



CERTIFICATE OF ACCREDITATION

This is to attest that

STANDARD METER LABORATORY, INC.

236 RICKENBACKER CIRCLE
LIVERMORE, CALIFORNIA 94551, U.S.A.

Calibration Laboratory CL-146

has met the requirements of AC204, *IAS Accreditation Criteria for Calibration Laboratories*, and has demonstrated compliance with the ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories*. This organization is accredited to provide the services specified in the scope of accreditation maintained on the following page(s).

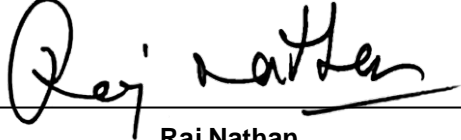
This certificate is valid up to December 1, 2022.

(See laboratory's scope of accreditation for fields of calibration and accredited calibration.)



This accreditation certificate supersedes any IAS accreditation bearing an earlier effective date. The certificate becomes invalid upon suspension, cancellation or revocation of accreditation. See www.iasonline.org for current accreditation information, or contact IAS at 562-364-8201.




Raj Nathan
President



SCOPE OF ACCREDITATION

IAS Accreditation Number	CL-146
Accredited Entity	Standard Meter Laboratory, Inc.
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Effective Date of Scope	May 13, 2020
Accreditation Standard	ISO/IEC 17025:2017

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)^{1,2}

CALIBRATION AREA	RANGE	EXPANDED UNCERTAINTY ³ (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
<i>Mechanical</i>			
Pressure Calibrators, Transmitters and Gauges	-1 inH ₂ O to 1 inH ₂ O	0.0002 inH ₂ O	Fluke 7250 LP
	-10 inH ₂ O to 0 inH ₂ O	0.0014 inH ₂ O	
	0 inH ₂ O to 10 inH ₂ O	0.0013 inH ₂ O	
-30 inH ₂ O to 0 inH ₂ O	0.0066 inH ₂ O		
0 inH ₂ O to 30 inH ₂ O	0.0066 inH ₂ O		
	-14.5 psig to 0 psig	0.0013 psig	Fluke PM600-A350K
	0 psig to 30 psig	0.0036 psig	
	0 psia to 0.2 psia	0.0016 psia	
	0.2 psia to 30 psia	0.0030 psia	
	-14.5 psig to 0 psig	0.0062 psig	Fluke PM500-BG2M
	0 psig to 300 psig	0.033 psig	
Torque	4 oz-in to 250 lb-in	0.31 %	BMX-40z BMX-25i BMX-250i
	10 lbf-ft to 1000 lbf-ft	0.5 %	LTT-100F BMX-1000i
<i>Thermal</i>			
Temperature Simulation			Fluke 5522A
Thermocouple Type B	600 °C to 799.99 °C	0.44 °C	
	800 °C to 999.99 °C	0.34 °C	
	1000 °C to 1549.99 °C	0.30 °C	
	1550 °C to 1820 °C	0.33 °C	
Type C	0 °C to 149.99 °C	0.30 °C	
	150 °C to 649.99 °C	0.26 °C	
	650 °C to 999.99 °C	0.31 °C	
	1000 °C to 1799.99 °C	0.50 °C	
	1800 °C to 2316 °C	0.84 °C	



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CALIBRATION AREA	RANGE	EXPANDED UNCERTAINTY ³ (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
Temperature Simulation continued			Fluke 5522A
Thermocouple Type E	-250 °C to -100.01 °C	0.50 °C	
	-100 °C to -25.01 °C	0.016 °C	
	-25 °C to 349.99 °C	0.14 °C	
	350 °C to 649.99 °C	0.16 °C	
	650 °C to 1000 °C	0.21 °C	
Type J	-210 °C to -100.01 °C	0.27 °C	
	-100 °C to -30.01 °C	0.16 °C	
	-30 °C to 149.99 °C	0.14 °C	
	150 °C to 759.99 °C	0.17 °C	
	760 °C to 1200 °C	0.23 °C	
Type K	-200 °C to -100.01 °C	0.33 °C	
	-100 °C to -25.01 °C	0.18 °C	
	-25 °C to 119.99 °C	0.16 °C	
	120 °C to 999.99 °C	0.26 °C	
	1000 °C to 1372 °C	0.40 °C	
Type L	-200 °C to -100.01 °C	0.37 °C	
	-100 °C to 799.99 °C	0.26 °C	
	800 °C to 900 °C	0.17 °C	
Type N	-200 °C to -100.01 °C	0.40 °C	
	-100 °C to -25.01 °C	0.22 °C	
	-25 °C to 119.99 °C	0.19 °C	
	120 °C to 409.99 °C	0.18 °C	
	410 °C to 1300 °C	0.27 °C	
Type R	0 °C to 249.99 °C	0.57 °C	
	250 °C to 399.99 °C	0.35 °C	
	400 °C to 999.99 °C	0.33 °C	
	1000 °C to 1767 °C	0.40 °C	
Type S	0 °C to 249.99 °C	0.47 °C	
	250 °C to 999.99 °C	0.36 °C	
	1000 °C to 1399.99 °C	0.37 °C	
	1400 °C to 1767 °C	0.46 °C	
Type T	-250 °C to -150.01 °C	0.63 °C	
	-150 °C to -0.01 °C	0.24 °C	
	0 °C to 119.99 °C	0.16 °C	
	120 °C to 400 °C	0.14 °C	
Type U	-200 °C to -0.01 °C	0.56 °C	
	0 °C to 600 °C	0.27 °C	



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CALIBRATION AREA	RANGE	EXPANDED UNCERTAINTY ³ (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
RTD			Fluke 5522A
PT385, 100 Ω	-200 °C to 99.99 °C 100 °C to 629.99 °C 630 °C to 800 °C	0.07 °C 0.12 °C 0.23 °C	
PT3926, 100 Ω	-200 °C to -0.01 °C 0 °C to 399.99 °C 400 °C to 629.99 °C	0.05 °C 0.10 °C 0.12 °C	
PT3916, 100 Ω	-200 °C to -0.01 °C 0 °C to 599.99 °C 600 °C to 630 °C	0.05 °C 0.10 °C 0.23 °C	
PT385, 200 Ω	-200 °C to -259.99 °C 260 °C to 630 °C	0.05 °C 0.16 °C	
PT385, 500 Ω	-200 °C to 259.99 °C 260 °C to 630 °C	0.06 °C 0.11 °C	
PT385, 1000 Ω	-200 °C to 99.99 °C 100 °C to 599.99 °C 600 °C to 630 °C	0.04 °C 0.07 °C 0.23 °C	
PT385, 120 Ω	-80 °C to 99.99 °C 100 °C to 260 °C	0.08 °C 0.14 °C	
CU427, 10 Ω	-100 °C to 260 °C	0.3 °C	
Temperature – Measure ⁵	-195.7 °C to 0 °C 0 °C to 100 °C 100 °C to 400 °C	0.004 °C 0.005 °C 0.007 °C	1502A/5628 M2801/IRTD-400
IR Thermometers	0 °C	0.10 °C	Ametek ATC-140A
	35 °C	0.22 °C	Fluke 4181-156
	100 °C	0.24 °C	
	200 °C	0.33 °C	
	350 °C	0.53 °C	
500 °C	0.8 °C		
Thermo Hygrometer	0 °C to 60 °C 0 %RH to 95 %RH	0.07 °C 0.51 %RH	Thunder Scientific 2500ST
Electrical/DC/Low Frequency			
GE Kaye Validators for Electrical and Temperature Parameters	0.1 V to 10 V (DC)	0.003 %	Fluke 5522A
	0.1 Ω to 100 Ω	0.009 %	Kaye X2020 Ical
	Only at 0 °C	0.013 °C	Kaye IRTD 400



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CALIBRATION AND MEASUREMENT CAPABILITY (CMC)^{1,2}

CALIBRATION AREA	RANGE	EXPANDED UNCERTAINTY ³ (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
DC Resistance – Generate ⁴ continued	110 MΩ to 329.9999 MΩ 330 MΩ to 1100 MΩ	0.3 % + 100 kΩ 1.5 % + 500 kΩ	
DC Resistance - Measure ⁵	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1 GΩ	19 μΩ/Ω + 0.06 mΩ 13 μΩ/Ω + 0.6 mΩ 10 μΩ/Ω + 0.6 mΩ 15 μΩ/Ω + 2.4 mΩ 59 μΩ/Ω + 120 mΩ 0.058 % + 1.2 kΩ 1.8 % + 10 kΩ	HP 3458A
AC Voltage – Generate ⁴	1 mV to 32.999 mV (10 Hz to 45 Hz) (45 Hz to 10 kHz) (10 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 500 kHz) 33 mV to 329.999 mV (10 Hz to 45 Hz) (45 Hz to 10 kHz) (10 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 500 kHz) 0.33 V to 3.29999 V (10 Hz to 45 Hz) (45 Hz to 10 kHz) (10 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 500 kHz) 3.3 V to 32.9999 V (10 Hz to 45 Hz) (45 Hz to 10 kHz) (10 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) 33 V to 329.999 V (45 Hz to 1 kHz) (1 kHz to 10 kHz) (10 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz)	800 μV/V + 6 μV 150 μV/V + 6 μV 200 μV/V + 6 μV 0.1 % + 6 μV 0.35 % + 12 μV 0.8 % + 50 μV 300 μV/V + 8 μV 145 μV/V + 8 μV 160 μV/V + 8 μV 350 μV/V + 8 μV 800 μV/V + 32 μV 0.2 % + 70 μV 300 μV/V + 50 μV 150 μV/V + 60 μV 190 μV/V + 60 μV 300 μV/V + 50 μV 700 μV/V + 0.13 mV 0.24 % + 0.6 mV 300 μV/V + 650 μV 150 μV/V + 600 μV 240 μV/V + 600 μV 350 μV/V + 600 μV 900 μV/V + 1.6 mV 190 μV/V + 2 mV 200 μV/V + 6 mV 250 μV/V + 6 mV 300 μV/V + 6 mV 0.2 % + 50 mV	Fluke 5522A



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CALIBRATION AND MEASUREMENT CAPABILITY (CMC)^{1,2}

CALIBRATION AREA	RANGE	EXPANDED UNCERTAINTY ³ (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
AC Voltage – Generate ⁴ continued	330 V to 1020 V (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz)	300 µV/V + 10 mV 250 µV/V + 10 mV 300 µV/V + 10 mV	Fluke 5522A
AC Voltage – Measure ⁵	1 mV to 10 mV (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz)	0.03 % + 3 µV 0.02 % + 2 µV 0.03 % + 2 µV 0.12 % + 2 µV 0.58 % + 2 µV 4.6 % + 2 µV	HP3458A, synchronous sub-sample mode
	10 mV to 100 mV (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz) (1 MHz to 2 MHz)	0.008 % + 4 µV 0.008 % + 2 µV 0.02 % + 2 µV 0.03 % + 2 µV 0.09 % + 2 µV 0.35 % + 10 µV 1.2 % + 10 µV 1.7 % + 10 µV	
	100 mV to 1 V (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz) (1 MHz to 2 MHz)	0.008 % + 40 µV 0.008 % + 20 µV 0.02 % + 20 µV 0.03 % + 20 µV 0.09 % + 20 µV 0.35 % + 100 µV 1.2 % + 100 µV 1.7 % + 100 µV	
	1 V to 10 V (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz) (1 MHz to 2 MHz)	0.008 % + 0.4 mV 0.008 % + 0.2 mV 0.02 % + 0.2 mV 0.03 % + 0.2 mV 0.09 % + 0.2 mV 0.35 % + 1 mV 1.2 % + 1 mV 1.7 % + 1 mV	
	10 V to 100 V (1 Hz to 40 Hz) (40 Hz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz)	0.02 % + 4 mV 0.02 % + 2 mV 0.04 % + 2 mV 0.14 % + 2 mV 0.46 % + 10 mV 1.7 % + 10 mV	



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CALIBRATION AND MEASUREMENT CAPABILITY (CMC)^{1,2}

CALIBRATION AREA	RANGE	EXPANDED UNCERTAINTY ³ (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
AC Voltage – Measure ⁵ continued	100 V to 700 V (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz)	0.05 % + 40 mV 0.05 % + 20 mV 0.07 % + 20 mV 0.14 % + 20 mV 0.35 % + 20 mV	HP3458A, synchronous sub-sample mode
High Voltage – Measure ⁵ @ 60 Hz	1 kV to 28 kV rms	5 %	Fluke 80K40 and HP3458A
	15 kV to 60 kV rms	2.3 %	SML-150 kV
AC Current – Generate ⁴	29 µA to 329.99 µA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) (10 kHz to 30 kHz)	0.2 % + 0.1 µA 0.15 % + 0.1 µA 0.13 % + 0.1 µA 0.3 % + 0.15 µA 0.8 % + 0.2 µA 1.6 % + 0.4 µA	Fluke 5522A
	330 µA to 3.29999 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) (10 kHz to 30 kHz)	0.2 % + 0.15 µA 0.13 % + 0.15 µA 0.1 % + 0.15 µA 0.2 % + 0.2 µA 0.5 % + 0.3 µA 1.0 % + 0.6 µA	
	3.3 mA to 32.9999 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) (10 kHz to 30 kHz)	0.18 % + 2 µA 0.09 % + 2 µA 0.04 % + 2 µA 0.08 % + 2 µA 0.2 % + 3 µA 0.4 % + 4 µA	
	33 mA to 329.999 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) (10 kHz to 30 kHz)	0.18 % + 20 µA 0.09 % + 20 µA 0.04 % + 20 µA 0.10 % + 50 µA 0.20 % + 100 µA 0.40 % + 200 µA	
	330 mA to 1.09999 A (10 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz)	0.18 % + 100 µA 0.05 % + 100 µA 0.6 % + 1 mA 2.5 % + 5 mA	
	1.1 A to 2.99999 A		



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CALIBRATION AREA	RANGE	EXPANDED UNCERTAINTY ³ (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
AC Current – Generate ⁴ continued	(10 Hz to 45 Hz) (45 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz) 3 A to 10.9999 A (45 Hz to 100 Hz) (100 Hz to 1 kHz) (1 kHz to 5 kHz) 11 A to 20.5 A (45 Hz to 100 Hz) (100 Hz to 1 kHz) (1 kHz to 5 kHz)	0.18 % + 100 µA 0.06 % + 100 µA 0.6 % + 1 mA 2.5 % + 5 mA 0.06 % + 2 mA 0.10 % + 2 mA 3.0 % + 2 mA 0.12 % + 5 mA 0.15 % + 5 mA 3.0 % + 5 mA	
Clamp Meter Calibrations	10 A to 16.4999 A (45 Hz to 64 Hz) (65 Hz to 440 Hz) 16.5 A to 149.999 A (45 Hz to 64 Hz) (65 Hz to 440 Hz) 150 A to 1025 A (45 Hz to 64 Hz) (65 Hz to 440 Hz)	0.56 % + 0.03 A 1 % + 0.03 A 0.56 % + 0.25 A 1 % + 0.25 A 0.56 % + 0.9 A 1 % + 0.9 A	5500A/Coil – with 5522A
AC Current – Measure ⁵	5 µA to 100 µA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 100 Hz) (100 Hz to 1 kHz) 100 µA to 1 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 100 Hz) (100 Hz to 5 kHz) 100 mA to 1 A (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 100 Hz) (100 Hz to 5 kHz) 1 A to 20 A (DC to 1 kHz) (1 kHz to 5 kHz)	0.46 % + 0.03 µA 0.17 % + 0.03 µA 0.07 % + 0.03 µA 0.07 % + 0.03 µA 0.5 % + 0.2 µA 0.17 % + 0.2 µA 0.07 % + 0.2 µA 0.04 % + 0.2 µA 0.46 % + 200 µA 0.18 % + 200 µA 0.09 % + 200 µA 0.12 % + 200 µA 0.025 % 0.035 %	HP3458A, synchronous sub-sample mode Fluke Y5020 with HP3458A



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CALIBRATION AREA	RANGE	EXPANDED UNCERTAINTY ³ (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
Capacitance – Generate ⁴	220.0 pF to 399.9 pF (10 Hz to 10 kHz)	0.5 % + 10 pF	Fluke 5522A
	0.4 nF to 1.0999 nF (10 Hz to 10 kHz)	0.5 % + 0.01 nF	
	1.1 nF to 3.2999 nF (10 Hz to 3 kHz)	0.5 % + 0.01 nF	
	3.3 nF to 10.9999 nF (10 Hz to 1 kHz)	0.25 % + 0.01 nF	
	11 nF to 32.9999 nF (10 Hz to 1 kHz)	0.25 % + 0.1 nF	
	33 nF to 109.999 nF (10 Hz to 1 kHz)	0.25 % + 0.1 nF	
	110 nF to 329.999 nF (10 Hz to 1 kHz)	0.25 % + 0.3 nF	
	0.33 µF to 1.09999 µF (10 Hz to 600 Hz)	0.25 % + 1 nF	
	1.1 µF to 3.29999 µF (10 Hz to 300 Hz)	0.25 % + 3 nF	
	3.3 µF to 10.9999 µF (10 Hz to 150 Hz)	0.25 % + 10 nF	
	11 µF to 32.9999 µF (10 Hz to 120 Hz)	0.40 % + 30 nF	
	33 µF to 109.999 µF (10 Hz to 80 Hz)	0.45 % + 100 nF	
	110 µF to 329.999 µF (0 Hz to 50 Hz)	0.45 % + 300 nF	
	0.33 mF to 1.09999 mF (0 Hz to 20 Hz)	0.45 % + 1 µF	
1.1 mF to 3.29999 mF (0 Hz to 6 Hz)	0.45 % + 3 µF		
3.3 mF 10.9999 mF (0 Hz to 2 Hz)	0.45 % + 10 µF		



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CALIBRATION AREA	RANGE	EXPANDED UNCERTAINTY ³ (±)	TECHNIQUE, REFERENCE STANDARD, EQUIPMENT
Capacitance – Generate ⁴ continued	11 mF to 32.9999 mF (0 Hz to 0.6 Hz)	0.75 % + 30 µF	Fluke 5522A
	33 mF to 110 mF (0 Hz to 0.2 Hz)	1.1 % + 100 µF	
Oscilloscope Leveled Sine Amplitude (50 kHz Reference)	5 mV to 5 V (p-p)	2.0 % + 0.30 mV	Fluke 5522A W/SC1100 (1.1 GHz O-scope Option)
Leveled Sine Flatness (into 50 Ω)	5 mV to 5 V (p-p) (50 kHz to 100 MHz) (100 MHz to 200 MHz) (200 MHz to 600 MHz) (600 MHz to 1.1 GHz)	3.7 % + 0.30 mV 4.2 % + 0.30 mV 6.2 % + 0.30 mV 7.2 % + 0.30 mV	
Square Wave 10 Hz to 10 kHz (into 50 Ω)	1.8 mV to 2.5 V (p-p) 1.8 mV to 55 V (p-p)	3 % + 0.10 mV 3 % + 0.10 mV	
Time Marker	5 s to 50 ms	(25 + t*1000) µs/s Where t is in seconds	
Time/Frequency			
Frequency – Measure ⁵	1 Hz to 39.99999 Hz 40 Hz to 10 MHz	0.05 % 0.01 %	HP 3458A
Frequency – Generate ⁴	1 Hz to 2 MHz	0.00029 %	Fluke 5522A

¹The uncertainty covered by the Calibration and Measurement Capability (CMC) is expressed as the expanded uncertainty having a specific coverage probability of approximately 95 %. It is the smallest measurement uncertainty 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. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than that provided in the CMC due to the behavior of the customer’s device and to influences from the circumstances of the specific calibration.

²If information in this CMC is presented in non-SI units, the conversion factors stated in NIST Special Publication 811 “Guide for the Use of the International System of Units (SI)” apply.

³When uncertainty is stated in relative terms (such as percent, a multiplier expressed as a decimal fraction or in scientific notation), it is in relation to instrument reading or instrument output, as appropriate, unless otherwise indicated.

⁴Capability is suitable for the calibration of measuring devices in the stated ranges.

⁵Capability is suitable for the calibration of devices intended to generate the measurand in the stated ranges.