing Machine (On-site Calibration)	2007-02-21			
	Techno Service Business Division	Length	CMM (On-site Calibration), Vision Measuring System (On-site Calibration)	IA Japan/NITE (JCSS)	0186	2006-12-27
Singapore	Mitutoyo Asia Pacific Pte. Ltd.	Length/Hardness	Form Measuring Instrument, CMM, etc.	SAC	LA-1996-0102-C	1996-11-08
Thailand	Mitutoyo (Thailand) Co., Ltd.	Length	Form Measuring Instrument, CMM, etc.	TISI	0258	2015-05-29
Indonesia	PT. Mitutoyo Indonesia	Length/Hardness	Form Measuring Instrument, CMM, etc.	KAN	LK-183-IDN	2014-08-20
Vietnam	Mitutoyo Vietnam Co., Ltd.	Length	Form Measuring Instrument, CMM, etc.	BoA	VILAS 741	2014-04-18
Malaysia	Mitutoyo (Malaysia) Sdn. Bhd.	Length/Hardness	Caliper, Form Measuring Instrument, CMM, etc.	STANDARDS MALAYSIA	SAMM 152	2013-10-10
Taiwan	Mitutoyo Taiwan Co., Ltd.	Length/Hardness	Surface Finish Specimen, Toolmaker Microscope, CMM, etc.	TAF	0336	1998-06-15
India	Mitutoyo South Asia Pvt. Ltd.	Length/Hardness	Caliper, Micrometer, Dial Indicator, etc.	NABL	C-0349	2006-02-03
China	Mitutoyo Measuring Instruments (Shanghai) Co., Ltd.	Length	Caliper, Micrometer, Dial Indicator, etc.	CNAS	CNAS L5506	2012-02-28
U.K.	Mitutoyo (UK) Ltd.	Length/Hardness	Gauge Block, Caliper, CMM, etc.	UKAS	0332	1990-07-30
Netherlands	Mitutoyo Nederland B.V.	Length/ Temperature	Gauge Block, Caliper, CMM, etc.	RvA	K086	1994-10-14
Germany	Mitutoyo Deutschland GmbH	Length	Gauge Block, Caliper, CMM, etc.	DAkkS	D-K-15096-01-00	1995-01-10
Switzerland	Mitutoyo Schweiz AG	Length	Gauge Block, Caliper, CMM, etc.	SAS	SCS 0074	1996-12-18
Italy	Mitutoyo Italiana S.r.l.	Length	Gauge Block, Reference hemisphere, CMM, etc.	ACCREDIA	LAT N.107	1998-05-01
Sweden	Mitutoyo Scandinavia AB	Length	CMM	SWEDAC	1794	2002-03-04
U.S.A.	Mitutoyo America Corporation	Length/ Temperature	Gauge Block, Caliper, CMM, etc.	A2LA	0750.01	1998-04-20
		Length/Hardness	CMM, Vision Measuring System, etc. (On-site Calibration)		1643.01	2002-01-15
Canada	Mitutoyo Canada Inc.	Length/Hardness	Gauge Block, Caliper, Micrometer, etc.	CLAS/SCC	2003-05	2003-10-07
Mexico	Mitutoyo Mexicana, S.A. de C.V	Length	Gauge Block, Caliper, CMM, etc.	EMA	D-45	2000-11-21
		Length	Caliper, Micrometer, Dial Indicator, etc.		D-45-S1	2014-12-12
		Hardness	Hardness Reference Block, etc.		DZA-28	2015-01-21
Brazil	Mitutoyo Sul Americana Ltda.	Length/Hardness	Gauge Block, Caliper, CMM, Rockwell Hardness Testing Machine, etc.	CGCRE	0031	1992-09-15
Argentina		Length	Micrometer, CMM, etc.	OAA	LC 010	2002-11-07

Name of Accreditation Bodies and Accreditation Systems

NITE: National Institute of Technology and Evaluation

IAJapan: International Accreditation Japan

JCSS: Japan Calibration Service System

SAC: Singapore Accreditation Council

TISI: Thai Industrial Standard Institute

KAN: Komite Akreditasi Nasional

BoA: BUREAU OF ACCREDITATION

STANDARDS MALAYSIA: Department of Standards Malaysia

TAF: Taiwan Accreditation Foundation

NABL: National Accreditation Board for Testing and Calibration Laboratories

CNAS: China National Accreditation Service for Conformity Assessment

UKAS: United Kingdom Accreditation Service

RvA: Raad voor Accreditatie

DAkkS: Deutsche Akkreditierungsstelle GmbH

SAS: Swiss Accreditation Service

ACCREDIA: L'ENTE ITALIANO DI ACCREDITAMENTO

SWEDAC: Swedish Board for Accreditation and Conformity Assessment

A2LA: American Association for Laboratory Accreditation

CLAS/SCC: Calibration Laboratory Assessment Service / Standards Council of Canada

EMA: Entidad Mexicana de Acreditación, a.c.

CGCRE: Coordenação Geral de Acreditação do INMETRO

OAA: Organismo Argentino de Acreditación

Name of each National metrology institutes and Accreditation bodies are based on our survey.

As of 20th July, 2016

Scope of End-standard Calibration

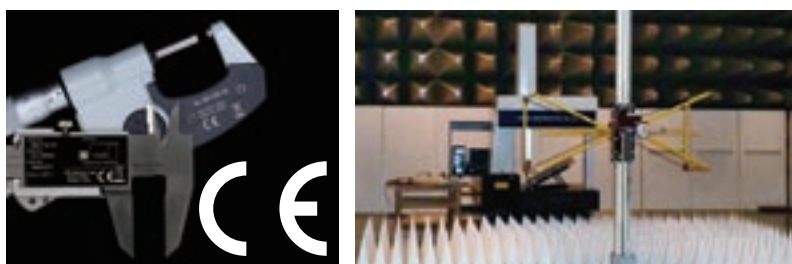
Scope and Highest Measurement Capacity of JCSS Accredited Calibration Laboratory

	High accuracy end standard for Gauge block, etc.	End standard for Gauge block, etc.	High accuracy end standard for Gauge block, etc.	End standard for Gauge block, etc.	Laser wavelength	Standard scale
Scope	Miyazaki Plant No.0030		Utsunomiya Measurement Standards Calibration Center No.0031			
	Interferometry 0.1mm or above 1000mm or below	Comparison 0.1mm or above 1000mm or below	Interferometry Over 500mm 1000mm or below	Comparison 0.5mm or above 1000mm or below	Wavelength of Range 633nm	1000mm or below
Best measurement performance L=nominal length (mm) (k=2)	0.1mm or above 100mm or below 0.020μm Over 100mm 250mm or below (0.010+0.00010·L)μm Over 250mm 1000mm or below (0.020+0.00020·L)μm	0.1mm or above 100mm or below 0.06μm Over 100mm 1000mm or below (0.04+0.00043·L)μm	Over 500mm 1000mm or below (0.24+0.07·L/1000)μm	0.5mm or above 100mm or below 0.06μm Over 100mm 1000mm or below (0.04+0.00043·L)μm	4.2×10 ⁻¹¹	350mm or below (0.10+0.12·L/1000)μm Over 350mm 1000mm or below (0.06+0.25·L/1000)μm

As of 1st April, 2016

Conformance to CE Marking

In order to improve safety, each plant has programs to comply with the Machinery Directives, the EMC Directives, and the Low Voltage Directives. Compliance to CE marking is also met. CE stands for "Conformité Européenne". CE marking indicates that a product complies with the essential requirements of the relevant European health, safety and environmental protection legislation.



Conformity evaluation for CE marking (EMC Directives)

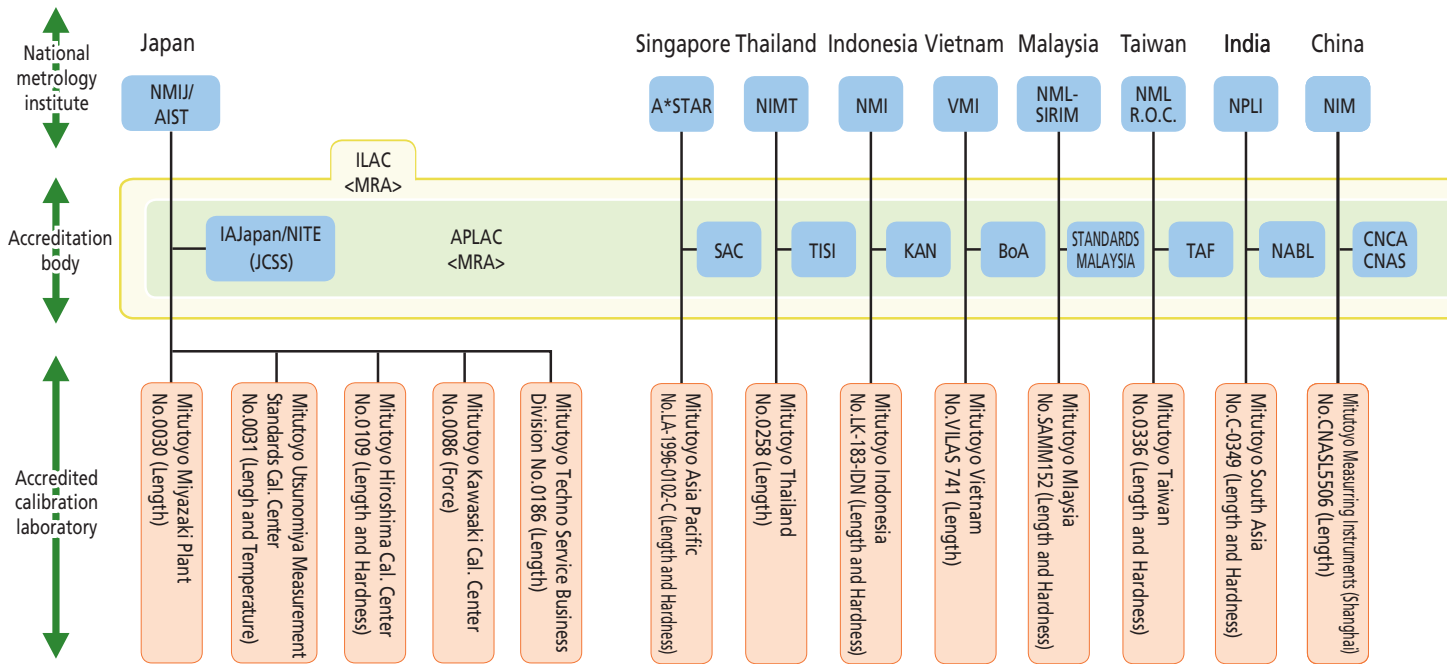
Major EU Directives relating to Mitutoyo products

Name of EU Directive	Applicable range
Machinery Directive	At least 1 part of a machine that may cause injury to human body if it moves due to movement of an actuator such as a motor
EMC Directive (Electromagnetic Compatibility Directive)	A product that may produce electromagnetic wave or which is influenced by electromagnetic wave from outside.
Low Voltage Directive	Equipment (device) that uses AC voltage of 50 - 1000V or DC voltage of 75 - 1500V.

Traceability System to National Standard

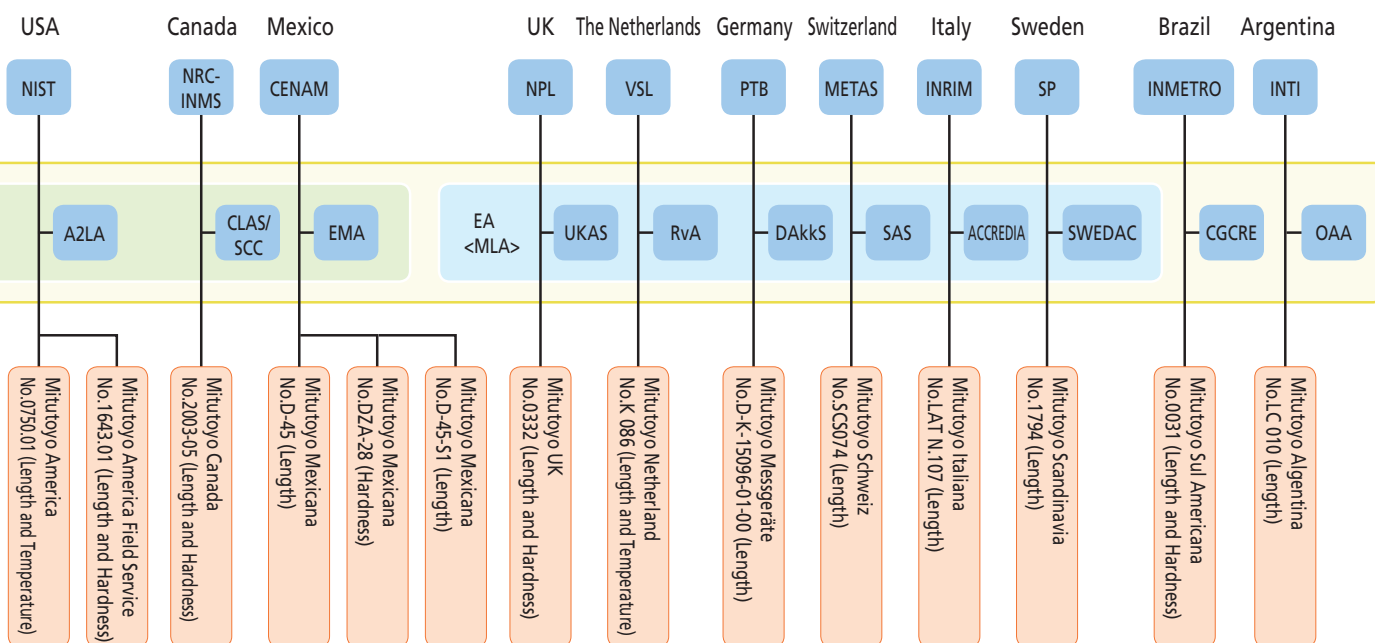
Calibration laboratories worldwide

Mitutoyo has built a network for comprehensive support of calibration of precision measuring products in the global market. To provide calibration services on a global scale, Mitutoyo has calibration laboratories that have received ISO/IEC 17025 certification, an international standard, from accredited organizations in each of the countries in which Mitutoyo operates in Japan and abroad.



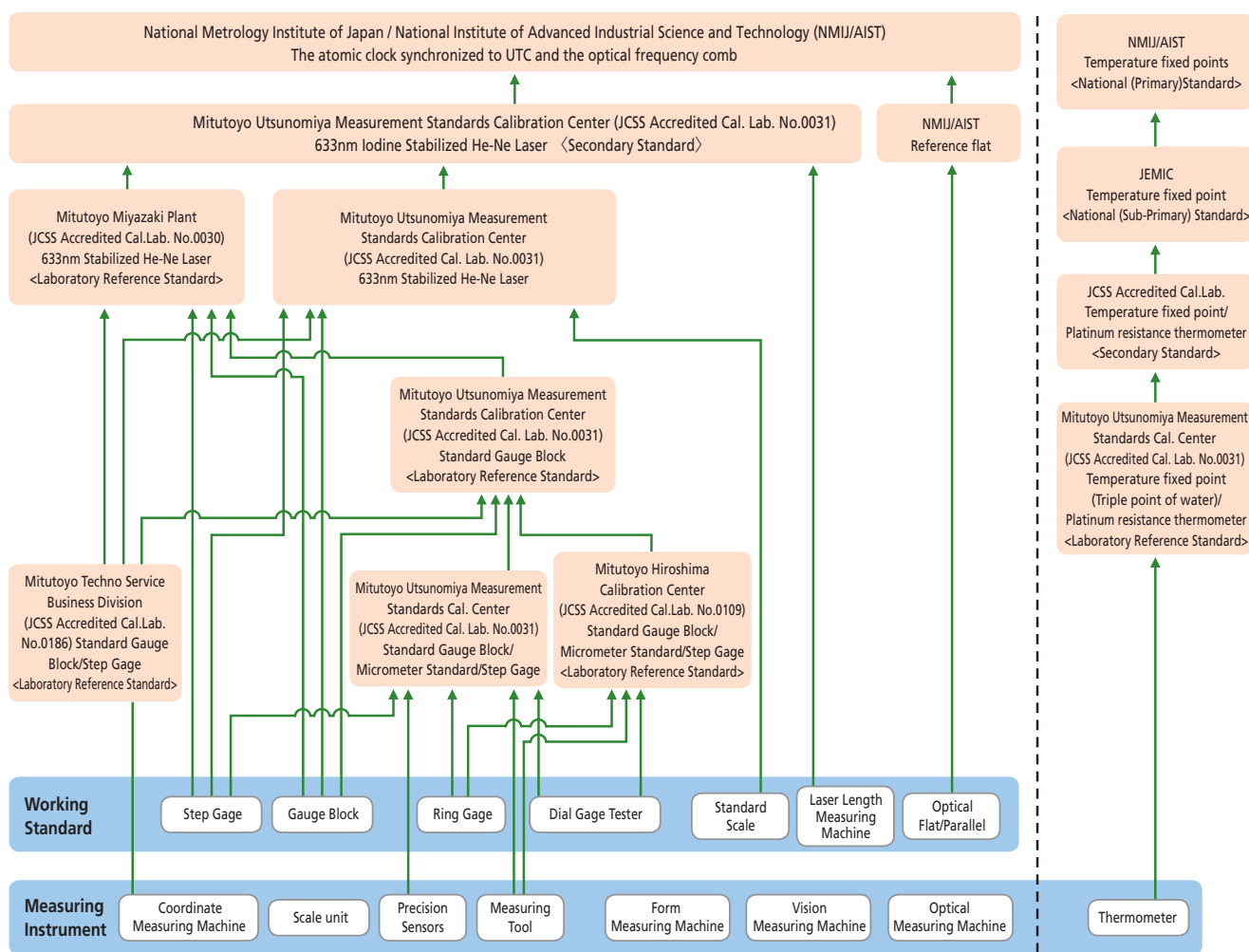
- Japan
 - AIST :National Institute of Advanced Industrial Science and Technology
 - NMIJ :National Metrology Institute of Japan
 - IAJapan :International Accreditation Japan
 - NITE :National Institute of Technology and Evaluation
 - JCSS :Japan Calibration Service System
- Singapore
 - A*STAR :Agency for Science, Technology and Research
 - SAC :Singapore Accreditation Council
- Thailand
 - NIMT :National Institute of Metrology (Thailand)
 - TISI :Thai Industrial Standard Institute
- Indonesia
 - NMI :Puslit Metrologi-LPI
 - KAN :Komite Akreditasi Nasional
- Vietnam
 - VMI :Vietnam Metrology Institute
 - BoA :BUREAU OF ACCREDITATION
- Malaysia
 - NML-SIRIM :National Metrology Laboratory-Standards and Industrial Research Institute of Malaysia
 - STANDARDS :Department of Standards Malaysia
 - MALAYSIA
- Taiwan
 - NML R.O.C. :National Measurement Laboratory R.O.C.
 - TAF :Taiwan Accreditation Foundation
- India
 - NPLI :National Physical Laboratory of India
 - NABL :National Accreditation Board for Testing and Calibration Laboratories
- China
 - NIM :National Institute of Metrology
 - CNCA :Certification and Accreditation Administration of the people's Republic of China
 - CNAS :China National Accreditation Service for Conformity Assessment
- USA
 - NIST :National Institute of Standards and Technology
 - A2LA :American Association for Laboratory Accreditation
- Canada
 - NRC-INMS :National Research Council Canada -Institute for National Measurement Standards
 - CLAS/SCC :Calibration Laboratory Assessment Service / Standards Council of Canada
- Mexico
 - CENAM :Centro Nacional de Metrología
 - EMA :Entidad Mexicana de Acreditación, a.c.
- UK
 - NPL :National Physical Laboratory
 - UKAS :United Kingdom Accreditation Service
- The Netherland
 - VSL :Van Swinden Laboratorium
 - RvA :Raad voor Accreditatie
- Germany
 - PTB :Physikalisch-Technische Bundesanstalt
 - DAkkS :Deutsche Akkreditierungsstelle GmbH

Note: The above are domestic and international locations where Mitutoyo provides ISO/IEC 17025 accredited calibration services. (As of 18th December, 2015)



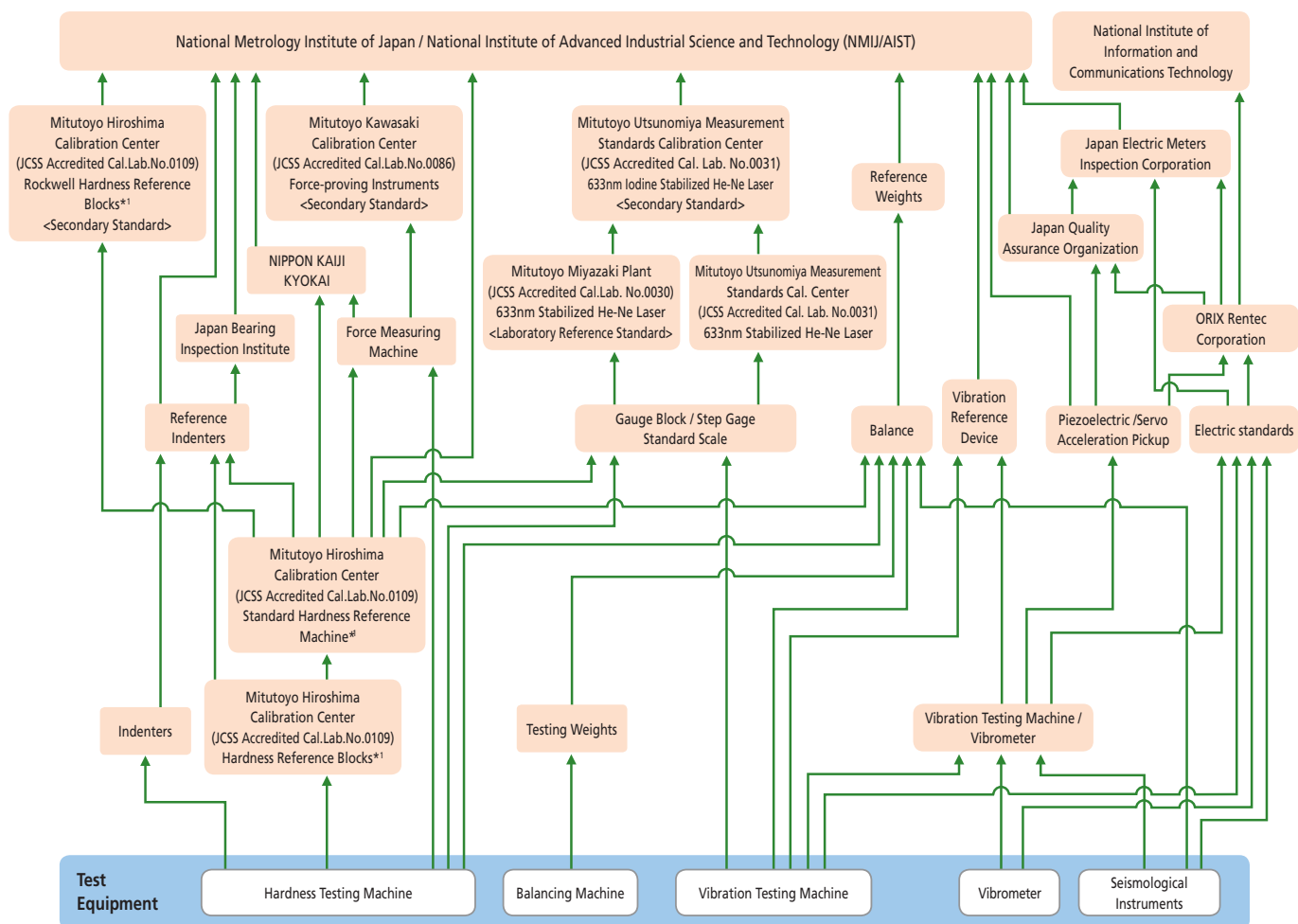
- Switzerland
METAS :Federal Institute of Metrology
SAS :Swiss Accreditation Service
- Italy
INRIM :Istituto Nazionale di Ricerca Metrologica
ACCREDIA :L'ENTE ITALIANO DI ACCREDITAMENTO
- Sweden
SP :SP Technical Research Institute of Sweden
SWEDAC :Swedish Board for Accreditation and Conformity Assessment
- Brazil
INMETRO :Instituto Nacional de Metrologia Qualidade e Tecnologia
CGCRE :Coordenação Geral de Acreditação do INMETRO
- Argentina
INTI :Instituto Nacional de Tecnología Industrial
OAA :Organismo Argentino de Acreditación
- ILAC :International Laboratory Accreditation Cooperation
APLAC :Asia-Pacific Laboratory Accreditation Cooperation
MRA :Mutual Recognition Arrangement
EA :European co-operation for Accreditation
MLA :Multilateral Agreement

Traceability of length field

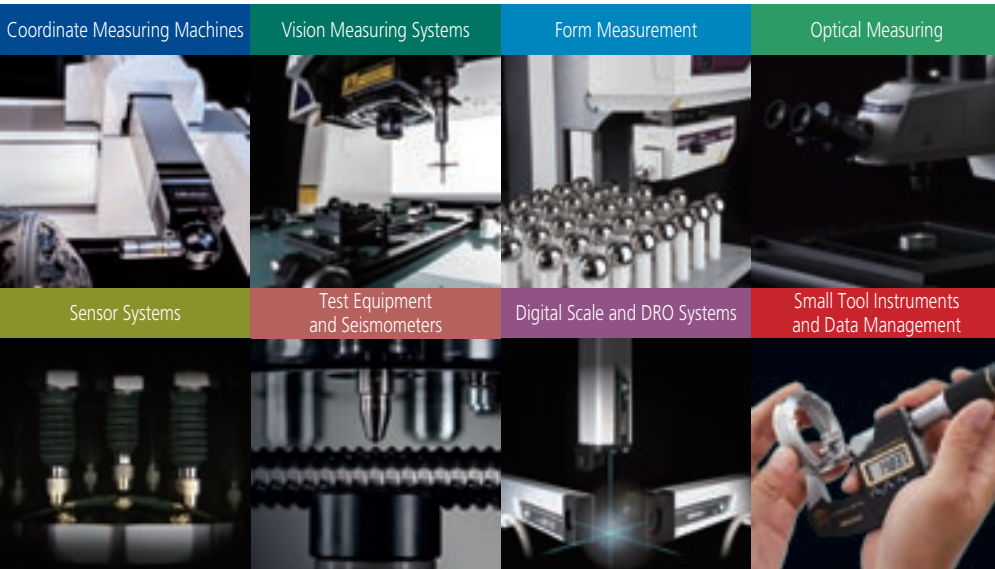


Note: This chart shows a simplified traceability system of Mitutoyo. Detailed traceability charts are published for each product.

Traceability of Test Equipment



*1 The scope of JCSS accreditation is from 20HRC up to 65HRC in the Rockwell Hardness Testing Machines and the Hardness Reference Blocks.
 Note: This chart shows a simplified traceability system of Mitutoyo. Detailed traceability charts are published for each product.
 (As of December, 2015)



Whatever your challenges are, Mitutoyo supports you from start to finish.

Mitutoyo is not only a manufacturer of top quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed up by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver bespoke measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.



Find additional product literature and our product catalogue

<http://www.mitutoyo.co.jp/global.html>

Note: Product illustrations are without obligation. Product descriptions, in particular any and all technical specifications, are only binding when explicitly agreed upon.
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