



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005  
& ANSI/NCSL Z540-1-1994

**Nationwide Gage Calibration, Inc.**

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**CALIBRATION**

Valid to :March 3, 2011

Certificate Number: AC-1160

**I. Electromagnetic – DC/Low Frequency**

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Voltage – Source	Up to 330 mV 330 mV to 3.3V (3.3 to 33) V (33 to 330) V 330 V to 1.02 kV	20 µV/V + 1 µV 11 µV/V + 2 µV 12 µV/V + 20 µV 18 µV/V + 150 µV 18 µV/V + 1.5 mV	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures
DC Current – Source	Up to 330µA 330µA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	150 µA/A + 20 nA 100 µA/A + 50 nA 100 µA/A + 250 nA 100 µA/A + 2.5 µA 200 µA/A + 40 µA 380 µA/A + 40 µA 500 µA/A + 500 µA 1 mA/A + 750 µA	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures
Resistance – Source	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1MΩ (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 1 100) MΩ	40 µΩ/Ω + 1 mΩ 30 µΩ/Ω + 1.5 mΩ 28 µΩ/Ω + 1.4 mΩ 28 µΩ/Ω + 2 mΩ 28 µΩ/Ω + 2 mΩ 28 µΩ/Ω + 20 mΩ 28 µΩ/Ω + 20 mΩ 28 µΩ/Ω + 200 mΩ 28 µΩ/Ω + 200 mΩ 32 µΩ/Ω + 2 mΩ 32 µΩ/Ω + 2 mΩ 60 µΩ/Ω + 30 mΩ 130 µΩ/Ω + 50 mΩ 250 µΩ/Ω + 2.5 mΩ 500 µΩ/Ω + 3 mΩ 3 mΩ/Ω + 100 kΩ 15 mΩ/Ω + 500 kΩ	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage – Source	<p><b>(1 to 33) mV</b>  (10 to 45) Hz  45 Hz to 10 kHz  (10 to 20) kHz  (20 to 50) kHz  (50 to 100) kHz  (100 to 500) kHz</p> <p><b>(33 to 330) mV</b>  (10 to 45) Hz  45 Hz to 10 kHz  (10 to 20) kHz  (20 to 50) kHz  (50 to 100) kHz  (100 to 500) kHz</p> <p><b>330 mV to 3.3 V</b>  (10 to 45) Hz  45 Hz to 10 kHz  (10 to 20) kHz  (20 to 50) kHz  (50 to 100) kHz  (100 to 500) kHz</p> <p><b>(3.3 to 33) V</b>  (10 to 45) Hz  45 Hz to 10 kHz  (10 to 20) kHz  (20 to 50) kHz  (50 to 100) kHz</p> <p><b>(33 to 330) V</b>  (10 to 45) Hz  45 Hz to 10 kHz  (10 to 20) kHz  (20 to 50) kHz  (50 to 100) kHz</p> <p><b>330 V to 1.02 kV</b>  45 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz</p>	<p>800 <math>\mu\text{V}/\text{V} + 6 \mu\text{V}</math>  150 <math>\mu\text{V}/\text{V} + 6 \mu\text{V}</math>  200 <math>\mu\text{V}/\text{V} + 6 \mu\text{V}</math>  1 <math>\text{mV}/\text{V} + 6 \mu\text{V}</math>  3.5 <math>\text{mV}/\text{V} + 12 \mu\text{V}</math>  8 <math>\text{mV}/\text{V} + 50 \mu\text{V}</math></p> <p>300 <math>\mu\text{V}/\text{V} + 8 \mu\text{V}</math>  145 <math>\mu\text{V}/\text{V} + 8 \mu\text{V}</math>  160 <math>\mu\text{V}/\text{V} + 8 \mu\text{V}</math>  350 <math>\mu\text{V}/\text{V} + 8 \mu\text{V}</math>  800 <math>\mu\text{V}/\text{V} + 32 \mu\text{V}</math>  2 <math>\text{mV}/\text{V} + 70 \mu\text{V}</math></p> <p>300 <math>\mu\text{V}/\text{V} + 50 \mu\text{V}</math>  150 <math>\mu\text{V}/\text{V} + 60 \mu\text{V}</math>  190 <math>\mu\text{V}/\text{V} + 60 \mu\text{V}</math>  300 <math>\mu\text{V}/\text{V} + 50 \mu\text{V}</math>  700 <math>\mu\text{V}/\text{V} + 125 \mu\text{V}</math>  2.4 <math>\text{mV}/\text{V} + 600 \mu\text{V}</math></p> <p>300 <math>\mu\text{V}/\text{V} + 650 \mu\text{V}</math>  150 <math>\mu\text{V}/\text{V} + 600 \mu\text{V}</math>  240 <math>\mu\text{V}/\text{V} + 600 \mu\text{V}</math>  350 <math>\mu\text{V}/\text{V} + 600 \mu\text{V}</math>  900 <math>\mu\text{V}/\text{V} + 1.6 \text{ mV}</math></p> <p>190 <math>\mu\text{V}/\text{V} + 2 \text{ mV}</math>  200 <math>\mu\text{V}/\text{V} + 6 \text{ mV}</math>  250 <math>\mu\text{V}/\text{V} + 6 \text{ mV}</math>  300 <math>\mu\text{V}/\text{V} + 6 \text{ mV}</math>  2 <math>\text{mV}/\text{V} + 50 \text{ mV}</math></p> <p>300 <math>\mu\text{V}/\text{V} + 10 \text{ mV}</math>  250 <math>\mu\text{V}/\text{V} + 10 \text{ mV}</math>  300 <math>\mu\text{V}/\text{V} + 10 \text{ mV}</math></p>	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures
AC Current -Source	<p><b>29 to 330) <math>\mu\text{A}</math></b>  (10 to 20) Hz  (20 to 45) Hz  45 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz  (10 to 30) kHz</p>	<p>2 <math>\text{mA}/\text{A} + 100 \text{ nA}</math>  1.5 <math>\text{mA}/\text{A} + 100 \text{ nA}</math>  1.25 <math>\text{mA}/\text{A} + 100 \text{ nA}</math>  3 <math>\text{mA}/\text{A} + 150 \text{ nA}</math>  8 <math>\text{mA}/\text{A} + 200 \text{ nA}</math>  16 <math>\text{mA}/\text{A} + 400 \text{ nA}</math></p>	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current -Source (Cont.)	<b>330 µA to 3.3 mA</b> (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz <b>(3.3 to 33) mA</b> (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz <b>(33 to 330) mA</b> (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz <b>330 mA to 1.1 A</b> (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz <b>(1.1 to 3) A</b> (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz <b>(3 to 11) A</b> (45 to 100) Hz (100 Hz to 1 kHz (1 to 5) kHz <b>(11 to 20.5) A</b> (45 to 100) Hz (100 Hz to 1 kHz (1 to 5) kHz	2 mA/A + 150 nA 1.25 mA/A + 150 nA 1 mA/A + 150 nA 2 mA/A + 200 nA 5 mA/A + 300 nA 10 mA/A + 600 nA  1.8 mA/A + 2 µA 900 µA/A + 2 µA 400 µA/A + 2 µA 800 µA/A + 2 µA 2 mA/A + 3 µA 4 mA/A + 4 µA  1.8 mA/A + 20 µA 900 µA/A + 20 µA 400 µA/A + 20 µA 1 mA/A + 50 µA 2 mA/A + 100 µA 4 mA/A + 200 µA  1.8 mA/A + 100 µA 500 µA/A + 100 µA 6 mA/A + 1 mA 25 mA/A + 5 mA  1.8 mA/A + 100 µA 600 µA/A + 100 µA 6 mA/A + 1 mA 25 mA/A + 5 mA  600 µA/A + 2 mA 1 mA/A + 2 mA 30 mA/A + 2 mA  1.2 mA/A + 5 mA 1.5 mA/A + 5 mA 30 mA/A + 5 mA	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures
Frequency - Source	10 mHz to 2 MHz	2.5 µHz/Hz ±5 µHz	Multi-Product Calibrator	OEM AND METCAL Sourced procedures
Capacitance - Source	(190 to 400) pF 400 pF to 1.1 nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF 330 nF to 1.1 µF	5 mF/F + 10pF 5 mF/F + 10pF 5 mF/F + 10pF 2.5 mF/F + 10pF 2.5 mF/F + 100pF 2.5 mF/F + 100pF 2.5 mF/F + 300pF 2.5 mF/F + 1 nF	Multi-Product Calibrator	OEM AND METCAL SOURCED CALIBRATION PROCEDURES



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Capacitance – Source (Cont.)	(1.1 to 3.3) μF (3.3 TO 11) μF (11 TO 33) μF (33 TO 110) μF (110 TO 330) μF 330 μF TO 1.1 mF (3.3 TO 11) mF (11 TO 33) mF (33 TO 110) mF	2.5 mF/F + 3 nF 2.5 mF/F + 10 nF 4 mF/F + 30 nF 4.5 mF/F + 100 nF 4.5 mF/F + 300 nF 4.5 mF/F + 1 μF 4.5 mF/F + 3 μF 4.5 mF/F + 10 μF 7.5 mF/F + 30 μF	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures
Electrical Simulation of Thermocouples				
Type B	(600 to 800) °C (800 to 1 000) °C (1 000 to 1550) °C (1550 to 1820) °C	0.44 °C 0.34 °C 0.30 °C 0.33 °C		
Type C	(0 to 150) °C (150 to 650) °C (650 to 1 000) °C (1 000 to 1 800) °C (1 800 to 2 316) °C	0.30 °C 0.26 °C 0.31 °C 0.50 °C 0.84 °C		
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C	0.5 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C		
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.4 °C		
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.37 °C 0.26 °C 0.17 °C		
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1 300) °C	0.40 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of Thermocouples (Cont.)				
Type R	(0 to 250) °C (250 to 400) °C (400 to 1 000) °C (1 000 to 1 767) °C	0.57 °C 0.35 °C 0.33 °C 0.4 °C	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures
Type S	(0 to 250) °C (250 to 1 000) °C (1 000 to 1 400) °C (1 400 to 1 767) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C		
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C		
Type U	(-200 to 0) °C (0 to 600) °C	0.56 °C 0.27 °C		
Electrical Simulation of RTDs				
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures
Pt 3926, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C		
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.25 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.23 °C		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of RTDs (Cont.) Pt 385, 200 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.04 °C 0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.05 °C 0.06 °C 0.08 °C 0.08 °C 0.09 °C 0.11 °C		
Pt 385, 1 000 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.03 °C 0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.07 °C 0.23 °C		
Pt 385, 120 Ω (Ni 120)	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.08 °C 0.08 °C 0.14 °C		
Cu 427, 10 Ω	(-100 to 260) °C	0.3 °C		
Electrical Simulation of Thermocouple Indicators*				
Type B	(600 to 800) °C (800 to 1 000) °C (1000 to 1 800) °C	2.2 °C 1.8 °C 1.4 °C		
Type E	(-200 to 0) °C (0 to 950) °C	0.9 °C 0.7 °C		
Type J	(-200 to 0) °C (0 to 1 200) °C	1 °C 0.7 °C		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of Thermocouple Indicators* (cont.)				
Type K	(-200 to 0) °C (0 to 1 370) °C	1.2 °C 0.8 °C	Precision Temperature Calibrator	CAL-11-TRTDM675
Type L	(-200 to 0) °C (0 to 900) °C	0.9 °C 0.7 °C		
Type N	(-200 to 0) °C (0 to 1 300) °C	1.5 °C 0.9 °C		
Type R	(-20 to 0) °C (0 to 500) °C (500 to 1 750) °C	2.5 °C 1.8 °C 1.4 °C		
Type S	(-20 to 0) °C (0 to 500) °C (500 to 1 750) °C	2.5 °C 1.8 °C 1.5 °C		
Type T	(-200 to 0) °C (0 to 400) °C	1.2 °C 0.8 °C		
Type U	(-200 to 0) °C (0 to 400) °C	1.1 °C 0.8 °C		
Electrical Simulation of RTDs*				
PtNi 120 (100 Ω)	(-80 to 260) °C	0.2 °C		
Pt 385 (100 Ω)	(-200 to 800) °C	0.3 °C		
Pt 392 (100 Ω)	(-200 to 630) °C	0.3 °C		
Pt JIS (100 Ω)	(-200 to 360) °C	0.3 °C		
Pt 385 (200 Ω)	(-200 to 250) °C (250 to 630) °C	0.2 °C 0.8 °C		
Pt 385 (500 Ω)	(-200 to 500) °C (500 to 630) °C	0.3 °C 0.4 °C		
Pt 385 (1 000 Ω)	(-200 to 100) °C (100 to 630) °C	0.2 °C 0.2 °C		

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<b>Oscilloscopes</b> Square Wave 50 Ω to 1 kHz 1 M Ω to 1 kHz  Leveled Sine Wave Amplitude (50 kHz ref)  Flatness (50 kHz ref)  Time Marker – Source & Period @ 50 V  Rise Time  Input Resistance	1 mV to 6.6 V p-p 1 mV to 130 V p-p  50 kHz reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz  50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz  5 s to 50 ms 20 ms to 100 ns 50 ns to 20 ns 10 ns 5 ns to 2 ns  ≤300 ps  (40 to 60) Ω 500 kΩ to 1.5 M Ω	2.5 mV/V + 40 μV 1 mV/V + 40 μV  20 mV/V + 300 μV 35 mV/V + 300 μV 40 mV/V + 300 μV 60 mV/V + 300 μV  15 mV/V + 100 μV 20 mV/V + 100 μV 40 mV/V + 100 μV  (25 + 1000t) μs/s 2.5 μs/s 2.5 μs/s 2.5 μs/s 2.5 μs/s  +0 ps/-100ps  0.1% 0.1%	Multi-Product Calibrator	OEM AND METCAL Sourced calibration procedures

## II. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature / Thermometers*	(35 to 200) °C  (35 to 100) °C (100 to 250) °C (250 to 375) °C  (-200 to 800) °C  (-200 to 1 200) °C	0.29 °C  0.32 °C 0.49 °C 0.67 °C  0.62 °C  1.21 °C	Temperature Microbath  Thermal Dry Well  Precision Temperature Calibrator w/ PT100 thermocouple  Precision Temperature Calibrator w/ J thermocouple	CAL-11-TH650

### III. Mechanical

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Torque Tools*	Up to 1 000 lbf-ft	(0.77 + 0.02X) lbf-ft	Torque Tester	CAL-11-TT200
Torque Transducers*	(0.5 to 400) ozf-in (5 to 50) lbf-in (10 to 100) lbf-in (20 to 200) lbf-in (37.5 to 375) lbf-in (75 to 750) lbf-ft Up to 2 000 lbf-ft	0.49 ozf-in 0.061 lbf-in 0.12 lbf-in 0.25 lbf-in 0.46 lbf-in 0.92 lbf-ft (0.115 + 0.0015X) lbf-ft	Weights & Torque Arms	CAL-11-TT210
Torque Arms	Up to 60 in	760 µin	Gage Blocks, Master Plugs, Bench Micrometer, Surface Plate	CAL-11-TTRA100
Hardness Testers*	<u>HRB</u> Low Medium High <u>HRC</u> Low Medium High <u>HRN</u> Low Medium High <u>HRT</u> Low Medium High	(POH) 1.3 1 0.9 0.9 0.8 0.8 0.8 0.9 0.9 0.9 0.9 0.8 0.8 0.9	Hardness Test Blocks	CAL-11-HT400
MicroHardness Testers*	Repeatability under forces P (gf) $500 \leq P \leq 1\,000$ $557 < HK < 685$ $571 < HV < 790$ Error	0.98 µm 0.3 µm	Hardness Test Blocks	CAL-HTMICRO100
Force Gages*	Up to 500 lbf Up to 1 000 lbf	(0.02 + 0.002X) lbf (0.1 + 0.0025X) lbf	Class F Weights Force Tester	CAL-11-FG275
Cable Tensiometers	Up to 1 000 lbf	(0.27 + 0.0086X) lbf	Force Tester	CAL-11-CT300

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Pressure Gages & Transducers*	Up to 200 psi Up to 1 000 psi Up to 7 000 psi Up to 10 000 psi	0.11 psi 0.17 psi 0.71 psi 0.71 psi	Standard Pressure Gages	CAL-11-PG250
Vacuum	Up to 30 in Hg	0.11 in Hg	Vacuum Test Gage	CAL-11-PG250
Scales / Balances*	Up to 3 000 g Up to 1 000 lb	(0.02 + 0.02X) mg (0.8 + 0.001X) lb	Class 4 Weights Class F Weights	CAL-11-SB290

#### IV. Dimensional

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Gage Blocks	Up to 4 in (4 to 20) in	(2.45 + 0.8L) μin (34.9 + 1.7L) μin	Gage Block Comparator, Gage Blocks, Measuring Machine, Surface Plate	CAL-11-GB101
Gage Block Comparator	Up to 4 in	1.4 μin	Master Gage Blocks	CAL-11-GB100
Pin Gages*	Up to 2 in	(32 + 1.1L) μin	Laser Micrometer, Master Plug Gages	CAL-11-PG122A
Plain Plug Gages*	Up to 10 in (10 to 36) in	(17 + 3L) μin (22.1 + 3.6L) μin	Bench Micrometer, Gage Blocks	CAL-11-PG122B
Plain Ring Gages	(0.040 to 12) in	(57.5 + L) μin	I.D. Comparator, Gage Blocks	CAL-11-PR123
Thread Measuring Wires	Up to 0.5 in	(17 + 0.1L) μin	Bench Micrometer, Gage Blocks, Master Plug Gage	CAL-11-MW119
Thread Plug Gages* Major Diameter Pitch Diameter	Up to 10 in	(55 + 0.1L) μin	Bench Micrometer, Thread Wires, Gage Blocks	CAL-11-TPG120

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Thread Ring Gages*	Up to 10 in	(60 + 2.8L) μin	Thread Set Plugs	CAL-11-TRG121
End Rod Standards*	Up to 36 in (36 to 60) in	(20.7 + 1.5L) μin (47.4 + 0.7L) μin	Precision Measuring Machine, Gage Blocks	CAL-11-ERS105
Calipers*	Up to 40 in	(269 + 0.2L) μin	Caliper Master, Gage Blocks, Surface Plate	CAL-11-VC110
Caliper Master*	Up to 12 in	(77.1 + 0.2L) μin	Gage Blocks, Precision Indicator, Surface Plate	CAL-11-CC100
Height Gages*	Up to 40 in	(181.4 + 0.5L) μin	Gage Blocks, Precision Indicator, Surface Plate	CAL-11-HG117
Indicators & LVDTs*	Up to 6 in	(18.6 + 0.3L) μin	Bench Micrometer, Gage Blocks	CAL-11-DI116
Depth Micrometers*	Up to 12 in	(224.6 + 0.07L) μin	Gage Blocks, Surface Plate	CAL-11-MIC113
Outside Micrometers*	Up to 24 in (24 to 60) in	(32.3 + L) μin (515.1 + 0.2 L) in	Gage Blocks, Optical Flat	CAL-11-MIC104
Inside Micrometers*	Up to 24 in (Rod Length)	(39 + 0.9L) μin	Precision Measuring Machine, Gage Blocks	CAL-11-MIC112
Laser Micrometers*	Up to 2 in	(22.9 + 0.13L) μin	Precision Master Plain Plugs	CAL-11-LM200
Supermicrometers / Bench Micrometers <sup>5,*</sup>	Up to 60 in	(11.3 + 0.2L) μin	Gage Blocks	CAL-11-SM500
ID/OD Comparator (Comparative)*	Up to 12 in	18.98 μin	Gage Blocks	CAL-IDC100
Radius Gages	Up to 1 in	497 μin	Precision Vision System	CAL-11-RA103
Scales / Rules / Tapes	Up to 12 ft	362 μin	Precision Vision System	CAL-11-SC102

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Surface Plates* Repeatability  Flatness	Up to (12 x 18) in Up to (120 x 120) in  Up to (120 X 120) in	42.5 µin 36.5 µin  (4.16 + 0.998L) µin	Mahr Indicator Repeat-o-Meter, Precision Indicator  Laser Optics System	CAL-11-SP600
Optical Comparators* Angle Magnification Radius Squareness (X&Y axis) Travel	Up to 30 in screen Up to 30 in screen Up to 30 in screen Up to 30 in screen Up to 12 in	500 µin per 2 min 470 µin 200 µin 130 µin 150 µin	Precision Balls, Glass Scales, Gage Blocks	CAL-11-OC450
Vision Systems* Angle Radius Squareness (X&Y axis) Travel	Up to 12 in Up to 12 in Up to 12 in Up to 12 in	500 µin per 2 min 51 µin 45 µin 50 µin	Precision Balls, Glass Scales, Gage Blocks	CAL-11-VS100

**Notes:**

1. Calibration and Measurement Capabilities (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of  $k=2$ .
2. This laboratory's capabilities include in-laboratory and field (on-site) calibrations. Since field conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected in the field than what is reported on the accredited scope.
3. Parameters identified with an asterisk (\*) are available for calibration at the customer location.
4. The use of (L) signifies Length in inches.
5. Uncertainty based on measurement over 1 inch lead screw.
6. The use of (X) signifies the value of the applied mass.
7. (\*\*) BMC/CMC for the Fluke 5520A is based upon "Zero Calibration performed within last 12 hours"
8. This scope is part of and must be included with the Certificate of Accreditation No. AC-1160



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Vice-President