**Issue date: 26 March 2025**
**Valid Until: -**

**NO: SAMM 282**



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| **LABORATORY LOCATION/ CENTRAL OFFICE:** | Microrep Calibration Laboratory, Microrep Precision (M) Sdn Bhd<br>No. 18, Jalan PJS 5/28A Pusat Dagangan P.J. Selatan (PJCC)<br>46150 Petaling Jaya, Selangor , 46150,<br>SELANGOR<br>MALAYSIA |
| **ACCREDITED SINCE :** | 26 MARCH 2025 |
| **FIELD(S) OF CALIBRATION:** | DIMENSIONAL<br>FORCE & TORQUE<br>HARDNESS<br>MASS<br>PRESSURE<br>TEMPERATURE |

This laboratory has demonstrated its technical competence to operate in accordance with MS ISO/IEC 17025:2017 (ISO/IEC 17025:2017).

This laboratory's fulfillment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations. The management system requirements in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001 (see Joint ISO-ILAC-IAF Communiqué dated April 2017).

*** The uncertainty covered by the CMC is expressed as the expanded uncertainty corresponding to a coverage probability of approximately 95 % and have a coverage factor of k=2 unless stated otherwise.**

| | |
|---|---|
| **CENTRAL LOCATION** | Microrep Calibration Laboratory, Microrep Precision (M) Sdn Bhd<br>No. 18, Jalan PJS 5/28A Pusat Dagangan P.J. Selatan (PJCC)<br>46150 Petaling Jaya, Selangor , 46150,<br>Selangor |
| **FIELD(S) OF CALIBRATION :** | DIMENSIONAL, FORCE, HARDNESS, MASS, PRESSURE, HEAT & TEMPERATURE |

**SCOPE OF CALIBRATION : DIMENSIONAL**

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| (i) 0.01 Mm/0.005 Mm Graduation (ii) 0.001 Mm/0.002 Mm Graduation | up to 50mm up to 5mm | 2.4 um 0.8 um | B 7503: 2011 Dial Gauge by using Dial Indicator Tester / Universal Horizontal |
| | up to 50mm up to 5mm | None | Metroscope / Universal Dial Gauge Checker |
| (i) External Dimension/ Diameter Measurement | Width/thickness: up to 100 mm Sphere/ball diameter: up to 60mm Cylindrical diameter: up to 120mm | (0.4+0.014L) um Where L= nominal Diameter in mm | |
| (ii) Internal Diameter Measurement | Internal diameter: 1 to 90mm | (0.6+0.017L) um Where L= nominal | |
| | Internal diameter: 1 to 90mm | diameter in mm | |
| (ii) Step Dimension | 0 to 30 mm (or inches equivalent) | 2.3 um | |
| 3-point Internal Micrometer (i) Deviation Of Reading (ii) Repeatability | From 3.5 to 6 mm Over 6 to 20 mm Over 20 to 40 mm Over 40 to 63 mm Over 63 to 88 mm Over 88 to 100 mm (or inches equivalent) | 1.5 um 1.5 um 2.2 um 3.0 ym 3.1 ym 3.2 um | With reference to DIN 863-4: 1999 Micrometers Part 4: Internal Micrometers by using Ring Gauges |
| Bevel Protractor | Angle Measurement: | None | With reference to |
| | 0 to 360° | 5 min | VDI/WDE/DGQ 2618 |
| | Straightness & Parallelism of Blade: up to 300 mm | None | Part 7.2 by using Angle Blocks and surface plate |
| | 0° to 360° | 5) | Calibrated using |
| Caliper Checker | up to 600mm | (0.6+0.004L) um Where = nominal length in mm | With reference to Microrep Test Method for Caliper Checker by using Gauge Block |
| | Up to 300 mm | External measurement = | Calibrated by |
| | Up to 300 mm | um | using Gauge |
| | Up to 300 mm | Internal measurement = | Block with |
| | Up to 300 mm | (2.8+0.003L) um | references to |
| | Up to 300 mm | Where = nominal length | HLB Test |
| | Up to 300 mm | inmm | Method HLBTM- |
| | Up to 300 mm | None | 10: 2011 for |
| | Up to 300 mm | None | Caliper Checker |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| | 0 mm to 600 mm | (0.9+0.8L) um | Calibration by laser |
| | 0 mm to 600 mm | Lis in unit meter | measurement system |
| Coating Thickness Measuring Instrument - Deviation Of Reading - Repeatability | up to 100 um Over 100 to 500 um Over 500 to 2000 um | 1.4 um 1.5 um 2.1 um | With reference to AS 3894.3 — 2002 by using Film Thickness Standard |
| Cylinder Gauge/ Bore Gage | up to 160mm (or inches equivalent) | 1.5 um | With reference to JIS B7515: 1982 Cylinder Gauges by using Dial Indicator Tester/ |
| | up to 160mm (or inches equivalent) | None | Universal Horizontal |
| | up to 160mm (or inches equivalent) | None | Metroscope |
| Depth Caliper/ Depth Gauge | up to 600mm (or inches equivalent) | (8.3+0.011L) um Where = nominal length in mm | With reference to JIS B 7518: 1993 Depth Gauge by using Gauge Blocks |
| Depth Micrometer | up to 150mm (or inches equivalent) | (0.92+0.01L) um Where = nominal length inmm | With reference to JIS B 7544: 1994 Depth Micrometer by using Gauge Blocks |
| | extension rod up to 150 mm | None | Calibrated using Gauge Block according to |
| | 1 inch traverse with extension rod up to 6 inch | 0.0001 inch | BS 6468:2008 |
| Dial Indicator | up to 700mm (or inches equivalent) | None | With reference to JIS |
| | 0mm to 10 mm | 0.004 mm | Calibrated by |
| | Up to 25 mm | 0.004 mm | Calibrated by |
| | Up to 25 mm | None | using Calibration |
| | Up to 25 mm | None | Tester with |
| | Up to 25 mm | None | reference to |
| | Up to 25 mm | None | JMAS 2001: |
| | Up to 25 mm | None | 1998 (except |
| | Up to 25 mm | None | No.5) Miniature |
| | Up to 25 mm | None | and Long Stroke |
| | Up to 25 mm | None | Dial Gauge |
| Dial Indicator (long Stroke) | up to 20mm 20 to 30mm 30 to 50mm | 1.3 um 1.3 um 1.6 um | With reference to Miniature and Long Stroke Dial Indicators, JMAS 2001: 1998 by using Universal Horizontal |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| | up to 20mm 20 to 30mm 30 to 50mm | None | Metroscope/ Universal Dial Gauge Checker |
| Dial Indicator/ Dial Test Indicator (for Linear Measurements) | up to 50.8 mm (or inches size equivalent) | (0.7+0.02L) ym Where = nominal length in mm | With reference to ASME B89.1.10M:2001 Dial Indicator by using Universal Horizontal |
| | up to 50.8 mm (or inches size equivalent) | None | Metroscope/ Universal Dial Gauge Checker |
| Dial Test Indicator | up to 1.6 mm | None | With reference to JIS B 7533: 2015 Dial Test |
| | Graduation: 0.01 mm/0.005 mm | 2.5 um | Indicator by using Dial Indicator Tester/ |
| | Graduation: 0.01 mm/0.005 mm | None | Universal Horizontal |
| | Graduation: 0.001 mm/0.002 mm | 1.1 um | Metroscope/ Universal Dial Gauge Checker |
| | Up to 0.28 mm 0.28 mm to 0.6 mm 0.6 mm to 1.5 mm | 1.5 um 1.8 um 5.0 um | Calibrated by using gauge block and dial gauge tester with reference to JIS B 7533:2015 |
| | 0mm to 1.5 mm | 0.004 mm | Calibrated by |
| | 0mm | None | Calibrated using gauge tester as standard with |
| | 0mm | None | reference to JIS |
| | 0mm | None | B7533:1990 |
| | Up to 3 mm | (0.3 + 0.06 L) um | Calibration by laser |
| | Up to 3 mm | None | measurement system |
| | Up to 3 mm | is measurement length | with reference to |
| | Up to 3 mm | in unit meter | JIS B 7533 |
| | Omm to 1.6mm | 0.7 um | Calibrated using i- |
| | Omm to 1.6mm | None | Checker with |
| | Omm to 1.6mm | None | reference to JIS B |
| | Omm to 1.6mm | None | 7533:2015 |
| | 0mm to 0.28 mm 0.28 mm to 1.0 mm | 10 um | Calibrate using Calibration Tester. with reference to JIS B 7533: 2015 |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| | Up to 1mm | 0.7 um | Calibrated by using i-checker as standards based on JIS B 7533:2015 |
| | Up to 0.3 mm 0.3 mm to 0.6 mm 0.6 mm to 2.0 mm | 1.4 um 1.5 um | Calibrate by using micrometer head as standards according to JIS B7533:2015 |
| | Up to 0.3 mm 0.3 mm to 0.6 mm 0.6 mm to 2.0 mm | None | Calibrate by using |
| Dial/digital Thickness Gauge | up to 25mm Graduation:0.01 mm Graduation:0.001 mm (or inches equivalent) | 6.0 um 1.3 um | With reference to Microrep Test Method for Dial Thickness Gauge by using Gauge Block |
| Digital Indicator | 0 to 25 mm 25 to 50 mm 50 to 100 mm (or inches equivalent) | 1.0 um 1.2 um 1.8 um | With reference to Microrep Test Method for Electronic (Digital) Indicator by using Horizontal |
| | 0 to 25 mm 25 to 50 mm 50 to 100 mm (or inches equivalent) | None | Metroscope/ Universal Dial Gauge Checker |
| | Up to 50 mm | 2.0 um | Calibrated by using gauge block with reference to |
| | Up to 50 mm | None | JIS B 7503:2011 |
| | 0mm to 25 mm | 1.0 um | Calibrated using |
| | Omm to 50mm | 0.7 um | Calibrated using i- |
| | Omm to 50mm | None | Checker and gauge |
| | Omm to 50mm | None | block with reference to |
| | Omm to 50mm | None | ASME B 89.1.10M-2001 |
| | Up to 50 mm | None | gauge block |
| | Up to 50 mm | None | JIS B7536:1982 |
| | 0 mm to 50 mm 0 inch to 2 inch | 2.3 um 0.0002 inch | Calibrated using Gauge Block according to in house calibration procedure LCP 01440 |
| Durometer/rubber | None | None | |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Electronic Comparator - Plunge Type - Lever Type | up to + 5mm | (0.31+0.001L) um Where = nominal length in mm | With reference to JIS B 7536: 1982 Electronic Comparator by using Universal Dial Gauge Checker |
| External Micrometer | up to 50 mm travel with frame up to 300 mm | (0.81+0.012L) um | With reference to BS EN ISO 3611: 2010 by using Gauge Blocks |
| | Over 300 to up to 600 mm | (0.47+0.013L) um Where = nominal | |
| | (or inches equivalent) | length in mm | |
| | 25 mm traverse | (0.81+0.012L) ym | Calibrated by |
| | 25 mm travel range | 0.001 mm | Calibrate using |
| | 25 mm travel range | None | gauge blocks as |
| | Frame size | None | standards based on |
| | Up to 100 mm | 0.002 mm | JIS B 7502:2016 |
| | 100 mm to 150 mm | 0.003 mm | Full surface e |
| | 150 mm to 200 mm | 0.004 mm | contact error |
| | 200 mm to 250 mm | 0.005 mm | Flatness e |
| | 250 mm to 300 mm | 0.006 mm | Parallelism e |
| | 325 mm to 350 mm | 0.007 mm | |
| | 350 mm to 400 mm | 0.008 mm | |
| | 400 mm to 500 mm | 0.010 mm | Note: Standard rod |
| | 400 mm to 500 mm | None | to be provided if the |
| | 400 mm to 500 mm | None | measurement range |
| | 400 mm to 500 mm | None | is > 25 mm |
| | 25 mm 25 mm spindle travel for 50 mm to 100 mm 100 mm to 175 mm frame | 1.0 um 1.5 um 2.0 um | Measurement of instrument error, and parallelism and flatness of measuring faces reference to JIS B7502:2016. Setting rod must be provided by customer. |
| | Up to 100 mm 100 mm to 275 mm | None | Calibrated by using gauge block as standards based on JIS B 7502:2016 |
| | 0~ 25mm | 0.002 mm | Gauge Block reference to ISO |
| | 100 mm to 150 mm frame (25 mm traverse) | None | Calibrated using Gauge Block according to |
| | 100 mm to 150 mm frame (25 mm traverse) | None | ISO 3611:2010 |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| | Up to 1 inch | 0.0003 inch | |
| | 1 inch to 6 inch frame (1 inch traverse) | 0.0003 inch | |
| | Up to 50 mm | 0.003 mm | |
| | 50 mm to 150 mm | 0.004 mm | Calibrated using Gauge |
| Feeler Gauge (thickness Gauge) | 0 to 3mm (or inches equivalent) | 0.9 um | With reference to JIS B 7524: 2008 Feeler Gauge by using Electronic Length Measuring and Gauge Blocks |
| Film Thickness Standard (thickness Foils) | up to 5mm (or inches equivalent) | (0.4+0.2L) um Where = nominal length in mm | With reference to Microrep Test Method for Film Thickness Standard (Thickness Foil) by using Universal Horizontal |
| | up to 5mm (or inches equivalent) | None | Metroscope |
| Force Gauges (push-pull Gauge, Rod Type Gauge And Dial Tension Gauge) | Up to 500 N | 0.5 % of full scale | With references to JIS B 7721: 2002 by using dead/standard weight (Calibration in tension mode only) |
| Gauge Block (metric) | 0.5 to 10 mm 10 to 25mm 25 to 50 mm 50 to 75 mm 75 to 100 mm | 0.10 um 0.12 um 0.14 um 0.17 um 0.21 um | With reference to VDI/VDE/DGQ 2618 — Part 1: 2004 Test instruction for gauge blocks by using Gauge Block Comparator & Reference Gauge Blocks |
| Hand Torque Tools | up to 10 N.m above 10 to 20 N.m above 20 to 50 N.m above 50 to 100 N.m | 0.03 N.m 0.05 N.m 0.15 N.m 0.35 N.m | With reference to ISO 6789-1 & 2: 2017 by using torque meter |
| | above 100 to 140 N.m | 0.8 N.m | |
| | above 140 to 200 N.m | 1.5N.m | |
| | 0.06 N.m to | 1.6% of Reading | |
| | 0.3 N.m | 1.5% of Reading | Calibration using |
| | 6 N.m to | 0.9% of Reading | reference torque |
| | 20 N.m to | 0.4% of Reading | testers with |
| | 100 N.m to | 0.4% of Reading | reference to ISO |
| | 500 N.m to | 0.9% of Reading | 6789-2:2017 |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| | 1000 N.m to to 2100 N.m | 0.7% of Reading | |
| | 2N.m to | 1.9 % of rdg. 1.1 % of rdg 0.8 % of rdg 0.4 % of rdg 0.3 % of rdg | Calibrated by using torque calibrator based on ISO 6789-2:2017 |
| | 0.3 N.m | 3.0% of reading | Calibration using torque transducers |
| | 2.N.m to 1500 N.m | 1.0% | |
| | 2.N.m to 1500 N.m | None | 2. The CMC quoted is |
| | 2.N.m to 1500 N.m | None | the relative expanded |
| | 2.N.m to 1500 N.m | None | uncertainty at each |
| | 2.N.m to 1500 N.m | None | calibration point |
| Hardness Tester (up To 8.500 Mn Spring Force) | 0-100 | 0.5 | With reference to JIS K 6253: 2006 (clause 6.3.7) by using balance |
| Hex Plug Gauge | up to 25.4mm (or inches equivalent) | 0.9 um | With reference to Microrep Test Method for Hex Gage by using Universal Horizontal |
| | up to 25.4mm (or inches equivalent) | None | Metroscope |
| Hydraulic | 0 psi to 1000 psi 1000 psi to 5000 psi 5000 psi to 10000 psi 10000 psi to 15000 psi | 0.7 psi 3 psi 6 psi 10 psi | |
| | 0 psi to 1000 psi 1000 psi to 10000 psi 10000 psi to 15000 psi | 0.3 psi 3.3 psi 3.9 psi | |
| | 0 psi to 1000 psi 1000 psi to 10000 psi 10000 psi to 15000 psi | 0.3 psi 3.3 psi 3.9 psi | |
| | 0 bar to 350 bar 350 bar to 700 bar | 0.09 bar 0.16 bar | |
| | 0 bar to 350 bar 350 bar to 700 bar | 0.09 bar 0.16 bar | |
| | 0 psi to 14500 psi | 4 psi | |
| | 14500 psi to 36000 psi | 14 psi | |
| | 0 to 10000 psi | 2.3 psi | based on |
| | 0 to 10000 psi | None | BS EN 837-1:1998, |
| | 0 to 10000 psi | None | BS EN 837-2:1998 & |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| | 0 to 10000 psi | None | BS EN 837-3:1998 |
| | 20 bar to 100 bar | 0.4 bar | Pressure Meter |
| | 0 bar to 700 bar 0 bar to 1000 bar | 0.14 bar 0.016 % of reading | Calibrated using deadweight tester or by comparison method according to MSA Test Method 1 |
| | 0 bar to 700 bar 0 bar to 1000 bar | None | and 2 - 2022 |
| | 0 bar to 700 bar | 0.59 bar | |
| | 300 bar to 700 bar | 0.1 bar | |
| | 700 bar to 2500 bar | 0.5 bar | |
| | 300 bar to 700 bar | 0.1 bar | |
| | 700 bar to 2500 bar | 0.46 bar | |
| Indicator Calibration Tester | up to 50 mm | (0.6+0.004L) um Where = nominal length in mm | With reference to Microrep Test Method for indicator Calibration Tester by using Electronic Length Measuring Machine and Gauge Blocks |
| Inside Micrometer-(caliper/tubular/solid Rod Type) | 25 mm travel with frame/Single Rod (or Extension Rod) size: up to 500 mm (or inches equivalent) | (0.6+0.013L) um Where = nominal length in mm | With reference to JIS B 7502: 1994 Micrometer Caliper by using Gauge Blocks |
| Lever Gauge (quickest) For External | Up to 200 mm | None | With reference to VDI/VDE/DEQ 2618 |
| Lever Gauge (quickest) For Internal | 5 to 150 mm | None | With reference to VDI/VDE/DEQ 2618 |
| Master Setting Disc/ Master Plug (i) Diameter Only | 0 to 30 mm 30 to 60 mm 60 to 100 mm (or inches equivalent) | 0.8 um 1.3 um 1.8 um | With reference to ASME B89.1.5:1998 Measurement of Plain External Diameters for use as Master Discs of |
| | 0 to 30 mm 30 to 60 mm 60 to 100 mm (or inches equivalent) | None | Cylindrical Plug Gages by using Universal Horizontal Metroscope |
| Measurement (external Caliper Gauge) | Up to 200 mm | None | Part 12.1-2005 by using Gauge Blocks |
| | 5 to 150 mm | None | Part 13.1-2005 by using Gauge Blocks |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Metal/steel Ruler | up to 1000mm (or inches equivalent) | 0.13 mm | With reference to JIS B 7516: 2005 Metal Ruler by using Measuring Tape Calibrator |
| Microindicator/ Mechanical Comparator | Up to 0.05 mm Over 0.05 to 0.1 mm Over 0.1 to 0.26 mm Over 0.26 to 0.5 mm Over 0.5 to 5.0 mm | 0.3 ym 0.4 um 0.5 um 1.6 um 6.0 um | With reference to DIN 879-1 (1999) Dial Indicator by using Universal Dial Gauge Checker |
| Parts/pieces With Plane Parallel, Spherical And Cylindrical Measuring Surface | up to 25.4mm (or inches equivalent) | None | By using Universal Horizontal Metroscope |
| Plain Plug Gauge/pin Gauge (*) (i) Diameter Only | up to 50mm (or inches equivalent) | (0.8+0.012L) um Where = nominal length in mm | With reference to AS 1997: 1977 Plain Limit Gauge by using Electronic Length Measuring Machine and Gauge Block |
| | up to 120mm (or inches equivalent) | (0.4+0.014L) um Where = nominal diameter in mm | With reference to AS 1997: 1977 Plain Limit Gauge by using Universal Horizontal Metroscope |
| Plain Ring Gauge (i) Diameter Only | 1mm to 90mm (or inches equivalent) | (0.6+0.017L) um Where = nominal diameter in mm | With reference to JIS B 7420: 1997 Plain Limit Gauge by using Universal Horizontal |
| | 1mm to 90mm (or inches equivalent) | None | Metroscope |
| Plain Taper Plug Gauge (i) Cone Diameter | 0 to 30 mm 30 to 50 mm 50 to 100 mm (or inches equivalent) | 1.6 um 2.0 um 3.1 ym | With reference to JIS B 3301: 1989 by using Universal Horizontal Metroscope and Gauge Blocks |
| Pneumatic Hydraulic | 0 psi to 30 psi 30 psi to 300 psi 0 psi to 1000 psi 1000 to 5000 psi 5000 psi to 10000 psi 10000 psi to 15000 psi | 0.03 psi 0.2 psi 0.7 psi 3 psi 6 psi 10 psi | MCL Procedure: CMP- P-002 Based on: ASME B40.1 Gauges: Pressure Indicating Dial Type (as per clause 6.2.4.1, 6.2.4.2 and 6.2.4.3) |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Precision Linear Height Gauge | up to 700mm (or inches equivalent) | (1.5+0.001L) um Where = nominal length in mm | With reference to JIS B 7517: 1983 Vernier, Dial and Digital Height Gauge by using Gauge Blocks |
| | up to 700mm | (1.5+0.001L) um Where = nominal length in mm | With reference to JIS B 7517: 1983 Vernier, Dial and Digital Height Gauge by using Gauge Blocks |
| Precision Surface Plate (flatness Of Local Area Only) | up to 2600 x 1600mm (length x width) | 2.2 um | With reference to JIS B 7513: 1992 by using Repeat Reading Gauge |
| Pressure Gaug | None | None | |
| | None | None | MCL Procedure: CMP- |
| Pressure Measuring Devices | None | None | MCL Procedure: CMP- P-001 Based on: |
| | None | None | |
| | None | None | |
| Pressure Recorder | -13 psi to 0 psi 0 psi to 30 psi 30 psi to 300 psi 0 psi to 1000 psi 1000 psi to 5000 psi 5000 psi to 10000 psi 10000 psi to 15000 psi | None | |
| Profile Projector - Individual Linear Axis Only | up to 200mm Over 200 to 300 mm | 4.5 um 7.0 um | With reference to JIS B 7184: 1999 Profile Projector by using Standard Glass Scale |
| Pt 50, Pt 100, Pt 200, Pt 400, Pt 1000 | From -25 to 150°C above 150 to 400°C above 400 to 660°C | 0.25°C 0.30°C 0.76°C | |
| | From -25 to 150°C above 150 to 400°C above 400 to 660°C | 0.25°C 0.30°C 0.76°C | |
| | From -25 to 150°C above 150 to 400°C above 400 to 660°C | 0.25°C 0.30°C 0.76°C | |
| Radius Gage (radius Only) | 0.1 to 200 mm | (7.5+0.038L) um | With reference to MTI test method CLTM-2 |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| | 0.1 to 200 mm | None | (1994) by using Profile Projector/Vision Measuring Machine |
| Resistance Temperature Detecto (rtd) | 2000°C to 2315°C | None | Thermometer (PRT) and Temperature Block Calibrator |
| | None | None | Thermometer (PRT) and Temperature Block Calibrator |
| Resistance Temperature Detecto (rtd) Pt 50, Pt 100, Pt 200, Pt 400, Pt 1000 | From -25 to 150°C above 150 to 400°C above 400 to 660°C | 0.25°C 0.30°C 0.76°C | Thermometer (PRT) and Temperature Block Calibrator |
| Resistance Temperature Detecto Rtd) | None | None | Thermometer (PRT) and Temperature Block Calibrator |
| Screw/thread Caliper Gauge -" Parallel (i) Pitch Diameter | Metric: M3 to M100 (or inches equivalent) | (3.2+0.002L) um Where = nominal length in mm | With reference to AS 2710: 1984 Screw Gauges — Verification by using Gauge Blocks/ Screw Check |
| | Metric: M3 to M100 (or inches equivalent) | None | Plugs |
| Screw/thread Plug Gauge (*) - Parallel (i) Major Diameter (ii) Pitch Diameter | up to 50mm (or inches equivalent) | 1.9 um | With reference to AS 2710: 1984 Screw Gauge — Verification by using Floating Carriage Diameter Measuring Machine |
| | up to 30 mm 30 to 60 mm 60 to 100 mm (or inches equivalent) | 1.7 um 2.0 um 2.3 um | With reference to JIS B 0261: 2004 Parallel screw thread gauges — Measuring method by using Universal Horizontal Metroscope |
| Screw/thread Plug Gauge -taper (i) Major Diameter (ii) Pitch Diameter (iii) Step Limits | up to 50mm (or inches equivalent) | 2.9 um | With reference to AS 2710: 1984 Screw Gauge — Verification by using Floating Carriage Diameter Measuring Machine |
| | 0 to 30 mm 30 to 60 mm 60 to 100 mm (or inches equivalent) | 2.8 um 3.0 um 3.2 um | With reference to JIS B 0261: 2004 Parallel screw thread gauges — Measuring method by using Universal Horizontal Metroscope |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Screw/thread Ring Gauge - Parallel (i) Minor Diameter (ii) Pitch Diameter | Metric: M3 to M40 (or inches equivalent) | (1.9+0.01L) ym Where = nominal length inmm | With reference to AS 2710: 1984 Screw Gauges — Verification by using Universal Horizontal Metroscope |
| | up to 64mm (or 2 inches) | (3.7+0.02L) ym Where = nominal diameter in mm | With reference to JIS B 0261: 2004 Parallel screw thread gauges — Measuring method by using Screw Check Plugs |
| Snap Gauge /width Gauge/gap Gauge | 3 to 100mm (or inches equivalent) | (1.1+0.013L) um Where = nominal length in mm | With reference to VDI/VDE/DGQ 2618 Part 4.7:2005 by using Universal Horizontal |
| | 3 to 100mm (or inches equivalent) | None | Metroscope/ Gauge Blocks |
| Standard Bar / Setting Rod | up to 600mm (or inches equivalent) | (0.36+0.013L) um Where = nominal length inmm | With reference to Microrep Test Method for Standard Bar/ |
| | up to 600mm (or inches equivalent) | None | Setting Rod by using Mu-checker and |
| | up to 600mm (or inches equivalent) | None | Gauge Blocks |
| Standard Weight/dead Weight | 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1g 29 59 10g 20g 50g 100g 200 g 500 g 1kg 2kg 5kg 10 kg 20 kg | 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.1 mg 0.2 mg 0.2 mg 0.2 mg 0.2 mg 0.3 mg 0.5 mg 2mg 20 mg 40 mg 200 mg 200 mg | MCL Procedure: CMP- M-002 Based on: OIML R 111- 1: 2004 (E) Part 1; Annex C |
| Steel Tape Measures/ Measuring Tapes | up to6m Over 6 to 15m Over 15 to 26m Over 26 to 43 m Over 43 to 65 m | (0.10+0.038L) mm (0.21+0.020L) mm (0.29+0.014L) mm (0.37+0.011L) mm (0.45+0.009L) mm Where in m | With reference to JIS B 7512: 2005 by using Measuring Tape Calibrator |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Temperature Indicator/recorder/ Calibrator Or Simulator - Electrical Simulation Resistance Temperatur Detector (rtd) Pt 50, Pt 100, Pt 200, Pt 400, Pt 500 & Pt 1000 | -200 °C to 200 ° 200°C to 600°C 600°C to 850°C | 0.2°C 0.3°C 0.4°C | MCL Procedure: CMP- T-001 Base on: EURAMET/c-11/v.01: July 2007 — Guidelines on the Calibration of Temperature Indicators and Simulators by Electrical Simulation and Measurement |
| | -200 °C to 200 °C 200°C to 600°C 600°C to 850°C | 0.2°C 0.3°C 0.4°C | MCL Procedure: CMP- T-001 Base on: EURAMET/c-11/v.01: July 2007 — Guidelines on the Calibration of Temperature Indicators and Simulators by Electrical Simulation and Measurement |
| Temperature Sensor With Indicator | 2000°C to 2315°C | None | By comparison method using Platinum Resistance |
| | 2000°C to 2315°C | None | By comparison method using Platinum Resistance |
| | -80 °C to 50 °C 50 °C to 250 °C | 0.07 °C 0.17 °C | Comparison with Standard |
| | 250 °C to 400 °C | 0.29 °C | Resistance |
| | 250 °C to 400 °C | None | Thermometer in |
| | 250 °C to 400 °C | None | calibration bath |
| | 250 °C to 400 °C | None | and heat block, humidity chamber |
| | 400 °C to 700 °C 700 °C to 1100 °C | 2.0°C | Comparison with Standard |
| | 400 °C to 700 °C 700 °C to 1100 °C | None | Thermocouple in calibration heat |
| | 400 °C to 700 °C 700 °C to 1100 °C | None | block |
| | -30 °C to 50 °C 50 °C to 250 °C | 0.07 °C 0.19 °C | Comparison with Standard |
| | 250 °C to 400 °C | 0.30 °C | Resistance |
| | 250 °C to 400 °C | None | Thermometer in |
| | 250 °C to 400 °C | None | calibration bath |

| Instrument Calibrated/Measurement Parameter | Range | Calibration and Measurement Capability Expressed as an Uncertainty (±)* | Remarks |
|---|---|---|---|
| | 250 °C to 400 °C | None | and heat block |
| | 400 °C to 700 °C 700 °C to 1100 °C | 2.1°C 2:7°C | Comparison with Standard |
| | 400 °C to 700 °C 700 °C to 1100 °C | None | Thermocouple in calibration heat |
| | 400 °C to 700 °C 700 °C to 1100 °C | None | block |
| | -35 °C to 165 °C | 0.1°C | Comparison with Pt100 in Temperature block calibrator |
| | -30 °C to 20°C 30 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C | 0.91°C 0.48 °C 0.76 °C 1.6°C | Comparison with PRT sensor in Liquid bath and Dry Block |
| | -40 °C to0°C 0 °C to 50°C 50 °C to 70 °C | 1.0°C 0.49 °C 1.0°C | |
| | 30 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C | 0.48 °C 0.76 °C 1.6°C | Comparison with Pt 100 and thermocouple in temperature block calibrator |
| | -20 °C to 150 °C 150 °C to 600 °C 600 °C to 800 °C | 1.0°C 3.1°C 4.6°C | Calibration using RTD Pt-100 probe and Thermocouple Type R |
| | 800 °C to 1100 °C | None | |
| | -30 °C to 300 °C 300 °C to 640 °C | 1.8°C | Comparison with Pt100 in liquid bath and Dry |
| | -30 °C to 30 °C 30 °C to 650 °C | 0.1 °C 0.3 °C | Comparison with standard resistance |
| | 651 °C to 1200 °C | 2.7 °C | thermometer / |
| | 651 °C to 1200 °C | None | thermocouple in block temperature bath |
| | 200 °C to 400 °C | None | |
| | 200 °C to 400 °C | None | |
| | 200 ?C to 400 ?C | None | |
| | 200 ?C to 400 ?C | None | |
| | -30 °C to 0 °C 0 °C to 200 °C 200 °C to 400 °C 400 °C to 600 °C | 0.09 °C 0.083 °C 0.33 °C 0.75 °C | temperature block calibrator |
| | 600 °C to 1200 °C | 2.7 °C | |
| | 30 °C to 200 °C 200 °C to 400 °C | 0.2 °C 0.41 °C | Comparison with reference Pt100 in temperature block calibrator |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Temperature Sensor Without Indicator | None | None | By comparison method using Platinum Resistance |
| | None | None | By comparison method using Platinum Resistance |
| Thermocouple | From -25 to 150°C above 150 to 400°C above 400 to 660°C | None | |
| | From -25 to 150°C above 150 to 400°C above 400 to 660°C | None | |
| | From -25 to 150°C above 150 to 400°C above 400 to 660°C | None | |
| | None | None | |
| | -200°C to -100°C | 0.29°C | |
| | 0°c 30 °C to 200 °C 200 °C to 400 °C | 0.2°C 0.6 °C 0.7°C | Comparison with Pt100 reference in liquid bath and temperature block calibrator |
| | 0°c 30 °C to 200 °C 200 °C to 400 °C | 0.2°C 0.6 °C 0.7°C | Comparison with Pt100 reference in liquid bath and temperature block calibrator |
| | 0?c 30 ?C to 200 ?C 200 ?C to 400 ?C | 0.2?C 0.6 ?C 0.7?C | Comparison with Pt100 reference in liquid bath and temperature block calibrator |
| | 0?c 30 ?C to 200 ?C 200 ?C to 400 ?C | 0.2?C 0.6 ?C 0.7?C | Comparison with Pt100 reference in liquid bath and temperature block calibrator |
| Thermocouple (cont.) | None | None | MCL Procedure: CMP- |
| | None | None | MCL Procedure: CMP-T-001 Base on |

**Issue date: 26 March 2025**
**Valid Until: -**

**NO: SAMM 282**



| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Thermocouple Type B Type R Type S Type E Type J Type K Type N Type T | 200°C to 400°C 400° to 1820°C -50°C to 0°C 0°C to 100°C 100°C to 1768°C 50°C to 0°C 0°C to 1768°C - 270°C to 200°C 200°C to 1000°C -210°C to 1200°C -270°C to -200°C -200°C to 1000°C 1000°C to 1372°C -270°C to -200°C -200°C to 1300°C -270°C to -200°C -200°C to 100°C 100°C to 400°C | 2.1°C 1.1°C 1.1°C 0.9°C 0.7°C 1.1°C 0.8°C 0.4°C 0.4°C 0.4°C 0.4°C 0.4°C 0.5°C 0.4°C 0.5°C 0.4°C 0.4°C 0.4°C | MCL Procedure: CMP- T-001 Base on: EURAMET/c-11/v.01: July 2007 — Guidelines on the Calibration of Temperature Indicators and Simulators by Electrical Simulation and Measurement |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Thermocouple Type B Type R Type S Type E Type J Type K Type N Type T Type U Type Type C | 200°C to 400°C 400° to 1820°C -50°C to 0°C 0°C to 100°C 100°C to 1768°C 50°C to 0°C 0°C to 1768°C - 270°C to 200°C 200°C to 1000°C -210°C to 1200°C -270°C to -200°C -200°C to 1000°C 1000°C to 1372°C -270°C to -200°C -200°C to 1300°C -270°C to -200°C -200°C to 100°C 100°C to 400°C -200°C to -100°C -100°C to 600°C -200°C to 900°C 0°C to 1000°C 1000°C to 2000°C 2000°C to 2315°C2.1°C 0.9°C 0.7°C 0.8°C 0.4°C 0.4°C 0.4°C 0.4°C 0.4°C 0.5°C 0.4°C 0.5°C 0.4°C 0.4°C 0.4°C 0.4°C 0.4°C 0.4°C 0.5°C 0.9°C 1.3°C | | MCL Procedure: CMP- T-001 Base on: EURAMET/c-11/v.01: July 2007 — Guidelines on the Calibration of Temperature Indicators and Simulators by Electrical Simulation and Measurement |
| Thermocouple Type J, | From -25 to 0°C above 0 to 300°C | 1.3°C 1.4°C | |
| | above 300 to 400°C | 1.5°C | |
| | above 400 to 500°C | 1.8°C | |
| | above 500 to 660°C | 2.2°C | |
| Thread Measuring Wires (i) Diameter Only | up to 6.5mm (or inches equivalent) | 0.5 um | With reference to ASME B89.1.17:2001 Measurement of Thread Measuring Wires by using Universal Horizontal |
| | up to 6.5mm (or inches equivalent) | None | Metroscope |
| Type D | 0°C to 1000°C 1000°C to 2000°C | 0.5°C 0.9°C | July 2007 — Guidelines on the Calibration of |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| | 2000°C to 2315°C | 1.3°C | Temperature Indicators and |
| | 2000°C to 2315°C | None | Simulators by Electrical Simulation |
| | 2000°C to 2315°C | None | and Measurement |
| | 0°C to 1000°C<br>1000°C to 2000°C | 0.5°C 0.9°C | |
| | 2000°C to 2315°C | 1.3°C | |
| Type G | 100°C to 2315°C | None | T-001 Base on: EURAMET/c-11/v.01: |
| | 100°C to 2315°C | 1.1°C | |
| Type J, K,n,e | From -25 to 0°C | 1.3°C | |
| | above 0 to 300°C | 1.4°C | |
| | above 300 to 400°C | 1.5°C | |
| | above 400 to 500°C | 1.8°C | |
| | above 500 to 660°C | 2.2°C | |
| | From -25 to 0°C | 1.3°C | |
| | above 0 to 300°C | 1.4°C | |
| | above 300 to 400°C | 1.5°C | |
| | above 400 to 500°C | 1.8°C | |
| | above 500 to 660°C | 2.2°C | |
| | From -25 to 0°C<br>above 0 to 300°C | 1.3°C 1.4°C | |
| | above 300 to 400°C | 1.5°C | |
| | above 400 to 500°C | 1.8°C | |
| | above 500 to 660°C | 2.2°C | |
| Type R, S | From -25 to 660°C | 1.3°C | |
| | From -25 to 660°C | 1.3°C | |
| | From -25 to 660°C | 1.3°C | |
| | From -25 to 660°C | 1.3°C | |
| Type T | From -25 to 0°C | 0.6°C | |
| | above 0 to 100°C | 0.9°C | |
| | above 100 to 200°C | 1.1°C | |
| | above 200 to 300°C | 1.3°C | |
| | above 300 to 400°C | 1.5°C | |
| | From -25 to 0°C | 0.6°C | |
| | above 0 to 100°C | 0.9°C | |
| | above 100 to 200°C | 1.1°C | |
| | above 200 to 300°C | 1.3°C | |
| | above 300 to 400°C | 1.5°C | |
| | From -25 to 0°C<br>above 0 to 100°C | 0.6°C 0.9°C | |
| | above 100 to 200°C | 1.1°C | |
| | above 200 to 300°C | 1.3°C | |
| | above 300 to 400°C | 1.5°C | |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| | From -25 to 0°C<br>above 0 to 100°C | 0.6°C 0.9°C | |
| | above 100 to 200°C | 1.1°C | |
| | above 200 to 300°C | 1.3°C | |
| | above 300 to 400°C | 1.5°C | |
| | -250 °C to 400 °C | 0.40 °C | |
| | -250 °C to 400 °C | 0.40 °C | |
| | -100 °C to 390 °C | 1.0°C | electrical simulation using temperature |
| | -100 °C to 390 °C | 1.0°C | electrical simulation using temperature |
| | -250 °C to 400 °C | 0.7 °C | |
| | -250 °C to 400 °C | None | |
| | -250 °C to 400 °C | 1.2°C | |
| | -250 °C to 400 °C | 2.0°C | |
| | -200 °C to -100 °C<br>-100 °C to 400 °C | 0.2 °C 0.1 °C | By electrical measurement using multimeter |
| | -200 °C to -100 °C<br>-100 °C to 400 °C | 0.6 °C 0.3 °C | By electrical simulation using calibrator |
| | -200 °C to -100 °C<br>-100 °C to 400 °C | 0.6 °C 0.3 °C | By electrical simulation using calibrator |
| | -200 °C to -100 °C<br>-100 °C to 400 °C | 0.6 °C 0.3 °C | By electrical simulation using calibrator |
| | -250 °C to 400 °C | 1.1°C | By Electrical Simulation Using Temperature Calibrator and ITS 90 Tables |
| | -250 °C to 400 °C | 2.0 °C | By Electrical Measurement Using Temperature Calibrator and ITS 90 Tables |
| | -250 °C to 400 °C | 1.3°C | By Electrical Simulation Using Temperature Calibrator and ITS 90 Tables |

| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Type Type C | -200°C to 900°C 0°C to 1000°C 1000°C to 2000°C 2000°C to 2315°C | 0.4°C 0.5°C 0.9°C 1.3°C | Calibration of Temperature Indicators and Simulators by Electrical Simulation |
| | -200°C to 900°C 0°C to 1000°C 1000°C to 2000°C 2000°C to 2315°C | None | and Measurement |
| Type U | -200°C to -100°C -100°C to 600°C | 0.4°C 0.4°C | EURAMET/c-11/v.01 July 2007 — Guidelines on the |
| Universal Horizontal Metroscope | up to 60mm | 0.2 um | By using Gauge Block |
| V-anvil Micrometer | up to 100mm | (0.96+0.018L) um Where = nominal length in mm | With reference to Microrep Test Method for V-Anvil Micrometer by using Master Disc/Setting Master |
| Vacuum Pneumatic | -13.5 psi to 0 psi 0 psi to 30 psi 30 psi to 300 psi | 0.03 psi 0.03 psi 0.2 psi | ASME B40.1 Gauges: Pressure Indicating Dial Type (as per clause 6.2.4.1 & 6.2.4.2 and 6.24.3) |
| | Up to bar 0 mbar to 70 mbar 70 mbar to 700 mbar 0 bar (abs) to 7 bar (abs) 0.7 bar to 6 bar 6 bar to 30 bar | 0.002 bar 0.016 mbar 0.14 mbar 0.0011 bar (abs) 0.004 bar 0.008 bar | Calibrated using test gauge as standard according to AS 1349 (1986) and DKD-R-6-1 (edition 01/2003) |
| | Up to -0.95 bar 0 mbar to 70 mbar 70 mbar to 700 mbar 0 bar (abs) to 7 bar (abs) 0.7 bar to 6 bar 6 bar to 30 bar | 0.002 bar 0.016 mbar 0.14 mbar 0.0011 bar (abs) 0.004 bar 0.008 bar | Calibrated using test gauge as standard according to AS 1349 (1986) and DKD-R-6-1 (edition 01/2003) |
| Vacuum Pneumatic Hydraulic | -13 psi to 0 psi 0 psi to 30 psi 30 psi to 300 psi 0 psi to 1000 psi 1000 psi to 5000 psi 5000 psi to 10000 psi 10000 psi to 15000 psi | 0.03 psi 0.03 psi 0.2 psi 0.7 psi 3 psi 6 psi 10 psi | P-001 Based on: ASME B40.1 Gauges: Pressure Indicating Dial Type (as per clause 6.2.4.1, 6.2.4.2 and 6.2.4.3) |

**Issue date: 26 March 2025**
**Valid Until: -**

**NO: SAMM 282**



| **Instrument Calibrated/Measurement Parameter** | **Range** | **Calibration and Measurement Capability Expressed as an Uncertainty (±)*** | **Remarks** |
|---|---|---|---|
| Vernier/dial/digital Caliper | up to 300 mm 300 to 450 mm 450 to 600 mm 600 to 1000 mm (or inches equivalent) | 11 um 13 um 15 um 22 um | With reference to BS EN ISO 13385: 2011 by using Caliper Checker or Gauge Blocks |
| Vernier/dial/digital Height Gauge | up to 300 mm 300 to 600 mm (or inches equivalent) | 11 um 15 um | With reference to JIS B 7517: 1993 with Vernier, Dial and Digital Height Gauges by using Caliper Checker or Gauges Blocks |
| Weighing Machines/ Balances | From 0g to 220g Over 220g to 420g Over 420g to 820g Over 820g to 1220g | 0.001 g 0.002 g 0.003 g 0.005 g | MCL Procedure: CMP- M-001 Based on UKAS LAB14: 2006 Calibration of Weighing Machines (Clause 4.3.3(a), 4.3.3(c) & 4.3.3 (d)) |
| | Over 1220g to 2000g | 0.03 g | |
| | Over 2000g to 5000g | 0.19 | |
| | Over 5000g to 20000g | 0.2g | |
| | Over 20000g to 30000g | 0.59 | |
| | Over 30000g to 50000g | 5g | |
| | Over 50000g to 100000g | 5g | |
| | Over 100000g to 200000g | 10g | |

**Issue date: 26 March 2025**
**Valid Until: -**

**NO: SAMM 282**



## SCOPE OF CALIBRATION : FORCE & TORQUE

| Instrument Calibrated/Measurement Parameter | Range | Calibration and Measurement Capability Expressed as an Uncertainty (±)* | Remarks |
|---|---|---|---|

**Issue date: 26 March 2025**
**Valid Until: -**

**NO: SAMM 282**



**SCOPE OF CALIBRATION : HARDNESS**

| Instrument Calibrated/Measurement Parameter | Range | Calibration and Measurement Capability Expressed as an Uncertainty (±)* | Remarks |
|---|---|---|---|

**Issue date: 26 March 2025**
**Valid Until: -**

**NO: SAMM 282**



**SCOPE OF CALIBRATION : MASS**

| Instrument Calibrated/Measurement Parameter | Range | Calibration and Measurement Capability Expressed as an Uncertainty (±)* | Remarks |
|---|---|---|---|

**Issue date: 26 March 2025**
**Valid Until: -**

**NO: SAMM 282**



**SCOPE OF CALIBRATION : PRESSURE**

| Instrument Calibrated/Measurement Parameter | Range | Calibration and Measurement Capability Expressed as an Uncertainty (±)* | Remarks |
|---|---|---|---|

**Issue date: 26 March 2025**
**Valid Until: -**

**NO: SAMM 282**



## SCOPE OF CALIBRATION : TEMPERATURE

| Instrument Calibrated/Measurement Parameter | Range | Calibration and Measurement Capability Expressed as an Uncertainty (±)* | Remarks |
|---|---|---|---|