



# National Accreditation Board for Testing and Calibration Laboratories

## SCOPE OF ACCREDITATION

**Laboratory Name :**

METROLOGY LABORATORY, CMTI, TUMKUR ROAD, BENGALURU, KARNATAKA, INDIA

**Accreditation Standard**

ISO/IEC 17025:2017

**Certificate Number**

CC-2153

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16/03/2023

S.No	Discipline / Group	Measurand or Reference Material/Type of instrument or material to be calibrated or measured / Quantity Measured /Instrument	Calibration or Measurement Method or procedure	Measurement range and additional parameters where applicable(Range and Frequency)	* Calibration and Measurement Capability(CMC)(±)
Permanent Facility					
1	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Angle Gauge Blocks	Using Autocollimator & Index Table by Comparison Method	0 ° to 90 °	1.2arc sec
2	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Angle Gauge Blocks	Using Rotary Table & Electronic Probe by Comparison Method	4 arc sec to 90 °	1.8arc sec
3	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Ball Bar System a)Ball Bar Calibrator	Using Coordinate Measuring Machine by Direct method	up to 300 mm	(1+L/3000)µm , L is in mm
4	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Ball Bar System b) Ball Bar Transducer@ 100 mm ± 1 mm Resolution: 0.01 micron	Using Universal Length Measuring Machine by Direct method	1 mm	0.4µm



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5	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Bench Centre: Co-axiality of Centres Parallelism of the axis of centres	Using Coordinate Measuring Machine by Direct method	50 mm to 600 mm	3.0µm
6	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Bevel Protractor / Combination Set a) Angle Resolution: 1 arc min	Using Profile Projector by Direct method	0 ° to 180 °	2.5arc min
7	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Bevel Protractor / Combination Set b) Geometrical Parameters (Parallelism, Straightness, Squareness & Flatness)	Using Digital Height Gauge & Electronic Probe & Surface Plate by Direct method	0 ° to 180 °	2.0µm
8	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Bore Gauge: Transmission Range:2 mm Resolution: 1 micron	Using Universal Length Measuring Machine by Direct method	300 mm	2.0µm



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9	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Clinometer Resolution: 60 arc sec	Using Electronic Level / Rotary Table by Comparison method	0 ° to 180 °	20arc sec
10	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Coincidence Level a) Sensitivity Sensitivity: 0.01 mm/m & coarser	Using Electronic Level & Rotary Table by Comparison method	200 µm/m	8 µm/m
11	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Cylindrical Rollers / Pins	Using Universal Length Measuring Machine by Direct method	0.1 to 20 mm	0.5µm
12	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Dial Gauge Plunger / Lever Type (Mechanical / Electronic) Resolution: 1 micron f) Sensitivity and Hysteresis	Using Precision Mandrel (Eccentric) by Direct method	0 to 100 mm	2.0µm
13	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Dial Gauge Lever Type (Mechanical / Digital) Resolution: 0.2 micron	Using Universal Length Measuring Machine / Gr '0' Slip Gauges by Comparison method	0 to 0.8 mm	0.4µm





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14	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Dial Gauge Lever Type (Mechanical / Digital) Resolution: 0.5 micron	Using Universal Length Measuring Machine / Gr '0' Slip Gauges by Comparison method	0 to 2 mm	0.5µm
15	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Dial Gauge Plunger Type (Mechanical / Digital) a)Resolution: 0.1 micron	Using Universal Length Measuring Machine / Gr '0' Slip Gauges by Comparison method	0 to 25 mm	0.3µm
16	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Dial Gauge Plunger Type (Mechanical / Digital) c)Resolution: 0.5 micron	Using Universal Length Measuring Machine / Gr '0' Slip Gauges by Comparison method	0 to 2 mm	0.5µm
17	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Dial Gauge Plunger Type (Mechanical / Digital) e)Resolution: 10.0 micron	Using Universal Length Measuring Machine / Gr '0' Slip Gauges by Comparison method	0 to 100 mm	7µm
18	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Dial Gauge Plunger Type (Mechanical / Digital) Resolution: 0.2 micron	Using Universal Length Measuring Machine / Gr '0' Slip Gauges by Comparison method	0 to 0.8 mm	0.4µm



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19	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Dial Gauge Plunger Type (Mechanical / Digital) Resolution: 1.0 micron	Using Universal Length Measuring Machine / Gr '0' Slip Gauges by Comparison method	0 to 50 mm	0.8µm
20	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Digital / Dial / Vernier - Caliper Depth Gauge / Gear Tooth Caliper Resolution: 10 µm c) Parallelism	Using Profile Projector by Direct method	Up to 1000 mm (Gear Tooth Vernier upto 300 mm)	2.5µm
21	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Digital / Dial/ Vernier - Calipers / Depth Gauge / Gear Tooth calipers Resolution: 10 µm a) Length	Using Gr "0" Slip Gauges, Master Ring Gauges by Direct method	Up to 300 mm	10µm
22	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Digital/ Dial/ Vernier - Calipers / Depth Gauge / Gear Tooth Calipers Resolution: 10 µm b)Length	Using Gr "0" Slip Gauges, Master Ring Gauges by Direct method	>300 mm to 1000 mm	10.3µm
23	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Electronic Probe - Lever Type Resolution: 0.1 micron	Using Universal Length Measuring Machine by Comparison method	Up to 2.0 mm	0.3µm



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24	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Electronic Probe - Plunger Type: a) Resolution: 0.1 micron	Using Universal Length Measuring Machine by Comparison method	Up to 25 mm	0.3µm
25	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Electronic Probe - Plunger Type: Resolution: 1.0 micron	Using Universal Length Measuring Machine by Comparison method	Up to 50 mm	0.7µm
26	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Feeler Gauges	Using Digital Micrometer (L.C: 1 micron) by Direct method	Up to 1 mm	2.0µm
27	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Frame Level a) Sensitivity Sensitivity: 0.01 mm/m and coarser	Using Electronic Level & Rotary Table by Comparison method	200 µm/m	8 µm/m
28	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Frame Level c) Geometrical Parameter i) Flatness of base	Using Surface Plate, Electronic Probe by Direct method	Up to 250 mm (Base length)	2.8 µm





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29	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Frame Level c) Geometrical Parameter ii) Parallelism of "V" wrt base flat	Using Electronic Probe & Cylindrical Test Mandrel by Direct method	Up to 250 mm (Base length)	2.8 μm
30	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Frame Level c) Geometrical Parameter iii) Parallelism between the faces	Using Electronic Probe by Direct method	Up to 250 mm (Base length)	2.8 μm
31	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Frame Level c) Geometrical Parameter iv) Squareness	Using Electronic Probe & Cylindrical Test Mandrel by Direct method	Up to 250 mm (Base length)	2.8 μm
32	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Granite Square / Try Square / Granite Cube - Squareness	Using Coordinate Measuring Machine by Direct method	Up to 800 X 1300 mm	3.2μm
33	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Height Gauge (Digital/ Vernier) Resolution: 10 micron a) Linear Accuracy	Using Step Gauge/ Grade "0" Slip Gauges, Electronic Probe by Comparison method	Up to 1000 mm	(6.0+L/1000)μm, L is in mm



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34	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Height Gauge (Digital/ Vernier) Resolution: 10 micron b)Geometrical Parameter (Flatness, Parallelism, Squareness)	Using Electronic Probe, Master Cylinder/ Granite Square by Comparison method	Up to 1000 mm	2.0µm
35	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Inclinometer Resolution:1deg	Using Rotary Table by Comparison method	0 ° to 90 °	18arc min
36	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Index Table	Using Autocollimator & Polygon Mirror by Comparison method	0 ° to 360 °	1.1arc sec
37	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Involute & Lead Master /Master Gears ( Spur / Helical) : Profile, Helix Angle Error, Pitch & Run Out	Using Gear Testing Machine by Direct method	Up to 300 mm	2.8 µm





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38	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Lever Arm : Linear Distance	Using Coordinate Measuring Machine by Direct method	Up to 1200 mm	(2.0+L/450)µm, L is in mm
39	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Micrometers / Depth Micro-meters / Micrometer Head Resolution: 1 micron a) Thimble Accuracy	By using Universal Length Measuring Machine / Gr "0" Slip Gauges & Electronic Probe by Direct method	Up to 100 mm	1.0µm
40	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Micrometers / Depth Micro-meters / Micrometer Head Resolution: 1 micron b) Thimble Accuracy	Using Universal Length Measuring Machine / Gr "0" Slip Gauges & Electronic Probe by Direct method	>100 to 300 mm	2.0µm
41	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Micrometers / Depth Micro-meters / Micrometer Head Resolution: 1 micron c) Thimble Accuracy	Using Universal Length Measuring Machine / Gr "0" Slip Gauges & Electronic Probe by Direct method	>300 to 1000 mm	5.0µm
42	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Micrometers / Depth Micro-meters / Micrometer Head Resolution: 1 micron d) Parallelity & Flatness of Anvils	Using Optical Flat & Parallel by Direct method	Up to 1000 mm	1.0µm



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43	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Radius Gauges	Using Profile Projector by Direct method	Up to 25 mm	20.0µm
44	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Rotary Table / Optical Dividing Head Resolution: 1 arc sec	Using Autocollimator & Polygon Mirror by Comparison method	0 ° to 360 °	1.2arc sec
45	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Gauge Rods / Extension Rods	Using Gr "0" Slip Gauges & Electronic Probe by Comparison method	>100 to 300 mm	(1.0+L/800)µm, L is in mm
46	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Gauge Rods / Extension Rods	Using Length Measuring Machine by Direct method	>300 to 1000 mm	(5.5+L/800)µm, where L is in mm
47	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Gauge Rods / Extension Rods	Using Gr "0" Slip Gauges & Electronic Probe by Comparison method	Up to 100 mm	1.0 µm



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48	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Gauge Rods / Extension Rods	Using Laser Measurement System by Direct method	Up to 1000 mm	$(3.0+L/2000)\mu\text{m}$ , L is in mm
49	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Master for Electronic Height Gauge	Using Gr "0" Slip Gauges & Electronic Probe by Comparison method	Up to 50 mm	1.0 $\mu\text{m}$
50	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Plug Gauges / Master Disc a) Diameter	Using Universal Length Measuring Machine / Gr "0" Slip gauges & Electronic Probe by Comparison method	Up to 100 mm	$(0.3+L/550)\mu\text{m}$ , L is in mm
51	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Plug Gauges / Master Disc b) Diameter	Using Universal Length Measuring Machine / Gr "0" Slip gauges & Electronic Probe by Comparison method	>100 mm to 300 mm	$(0.5+L/500)\mu\text{m}$ , L is in mm
52	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Plug Gauges / Master Disc c) Diameter	Using CMM by Direct method	Up to 300 mm	$(0.8+L/500)\mu\text{m}$ , L is in mm





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53	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Plug Gauges / Master Disc d) Circularity	Using Form Tester by Direct method	Up to 300 mm , roundness up to 20 $\mu\text{m}$	0.1 $\mu\text{m}$
54	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Plug Gauges / Master Disc e) Roughness	Using Roughness Tester by Direct method	Ra. 10 $\mu\text{m}$	5.5%
55	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Ring Gauges a) Diameter	Using Universal Length Measuring Machine by Comparison method	3 to 100 mm	(0.83+L/485) $\mu\text{m}$ , L is in mm
56	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Ring Gauges b) Diameter	Using Universal Length Measuring Machine by Comparison method	>100 mm to 275 mm	(0.9+L/250) $\mu\text{m}$ , L is in mm
57	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Ring Gauges c) Diameter	Using CMM by Direct method	Up to 275 mm	(0.98+L/975) $\mu\text{m}$ , L is in mm



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58	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Ring Gauges dia upto 275 mm d) Circularity	Using Form Tester by Direct method	Up to 20 $\mu\text{m}$	0.1 $\mu\text{m}$
59	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Setting Ring Gauges dia upto 275 mm e) Roughness	Using Roughness Tester by Direct method	Ra. 10 $\mu\text{m}$	5.5%
60	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Sine Bar / Sine Centre / Sine Table a) Angle	Using Gr "0" Slip Gauges, Angle Gauges, Electronic Probe & CMM by Comparison method	Up to 500 mm	3.3arc sec
61	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Sine Bar / Sine Centre / Sine Table b)Centre distance between Rollers, Parallelism w.r.t base, Parallelism of end surface with respect roller, Flatness of working face.	Using Gr "0" Slip Gauges, Angle Gauges, Electronic Probe & CMM by Comparison method	Up to 500 mm	1.2 $\mu\text{m}$



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62	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Spirit Level a) Sensitivity Sensitivity: 0.01 mm/m and coarser	Using Electronic Level & Rotary Table by Comparison method	200 µm/m	8 µm/m
63	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Spirit Level c) Geometrical Parameter i) Flatness of base	Using Surface Plate, Electronic Probe by Direct method	Up to 250 mm (Base length)	2.8 µm
64	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Spirit Level c) Geometrical Parameter ii) Parallelism of "V" wrt base flat	Using Electronic Probe & Cylindrical Test Mandrel by Direct method	Up to 250 mm (Base length)	2.8 µm
65	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Steel Scales L.C: 0.5 mm	Using Profile Projector & Length Measuring Machine by Direct method	>200 to 2000 mm	(13+L/125)µm, L is in mm
66	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Steel Scales L.C: 0.5 mm	Using Profile Projector & Length Measuring Machine by Direct method	Up to 200 mm	10µm





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67	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Steel Tapes & Pi Tapes L.C: 0.5 mm	Using Profile Projector & Length Measuring Machine by Direct method	Up to 15 m length	(25+L/250) $\mu$ m, L is in mm
68	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Stick type Internal Micrometer Resolution: 1 micron	Using Universal Length Measuring Machine / Gr "0" Slip Gauges & Electronic Probe by Direct method	50 mm to 1000 mm	3.0 $\mu$ m for Thimble accuracy &. (5.3 +L/109) $\mu$ m for extension rods. where L in mm
69	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Straight Edge & Parallels a) Straightness	Using Electronic Probe / Electronic Level by Direct method	50 mm to 2000 mm	2.0 $\mu$ m
70	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Straight Edge & Parallels b) Parallelism	Using Electronic Probe	50 mm to 2000 mm	2.0 $\mu$ m
71	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Surface Plate	Using CMM by Direct method	630 X 630 mm	2.5 $\mu$ m



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72	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Surface Plate	Using Electronic Level by Direct method	Up to 5000 mm x 5000 mm longer side	0.74 * Sqrt (L+W)/100µm Where,L & W are in mm
73	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Plug Gauges a) Half Taper Angle	Using CMM by Direct method	10 °	6 arc sec
74	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Plug Gauges b) Dia @ end	Using CMM by Direct method	200 mm major Dia X 450 mm	1.5µm
75	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Plug Gauges d) Straightness	Using Form Tester by Direct method	Up to 450 mm length	1.0µm
76	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Plug Gauges d) Straightness	Using CMM by Direct method	Up to 450 mm length	2.0µm



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77	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Plug Gauges e) Roughness	Using Roughness Tester by Direct method	Up to Ra. 10 µm	5.5%
78	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Plug Gauges up to 200 mm major dia c) Circularity	Using Form Tester by Direct method	20 µm	0.1µm
79	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Ring Gauges b) Dia @ end	Using CMM by Direct method	Up to 200 mm major Dia X 450 mm length	1.5µm
80	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Ring Gauges d) Straightness	Using Form Tester by Direct method	Up to 450 mm length	1.0 µm
81	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Ring Gauges d) Straightness	Using CMM by Direct method	Up to 450 mm length	2.0µm





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82	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Ring Gauges e) Roughness	Using Roughness Tester by Direct method	Up to Ra 10 $\mu$ m	5.5%
83	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Ring Gauges 200 mm c) Circularity	Using Form Tester by Direct method	Up to 20 $\mu$ m	0.1 $\mu$ m
84	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Taper Ring Gauges Size 200 mm Dia X 450 mm Gauge Length a) Taper Angle	Using CMM by Direct method	10 °	6arc sec
85	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Test Mandrels a) Taper Angle (1000 mm long for Taper Mandrel) (Half Taper Angle)	Using CMM by Direct method	Up to 30 °	6.0arc sec
86	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Test Mandrels b) Dimension: Diameter	Using Marameter by Direct method	Up to 1000 mm (Long)	2.0 $\mu$ m



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87	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Test Mandrels c) Geometrical Parameters: Roundness, Straightness, Cylindricity, Roughness and Concentricity	Using CMM by Direct method	Up to 1000 mm	2.0µm
88	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Test Mandrels c) Geometrical Parameters: Roundness, Straightness, Cylindricity, Roughness and Concentricity	Using Form Tester by Direct method	Up to 450 mm	1.2µm
89	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Test Mandrels c) Geometrical Parameters: iv) Run out	Using Bench Center, Electronic Probe by Direct Method	Up to 600 mm	2.0 µm
90	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Test Mandrels up to 1000 mm long d) Roughness	Using Roughness Tester by Direct method	Up to Ra. 10 µm	5.5%



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91	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Test Sieves a) Wire Clothes	Using Profile Projector by Direct method	32 µm to 4 mm	3.0µm
92	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Test Sieves b) Wire Clothes / Mesh of wires	Using Profile Projector by Direct method	>4 mm to 10 mm	10µm
93	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Test Sieves c) Perforated Plate	Using Vernier Caliper by Direct method	>10 to 125 mm	100µm
94	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Thread Measuring Wire	Using Universal Length Measuring Machine by Direct method	0.17 to 6.35 mm	0.5µm
95	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Thread Pitch Gauges a) Pitch	Using Profile Projector by Direct method	Up to 6 mm	1.4µm





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96	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Thread Pitch Gauges b) Flank Angle (Half angle)	Using Profile Projector by Direct method	Up to 30 °	1.2arc min
97	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Thread Plug Gauges a) Diameter	Using Universal Length Measuring Machine by Comparison method	Up to 125 mm dia	2.0µm
98	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Thread Plug Gauges b) Pitch	Using Profile Projector by Direct method	Up to 6 mm pitch	1.0µm
99	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Thread Plug Gauges c) Flank Angle (Half angle)	Using Profile Projector by Direct method	Up to 30 °	2.5arc min
100	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Thread Ring Gauges (Effective Dia & Minor Dia)	Using Universal Length Measuring Machine & Bore Gauge by Direct method	3 to 125 mm	2.0µm



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101	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Thread Ring Gauges b) Pitch	Using Profile Projector by Direct method	Up to 6 mm pitch	2.0 μm
102	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Thread Ring Gauges c) Flank Angle (half angle)	Using Profile Projector by Direct method	Up to 30 °	2.5arc min
103	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	V Block (Single non-paired) c) Symmetry of V axis	Using Electronic Probe & Mandrel by Comparison method	200X125X90 mm	3.0μm
104	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Glass Grid d) Circular / Square / Rectangle Shape	Using Profile Projector (LC 0.1 μm) by Direct method	Up to 200 mm	2.5μm
105	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Glass Grid a) Grating L.C.: 0.1 mm	Using Profile Projector(LC 0.1μm) by Direct method	Up to 200 mm	2.5μm



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106	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	2D Height Gauge / Height Measuring Instrument Resolution: 0.1 micron a) Linear	Using Step Gauge/ Grade "0" Slip Gauges, Electronic Probe by Comparison method	Up to 1000 mm	(1.0+L/400)mm, L is in mm
107	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	2D Height Gauge / Height Measuring Instrument Resolution: 0.1 micron b) Squareness	Using Master Cylinder/ Granite Square by Comparison method	Up to 1000 mm	1.6µm
108	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Angular Graticule L.C.: 1 arc min	Using Profile Projector, LC 1 arc sec by Direct method	0 to 360 °	66arc sec
109	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Articulated Arm CMM (Portable Arm CMM), Linear, Size Error, Location Error Resolution: 1 micron	Using Long Slip Gauge K Grade & Master Sphere by Direct method	Up to Dia 2.5 m	(6.2+L/1050)mm, L is in mm
110	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Autocollimator Resolution: 0.05 arc sec	Using Auto-collimator & Double sided Plane Parallel Reflector by Comparison method	Up to 2000 arc sec	0.5arc sec
111	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Caliper Checker / Check Master / Inside Micro Checker	Using Step Gauge & Coordinate Measuring Machine by Comparison method	Up to 1100 mm	(0.85+L/450) µm , L is in mm





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112	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Co-ordinate Measuring Machine a) Maximum Permissible Error of length measurement E 0, MPE Resolution: 0.01 micron	Using Step Gauges / Slip Gauges by Direct method	1300X900X700 mm	(0.3+L/3111) $\mu$ m, L is in mm
113	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Co-ordinate Measuring Machine b) Maximum Permissible Error P FTU, MPE Resolution: 0.01 micron	Using Master Sphere by Direct method	1300X900X700 mm	0.1 $\mu$ m
114	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Co-ordinate Measuring Machine c) Rotary FA, FR and FT Resolution: 0.5 arc sec	Using Calibration Spheres by Direct method	1300X900X700 mm	0.4 $\mu$ m
115	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Depth Microchecker a) Pitch Block Accuracy	Using Gr "0" Slip Gauges & Electronic Probe by Comparison method	Up to 300 mm	(0.65+L/500) $\mu$ m, L is in mm
116	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Depth Microchecker b) Parallelity	Using Gr "0" Slip Gauges & Electronic Probe by Comparison method	Up to 300 mm	2.0 $\mu$ m
117	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Dial Gauge Calibrator/ Tester Resolution: 0.1 micron	Using Universal Length Measuring Machine by Comparison method	0 to 25 mm	0.3 $\mu$ m



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118	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Dial Gauge Calibrator/ Tester Resolution: 0.1 micron	Using Gr '0' Slip Gauges & Electronic Probe by Comparison method	0 to 25 mm	0.5µm
119	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Electronic Level a) Angle Resolution: 0.1 arc sec	Using Autocollimator, Plane Mirror, on a common Tilt Table by Comparison method	Up to 1000 arc sec	1.0arc sec
120	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Electronic Level b) Angle Resolution: 0.1 arc sec	Using Electronic Level on a common Tilt Table by Comparison method	Up to 1000 arc sec	1.5arc sec
121	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Electronic Level c) Angle (Resolution 0.1 arc sec)	Using Rotary Table by Comparison method	1000 arc sec to 45 deg	2.5arc sec
122	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Electronic Level d) Geometrical Parameter (Flatness, Parallelism & Squareness) iii) Parallelism	Using Electronic Probe & Cylindrical test mandrel	Up to 200 mm (Base length)	2.0 µm
123	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Electronic Level d) Geometrical Parameter (Flatness, Parallelism & Squareness) iv) Squareness	Using Electronic Height Gauge and Cylindrical test mandrel	Up to 200 mm (Base length)	2.0µm



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124	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Electronic Level d) Geometrical Parameter (Flatness, Parallelism & Squareness) i) Flatness	Using Coordinate Measuring Machine	Up to 200 mm (Base length)	2.0 μm
125	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Electronic Level d) Geometrical Parameter (Flatness)	Using Electronic Probe by Direct method	Up to 200 mm	2.0mm
126	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Extensometer Resolution : 1 μm	Using Electronic Height Gauge (Resolution: 0.1μm) & Profile Projector by Direct method	Up to 5 mm	1.7μm
127	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Flatness Interferometer	Using Reference (Transmission) Flat by Direct method	Up to dia 100 mm	40nm
128	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Gear Testing Machine	Using Lead & Profile Master, Master Gear by Direct method	Up to 300 mm	2.6μm
129	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Glass Scales/ Glass Grid b) Grating L.C.: 0.01 mm	Using F25 CMM by Direct method	Up to 100 mm	0.9μm





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130	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Glass Scales/ Glass Grid c) Grating L.C.: 0.1 mm	Using Laser Measurement System by Direct method	Up to 400 mm	$(0.3+L/500)\mu\text{m}$ , L is in mm
131	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Height Master Resolution: 0.1 micron	Using Step Gauge & Coordinate Measuring Machine/ Grade "0" Slip Gauges, Electronic Comparator by Comparison method	Up to 1000 mm	$(0.4+L/2000)\mu\text{m}$ , L is in mm
132	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Length Bars	Using Grade "K" Slip Gauges & Electronic Probe by Comparison method	Above 100 to 300 mm	$(0.45+L/1000)\mu\text{m}$ , L is in mm
133	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Length Bars	Using CMM & Long Slip Gauges by Comparison method	Above 300 to 1000 mm	$(0.6+L/925)\mu\text{m}$ , L is in mm
134	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Length Bars	Using Slip Gauges & Slip Gauge Comparator by Comparison method	Up to 100 mm	$(0.056+L/1600)\mu\text{m}$ , L is in mm
135	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Length Measuring Machine LC: 1 micron	Using Laser Measuring System/ Slip Gauges by Direct method	0 to 2.5 m	$(3+L/110)\mu\text{m}$ , L is in mm



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136	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Magnification Master (Flick Standard)	Using Form Tester by Direct method	>20 to 300 $\mu\text{m}$	$(0.40+L/400)\mu\text{m}$ , L is in mm
137	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Magnification Master (Flick Standard)	Using Form Tester by Direct method	Up to 20 mm	0.4 $\mu\text{m}$
138	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Master Cylinder a) Circularity	Using Form Tester by Direct method	Up to 300 mm	0.14 $\mu\text{m}$
139	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Master Cylinder b) Cylindricity & Straightness	Using Form Tester by Direct method	Up to 300 mm	0.6 $\mu\text{m}$
140	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Master Cylinder c) Squareness & Flatness	Using Form Tester by Direct method	Up to 300 mm	1.0 $\mu\text{m}$
141	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Master Cylinder d) Surface Roughness	Using Roughness Tester by Direct method	Up to 300 mm	6.8%
142	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Master Cylinder e) Circularity	Using Form Tester by Direct method	>300 mm to 500 mm	0.173 $\mu\text{m}$



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143	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Master Cylinder f) Cylindricity & Straightness	Using Form Tester by Direct method	Above 300 to 500 mm	1.0µm
144	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Master Cylinder g)Squareness & Flatness	Using Form Tester by Direct method	>300 mm to 500 mm	1.2µm
145	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Master Cylinder h)Surface Roughness	Using Roughness Tester by Direct method	>300 to 500 mm	6.8%
146	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Optical Flat (Flatness)	Using Flatness Interferometer & Reference (Transmission) Flat by Direct method	Up to Dia 100 mm	0.041mm
147	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Optical Flat Dia 250 mm Straightness of horizontal surface	Using Form Tester by Direct method	Over 200 mm	0.4µm
148	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Optical Parallel a) Flatness	Using Flatness Interferometer & Reference (Transmission) Flat by Direct method	Up to Dia 100 mm	0.041mm





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149	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Optical Parallel b) Parallelism	Using Flatness Interferometer & Reference (Transmission) Flat by Direct method	Up to Dia 100 mm	0.067mm
150	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Optical Parallel c) Thickness	Using Universal Length Measuring Machine & Gr "0" Slip Gauges by Comparison method	Up to Dia 100 mm	0.2µm
151	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Polygons Mirror / Prisms	Using Autocollimator & Index Table by Comparison method	360 °	1.3arc sec
152	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Profile Projector a)Length Resolution: 0.1 µm	Using Glass Scale by Direct method	Up to 200 mm	(0.85+L/325)µm, L is in mm
153	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Profile Projector b)Length Resolution: 0.1 µm	Using Laser Measuring System by Direct method	Up to 200 mm	(0.7+L/650)µm, L is in mm
154	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Profile Projector c) Angle Resolution: 1 arc sec	Using Angle Gauge Blocks by Direct method	360 °	17arc sec
155	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Profile Projector d) Magnification	Using Glass Scale & Vernier Caliper by Direct method	100 X	0.4%



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156	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Radius Standard / Contour Master a) Size	Using Universal Length Measuring Machine by Comparison method	Up to 100 mm	0.5µm
157	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Radius Standard / Contour Master b) Size	Using CMM by Direct method	Up to 100 mm	1.5µm
158	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Radius Standard / Contour Master c) Circularity	Using Form Tester by Direct method	Up to 100 mm	0.06µm
159	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Radius Standard / Contour Master d) Roughness	Using Roughness Tester by Direct method	Up to 100 mm	5.5%
160	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Radius Standard / Contour Master e) Contour Master Step Height	Using CMM by Direct method	Up to 100 mm	1.5µm
161	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Rotary Indexer with Laser Measuring System Resolution:0.1 arc sec	Using Indexing Table by Direct method	Up to 360 °	2.1arc sec
162	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roughness Tester a) Stand alone Resolution: 0.3 nm	Using Depth Master & Surface Roughness Masters by Direct method	25 µm	4.1%



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163	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roughness Tester b) Portable Resolution: 1 nm	Using Depth Master & Surface Roughness Masters by Direct method	25 µm	5.5%
164	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roundness / Form Tester a) Roundness Resolution: 0.3 nm	Using Glass Hemisphere by Direct method	Up to Dia 350 mm X 500 mm	0.04µm
165	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roundness / Form Tester b) Magnification	Using Magnification (Flick) Standard by Direct method	Up to Dia 350 mm X 500 mm	0.4µm
166	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roundness / Form Tester c)Straightness of Horizontal Arm, Straightness of Vertical Column and Perpendicularity of Vertical Column	Using Master Cylinder / Optical Flat by Direct method	Up to Dia 350 mm X 500 mm	1.0µm
167	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roundness master (Roundness)	Using Form Tester by Direct method	Up to 300 mm	0.06µm
168	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Slip Gauges / Gauge Blocks a) Metric	Using Gauge Block Interferometer by Direct method	Up to 100 mm	(0.03+L/3000)mm, L is in mm





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169	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Slip Gauges / Gauge Blocks a) Metric	Using Slip Gauges & Slip Gauge Comparator by Comparison method	Up to 100 mm	$(0.056+L/1600)\mu\text{m}$ , L is in mm
170	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Slip Gauges / Gauge Blocks	Using Gauge Block Interferometer by Direct method	Above 100 to 300 mm	$(0.05+L/3000)\mu\text{m}$ , L is in mm
171	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Slip Gauges / Gauge Blocks	Using Grade 'K' Slip Gauges & Electronic Probe by Comparison method	Above 100 to 300 mm	$(0.45+L/1000)\mu\text{m}$ , L is in mm
172	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Slip Gauges / Gauge Blocks	Using CMM & Long Slip Gauges by Comparison method	Above 300 to 1000 mm	$(0.6+L/925)\mu\text{m}$ , L is in mm
173	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Slip Gauges / Gauge Blocks	Using Gauge Block Interferometer by Direct method	Up to 101.6 mm	$(0.03+L/1666)\mu\text{m}$ , L is in mm
174	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Slip Gauges / Gauge Blocks	Using Slip Gauges & Slip Gauge Comparator by Comparison method	Up to 101.6 mm	$(0.056+L/1560)\mu\text{m}$ , L is in mm
175	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Spherical Master , Thread Measuring Balls & Master Steel Balls a) Dimension - Full Sphere	Using Universal Length Measuring Machine by Comparison method	0.8 to 50 mm	0.5 $\mu\text{m}$



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176	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Spherical Master , Thread Measuring Balls & Master Steel Balls b) Dimension - Hemisphere	Using CMM by Direct method	0.8 to 50 mm	2.0µm
177	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Spherical Master , Thread Measuring Balls & Master Steel Balls c) Circularity	Using Form Tester by Direct method	0.8 to 50 mm	0.06µm
178	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Spherical Master , Thread Measuring Balls & Master Steel Balls d) Surface Roughness	Using Roughness Tester by Direct method	0.8 to 50 mm	5.5%
179	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Step Gauges	Using Step Gauges & CMM by Comparison method	Up to 1100 mm	(0.33+L/2010)µm, L is in mm
180	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Surface Roughness Master-Depth	Using Roughness Tester by Direct method	Up to 10 mm	5.5%
181	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Surface Roughness Master: Ra	Using Roughness Tester by Direct method	Up to 7 mm	5.5%
182	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Surface Roughness Master: Rmax	Using Roughness Tester by Direct method	Up to 25 mm	5.5%



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183	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Surface Roughness Master: Rz	Using Roughness Tester by Direct method	Up to 25 mm	5.5%
184	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Test Mandrels c) Geometrical Parameters: ii) Run-out	Bench Center, Electronic Probe by Direct method	Up to 450 mm	1.2 μm
185	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Ultra Precision Co-Ordinate Measuring Machine, F25 Resolution: 0.001 micron	Using Grade "K" Slip Gauges & Glass Scale by Direct method	130X130X100 mm	0.60μm
186	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Universal Length Measuring Machine / Metroscope Resolution: 0.01 micron	Using Laser Measuring System by Direct method	Up to 100 mm	(0.1+L/345)μm, L is in mm
187	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Universal Length Measuring Machine / Metroscope Resolution: 0.01 micron	Using Grade "K" Slip Gauges by Direct method	Up to 100 mm	(0.16+L/500)μm, L is in mm
188	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	V Block (Single non-paired) a) Parallelism	Using Electronic Probe by comparison method	200X125X90 mm	3.0 μm





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189	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	V Block (Single non-paired) b) Squareness	Using Electronic Height Gauge by Comparison Method	200X125X90 mm	3.0 $\mu$ m
190	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Video Measuring System a) Length Resolution: 0.1 micron	Using Glass Scale by Direct method	300X200 mm	(0.7+L/385) $\mu$ m, L is in mm
191	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Video Measuring System b) Angle	Using Angle Gauge Block by Direct method	300X200 mm	5.0arc sec



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Site Facility					
1	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Rotary / Indexing table	Using Laser Measuring System with Rotary Indexer/ Autocollimator by Direct method	0 ° to 360 ° (Multi rotation)	2.8arc sec
2	MECHANICAL-DIMENSION (BASIC MEASURING INSTRUMENT, GAUGE ETC.)	Surface Plate	Using Electronic Level by Direct method	Up to 5000 mm × 5000 mm longer side	0.74 * Sqrt (L+W)/100µm Where,L & W are in mm
3	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Articulated Arm CMM (Portable Arm CMM), Linear, Size Error, Location Error Resolution: 1 micron	Using Long Slip Gauge K Grade & Master Sphere by Direct method	Up to Dia 2.5 m	(6.2+L/1050)mm, L is in mm
4	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	CNC Machine Tools: b) Pitch / Yaw	Using Laser Measuring System by Direct method	Up to 10 m	2.4arc sec
5	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	CNC Machine Tools: e) Squareness	Using Laser Measuring System by Direct method	Up to 4 m	1.5arc sec
6	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	CNC Machine Tools: h) Roll	Using Electronic Level by Direct method	Up to 10 m	2.0arc sec



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7	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	CNC Machine Tools: a) Positioning Accuracy	Using Laser Measuring System by Direct method	Up to 10 m	$(0.2+L/600)\mu\text{m}$ , L is in mm
8	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	CNC Machine Tools: c) Straightness	Using Laser Measuring System by Direct method	Up to 4 m	$(1+L/500)\mu\text{m}$ , L is in mm
9	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	CNC Machine Tools: d) Straightness	Using Laser Measuring System by Direct method	Above 4 to 10 m	$(6+L/1500)\mu\text{m}$ , L is in mm
10	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	CNC Machine Tools: f) Squareness	Using Laser Measuring System by Direct method	>4 to 10 m	2.0arc sec
11	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	CNC Machine Tools: g) Squareness	Using Granite Square by Direct method	Up to 700 mm	5.35 $\mu\text{m}$
12	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	CNC Machine Tools: i) Positioning/ Indexing Accuracy	Using Laser Measuring System with Rotary Indexer/ Autocollimator by Direct method	0 ° to 360 °	2.8arc sec





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13	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Co-Ordinate Measuring Machine Resolution: 0.1 micron b) Maximum permissible Error P FTU, MPE	Using Master Sphere by Direct method	3000X2000X1500 mm	0.4µm
14	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Co-Ordinate Measuring Machine Resolution: 0.1 micron a) Maximum permissible Error of length measurement E 0, MPE	Using Step Gauges/ Slip Gauges by Direct method	3000X2000X1500 mm	0.41 + L/1956 µm L is in mm
15	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Gear Testing Machine	Using Lead & Profile Master, Master Gear by Direct method	Up to 300 mm	2.6µm
16	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Laser Micrometer Resolution: 0.1 micron	Using Cylindrical Pins / Plug Gauge by Direct method	Up to 50 mm	(0.3+L/400)µm, L is in mm
17	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Length Measuring Machine Resolution: 1 micron	Using Laser Measuring System/ Slip Gauges by Direct method	0 to 5 m	(1.3+L/300)µm, L is in mm
18	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Profile Projector a)Length Resolution: 0.1 µm	Using Glass Scale by Direct method	Up to 200 mm	(0.85+L/325)µm, L is in mm



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19	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Profile Projector b)Length Resolution: 0.1 μm	Using Laser Measuring System by Direct method	Up to 500 mm	(0.7+L/400)μm , L is in mm
20	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Profile Projector c) Angle Resolution: 1 arc sec	Using Angle Gauge Blocks by Direct method	360 °	17arc sec
21	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Profile Projector d) Magnification	Using Glass Scale & Vernier Caliper by Direct method	100X	0.4%
22	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roughness Tester a) Stand alone Resolution: 0.3 nm	Using Depth Master & Surface Roughness Masters by Direct method	25 μm	4.1%
23	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roughness Tester b) Portable Resolution: 1 nm	Using Depth Master & Surface Roughness Masters by Direct method	25 μm	5.5%
24	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roundness / Form Tester a) Roundness Resolution: 0.3 nm	Using Glass Hemisphere by Direct method	Up to Dia 350 mm X 500 mm	0.04μm
25	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roundness / Form Tester b) Magnification	Using Magnification (Flick) Standard by Direct method	Up to Dia 350 mm X 500 mm	0.4μm



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26	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Roundness / Form Tester c)Straightness of Horizontal Arm, Straightness of Vertical Column and Perpendicularity of Vertical Column	Using Master Cylinder / Optical Flat by Direct method	Up to Dia 350 mm X 500 mm	1.0µm
27	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Universal Length Measuring Machine / Metroscope Resolution: 0.01 micron	Using Grade "0" Slip Gauges by Direct method	Above 100 to 300 mm	(0.55+L/1000)µm, L is in mm
28	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Universal Length Measuring Machine / Metroscope Resolution: 0.01 micron	Using Grade "0" Slip Gauges by Direct method	Up to 100 mm	(0.2+L/500)µm, L is in mm
29	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Universal Length Measuring Machine / Metroscope Resolution: 0.01 micron	Using Laser Measuring System by Direct method	Up to 1000 mm	(0.1+L/345)µm, L is in mm
30	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Universal Measuring Microscope Resolution: 1 micron	Using Gr "0" Slip gauges & Electronic Probe by Direct method	Up to 200 mm	(0.6+L/500)µm, L is in mm





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31	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Universal Measuring Microscope Resolution: 1 micron	Using Laser Measuring System by Direct method	Up to 500 mm	$(0.7+L/400)\mu\text{m}$ , L is in mm
32	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Video Measuring System a) Length Resolution: 0.1 micron	Using Glass Scale by Direct method	300X200 mm	$(0.7+L/385)\mu\text{m}$ , L is in mm
33	MECHANICAL-DIMENSION (PRECISION INSTRUMENTS)	Video Measuring System b) Angle	Using Angle Gauge Block by Direct method	300X200 mm	5.0arc sec

\* CMCs represent expanded uncertainties expressed at approximately the 95% level of confidence, using a coverage factor of  $k = 2$ .