SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: July 31, 2025 Certificate Number: 2806.01

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with A2LA's Calibration Program Requirements), accreditation is granted to this laboratory to perform the following calibrations[1, 17]:

I. Acoustical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Sound Level Meter	Up to 115 dB	0.64 dB	Fluke 5730A with microphone

II. Chemical Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
CO_2 – Measure[3]	Up to 2.5 % CO_2 Up to 5 % CO_2 Up to 10 % CO_2 Up to 20 % CO_2	0.33 % CO_2 0.42 % CO_2 0.39 % CO_2 0.51 % CO_2	Euro-Gas CO2-SS-20: ASTM E1292; ISO 8573-6; CEI EN 50270; CGA G-6
CO_2 – Measuring Equipment[3]	2.5 % CO_2 5 % CO_2 10 % CO_2 20 % CO_2	0.24 % CO_2 0.26 % CO_2 0.31 % CO_2 0.46 % CO_2	Reference gases

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Conductivity – Measuring Equipment[3]	1000 µS/cm 10 000 µS/cm 100 000 µS/cm	14 µS/cm 0.19 mS/cm 0.95 mS/cm	Conductivity buffer solutions
pH – Measuring Equipment[3]	(4, 7, 10) pH	0.02 pH	pH buffer solutions
Chloride – Measuring Equipment[3]	10 000 Cl mg/l	1.2 Cl mg/l	Buffer solutions
Gas Detection & Measuring Instruments	100 CO ppm 25 H_2S ppm 2.5 CH_4 18 % O_2	2.4 % CO 5.1 % H_2S 2.2 % CH_4 2.4 % O_2	Reference gases

III. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Calipers[3]	Up to 350 mm (>350 to 1000) mm (>1000 to 1500) mm	12 µm (480 µin) 20 µm (790 µin) 56 µm (0.0022 in)	Caliper checker gage blocks: DIN 862; ISO 13385; JIS B 7507
Thickness & Feeler Gages[3]	Up to 0.01 mm (>0.01 to 1) mm (>1 to 2) mm (>2 to 3) mm (>3 to 10) mm (>10 to 20) mm (>20 to 30) mm (>30 to 40) mm (>40 to 50) mm	0.5 µm (20 µin) 0.6 µm (24 µin) 0.7 µm (28 µin) 0.8 µm (32 µin) 0.9 µm (35 µin) 1 µm (39 µin) 1.1 µm (43 µin) 1.3 µm (51 µin) 1.5 µm (59 µin)	Gage blocks; UMM: JIS B7524; DIN 2275

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments[11]
Micrometers[3,13]	Up to 50 mm Up to 100 mm Up to 200 mm Up to 300 mm Up to 450 mm Up to 575 mm Up to 1000 mm	0.0013 mm 0.0018 mm 0.0029 mm 0.0049 mm 0.0037 mm 0.0091 mm 0.017 mm	Gage blocks: ISO 3611; DIN 863 Part 1-4; JIS B 7502; JIS B 7520
Flatness, Parallelism	Up to 0.05 mm	0.0004 mm	Optical flat, parallel
Gauge Blocks	Up to 25 mm Up to 50 mm Up to 75 mm Up to 100 mm	0.24 µm 0.27 µm 0.37 µm 0.41 µm	ISO 3650 Gauge blocks, comparator
Length Indicators (Dial, Lever, Dial Gauge, Test, LVDT)[3]	Up to 100 mm	(1 + 0.5*R*) µm	Indicator calibrator; UMM: DIN 879; DIN 879-1; DIN 879-3; DIN 878; DIN 2270; JIS B7503; JIS B 7533; ISO 13102
Height Gages[3]	Up to 500 mm (>500 to 1500) mm	2.8 µm (110 µin) 19 µm (750 µin)	Gage blocks, surface plate: JIS B7517; BS 1643; BS EN ISO 13225
Bore Gages	Up to 10 mm	1.0 µm (39 µin)	Gage blocks; ring gages; UMM: JIS B7515
Cylindrical & Taper Gages – Pins & Plain Plugs[10] Plain Rings[10]	 Up to 100 mm (>100 to 300) mm (>300 to 550) mm Up to 100 mm (>100 to 300) mm (>300 to 450) mm	 1 µm (39 µin) 2 µm (79 µin) 2.8 µm (110 µin) 1 µm (39 µin) 2 µm (79 µin) 2.5 µm (98 µin)	 UMM, gage blocks: ISO 594/1; ISO 80369-7; ASME B1.20.5; ISO 286; ISO 286-1; ISO 286-2 DIN 7162; DIN EN ISO 1938-1; DIN 7163; DIN 7164

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Length Standards (Micrometer Settings, End Rods, Length Bars)	Up to 100 mm (>100 to 500) mm	1.5 µm (59 µin) 2.7 µm (110 µin)	UMM, gage blocks: BS 870; BS EN ISO 3611; JIS B 7502
Thread Wires	Up to 7 mm	0.6 µm (24 µin)	UMM, gage blocks: BS 5590; ASME B1.2
Bevel Protractors[3], Clinometers, Bubble Levels	Up to 5° (>5 to 180)°	0.013 s 0.04 s	Angle blocks[6], BS 1685; BS 958; DIN 877; JIS B 7510
Cylindrical & Taper Thread Plug Gage – Pitch Diameter Major Diameter[9]	 Up to 100 mm (>100 to 300) mm (>300 to 550) mm Up to 100 mm (>100 to 300) mm (>300 to 550) mm	 1.5 µm (59 µin) 2.1 µm (75 µin) 3.4 µm (140 µin) 1 µm (39 µin) 2 µm (79 µin) 2.8 µm (110 µin)	Thread wires; UMM: ISO 7-1; ISO 7-2; ISO 965; ISO 1502; ISO 228; ISO 11363; ISO 15872; DIN 477; DIN 2999; DIN 103; DIN 40431; DIN 513; DIN 40430;DIN 158; DIN 158-1; DIN EN 10226; EN 10226; DIN 405; DIN EN 144-1; BS 93; BS 811; BS 84; BS 919; BS 21; BS EN 10226-1; DIN EN 10226-1;DIN EN 10226-2; DIN EN 10226-3; BS 3409; BS 4377; BS 1657; BS 1104; DIN 7756; MIL-T-21309; A-A-59158; FED STD H28; ASME B1.2; ASME B1.5; ASME B1.8; ASME B 1.9; ASME B1.12; ASME B1.15; ASME B1.20.1; ASME B1.20.3; ASME B1.20.5; ASME B1.20.7; ASME B1.13M; ASME B1.16M; ASME B1.21M; ASME B1.22M; ASME B18.29.1 ASME B 1.1; BS 1580; API Spec 5B; API Spec 7-2; AWWA C800-05; SAE MA 1696.

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Solid & Tapered Thread Ring Gage –			Ball probe, micrometer Tri-O-Bor, UMM:
Pitch Diameter	(0.5 to 100) mm (>100 to 300) mm (>300 to 450) mm	1.5 µm (59 µin) 3.9 µm (150 µin) 4.3 µm (170 µin)	ISO 7-1; ISO 7-2; ISO 228 ; ISO 965; ISO 1502; ISO 11363; ISO 15872; DIN 477; DIN 2999; DIN 103; DIN 40431; DIN 513; DIN 40430;DIN 158; DIN 158-1; DIN EN 10226; EN 10226; DIN 405; DIN EN 144-1; BS 93; BS 811;BS 84; BS 919; BS 21; BS EN 10226-1; DIN EN 10226-1;DIN EN 10226-2; DIN EN 10226-3; BS 3409; BS 4377; BS 1657; BS 1104; BS 1580-1; BS 1580-3; DIN 7756; MIL-T-21309; A-A-59158; FED STD H28; ASME B1.3; ASME B1.5; ASME B1.8; ASME B 1.9; ASME B1.12; ASME B1.15; ASME B1.20.1; ASME B1.20.3; ASME B1.20.5; ASME B1.20.7; ASME B1.13M; ASME B1.16M; ASME B1.21M; ASME B1.22M; ASME B1.1; API Spec 5B; API Spec 7-2; AWWA C800-05; SAE MA 1696.
Minor Diameter[9]	(6 to 50) mm (>50 to 100) mm	2.4 µm (94 µin) 2.9 µm (110 µin)	

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Measuring Rules[3]	Up to 1 m (>1 to 2) m	0.009 mm (350 µin) 0.013 mm (510 µin)	Length standards: JIS B 7516
Measuring Tapes[3]	Up to 10 m (>10 to 20) m (>20 to 30) m (>30 to 40) m (>40 to 50) m	0.03 mm (0.0012 in) 0.035 mm (0.0014 in) 0.04 mm (0.0016 in) 0.05 mm (0.0020 in) 0.06 mm (0.0024 in)	Length standards: JIS B 7512; JIS B 7522; BS 4035; BS 4484-1
Extensometers[3] – Displacement	(0.01 to 25) mm (1 to 500) mm	17 µm (670 µin) 2.6 µm (100 µin)	Micrometers; indicators Gage blocks: ASTM E83; ASTM E2309; ASTM E2309/E2309M; ISO 5893; ASTM E8/E8M ISO 9513, ASTM D5311; ASTM D5311/D5311M
Length Measuring Instruments – UMMs, Bench Micrometers, Indicators, Calibrators, Caliper Checkers	Up to 1 mm (>1 to 20) mm (>20 to 50) mm (>50 to 100) mm (>100 to 200) mm (>200 to 300) mm (>300 to 460) mm (>460 to 625) mm (>625 to 1010) mm	0.12 µm (4.7 µin) 0.18 µm (7.1 µin) 0.2 µm (7.9 µin) 0.24 µm (9.5 µin) 4 µm (160 µin) 5.6 µm (220 µin) 14 µm (550 µin) 20 µm (790 µin) 30 µm (1200 µin)	Gage blocks, LVDT
Line Standard Scales	Up to 1 mm (>1 to 10) mm (>10 to 50) mm (>50 to 200) mm	0.7 µm (28 µin) 1.3 µm (51 µin) 1.7 µm (67 µin) 2.5 µm (98 µin)	UMM: JIS B 7541

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Measuring Projectors & Microscopes[3] –			Line standard scales: JIS B7184; JIS B7153; ASTM 1951;
Displacement	Up to 10 mm (>10 to 20) mm (>20 to 50) mm (>50 to 100) mm (>100 to 200) mm	1.6 µm (63 µin) 2.0 µm (78 µin) 2.8 µm (110 µin) 3.3 µm (130 µin) 4.8 µm (190 µin)	ASTM 112
Angle	(0 to 90)°	44" (0.000 21 rad)	Angle blocks
Surface (Granite) Plates – Measure[3]			
Flatness Only	Up to 2.5 m x 1.6 m	0.001 mm	Electronic level: ISO 8512-2, DIN 876, GGG-P-463cc, BS 817 to manufacturer or customer requirements
Laser CMM[3]			
Diameter	25 mm	5.0 µm (200 µin)	Titanium cylinder

IV. Dimensional Testing/Calibration

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Linear Measurement (Single Axis)[3, 7]	Up to 0.2 m (>0.2 to 0.5) m (>0.5 to 1.0) m (>1.0 to 5.0) m (>5.0 to 10.0) m (>10.0 to 20.0) m (>20.0 to 40.0) m	0.028 mm 0.28 mm 0.9 mm 0.043 mm 1.9 mm 4 mm 5.4 mm	Length standards
	Up to 50 mm	3.0 µm (120 µin)	Measuring projector

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments[11]
Inspection Fixtures – Length, Single Axis (Straight Edges, Knife Edges)[7]	Up to 500 mm	2.6 µm (79 µin)	LVDT: DIN 874; JIS B 7514
Inspection Fixtures – Length, Two Axis (V-Blocks, Bar Parallels, 1-2-3 Blocks, Squares, Sine Bars, Sine Plates, Angle Irons)[7]			BS 3731; BS 3064; JIS B 7523; JIS B 7526; JIS B 7539; JIS B 7540; JIS B 7514; DIN 875; DIN 875-1; DIN 874; DIN 2273; DIN 2274
Flatness	Up to 500 mm	5.6 µm (220 µin)	LVDT, granite plate
Angle	Up to 60° (5 to 60)° (>60 to 180)° (0.5 to 60)°	4" (0.000 019 rad) 0.6*R* 1.0*R* 36" (0.000 17 rad)	Sine bar, granite plate bevel protractor Measuring projector
Parallelism	Up to 200 mm	3.0 µm (120 µin)	LVDT, granite plate
Perpendicularity	Up to 600 mm	2.8 µm (110 µin)	Square, granite plate, gage blocks

V. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 15] (±)	Comments[11]
DC Voltage – Measure[3]	0 mV 0.2 µV to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V	0.4 µV 9.5 µV/V 10 µV/V 7.9 µV/V 13 µV/V 13 µV/V	Fluke 8588A

Parameter/Equipment	Range	CMC[2, 15] (±)	Comments[11]
DC Voltage – Generate[3]	0 mV 1 V 10 V 0.1 µV to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (22 to 1100) V	0.54 µV 6 µV/V 3.9 µV/V 9.2 µV/V 7.0 µV/V 7 µV/V 4 µV/V 9.2 µV/V 11 µV/V	Fluke 5730A
DC High Voltage – Measure[3]	(1000 to 4000) V (4000 to 5000) V (5000 to 9000) V (9000 to 10 000) V (10 000 to 30 000) V	1.3 V 1.6 V 2.8 V 3.2 V 9.1 V	Vitrek 4700 with HVL-35 & HVP-35 HV probes
DC Current – Measure[3]	0 µA (0 to 20) µA (20 to 200) µA (0.2 to 1) mA (1 to 2) mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 30) A	0.42 nA 1 nA 2.6 nA 15 nA 25 nA 0.3 µA 12 µA 0.4 mA 27 mA	Fluke 8588A
DC Current – Generate[3]	0 mA (10 to 220) µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 3) A (3 to 10) A (10 to 20) A	0.62 nA 8.3 nA 0.072 µA 0.72 µA 9.2 µA 170 µA 1.2 mA 5.5 mA 21 mA	Fluke 5730A
Clamp Meters	(20 to 150) A (150 to 500) A (500 to 1000) A	2.2 A 2.5 A 3.4 A	Fluke 5522A with Fluke 5500A/Coil

Parameter/Equipment	Range	CMC[2, 15] (±)	Comments[11]
Resistance – Measure[3]	0 Ω (0 to 2) Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 100) MΩ 100 MΩ to 1 GΩ	4 µΩ 25 µΩ/Ω 25 µΩ/Ω 18 µΩ/Ω 18 µΩ/Ω 19 µΩ/Ω 19 µΩ/Ω 29 µΩ/Ω 73 µΩ/Ω 580 µΩ/Ω 11 mΩ/Ω	Fluke 8588A
Resistance – Generate[3]			
Fixed Points	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	40 µΩ 95 µΩ/Ω 98 µΩ/Ω 25 µΩ/Ω 25 µΩ/Ω 13 µΩ/Ω 13 µΩ/Ω 10 µΩ/Ω 10 µΩ/Ω 10 µΩ/Ω 10 µΩ/Ω 12 µΩ/Ω 12 µΩ/Ω 17 µΩ/Ω 22 µΩ/Ω 45 µΩ/Ω 60 µΩ/Ω 120 µΩ/Ω	Fluke 5730A
Ranged	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (330 to 1100) Ω (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ (330 to 1100) kΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (330 to 1100) MΩ	0.0015 Ω 0.0025 Ω 0.0048 Ω 44 µΩ/Ω 43 µΩ/Ω 47 µΩ/Ω 36 µΩ/Ω 46 µΩ/Ω 37 µΩ/Ω 52 µΩ/Ω 39 µΩ/Ω 88 µΩ/Ω 160 µΩ/Ω 490 µΩ/Ω 840 µΩ/Ω 4 mΩ/Ω 17 mΩ/Ω	Fluke 5522A

Parameter/Range	Frequency	CMC[2, 15] (±)	Comments[11]
AC Voltage – Measure[3]			
(10 to 100) mV	10 Hz to 2 kHz (2 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.01 % + 3.9 µV 0.01 % + 5.5 µV 0.07 % + 36 µV 0.3 % + 130 µV 1.3 % + 230 µV	Fluke 8588A
100 mV to 1 V	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	0.01 % + 12 µV 0.02 % + 19 µV 0.04 % + 37 µV 0.10 % + 95 µV 0.10 % + 95 µV 1.4 % + 1.4 mV 2.4 % + 2.3 mV 6.4 % + 6.4 mV 10 % + 10 mV 18 % + 18 mV	
(1 to 10) V	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8to 10) MHz	0.01 % + 120 µV 0.02 % + 190 µV 0.04 % + 370 µV 0.10 % + 950 µV 0.39 % + 3.9 mV 1.4 % + 14 mV 2.3 % + 23 mV 6.4 % + 64 mV 10 % + 100 mV 17 % + 180 mV	
(10 to 100) V	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.01 % + 1.2 mV 0.01 % + 1.2 mV 0.04 % + 3.7 mV 0.10 % + 9.5 mV 0.62 % + 39 mV 1.8 % + 140 mV	
(100 to 1000) V	40 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.02 % + 14 mV 0.02 % + 14 mV 0.04 % + 37 mV 0.10 % + 96 mV	

Parameter/Range	Frequency	CMC[2, 15] (±)	Comments[11]
AC Voltage – Generate[3]			
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz (40 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.02 % + 0.8 µV 0.01 % + 0.7 µV 0.01 % + 0.7 µV 0.02 % + 0.9 µV 0.05 % + 1.4 µV 0.11 % + 2.4 µV 0.14 % + 3.3 µV 0.27 % + 7.4 µV	Fluke 5730A
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.02 % + 5.3 µV 0.01 % + 2.3 µV 0.01 % + 2.1 µV 0.01 % + 4.4 µV 0.03 % + 11 µV 0.06 % + 22 µV 0.06 % + 29 µV 0.27 % + 56 µV	
220 mV to 2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.03 % + 49 µV 0.01 % + 19 µV 0.01 % + 19 µV 0.01 % + 25 µV 0.01 % + 64 µV 0.04 % + 130 µV 0.11 % + 280 µV 0.18 % + 550 µV	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.02 % + 0.5 mV 0.03 % + 0.5 mV 0.01 % + 0.1 mV 0.004 % + 0.1 mV 0.01 % + 0.2 mV 0.01 % + 0.8 mV 0.02 % + 2.2 mV 0.09 % + 3.8 mV	
(22 to 220) V	(10 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.02 % + 5.2 mV 0.01 % + 2.0 mV 0.01 % + 1.5 mV 0.01 % + 1.9 mV	
(220 to 1100) V	50 Hz to 1 kHz	0.01 % + 19 mV	

Parameter/Range	Frequency	CMC[2, 15] (±)	Comments[11]
AC High Voltage – Measure[3]			
(1 to 5) kV (5 to 10) kV (10 to 30) kV	50/60 Hz	5.3 V 10 V 30 V	Vitrek 4700 with HVL-35 HV probe
AC Current – Measure[3]			
(10 to 100) µA	10 Hz to 2 kHz (2 to 10) kHz	0.01 % + 0.033 µA 0.01 % + 0.033 µA	Fluke 8588A
100 µA to 1 mA	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.04 % + 0.042 µA 0.04 % + 0.078 µA 0.07 % + 0.10 µA	
(1 to 10) mA	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.04 % + 0.4 µA 0.04 % + 0.8 µA 0.07 % + 1.0 µA	
(10 to 100) mA	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.04 % + 4.1 µA 0.08 % + 7.7 µA 0.07 % + 9.9 µA	
100 mA to 1 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.04 % + 0.04 mA 0.08 % + 0.08 mA 0.10 % + 0.1 mA	
(1 to 30) A	1 Hz to 2 kHz (2 to 10) kHz	0.26 % + 0.5 µA 0.26 % + 0.8 µA	
AC Current – Generate[3]			
(0.1 to 220) µA	(1 to 100) Hz (100 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.011 µA 0.088 µA 0.030 µA 0.030 µA 0.073 µA	Fluke 5730A
200 µA to 2.2 mA	(1 to 100) Hz (1 to 5) kHz 5 kHz to 10) kHz	0.075 mA 0.03 mA 0.073 mA	

Parameter/Range	Frequency	CMC[2, 15, 18] (±)	Comments[11]
AC Current – Generate[3] (cont)			
(2.2 to 22) mA	(1 to 100) Hz (1 to 5) kHz (5 to 10) kHz	0.0006 mA 0.0002 mA 0.0005 mA	Fluke 5730A
(22 to 220) mA	(1 to 100) Hz (1 to 5) kHz (5 to 10) kHz	0.005 mA 0.002 mA 0.005 mA	
220 mA to 2.2 A	(1 to 100) Hz (1 to 5) kHz (5 to 10) kHz	0.06 A 0.02 A 0.05 A	
(2.2 to 11) A	1 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.04 A 0.001 A 0.01 A	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.02 A 0.01 A 0.01 A	
Current Clamp Meters (Toroidal & other types)			
(20 to 600) A (>600 to 1000) A	(50 to 400) Hz (50 to 400) Hz	4.1 A 6.6 A	Fluke 5522A with Fluke 5500A/coil
Capacitance – Measure[3]			
10 pF	100 kHz to 1 MHz (1 to 2) MHz	0.3 % 1 %	Hioki IM-3533 LCR Meter
100 pF	(1 to 2) MHz	0.3 %	
1000 pF	20 Hz to 1 kHz 1 kHz to 1 MHz (1 to 2) MHz	3 % 0.3 % 1 %	
0.1 µF	120 Hz to 100 kHz	0.3 %	
10 µF	20 Hz to 10 kHz (10 to 100) kHz	0.3 % 7 %	

Parameter/Equipment	Range	CMC[2, 15, 18] (±)	Comments[11]
Capacitance – Generate[3]	(220 to 400) pF (0.4 to 3.3) nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF (0.33 to 1.1) µF (1.1 to 3.3) µF (3.3 to 11) µF (11 to 33) µF (33 to 110) µF (110 to 330) µF (330 to 1100) µF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.5 % + 12 pF 0.5 % + 12 pF 0.27 % + 0.02 nF 0.27 % + 0.13 nF 0.29 % + 0.59 nF 0.12 % + 0.002 µF 0.25 % + 0.006 µF 0.25 % + 0.019 µF 0.39 % + 0.077 µF 0.45 % + 0.26 µF 0.45 % + 0.80 µF 0.45 % + 2.5 µF 0.45 % + 0.008 mF 1.1 % + 0.025 mF 0.76 % + 0.11 mF 1.2 % + 0.48 mF	Fluke 5522A
Inductance – Generate[3] 100 µH	1 kHz	0.06 µH	Fluke 5500A/Coil with Hioki IM-3533

Parameter/Equipment	Range	CMC[2, 15] (±)	Comments[11]
Oscilloscope[3] –			
DC Voltage			
50 Ω	(0 to 6.6) V	0.06 V	Fluke 5522A/SC1100
1 MΩ	(0 to 130) V	0.05 % + 0.04 mV	
Flatness			
50 kHz Reference	50 kHz to 100 MHz	2.2 % + 5 mV	
	(100to 300) MHz	2.4 % + 5 mV	
	(300 to 600) MHz	3.6 % + 5 mV	
	600 MHz to 1.1 GHz	2.7 % + 5 mV	
Squarewave			
10 Hz to 10 kHz			
50 Ω	1 mV to 6.6 V_{p-p}	0.017 V	
1 MΩ	1 mV to 130 V_{p-p}	0.1 % + 42 µV	
Sinewave Flatness Relative to 50 kHz			
5 mV to 5.5 V	50 kHz to 100 MHz	3.3 % + 5.0 mV	
	(100 to 300) MHz	3.6 % + 5.0 mV	
	(300 to 600) MHz	5.0 % + 5.0 mV	
5 mV to 3.5 V	(0.6 to 1.1) GHz	3.6 % + 4.9 mV	
Rise Time – Generate	(200 to 300) ps 1 kHz to 2 MHz	120 ps	
	(200 to 350) ps (2 to 10) MHz	100 ps	
Amplitude	5 mV to 2.5 V	0.3 mV + 10 %	
Time Marker – 50 Ω	5 s to 50 ms	5 µs	
	20 ms to 100 ns	50 ns	
	(50 to 20) ns	0.13 ps	
	10 ns	23 fs	
	(5 to 2) ns	13 fs	
Wave Generator			
50 Ω	1.8 mV_{pk-pk} to 2.5 V_{pk-pk}	0.075 V_{pk-pk}	
1 M Ω	1.8 mV_{pk-pk} to 55 V_{pk-pk}	1.7 V_{pk-pk}	

Parameter/Equipment	Range	CMC[2, 15] (±)	Comments[11]
Low Resistance (Earth Resistance)[3]– Generate	10 mΩ (100 to 500) mΩ (0.5 to 2) Ω (2 to 5) Ω (5 to 29.9) Ω (30 to 199.9) Ω (200 to 499) Ω 500 Ω to 1.999 kΩ (2 to 4.99) kΩ (5 to 10) kΩ	0.51 mΩ 0.008 Ω + 0.4 % 0.010 Ω + 0.2 % 0.013 Ω + 0.24 % 0.017 Ω + 0.16 % 0.081 Ω + 0.15 % 0.66 Ω + 0.12 % 1 Ω + 0.15 % 7 Ω + 0.11 % 10 Ω + 0.15 %	Fluke 5322A
High Resistance (Insulation Resistance)[3] – Generate	(10 to 39.99) kΩ (40 to 99.99) kΩ (100 to 199.99) kΩ (200 to 999.99) kΩ (1 to 9.999) MΩ (10 to 999.9) MΩ (1 to 10) GΩ 100 GΩ	47 Ω + 0.16 % 23 Ω + 0.22 % 11 Ω + 0.23 % 8.6 Ω + 0.23 % 1.8 Ω + 0.35 % 2.9 Ω + 0.6 % 1.1 MΩ + 1.2 % 3.5 GΩ	Fluke 5322A
High Resistance (Insulation Resistance)[3] – Source with R Multiplier	(0.35 to 99.99) GΩ (100 to 999.9) GΩ (1 to 10) TΩ	7 MΩ + 1.3 % 2 GΩ + 2.4 % 31 GΩ + 3.5 %	Fluke 5322A
Ground Bond Resistance – Decade Source, Fixed Points[3]	1 mΩ 14 mΩ 39 mΩ 94 mΩ 340 mΩ 490 mΩ 960 mΩ 1.7 Ω 4.7 Ω 9 Ω 17 Ω 47 Ω 90 Ω 170 Ω 470 Ω 900 Ω 1.7 kΩ	0.2 mΩ 0.7 mΩ 1.7 mΩ 1.8 mΩ 3.5 mΩ 3.5 mΩ 7.9 mΩ 0.008 Ω 0.021 Ω 0.036 Ω 0.039 Ω 0.24 Ω 0.40 Ω 0.80 Ω 2.0 Ω 4.0 Ω 7.8 Ω	Fluke 5322A

Parameter/Equipment	Range	CMC[2, 15, 18] (±)	Comments[11]
Leakage Current – Measure[3]			
Passive / Differential Mode	(0.1 to 30) mA	2.6 µA + 0.44 %	Fluke 5322A
Residual Current – Measure[3]			
Trip Current	(3 to 3000) mA	0.8 %	Fluke 5322A
Trip Time Range	(10 to 5000) ms	0.29 ms + 0.029 %	
DC Voltage – Measure[3]	(4 to 10) V (10 to 100) V (100 to 1000) V (1000 to 5000) V	0.009 V + 0.17 % 0.10 V + 0.20 % 0.75 V + 0.20 % 6.8 V + 0.32 %	Fluke 5322A

Parameter/Range	Frequency	CMC[2, 15] (±)	Comments[11]
AC Voltage – Measure[3]			
(4 to 10) V (10 to 100) V (100 to 1000) V (1000 to 5000) V	(50 to 400) Hz	0.009 V + 0.17 % 0.10 V + 0.20 % 0.75 V + 0.20 % 7.7 V + 0.45 %	Fluke 5322A
AC/DC High Voltage – Measure[3]			
(5000 to 10 000) V	DC	16 V + 0.27 %	Fluke 5322A
(5000 to 7000) V	(50 to 60) Hz	32 V + 0.56 %	
AC Current –Measure[3]			
(100 to 300) mA (0.3 to 3) A (3 to 20) A	(50 to 400) Hz	0.24 mA + 0.12 % 2 mA + 0.12 % 23 mA + 0.24 %	Fluke 5322A

Parameter/Range	Frequency	CMC[2, 15] (±)	Comments[11]
AC Current – Measure[3] (100 to 300) mA (0.3 to 3) A (3 to 30) A	(20 to 400) Hz	 0.33 mA + 0.25 % 2 mA + 0.23 % 33 mA + 0.42 %	 Fluke 5322A, Metcal
AC Current – Hipot Leakage Current Measure[3] (30 to 300) µA (0.3 to 3) mA (3 to 30) mA (30 to 300) mA	(20 to 400) Hz	 0.56 µA + 0.42 % 4 µA + 0.29 % 39 µA + 0.29 % 0.39 mA + 0.29 %	 Fluke 5322A, Metcal

Parameter/Equipment	Range	CMC[2, 15] (±)	Comments[11]
DC Current – Measure[3]	(100 to 300) mA (0.3 to 3) A (3 to 20) A	0.24 mA + 0.18 % 2 mA + 0.17 % 23 mA + 0.30 %	Fluke 5322A
DC Current – Measure[3]	(100 to 300) mA (0.3 to 3) A (3 to 30) A	0.33 mA + 0.25 % 2 mA + 0.23 % 33 mA + 0.42 %	Fluke 5322A, Metcal
DC Current – Hipot Leakage Current Measure[3]	(30 to 300) µA (0.3 to 3) mA (3 to 30) mA (30 to 300) mA	0.56 µA + 0.42 % 4 µA + 0.29 % 39 µA + 0.29 % 0.39 mA + 0.29 %	Fluke 5322A, Metcal
Electrical Simulation of RTDs[3] – Pt 50 Ω, Pt 100 Ω, Pt 200 Ω, Pt 500 Ω Pt 1000 Ω	 (-190 to 830) °C	 0.11 °C	 Process calibrator: EURAMET/cg-11; AMS 2750

Parameter/Equipment	Range	CMC[2, 15] (±)	Comments[11]
Electrical Simulation of Thermocouples[3] –			
Type B	(250 to 900) °C (>900 to 1800)	0.06 °C 0.07 °C	Process calibrator: EURAMET/cg-11; AMS 2750
Type C	(250 to 900) °C (>900 to 2250) °C	0.17 °C 0.27 °C	
Type E	(-200 to 0) °C (>0 to 990) °C	0.1 °C 0.12 °C	
Type J	(-200 to 0) °C (>0 to 1190) °C	0.13 °C 0.12 °C	
Type K	(-200 to -100) °C (>-100 to 0) °C (>0 to 900) °C (>900 to 1360) °C	0.08 °C 0.07 °C 0.09 °C 0.13 °C	
Type N	(-200 to 0) °C (>0 to 1290) °C	0.12 °C 0.14 °C	
Type S	(-40 to 600) °C (>600 to 1750) °C	0.2 °C 0.24 °C	
Type R	(-40 to 600) °C (>600 to 1750) °C	0.18 °C 0.19 °C	
Type T	(-200 to -180) °C (>-180 to 0) °C (>0 to 390) °C	0.16 °C 0.16 °C 0.19 °C	

VI. Electrical – RF/Microwave

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Amplitude Modulation – Generate	Rate: (1.5 to 500) MHz, Depth: Up to 80 %	5.8×10^{-10} Hz	Agilent E4422B

Parameter/Range	Frequency	CMC[2] (±)	Comments[11]
Frequency Modulation – Generate	Rate: Up to 10 Hz Depth: (Up to 15) % Rate: 10 Hz to 350 MHz Depth: (Up to 90) %	6.5×10^{-10} Hz 6.4×10^{-10} Hz	Agilent E4422B
Power, Absolute – Generate (0 to 0.1) dBm (-45 to ~ 9) dBm	 3 kHz to 25 MHz 150 kHz to 4 GHz	 0.23 dBm 0.62 dBm	Agilent E4422B
Power Meter with Sensor, Absolute - Measure (-10 to 35) dBm	10 MHz to 18 GHz	0.03 dBm	Agilent E4417A & Agilent 8481H
Relative Power – Measure Up to -80 dB Up to -48 dB Up to -4 dB Up to 65 dB	 50 MHz, 0 dBm Reference	 0.52 dB 0.51 dB 0.51 dB 0.52 dB	Agilent E4404B
dBc – Measure	Up to 500 MHz, -90 dBc	2.5 dBc/Hz	Agilent E4404B
Harmonic & Non-Harmonic – Generate (-44 to -77) dBc	 500 kHz to 3500 MHz	 1.2 dBc	Agilent E4422B
Phase Noise – Generate -128 dBc/Hz	 500 kHz to 3500 MHz	 2.1 dBc/Hz	Agilent E4422B

Parameter/Ranget	Frequency	CMC[2] (±)	Comments[11]
Output Flatness – Generate 0 dBm	250 kHz to 4000 MHz	0.61 dBm/Hz	Agilent E4422B
Noise Test – Measure -124 dBc/Hz	(10 to 100) kHz	2.5 dBc/Hz	Agilent E4404B

VII. Fluid Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Viscosity - Measuring Instruments 20 cSt at 40 °C Dynamic Viscosity Kinematic Viscosity 20 cSt at 100 °C Dynamic Viscosity Kinematic Viscosity	 16.838 mPa.s 20.287 mm^2/s 3.275 mPa.s 4.248 mm^2/s	 0.11 mPa.s 0.11 mm^2/s 0.1 mPa.s 20 mm^2/s	Viscosity/Density reference standard
Density, Petroleum Distallates & Viscouos Oils 20 cSt at 15 °C Reference	 0.84593 g/cm3	 0.01 g/cm^3	Viscosity/Density reference standard

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Volumetric Glassware[3, 8]	Up to 5 mL (>5 to 20) mL (>20 to 150) mL (>150 to 200) mL (>200 to 500) mL (>500 to 1000) mL (>1000 to 5000) mL (>5000 to 10 000) mL (>10 000 to 15 000) mL (>15 000 to 20 000) mL (>20 000 to 50 000) mL	0.001 mL 0.002 mL 0.003 mL 0.004 mL 0.10 mL 0.11 mL 0.11 mL 0.20 mL 0.21 mL 0.22 mL 3.1 mL	ASTM C 231
Volumetric Apparatus, Pipettes Fixed points	1 µL 2 µL 5 µL 10 µL 20 µL 50 µL 100 µL 200 µL 500 µL 1 mL 2 mL 5 mL 10 mL 20 mL 50 mL 100 mL	0.016 µL 0.016 µL 0.016 µL 0.016 µL 0.016 µL 0.017 µL 0.017 µL 0.017 µL 0.017 µL 0.018 µL 0.021 µL 0.40 µL 0.49 µL 0.66 µL 1.9 µL 2.4 µL	Gravimetric method with analytical balance: ISO 8655-1; ISO 8655-2; ISO 8655-3; ISO 8655-4; ISO 8655-5; ISO 8655-6

VIII. Mechanical

Parameter/Equipment	Range	CMC[2, 18] (±)	Comments[11]
Force[3] –			
Load Cell (Force Transducer)			ASTM E74; ISO 376
Compression & Tension	(0.001 to 1) kN (>1 to 10) kN	0.04 % 0.05 %	Dead weights
	(10 to 50) kN (>50 to 100) kN	0.057 % 0.088 %	Load cell standards
Compression	(100 to 500) kN (>500 to 5000) kN	0.073 % 0.09 %	Load cell standards
Testing Machines Force Push/Pull Gages Dynamometers			ASTM E4; ISO 7500-1; ISO 7500-2; BS EN 12390-4 (Israeli standard 26 part 4-1) [12]
Compression & Tension	Up to 50 kN (50 to 100) kN (100 to 200) kN (200 to 500) kN (500 to 1000) kN	0.052 % 0.039 % 0.063 % 0.057 % 0.033 %	Dead weights
Compression	(500 to 1000) kN (1000 to 5000) kN	0.041 % 0.039 %	Load cell standards
Rate of Stress	(0.05 to 2) MPa/s	0.07 MPa/s	BS EN 12390-3; load cell, stop watch
Rate of Straining	(0.5 to 12) MPa/s (0.05 to 0.8) mm/mm/min	0.3 MPa/s 0.02 mm/mm/min	ASTM E2658; load cell, stop watch

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Pressure Gages[3]– Pneumatic –			OIML/R 101; Israeli standard 697; EA-10/17
Gage & Differential	(-1250 to 1250) kPa (-15 to 15) kPa (-100 to 100) kPa	0.8 Pa 3 Pa 0.14 kPa	Druck, LPE 9400 Druck, DPI 610 Druck, DPI 610
Absolute	(13 to 1250) Pa (0.04 to 200) kPa	0.73 Pa 0.53 kPa	Druck, LPE 940 Druck, DPI 104
Hydraulic & Pneumatic	(0 to 7) MPa (>7 to 70) MPa (>70 to 200) MPa	0.4 kPa 10 kPa 32 kPa	Druck, DPI 104 Druck, DPI 104 AEP Transducers LAB DMM
Pressure Testers, Pressure transducers, Pressure Indicators –			
Pneumatic	(-100 to 100) kPa	2 Pa	Deadweight tester YANTRIKA, REW 401HAA/1
	(0 to 7) MPa	150 Pa	Deadweight tester YANTRIKA, REW 417HAA/1
Hydraulic	(0 to 7) MPa (>7 to 140) MPa	170 Pa 1 kPa	Deadweight tester YANTRIKA, REW 309HAO/

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Durometers Calibration – Indenter – Extension & Shape			ASTM D 2240; ISO 868; DIN 53505; DIN ISO 7619-1;DIN ISO 48-4; ASTM D1415
Diameter	Diameter of the base of the cone 0.79 mm (A, C)	4 µm (160 µin)	Optical inspection under magnification
Radius	Tip radius R 0.1 mm (B, D), R 1.19 mm (O, DO)	 3 µm (120 µin) 10 µm (390 µin)	
Angle	Cone angle 35° (A, C), 30° (B, D)	 51" (0.000 25 rad)	
Extension	2.5 mm (A, B, C, D, O, DO)	8 µm (320 µin)	Load cell standards; dead weights
Spring Calibration Force	(0.8 to 8.05) N - A, B, E, O (4.4 to 44.45) N - C, D, DO	0.04 N 0.4 N	
Scales & Balances[3] (Includes Analytical Balances)	Up to 20 mg (>20 to 100) mg (>100 to 1000) mg (>1 to 10) g (>10 to 20) g (>20 to 100) g (>100 to 200) g (>200 to 500) g (>500 to 1000) g (>1 to 10) kg (>10 to 200) kg (>200 to 1000) kg (1000 to 2400) kg	0.002 mg 0.003 mg 0.004 mg 0.009 mg 0.014 mg 0.092 mg 0.170 mg 0.8 mg 0.9 mg 0.08 g 1.3 g 15 g 23 g	Mass standards: Class E1, E_2, F1, F2, M_1, M2, M_3: OIML R76-1, OIML R 111-1 EURAMET/cg-18, USP 41

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Mass Pieces	1 mg & 2 mg 5 mg 10 mg 20 mg 50 mg & 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g, 1 kg, 10 kg, 20 kg 50 kg	0.001 mg 0.002 mg 0.004 mg 0.007 mg 0.009 mg 0.011 mg 0.013 mg 0.000 04 g 0.000 06 g 0.0001 g 0.0003 g 0.0005 g 0.001 g 0.003 g 0.005 g 0.014 g 0.11 g	OIML R101 OIML R 111-1 1 mg to 500 mg Grade E2. 1 g to 20 Grade F1 Accuracy grades: M_1, M_2, M_3
Custom Weights/Fixtures[3, 8] –			
Mass	From (10 to 100) g (>100 to 1000) g (>1 to 10) kg (>10 to 30) kg	0.092 mg 0.9 mg 0.08 g 1.3 g	Precision scales[6] OIML R 111-1
Torque –			
Torque Wrenches & Torque Drivers[3]	(0 to 0.25) N·m (0.25 to 0.7) N·m (0.7 to 2.5) N·m (2.5 to 25) N·m (25 to 250) N·m (150 to 1500) N·m Up to 2700 N·m Up to 4000 N·m Up to 5400 N·m Up to 6800 N·m Up to 8100 N·m Up to 9500 N·m Up to 10 800 N·m Up to 13 560 N·m	0.005 N·m 0.005 N·m 0.007 N·m 0.047 N·m 0.31 N·m 1.9 N·m 2.1 N·m 3.1 N·m 4.2 N·m 5.3 N·m 6.2 N·m 7.3 N·m 8.3 N·m 10 N·m	Torque calibrators, ISO 6789; ISO 6789-1; ISO 6789-2 Torque meter
Torque Calibrators	Up to 2.8 N·m (>2.8 to 28) N·m (>28 to 135) N·m (>135 to 500) N·m	0.002 N·m 0.0039 N·m 0.023 N·m 0.074 N·m	Dead weights & arms; BS 7882

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Indirect Verification of Rockwell Hardness Testers[3]	HRA: Low Medium High HRBW: Low Medium High HRC: Low Medium High HREW: Low Medium High HR15TW: Low Medium High	 0.24 HRA 0.24 HRA 0.18 HRA 0.58 HRBW 0.39 HRBW 0.40 HRBW 0.29 HRC 0.24 HRC 0.40 HRC 0.19 HREW 0.28 HREW 0.18 HREW 0.28 HR15TW 0.25 HR15TW 0.31 HR15TW	Hardness standards: ASTM E18; ISO 6508-2
Indirect Verification of Vickers Hardness Testers[3] (0.1, 0.5, 1 & 10) kg	(≥100 to 240) HV (>240 to ≤600) HV >600 HV	3.3 HV 6.1 HV 8.1 HV	Hardness standards: ASTM E384, ASTM E92; ISO 6507-2
Indirect Verification of Brinell Hardness Testers[3], (10/3000, 10/1000, & 2.5/187.5)	<125 HBW (125 to 225) HBW >225 HBW	1.9 HBW 2.9 HBW 4.4 HBW	Hardness standards: ASTM E10; ISO 6506-2
Sieves	Standard Sieve Designation (Customer Defined Parameters)	7 µm (280 µin)	Measuring projector; caliper; ASTM E11; ISO 3310-1; ISO 3310-2; ISO 3310-3; ISO 2395; ISO 565; ISO 9044-1999

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Hammers[3] –			
Weighing	Defined by Standard	0.0012 g	ASTM D 1557; ASTM D 698; ASTM D 2168; ASTM D 1883 ASTM C805/C805M (Israeli standard 26 part 7). EN 12504-2
Height of Free Fall	Defined by Standard	0.9 mm (0.035 in)	
Impact Testing Devices3 (Direct Method Only) –			
Energy	(1 to 5.5) J (>5.5 to 150) J (>150 to 406) J	0.2 J 0.48 J 3.0 J	ASTM D 256; ASTM E 23; AS 1146.3; EN 10045; ISO 148; ISO 148-1; ISO 148-2; BS 131; BS 131-1; BS 131-5; BS 131-6; BS 131-7;
Velocity	(3 to 6) m/s	0.004 m/s	
Length	200 mm (>200 to 500) mm (>500 to 1500) mm	0.014 mm 0.097 mm 1.2 mm	

IX. Optical Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Lux Meter[3]	Up to 50 Lux Up to 500 Lux Up to 5000 Lux Up to 10 000 Lux	0.79 Lux 1.1 Lux 3.2 Lux 6.2 Lux	Lux Meter
Optical Gloss Meters	≈ 60 GU at 20° ≈ 45 GU at 60° ≈ 100 GU at 85°	1.0 GU 0.78 GU 0.82 GU	BS-EN-ISO 2813 ASTM D523
Optical Gloss Tiles	≈ 1990 GU at 20° ≈ 940 GU at 60° ≈ 160 GU at 85°	3.7 GU 1.0 GU 1.3 GU	BS-EN-ISO 2813 ASTM D523

X. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
Thermocouple Calibration –			
Type E	(190 to 0) °C (>0 to 960) °C	0.24 °C 0.24 °C	AMS 2750; ASTM E220
Type J	(-190 to 0) °C (>0 to 960) °C	0.18 °C 0.24 °C	
Type K	(-190 to 0) °C (>0 to 230) °C (>230 to 660) °C (>660 to 960) °C (>960 to 1250) °C	0.19 °C 0.18 °C 0.22 °C 0.28 °C 2.5 °C	
Type N	(-190 to 0) °C (>0 to 230) °C (>230 to 660) °C (>660 to 960) °C (>960 to 1250) °C	0.28 °C 0.28 °C 0.22 °C 0.22 °C 2.5 °C	
Type R	(-40 to 0) °C (>0 to 600) °C (>600 to 960) °C (>960 to 1300) °C	0.96 °C 0.43 °C 0.46 °C 1.8 °C	
Type S	(-40 to 0) °C (>0 to 600) °C (>600 to 960) °C (>960 to 1300) °C	0.65 °C 0.49 °C 0.51 °C 1.8 °C	
Type T	(-190 to 0) °C (>0 to 230) °C (>230 to 420) °C	0.20 °C 0.25 °C 0.23 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments[11]
RTD Probes Calibration	(-190 to 0) °C (>0 to 150) °C (>150 to 230) °C (>230 to 660) °C (>660 to 960) °C	0.09 °C 0.09 °C 0.09 °C 0.09 °C 0.1 °C	AMS 2750; ASTM E644; ASTM E1137; ASTM E1137/E1137M
Temperature Measuring Equipment[3] –			SPRT, RTD standards:
Liquid in Glass Thermometers	(-80 to 0) °C (>0 to 100) °C (>100 to 230) °C	0.12 °C 0.09 °C 0.09 °C	ASTM E1; ASTM E77; ISO 1770; ISO 1771
Mechanical & Electrical Indicators with Probe(s)	(-190 to 0) °C (>0 to 100) °C (>100 to 420) °C (>420 to 660) °C	0.09 °C 0.09 °C 0.09 °C 0.09 °C	AMS 2750
Temperature – Measure[3]			
Liquid Baths	(-190 to -40) °C (>-40 to 0) °C (>0 to 150) °C	0.09 °C 0.09 °C 0.09 °C	PRTs & thermocouple reference standards
Uniformity Surveys (Ovens, Furnaces, Autoclaves & Freezers)	(-190 to 100) °C (>100 to 420) °C (>420 to 660) °C (>660 to 960) °C (>960 to 1250) °C	0.27 °C 0.28 °C 0.30 °C 0.38 °C 2.0 °C	Measurement & uniformity surveys; AMS 2750; ISO 17665-1; ISO 17665-2; SI 1291 (Israeli standard)[14]
Relative Humidity[3] –			
Measuring Equipment (5 to 50) °C	10 % RH (>10 to 35) % RH (>35 to 65) % RH (>65 to 95) % RH	0.77 % RH 0.76 % RH 1.6 % RH 1.7 % RH	Humidity chamber
Measure	(10 to 20) % RH (>20 to 65) % RH (>65 to 90) % RH	0.42 % RH 0.91 % RH 1.6 % RH	Rotronic humidity indicator

Parameter/Equipment	Range	CMC[2, 16] (±)	Comments[11]
Dewpoint –			
Measuring Equipment	(-40 to 95) °C	0.056 °C	Chilled mirror ASTM D4230, ASTM E104, ASTM E546, ASTM E576, MIL-I-24144, MIL-M-24144
Measure[3]	(-40 to 180) °C	0.2 °C	

XI. Time & Frequency

Parameter/Equipment	Range	CMC[2, 4, 16] (±)	Comments
Frequency – Measure[3]	0.037 Hz to 230 MHz	5 x 10^{-9} (0.3 h)	Keysight 53230A locked with GPS receiver
	Up to 1.5 GHz Up to 4 GHz Up to 6 GHz	8.2 × 10^{-5} GHz 7.0 × 10^{-5} GHz 6.2 × 10^{-5} GHz	Agilent E4404B
Frequency – Generate[3]	10 MHz	1 x 10^{-11} (24 h)	Fluke 910R
	0.1 Hz to 150 kHz	4.8x10^{-9} (0.3h)	Fluke 5522A w/910R
	150 kHz to 4 GHz	8.7 × 10^{-10} Hz	Agilent E4422B
Stopwatches & Timers[3]	1 s to 24 hr	0.09 s	Stopwatch
Rotational Speed – Measure[3, 4] –			
Optical Rotational Speed (RPM)	(15 to 60) RPM (>60 to 3000) RPM (>3000 to 24 000) RPM (>24 000 to 48 000) RPM (>48 000 to 90 000) RPM	0.18 RPM 0.34 RPM 4 RPM 30 RPM 54 RPM	Optical tachometer (mode photo) ASTM D4060
Mechanical Rotational Speed (RPM)	(1.5 to 30) RPM (30 to 60) RPM (>60 to 600) RPM (>600 to 1000) RPM (>1000 to 6000) RPM	0.17 RPM 0.18 RPM 0.24 RPM 0.63 RPM 2 RPM	Mechanical tachometer (mode contact)

Parameter/Equipment	Range	CMC[2, 4, 16] (±)	Comments
Speed – Measure[3, 4] Surface Speed	(10 to 400) m/min	0.25 m/min	Mechanical tachometer (mode m/min)
Length Counter – Measure[3]	(2 to 1000) m	0.5 m	Mechanical tachometer; (mode m/min), mechanical stopwatch

[1] This laboratory offers commercial calibration, dimensional testing, and field calibration services.

[2] Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMCs represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

[3] Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g., resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] In the statement of CMC, *L* is the numerical value of the nominal length of the device measured in meters. In the statement of best uncertainty, *R* is the numerical value of the resolution of the device measured in micrometers; LSVD represents the least significant valid displayed division of the device subject to calibration; RPM is revolution per minute, ORM is oscillation per minute.

[5] In the statement of CMC, *R* is the numerical value of the resolution of the angle measuring devices measured in degrees or in minutes.

[6] Calibrated by P.K. Labs

[7] This laboratory meets R205 – *Specific Requirements: Calibration Laboratory Accreditation Program* for the types of dimensional tests listed above and is considered equivalent to that of a calibration.

[8] Including weighing of distilled water (density 1 g/cm^3) and conversion to the volume units.

[9] Compliance according to the policy of the P.K.Labs

[10] Compliance of the setting or limit gauges according to the policy of the P.K.Labs.

[11] Calibration can be also performed to manufacturer or specific customer requirements.

[12] Calibration of the compression machines for testing of hardened concrete (Israeli standard 26 part 4-1-is the Hebrew version)

[13] Calibration of micrometers "Tri-O-Bor"(internal micrometer with three-point contact) according to test instruction VDI/VDE/DGO 2618 as an expansion of DIN 863

[14] Calibration of the vehicles for food transport in a controlled temperature (Israeli standard 1291 is the Hebrew version)

[15] The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification

[16] The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter

[17] This scope meets A2LA's *P112 Flexible Scope Policy*.

[18] In the statement of CMC, percentages are percentages of reading, unless otherwise indicated.

Accredited Laboratory

A2LA has accredited

P.K. CALIBRATION & CONSULTING LABS LTD

Tefen, ISRAEL

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 28th day of June 2023.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2806.01
Valid to July 31, 2025

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.