



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

Nationwide Gage Calibration, Inc.

159 Covington Drive, Bloomingdale, IL 60108
Richard Parish Phone: 630-529-4959

CALIBRATION

Valid to: March 3, 2011

Certificate Number: AC-1160

I. Electromagnetic – DC/Low Frequency

Table with 5 columns: PARAMETER / EQUIPMENT, RANGE, BEST MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)], REFERENCE STANDARD OR EQUIPMENT, METHOD(S). Rows include Electrical Simulation of Thermocouple Indicators\* with sub-rows for Type B, E, J, K, L, N, and R.



PARAMETER / EQUIPMENT	RANGE	BEST MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of Thermocouple Indicators* (cont.)				
Type S	(-20 to 0) °C	2.5 °C	Precision Temperature Calibrator	CAL-11-TRTDM675
	(0 to 500) °C	1.8 °C		
	(500 to 1 750) °C	1.5 °C		
Type T	(-200 to 0) °C	1.2 °C		
	(0 to 400) °C	0.8 °C		
Type U	(-200 to 0) °C	1.1 °C		
	(0 to 400) °C	0.8 °C		
Electrical Simulation of RTDs*				
PtNi 120 (100 Ω)	(-80 to 260) °C	0.2 °C	Precision Temperature Calibrator	CAL-11-TRTDM675
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	0.2 °C		
	(250 to 630) °C	0.8 °C		
Pt 385 (500 Ω)	(-200 to 500) °C	0.3 °C		
	(500 to 630) °C	0.4 °C		
Pt 385 (1 000 Ω)	(-200 to 100) °C	0.2 °C		
	(100 to 630) °C	0.2 °C		

## II. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	BEST MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature / Thermometers*	(35 to 200) °C	0.29 °C	Hart 6102 Microbath	CAL-11-TH650
	(35 to 100) °C	0.32 °C	Hart 9100S Dry Well	
	(100 to 250) °C	0.49 °C		
	(250 to 375) °C	0.67 °C		
	(-200 to 800) °C	0.62 °C	Precision Temperature Calibrator w/ PT100 thermocouple	
	(-200 to 1 200) °C	1.21 °C	Precision Temperature Calibrator w/ J thermocouple	

### III. Mechanical

PARAMETER / EQUIPMENT	RANGE	BEST MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Torque Tools*	Up to 1 000 ft-lb	(0.77 + 0.02X) ft-lb	Torque Tester	CAL-11-TT200
Torque Transducers*	(0.5 to 400) in-oz (5 to 50) in-lb (10 to 100) in-lb (20 to 200) in-lb (37.5 to 375) in-lb (75 to 750) ft-lb Up to 2 000 ft-lb	0.49 in-oz 0.061 in-lb 0.12 in-lb 0.25 in-lb 0.46 in-lb 0.92 ft-lb (0.115 + 0.0015X) ft-lb	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
Force Gages*	Up to 500 ft-lb Up to 1 000 ft-lb	(0.02 + 0.002X) ft-lb (0.1 + 0.0025X) ft-lb	Class F Weights Force Tester	CAL-11-FG275
Cable Tensiometers	Up to 1 000 ft-lb	(0.27 + 0.0086X) ft-lb	Force Tester	CAL-11-CT300
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	BEST 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) $\mu$ in (34.9 + 1.7L) $\mu$ in	Gage Block Comparator, Gage Blocks, Measuring Machine, Surface Plate	CAL-11-GB101
Gage Block Comparator	Up to 4 in	1.4 $\mu$ in	Master Gage Blocks	CAL-11-GB100
Pin Gages*	Up to 2 in	(32 + 1.1L) $\mu$ in	Laser Micrometer, Master Plug Gages	CAL-11-PG122A
Plain Plug Gages*	Up to 10 in (10 to 36) in	(17 + 3L) $\mu$ in (22.1 + 3.6L) $\mu$ in	Bench Micrometer, Gage Blocks	CAL-11-PG122B
Plain Ring Gages	(0.040 to 12) in	(57.5 + L) $\mu$ in	I.D. Comparator, Gage Blocks	CAL-11-PR123
Thread Measuring Wires	Up to 0.5 in	(17 + 0.1L) $\mu$ in	Bench Micrometer, Gage Blocks, Master Plug Gage	CAL-11-MW119
Thread Plug Gages* Major Diameter Pitch Diameter	Up to 10 in	(55 + 0.1L) $\mu$ in	Bench Micrometer, Thread Wires, Gage Blocks	CAL-11-TPG120
Thread Ring Gages*	Up to 10 in	(60 + 2.8L) $\mu$ in	Thread Set Plugs	CAL-11-TRG121
End Rod Standards*	Up to 36 in (36 to 60) in	(20.7 + 1.5L) $\mu$ in (47.4 + 0.7L) $\mu$ in	Precision Measuring Machine, Gage Blocks	CAL-11-ERS105
Calipers*	Up to 40 in	(269 + 0.2L) $\mu$ in	Caliper Master, Gage Blocks, Surface Plate	CAL-11-VC110
Caliper Master*	Up to 12 in	(77.1 + 0.2L) $\mu$ in	Gage Blocks, Precision Indicator, Surface Plate	CAL-11-CC100
Height Gages*	Up to 40 in	(181.4 + 0.5L) $\mu$ in	Gage Blocks, Precision Indicator, Surface Plate	CAL-11-HG117
Indicators & LVDTs*	Up to 6 in	(18.6 + 0.3L) $\mu$ in	Bench Micrometer, Gage Blocks	CAL-11-DI116
Depth Micrometers*	Up to 12 in	(224.6 + 0.07L) $\mu$ in	Gage Blocks, Surface Plate	CAL-11-MIC113
Outside Micrometers*	Up to 24 in (24 to 60) in	(32.3 + L) $\mu$ in (515.1 + 0.2 L) in	Gage Blocks, Optical Flat	CAL-11-MIC104

PARAMETER / EQUIPMENT	RANGE	BEST MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Inside Micrometers*	Up to 24 in (Rod Length)	(39 + 0.9L) $\mu$ in	Precision Measuring Machine, Gage Blocks	CAL-11-MIC112
Laser Micrometers*	Up to 2 in	(22.9 + 0.13L) $\mu$ in	Precision Master Plain Plugs	CAL-11-LM200
Supermicrometers / Bench Micrometers <sup>5,*</sup>	Up to 60 in	(11.3 + 0.2L) $\mu$ in	Gage Blocks	CAL-11-SM500
ID/OD Comparator (Comparative)*	Up to 12 in	18.98 $\mu$ in	Gage Blocks	CAL-IDC100
Radius Gages	Up to 1 in	497 $\mu$ in	Precision Vision System	CAL-11-RA103
Scales / Rules / Tapes	Up to 12 ft	362 $\mu$ in	Precision Vision System	CAL-11-SC102
Surface Plates* (Repeatability only)	Up to (12 x 18) in Up to (120 x 120) in	42.5 $\mu$ in 36.5 $\mu$ in	Mahr Indicator Repeat-o-Meter, Precision Indicator	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 $\mu$ in per 2 min 470 $\mu$ in 200 $\mu$ in 130 $\mu$ in 150 $\mu$ in	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 $\mu$ in per 2 min 51 $\mu$ in 45 $\mu$ in 50 $\mu$ in	Precision Balls, Glass Scales, Gage Blocks	CAL-11-VS100

**Notes:**

1. Best Measurement Uncertainties (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. This scope is part of and must be included with the Certificate of Accreditation No. AC-1160

*Karl Greenaway*

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Vice-President