



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

Calibration Laboratory, LLC

3330 East 83rd Place

Merrillville, IN 46410

(and satellite location as listed on the scope)

has been assessed by ANAB and meets the requirements of international standard

ISO/IEC 17025:2005

and national standards

ANSI/NCSL Z540-1-1994 (R2002) AND

ANSI/NCSL Z540.3-2006 (R2013)

while demonstrating technical competence in the fields of

CALIBRATION & TESTING

Refer to the accompanying Scope of Accreditation for information regarding the types of calibrations / tests to which this accreditation applies.

L2216

Certificate Number


ANAB Approval

Certificate Valid: 04/27/2018-02/15/2019
Version No. 002 Issued: 04/27/2018



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. 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).



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005,
ANSI/NCSL Z540-1-1994 (R2002) AND ANSI/NCSL Z540.3-2006 (R2013)

Calibration Laboratory, LLC

3330 East 83rd Place
Merrillville, IN 46410
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CALIBRATION AND TESTING

Valid to: February 15, 2019

Certificate Number: L2216

Calibration

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters (Fixed Points) ¹	4, 7 & 10 pH	0.045 pH	Buffer Solutions and RTD Probe

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Measure @ 1 kHz	(0.1 to 10) pF (10 to 100) pF (100 to 1000) pF (1 to 10) nF (10 to 100) nF (100 to 1 000) nF (1 to 10) µF (10 to 100) µF (100 to 1 000) µF	4.7 mF/F 0.6 mF/F 0.26 mF/F 0.26 mF/F 0.27 mF/F 0.26 mF/F 0.26 mF/F 0.59 mF/F 4.7 mF/F	GenRad 1689M LCR Meter



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Synthesized Source ¹	(0.19 to 0.4) nF (0.4 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 (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 (0.33 to 1.1) mF (1.1 mF to 3.3) mF (3.3 to 1) mF (11 to 33) mF (33 to 110) mF	0.005 nF/nF + 0.01 nF 0.005 nF/nF + 0.01 nF 0.005 nF/nF + 0.01 nF 0.002 nF/nF + 0.1 nF 0.002 nF/nF + 0.1 nF 0.003 nF/nF + 0.088 nF 0.002 nF/nF + 0.3 nF 0.003 μF/μF + 0.98 nF 0.003 μF/μF + 3 nF 0.003 μF/μF + 10 nF 0.004 μF/μF + 30 nF 0.005 μF/μF + 0.1 μF 0.005 μF/μF + 0.3 μF 0.005 μF/μF + 1 μF 0.9 mF/mF + 57 μF 3 μF/mF + 55 μF 7 μF/mF + 48 μF 10 μF/mF + 0.1 mF	Fluke 5520A/SC1100 Multi Product Calibrator
AC Current - Source	(9 to 220) μA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (0.22 to 2.2) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.3 nA/μA + 20 nA 0.2 nA/μA + 12 nA 0.12 nA/μA + 10 nA 0.35 nA/μA + 15 nA 1.3 nA/μA + 80 nA 0.3 nA/μA + 50 nA 0.2 nA/μA + 40 nA 0.12 nA/μA + 40 nA 0.24 nA/μA + 130 nA 1.3 nA/μA + 800 nA 0.3 nA/μA + 0.5 μA 0.2 nA/μA + 0.4 μA 0.12 nA/μA + 0.4 μA 0.24 nA/μA + 0.7 μA 1.3 nA/μA + 6 μA	Fluke 5730A Multi Product Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current - Source	(22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (0.22 to 2.2) A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.25 nA/μA + 4 μA 0.16 nA/μA + 3.5 μA 0.103 nA/μA + 2.5 μA 0.2 nA/μA + 3.5 μA 1.1 nA/μA + 10 μA 0.244 nA/μA + 35 μA 0.45 nA/μA + 80 μA 7 nA/μA + 160 μA	Fluke 5730A Multi Product Calibrator
AC Current - Source	(2.2 to 11) A 40 Hz to 1kHz (1 to 5) kHz (5 to 10) kHz	0.46 mA/A + 0.17 mA 0.95 mA/A + 0.38 mA 3.6 mA/A + 0.75 mA	Fluke 5730A Multi Product Calibrator Fluke 5725A
AC Current – Source ¹	(30 to 330) μA (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 (0.33 to 3.3) mA (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 (3.3 to 33) mA (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	2 nA/μA + 0.1 μA 1.5 nA/μA + 0.1 μA 1.2 nA/μA + 0.1 μA 3 nA/μA + 0.15 μA 8 nA/μA + 0.2 μA 16 nA/μA + 0.4 μA 2 μA/mA + 0.15 μA 1.2 μA/mA + 0.15 μA 1 μA/mA + 0.15 μA 2 μA/mA + 0.2 μA 5 μA/mA + 0.3 μA 10 μA/mA + 0.6 μA 1.8 μA/mA + 2 μA 0.9 μA/mA + 2 μA 0.4 μA/mA + 2 μA 0.8 μA/mA + 2 μA 2 μA/mA + 3 μA 4 μA/mA + 4 μA	Fluke 5520A/SC1100 Multi Product Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(33 to 330) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 10 kHz to 30 kHz (0.33 to 1.1) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (1.1 to 3) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (3 to 11) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (11 to 20) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.8 μ A/mA + 20 μ A 0.9 μ A/mA + 20 μ A 0.4 μ A/mA + 20 μ A 1 μ A/mA + 50 μ A 2 μ A/mA + 0.1 mA 4 μ A/mA + 0.2 mA 1.6 μ A/mA + 0.18 mA 0.44 μ A/mA + 0.12 mA 5.2 μ A/mA + 1.3 mA 2.2 μ A/mA + 0.61 mA 1.8 mA/A + 0.1 mA 0.6 mA/A + 0.1 mA 6 mA/A + 1 mA 25 mA/A + 5 mA 0.6 mA/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	Fluke 5520A/SC1100 Multi Product Calibrator
AC Current - Source	(0.2 to 120) A 10 Hz to 850 Hz 850 Hz to 6 kHz 6 kHz to 10 kHz	0.11 mA/A + 36 μ A 0.44 mA/A + 72 μ A 16 mA/A + 62 mA	Fluke 5730A Multi Product Calibrator Fluke 52120A
AC Current – Measure ¹	5 A to 30 kA 60 Hz	7 A + 1% of reading	AEMC 30K-24-2 Current Probe

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current Source – Current Clamps ¹	(45 to 65) Hz (10 to 16.5) A (16.5 to 150) A (150 to 1 025) A (65 to 440) Hz (10 to 16.5) A (16.5 to 150) A (150 to 1 025) A	0.2 mA / A + 0.3 A 2.7 mA / A + 0.25 A 3.8 mA / A + 0.15 A 0.27 mA / A + 0.28 A 8.7 mA / A + 0.18 A 9.5 mA/A + 0.14 A	Fluke 5520A/SC1100 Multi Product Calibrator with 50-turn coil
AC Current Source – Current Clamps	(0.2 to 25) A (6 kHz to 10 kHz) (0.2 to 50) A (3 kHz to 6 kHz) (0.2 to 50) A (1 kHz to 3 kHz) (0.2 to 50) A 10 Hz to 1 kHz (50 to 75) A (3 kHz to 6 kHz) (50 to 300) A (1 kHz to 3 kHz)	33 mA/A + 13 mA 10 mA/A + 13 mA 4.7 mA/A + 9.4 mA 5.4 mA/A + 13 mA 10 mA/A + 130 mA 5.3 mA/A + 130 mA	Fluke 5730A Multi Product Calibrator Fluke 52120A Fluke 3 kA 25-Turn Coil
AC Current Source – Current Clamps	(50 to 500) A 10 Hz to 1 kHz (500 to 1 000) A 300 Hz to 1 kHz (500 to 3 000) A 10 Hz to 300 Hz	4.7 mA/A + 94 mA 4.7 mA/A + 560 mA 4.7 mA/A + 560 mA	Fluke 5730A Multi Product Calibrator Fluke 52120A Fluke 3 kA 25-Turn Coil
DC Current - Source	(0 to 220) μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	40 μ A/A + 6 nA 35 μ A/A + 7 nA 35 μ A/A + 40 nA 45 μ A/A + 0.7 μ A 80 μ A/A + 12 μ A	Fluke 5730A Multi Product Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Source ¹	0 μ A to 330 μ A 0.3 mA to 3.3 mA 3.3 mA to 33 mA 33 mA to 330 mA 0.33 A to 1.1 A 1.1 A to 3 A 3 A to 11 A 11 A to 20 A	0.14 nA/ μ A + 27 nA 0.1 μ A/ μ A + 52 nA 0.1 μ A/ μ A + 0.28 μ A 0.1 μ A/ μ A + 2.5 μ A 0.2 mA/A + 40 μ A 0.38 mA/A + 40 μ A 0.5 mA/A + 0.5 mA 1 mA/A + 0.75 mA	Fluke 5520A/SC1100 Multi Product Calibrator
DC Current – Source	(0 to 100) A	0.12 mA/A + 80 μ A	Fluke 52120A Amplifier
DC Current – Source	(2.2 to 11) A	0.36 mA/A + 0.48 mA	Fluke 5730A Multi Product Calibrator Fluke 5725A Amplifier
DC Source – Current Clamps ¹	(10 to 150) A (150 to 1 025) A	3.6 mA/A + 1.5 mA 3.4 mA/A + 0.11 A	Fluke 5520A/SC1100 Multi Product Calibrator Fluke 5500/Coil
	(1 025 to 1 500) A	1.6 A + 0.3 % of reading	Transmille 9041 Multi Product Calibrator Fluke 5500/Coil
DC Source – Current Clamps	(0 to 2 500) A	7.3 mA/A + 14 mA	Fluke 5730A Multi Product Calibrator Fluke 52120A Fluke 3KA 25-Turn Coil
DC Current – Measure	0.01 nA to 10 nA	10 pA/nA + 5.9 pA	Transmille 8081 Multimeter
	(0 to 200) μ A	30 μ A/A + 17 pA	Fluke 8508A Multimeter
	10 nA to 100 nA (0.1 to 1) μ A 1 μ A to 10 μ A (10 to 100) μ A	5 pA + 0.2 % of reading 0.02 nA + 0.02 % of reading 0.1 nA + 0.003 % of reading 0.5 nA + 0.001 % of reading	Transmille 8081 Multimeter



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Measure	200 μ A to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A	10 nA/ μ A + 6 nA 0.01 μ A/mA + 6 nA 0.03 μ A/mA + 0.9 μ A 200 μ A/A + 17 μ A 0.4 mA/A + 0.41 mA	Fluke 8508A Multimeter
	(>20 to 30) A	4.4 mA + 0.05 % of reading	Transmille 8081 Multimeter
	(>30 to 3 000) A	0.41% + 0.01 % of reading	Empro Shunt, Fluke 8508A Multimeter
AC Current – Measure	0.1 nA to 100 μ A (10 to 40) Hz 40 Hz to 1 kHz (1 to 10) kHz	0.015 μ A + 0.05 % of reading 0.012 μ A + 0.03 % of reading 0.03 μ A + 0.07 % of reading	Transmille 8081 Multimeter
AC Current – Measure	(100 to 200) μ A 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.3 nA/ μ A + 0.025 μ A 0.6 nA/ μ A + 0.024 μ A 4 nA/ μ A + 0.021 μ A	Fluke 8508A Multimeter
	(0.2 to 2) mA 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.28 μ A/mA + 0.2 μ A 0.65 μ A/mA + 0.2 μ A 4 μ A/mA + 0.2 μ A	
	(2 to 20) mA 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.28 μ A/mA + 2 μ A 0.65 μ A/mA + 2 μ A 4 μ A/mA + 2 μ A	
AC Current – Measure	(20 to 200) mA 10 Hz to 10 kHz (10 to 30) kHz	0.25 μ A/mA + 20 μ A 0.6 μ A/mA + 20 μ A	Fluke 8508A Multimeter
	200 mA to 2 A 10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.6 mA/A + 0.2 mA 0.7 mA/A + 0.2 mA 3 mA/A + 0.2 mA	
AC Current – Measure	(2 to 20) A 10 Hz to 2 kHz (2 to 10) kHz	0.8 mA/A + 2 mA 2.5 mA/A + 2 mA	Fluke 8508A Multimeter



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure	(>20 to 30) A (10 to 40) Hz 40 Hz to 1 kHz	12 mA + 0.08 % of reading 9.2 mA + 0.07 % of reading	Transmille 8081 Multimeter
	(>30 to 2 000) A 60 Hz	0.41 + 0.01 % of reading	Empro Shunt, HP 34401A Multimeter
AC Current – Measure ¹	5A to 30 kA 60 Hz	7.7 A + 1 % of reading	AEMC 30K-24-2 Current Probe
Inductance – Measure (100 Hz to 1 kHz)	(10 to 100) μ H (0.1 to 1) mH (1 to 10) mH (10 to 100) mH (0.1 to 1) H 1 H to 10 H	2 nH/ μ H + 8 nH 0.8 μ H/mH + 0.2 μ H 0.5 μ H/mH + 0.5 μ H 0.5 μ H/mH + 3 mH 0.3 mH/H + 0.3 mH 0.5 mH/H + 0.3 mH	GenRad 1689M LCR Meter
Inductance – Generate Fixed Points (100 Hz, 1kHz) ¹	100 μ H 500 μ H 1 mH 10 mH 50 mH 100 mH 200 mH 1 H 2 H 10 H	0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading	GenRad 1482 Series Inductors
Phase – Generate (0.1 to 100) V	(0 to 999.999) Deg 1 Hz to 1 kHz (1 to 6.25) kHz (6.25 to 50) kHz (50 to 100) kHz	6.7 mDeg 12 mDeg 29 mDeg 58 mDeg	Clarke Hess 5000
Phase – Measure (0.01 to 120) V	(0 to 360) Deg 20 Hz to 6 kHz (>6 to 50) kHz (>50 to 100) kHz	120 mDeg 120 mDeg 810 mDeg	Krohn-Hite 6500A

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Power - Source ¹	(0 to 336) W (336 to 3 060) W (3 060 to 20 910) W	0.04 % of output 0.054 % of output 0.13 % of output	Fluke 5520A/SC1100 Multi Product Calibrator
AC Power – Source (45 to 65) Hz ¹	(0.11 to 3) mW (3 to 11) mW (11 to 30) mW (30 to 110) mW (110 to 300) mW (300 to 730) mW	0.14 % of output 0.1 % of output 0.16 % of output 0.12 % of output 0.15 % of output 0.13 % of output	Fluke 5520A/SC1100 Multi Product Calibrator
AC Power – Source (45 to 65) Hz ¹	(0.73 to 1.5) W (1.5 to 6.8) W (6.8 to 9.2) W (9.2 to 34) W (34 to 92) W (92 to 337) W (337 to 918) W (918 to 2 244) W (2 244 to 4 590) W (4 590 to 11 220) W	0.15 % of output 0.14 % of output 0.14 % of output 0.1 % of output 0.14 % of output 0.1 % of output 0.13 % of output 0.11 % of output 0.14 % of output 0.12 % of output	Fluke 5520A/SC1100 Multi Product Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source Fixed Points	0 Ω	40 μΩ	Fluke 5730A Multi Product Calibrator
	1 Ω	95 μΩ	
	1.9 Ω	0.18 mΩ	
	10 Ω	0.23 mΩ	
	19 Ω	0.44 mΩ	
	100 Ω	1 mΩ	
	190 Ω	1.9 mΩ	
	1 kΩ	6.5 mΩ	
	1.9 kΩ	12 mΩ	
	10 kΩ	65 mΩ	
	19 kΩ	120 mΩ	
	100 kΩ	0.85 Ω	
	190 kΩ	1.6 Ω	
	1 MΩ	13 Ω	
	1.9 MΩ	34 Ω	
	10 MΩ	400 Ω	
19 MΩ	890 Ω		
100 MΩ	10 kΩ		
Fixed Resistors	1 Ω	12 μΩ	Transmille 3000RS Resistance Standard
	10 Ω	58 μΩ	
	100 Ω	620 μΩ	
	1 kΩ	6.3 mΩ	
	10 kΩ	18 mΩ	
	100 kΩ	400 mΩ	
	1 MΩ	6.5 Ω	
	10 MΩ	56 Ω	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source ¹	(0 to 11) Ω	40 μΩ/Ω + 1 mΩ	Fluke 5520A/SC1100 Multi Product Calibrator
	(11 to 33) Ω	30 μΩ/Ω + 1.5 mΩ	
	(33 to 110) Ω	28 μΩ/Ω + 1.4 mΩ	
	(110 to 330) Ω	28 μΩ/Ω + 2.1 mΩ	
	(330 to 1 100) Ω	28 μΩ Ω + 2 mΩ	
	(1.1 to 3.3) kΩ	28 μΩ/Ω + 200 mΩ	
	(3.3 to 11) kΩ	30 μΩ/Ω + 200 mΩ	
	(11 to 33) kΩ	30 μΩ/Ω + 210 mΩ	
	(33 to 110) kΩ	28 μΩ/Ω + 240 mΩ	
	(110 to 330) kΩ	32 μΩ/Ω + 2 Ω	
	(0.33 to 1.1) MΩ	32 μΩ/Ω + 2 Ω	
	(1.1 to 3.3) MΩ	69 μΩ/Ω + 21 Ω	
	(3.3 to 11) MΩ	130 μΩ/Ω + 50 Ω	
	(11 to 33) MΩ	250 μΩ/Ω + 2.5 kΩ	
	(33 to 110) MΩ	0.5 mΩ/Ω + 3 kΩ	
(110 to 330) MΩ	3 mΩ/Ω + 100 kΩ		
(330 to 1 100) MΩ	15 mΩ/Ω + 0.5 MΩ		
Resistance – Measure	(0.1 to 2) Ω	10 μΩ/Ω + 4 μΩ	Fluke 8508A Multimeter
	(2 to 20) Ω	9 μΩ/Ω + 14 μΩ	
	(20 to 200) Ω	7.5 μΩ/Ω + 50 μΩ	
	(0.2 to 2) kΩ	7.5 μΩ/Ω + 0.5 mΩ	
	(2 to 20) kΩ	8 μΩ/Ω + 5 mΩ	
	(20 to 200) kΩ	7.5 μΩ/Ω + 50 mΩ	
	(0.2 to 2) MΩ	8.9 μΩ/Ω + 0.9 Ω	Fluke 8508A Multimeter HV mode
	(2 to 20) MΩ	15 Ω/MΩ + 110 Ω	
	(20 to 200) MΩ	10 kΩ + 65 Ω/MΩ	
(0.2 to 2) GΩ	1 MΩ + 0.51 MΩ/Ω	Transmille 8081 Multimeter	
(2 to 20) GΩ	10 MΩ + 0.53 MΩ/Ω		
24 GΩ to 2 TΩ	1 MΩ + 1.2 % of reading		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices ¹	Pt 385, 100 Ω		Fluke 5520A/SC1100 Multi Product Calibrator
	(-200 to -80) °C	0.052 °C	
	(-80 to 0) °C	0.052 °C	
	(0 to 100) °C	0.07 °C	
	(100 to 300) °C	0.091 °C	
	(300 to 400) °C	0.1 °C	
	(400 to 630) °C	0.12 °C	
	(630 to 800) °C	0.23 °C	
	Pt 385, 200 Ω		
	(-200 to -80) °C	0.043 °C	
	(-80 to 0) °C	0.043 °C	
	(0 to 100) °C	0.043 °C	
	(100 to 260) °C	0.052 °C	
	(260 to 300) °C	0.12 °C	
	(300 to 400) °C	0.13 °C	
	(400 to 600) °C	0.14 °C	
	(600 to 630) °C	0.16 °C	
	Pt 385, 500 Ω		
	(-200 to -80) °C	0.043 °C	
	(-80 to 0) °C	0.052 °C	
	(0 to 100) °C	0.052 °C	
	(100 to 260) °C	0.062 °C	
	(260 to 300) °C	0.081 °C	
	(300 to 400) °C	0.081 °C	
(400 to 600) °C	0.091 °C		
(600 to 630) °C	0.11 °C		
Pt 385, 1000 Ω			
(-200 to -80) °C	0.034 °C		
(-80 to 0) °C	0.034 °C		
(0 to 100) °C	0.043 °C		
(100 to 260) °C	0.052 °C		
(260 to 300) °C	0.062 °C		
(300 to 400) °C	0.072 °C		
(400 to 600) °C	0.072 °C		
(600 to 630) °C	0.23 °C		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices ¹	Pt 3916, 100 Ω		Fluke 5520A/SC1100 Multi Product Calibrator
	(-200 to -190) °C	0.25 °C	
	(-190 to -80) °C	0.043 °C	
	(-80 to 0) °C	0.053 °C	
	(0 to 100) °C	0.062 °C	
	(100 to 260) °C	0.072 °C	
	(260 to 300) °C	0.082 °C	
	(300 to 400) °C	0.092 °C	
	(400 to 600) °C	0.1 °C	
	(600 to 630) °C	0.23 °C	
	Pt 3926, 100 Ω		
	(-200 to -80) °C	0.053 °C	
	(-80 to 0) °C	0.053 °C	
	(0 to 100) °C	0.072 °C	
	(100 to 300) °C	0.092 °C	
(300 to 400) °C	0.1 °C		
(400 to 630) °C	0.12 °C		
PtNi 385, 120 Ω			
(-80 to 0) °C	0.083 °C		
(0 to 100) °C	0.083 °C		
(100 to 260) °C	0.14 °C		
Cu 427, 10 Ω			
(-100 to 260) °C	0.3 °C		
DC Voltage – Source	(0 to 220) mV	8.3 μV/V + 0.4 μV	Fluke 5730A Multi Product Calibrator
	(0.22 to 2.2) V	5 μV/V + 0.7 μV	
DC Voltage – Source ¹	(2.2 to 11) V	3.5 μV/V + 2.5 μV	Ross VMP15-GH Divider, HP 34401A Multimeter
	(11 to 22) V	3.5 μV/V + 4 μV	
	(22 to 220) V	5.8 μV/V + 58 μV	
	(220 to 1 000) V	6.5 μV/V + 0.4 mV	
	(1 to 15) kV	1 mV/V + 630 mV	
DC Voltage – Source ¹	(1 to 10) kV	0.58 kV + 0.005 % of reading	Hipotronics KVM 100 High Voltage Meter
	(10 to 100) kV	0.082 kV + 0.001 % of reading	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage - Source ¹	(0 to 330) mV (0.3 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1 000) V	0.018 μ V/mV + 2.1 V 10.6 μ V/V + 3.8 μ V 12 μ V/V + 35 μ V 18 μ V/V + 260 μ V 18 mV/V + 1.5 mV	Fluke 5520A/SC1100 Multi Product Calibrator
AC Voltage – Source	(0.22 to 2.2) 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 (2.2 to 22) 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 (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	0.24 mV/V + 4 μ V 90 nV/mV + 4 μ V 80 nV/mV + 4 μ V 0.2 μ V/mV + 4 μ V 0.5 μ V/mV + 5 μ V 1.1 μ V/mV + 10 μ V 1.4 μ V/mV + 20 μ V 2.7 μ V/mV + 20 μ V 0.24 μ V/mV + 4 μ V 90 nV/mV + 4 μ V 80 nV/mV + 4 μ V 0.2 μ V/mV + 4 μ V 0.5 μ V/mV + 5 μ V 1.1 μ V/mV + 10 μ V 1.4 μ V/mV + 20 μ V 2.7 μ V/mV + 20 μ V 0.24 μ V/mV + 12 μ V 90 nV/mV + 7 μ V 57 nV/mV + 7 μ V 0.12 μ V/mV + 7 μ V 0.31 μ V/mV + 17 μ V 0.66 μ V/mV + 20 μ V 1.4 μ V/mV + 25 μ V 2.7 μ V/mV + 45 μ V	Fluke 5730A Multi Product Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source	(0.22 to 2.2) V		Fluke 5730A Multi Product Calibrator
	(10 to 20) Hz	0.24 mV/V + 40 μV	
	(20 to 40) Hz	90 μV/V + 15 μV	
	40 Hz to 20 kHz	42 μV/V + 8 μV	
	(20 to 50) kHz	67 μV/V + 10 μV	
	(50 to 100) kHz	85 μV/V + 30 μV	
	(100 to 300) kHz	0.34 mV/V + 80 μV	
	(300 to 500) kHz	1 mV/V + 0.2 mV	
	500 kHz to 1 MHz	1.7 mV/V + 0.3 mV	
	(2.2 to 22) V		
	(10 to 20) Hz	0.24 mV/V + 0.4 mV	
	(20 to 40) Hz	90 μV/V + 0.15 mV	
	40 Hz to 20 kHz	42 μV/V + 50 μV	
	(20 to 50) kHz	67 μV/V + 0.1 mV	
	(50 to 100) kHz	83 μV/V + 0.2 mV	
	(100 to 300) kHz	0.25 mV/V + 0.6 mV	
	(300 to 500) kHz	1 mV/V + 2 mV	
	500 kHz to 1 MHz	1.5 mV/V + 3.2 mV	
	(22 to 220) V		
	(10 to 20) Hz	0.24 mV/V + 4 mV	
	(20 to 40) Hz	90 μV/V + 1.5 mV	
40 Hz to 20 kHz	52 μV/V + 0.6 mV		
(20 to 50) kHz	80 μV/V + 1 mV		
(50 to 100) kHz	0.15 mV/V + 2.5 mV		
(100 to 300) kHz	0.9 mV/V + 16 mV		
(300 to 500) kHz	3.6 mV/V + 40 mV		
500 kHz to 1 MHz	8 mV/V + 80 mV		
(220 to 1 100) V			
(15 to 50) Hz	0.3 mV/V + 16 mV		
50 Hz to 1 kHz	70 μV/V + 3.5 mV		
AC Voltage - Source	(220 to 750) V		Fluke 5730A Multi Product Calibrator Fluke 5725A
	30 kHz to 50 kHz	0.6 mV/V + 11 mV	
	50 kHz to 100 kHz	2.3 mV/V + 45 mV	
	(220 to 1 100) V		
	40 to 1 kHz	70 μV/V + 4 mV	
	1 kHz to 20 kHz	0.17 mV/V + 6 mV	
20 kHz to 30 kHz	0.6 mV/V + 11 mV		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Source ¹	(1 to 33) mV		Fluke 5520A/SC1100 Multi Product Calibrator
	(10 to 45) Hz	0.8 $\mu\text{V/mV}$ + 6 μV	
	45 Hz to 10 kHz	0.15 $\mu\text{V/mV}$ + 6.3 μV	
	(10 to 20) kHz	0.2 $\mu\text{V/mV}$ + 6.3 μV	
	(20 to 50) kHz	1 $\mu\text{V/mV}$ + 6.2 μV	
	(50 to 100) kHz	3.5 $\mu\text{V/mV}$ + 12 μV	
	(100 to 500) kHz	8 $\mu\text{V/mV}$ + 50 μV	
	(33 to 330) mV		
	(10 to 45) Hz	0.3 $\mu\text{V/mV}$ + 8.1 μV	
	45 Hz to 10 kHz	0.15 $\mu\text{V/mV}$ + 8.1 μV	
	(10 to 20) kHz	0.16 $\mu\text{V/mV}$ + 8.1 μV	
	(20 to 50) kHz	0.35 $\mu\text{V/mV}$ + 8.1 μV	
	(50 to 100) kHz	0.8 $\mu\text{V/mV}$ + 32 μV	
	(100 to 500) kHz	2 $\mu\text{V/mV}$ + 70 μV	
	(0.33 to 3.3) V		
	(10 to 45) Hz	300 $\mu\text{V/V}$ + 50 μV	
	45 Hz to 10 kHz	150 $\mu\text{V/V}$ + 60 μV	
	(10 to 20) kHz	190 $\mu\text{V/V}$ + 60 μV	
	(20 to 50) kHz	300 $\mu\text{V/V}$ + 50 μV	
	(50 to 100) kHz	700 $\mu\text{V/V}$ + 130 μV	
	(100 to 500) kHz	2.4 mV/V + 0.6 mV	
	(3.3 to 33) V		
	(10 to 45) Hz	0.3 mV/V + 0.65 mV	
	45 Hz to 10 kHz	0.3 mV/V + 0.65 mV	
(10 to 20) kHz	0.24 mV/V + 0.6 mV		
(20 to 50) kHz	0.35 mV/V + 0.6 mV		
(50 to 100) kHz	0.9 mV/V + 1.6 mV		
(33 to 330) V			
45 Hz to 1 kHz	0.19 mV/V + 2 mV		
(1 to 10) kHz	0.2 mV/V + 6 mV		
(10 to 20) kHz	0.25 mV/V + 6 mV		
(20 to 50) kHz	0.3 mV/V + 6 mV		
(50 to 100) kHz	2 mV/V + 50 mV		
(330 to 1 000) V			
45 Hz to 1 kHz	0.3 mV/V + 10 mV		
(1 to 5) kHz	0.25 mV/V + 10 mV		
(5 to 10) kHz	0.3 mV/V + 10 mV		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source	DC to 60 Hz (1 to 15) kV	5 mV/V + 3 V	Hipotronics Source, Ross Divider & HP 34401A
DC Voltage – Measure	(0 to 200) mV (0.2 to 2) V (2 to 20) V (20 to 200) V (200 to 1 000) V	4 μV/V + 0.11 μV 4 μV + 3 μV/V 4 μV + 3 μV/V 0.04 mV + 4.5 μV/V 0.53 mV + 4.5 μV/V	Fluke 8508A Multimeter
	(1 to 15) kV	1 mV/V + 630 mV	Ross Divider & HP 34401A Multimeter
DC Voltage – Measure ¹	(1 to 100) kV	0.002 kV + 0.5 % of reading	Hipotronics KVM 100 High Voltage Meter
	(20 to 200) kV	0.02 kV + 0.5 % of reading	Hipotronics KVM 200 High Voltage Meter
pH Calibrators	(-120 to 120) mV	0.027 mV	Fluke 8508A Multimeter
AC Voltage – Measure	Up to 2.2 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	1.3 μV + 1.7 μV/mV 1.3 μV + 0.73 μV/mV 1.3 μV + 0.41 μV/mV 2 μV + 0.81 μV/mV 2.5 μV + 1.2 μV/mV 4 μV + 2.3 μV/mV 8 μV + 2.4 μV/mV 8 μV + 3.5 μV/mV	Fluke 5790A Multi Product Calibrator
	(2.2 to 7) 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	1.3 μV + 0.85 μV/mV 1.3 μV + 0.37 μV/mV 1.3 μV + 0.21 μV/mV 2 μV + 0.4 μV/mV 2.5 μV + 0.6 μV/mV 4 μV + 1.2 μV/mV 8 μV + 1.3 μV/mV 8 μV + 2.3 μV/mV	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(7 to 22) mV		Fluke 5790A Multi Product Calibrator
	(10 to 20) Hz	1.3 μ V + 0.29 μ V/mV	
	(20 to 40) Hz	1.3 μ V + 0.19 μ V/mV	
	40 Hz to 20 kHz	1.3 μ V + 0.11 μ V/mV	
	(20 to 50) kHz	2 μ V + 0.21 μ V/mV	
	(50 to 100) kHz	2.5 μ V + 0.31 μ V/mV	
	(100 to 300) kHz	4 μ V + 0.81 μ V/mV	
	(300 to 500) kHz	8 μ V + 0.89 μ V/mV	
	500 kHz to 1 MHz	8 μ V + 1.7 μ V/mV	
	(22 to 70) mV		
	(10 to 20) Hz	1.5 μ V + 0.24 μ V/mV	
	(20 to 40) Hz	1.5 μ V + 0.12 μ V/mV	
	40 Hz to 20 kHz	1.5 μ V + 0.07 μ V/mV	
	(20 to 50) kHz	2 μ V + 0.13 μ V/mV	
	(50 to 100) kHz	2.5 μ V + 0.26 μ V/mV	
	(100 to 300) kHz	4 μ V + 0.51 μ V/mV	
	(300 to 500) kHz	8 μ V + 0.67 μ V/mV	
	500 kHz to 1 MHz	8 μ V + 1.1 μ V/mV	
	(70 to 220) mV		
	(10 to 20) Hz	1.5 μ V + 0.21 μ V/mV	
	(20 to 40) Hz	1.5 μ V + 0.09 μ V/mV	
	40 Hz to 20 kHz	1.5 μ V + 0.04 μ V/mV	
	(20 to 50) kHz	2 μ V + 0.07 μ V/mV	
	(50 to 100) kHz	2.5 μ V + 0.16 μ V/mV	
	(100 to 300) kHz	4 μ V + 0.25 μ V/mV	
	(300 to 500) kHz	8 μ V + 0.38 μ V/mV	
	500 kHz to 1 MHz	8 μ V + 1 μ V/mV	
	(220 to 700) mV		
	(10 to 20) Hz	1.6 μ V + 0.21 μ V/mV	
	(20 to 40) Hz	1.7 μ V + 0.08 μ V/mV	
40 Hz to 20 kHz	2 μ V + 0.03 μ V/mV		
(20 to 50) kHz	2.3 μ V + 0.05 μ V/mV		
(50 to 100) kHz	2.7 μ V + 0.08 μ V/mV		
(100 to 300) kHz	4.1 μ V + 0.18 μ V/mV		
(300 to 500) kHz	8 μ V + 0.3 μ V/mV		
500 kHz to 1 MHz	8 μ V + 0.96 μ V/mV		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(0.7 to 2.2) V		Fluke 5790A Multi Product Calibrator
	(10 to 20) Hz	0.02 μ V + 200 μ V/V	
	(20 to 40) Hz	0.07 μ V + 66 μ V/V	
	40 Hz to 20 kHz	0.2 μ V + 24 μ V/V	
	(20 to 50) kHz	0.1 μ V + 46 μ V/V	
	(50 to 100) kHz	0.07 μ V + 71 μ V/V	
	(100 to 300) kHz	0.03 μ V + 160 μ V / V	
	(300 to 500) kHz	0.02 μ V + 260 μ V/V	
	500 kHz to 1 MHz	0.01 μ V + 900 μ V/V	
	(2.2 to 7) V		
	(10 to 20) Hz	0.6 μ V + 200 μ V/V	
	(20 to 40) Hz	2 μ V + 70 μ V/V	
	40 Hz to 20 kHz	5 μ V + 20 μ V/V	
	(20 to 50) kHz	2 μ V + 50 μ V/V	
	(50 to 100) kHz	1 μ V + 80 μ V/V	
	(100 to 300) kHz	0.6 μ V + 200 μ V/V	
	(300 to 500) kHz	0.3 μ V + 400 μ V/V	
	500 kHz to 1 MHz	0.09 μ V + 1 mV/V	
	(7 to 22) V		
	(10 to 20) Hz	0.1 μ V + 0.2 mV/V	
	(20 to 40) Hz	0.1 μ V + 0.07 mV/V	
	40 Hz to 20 kHz	0.1 μ V + 0.03 mV/V	
	(20 to 50) kHz	0.6 μ V + 0.05 mV/V	
	(50 to 100) kHz	30 μ V + 0.08 mV/V	
	(100 to 300) kHz	0.1 μ V + 0.2 mV/V	
	(300 to 500) kHz	0.1 μ V + 0.4 mV/V	
	500 kHz to 1 MHz	0.02 μ V + 1 mV/V	
	(22 to 70) V		
	(10 to 20) Hz	2 μ V + 0.2 mV/V	
	(20 to 40) Hz	2 μ V + 0.07 mV/V	
40 Hz to 20 kHz	10 μ V + 0.03 mV/V		
(20 to 50) kHz	7 μ V + 0.06 mV / V		
(50 to 100) kHz	4 μ V + 0.09 mV/V		
(100 to 300) kHz	2 μ V + 0.2 mV/V		
(300 to 500) kHz	1 μ V + 0.4 mV/V		
500 kHz to 1 MHz	0.3 μ V + 1 mV/V		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(70 to 220) V		Fluke 5790A Multi Product Calibrator
	(10 to 20) Hz	2 μ V + 0.2 mV/V	
	(20 to 40) Hz	6 μ V + 0.07 mV/V	
	40 Hz to 20 kHz	10 μ V + 0.03 mV/V	
	(20 to 50) kHz	6 μ V + 0.07 mV/V	
	(50 to 100) kHz	4 μ V + 0.1 mV/V	
	(100 to 300) kHz	2 μ V + 0.2 mV/V	
	(300 to 500) kHz	0.8 μ V + 0.5 mV/V	
	(220 to 700) V		
	(10 to 20) Hz	50 μ V + 0.2 mV/V	
	(20 to 40) Hz	100 μ V + 0.1 mV/V	
	40 Hz to 20 kHz	200 μ V + 0.04 mV/V	
	(20 to 50) kHz	80 μ V + 0.1 mV/V	
	(50 to 100) kHz	20 μ V + 0.5 mV/V	
	(700 to 1 000) V		
(10 to 20) Hz	30 μ V + 0.2 mV/V		
(20 to 40) Hz	70 μ V + 0.1 mV/V		
40 Hz to 20 kHz	200 μ V + 0.04 mV/V		
(20 to 50) kHz	50 μ V + 0.1 mV/V		
(50 to 100) kHz	10 μ V + 0.5 mV/V		
AC Voltage – Measure	Up to 200 mV		Fluke 8508A Multimeter
	(1 to 10) Hz	14 μ V + 0.16 mV/V	
	(10 to 40) Hz	4 μ V + 0.11 mV/V	
	(40 to 100) Hz	20 μ V + 85 μ V/V	
	100 Hz to 2 kHz	2 μ V + 100 μ V/V	
	(2 to 10) kHz	3.9 μ V + 100 μ V/V	
	(10 to 30) kHz	8 μ V + 0.3 mV/V	
	(30 to 100) kHz	20 μ V + 0.7 mV/V	
	(100 to 300) kHz	2 mV + 3 mV/V	
	300 kHz to 1 MHz	20 mV + 10 mV/V	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(0.2 to 2) V (1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 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	120 μ V + 0.14 mV/V 20 μ V + 0.1 mV/V 20 μ V + 85 μ V/V 20 μ V + 65 μ V/V 20 μ V + 85 μ V/V 40 μ V + 0.2 mV/V 0.2 mV + 0.5 mV/V 2 mV + 3 mV/V 20 mV + 10 mV/V	Fluke 8508A Multimeter
	(2 to 20) V (1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 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	1.2 mV + 0.14 mV/V 0.2 mV + 0.11 mV/V 0.19 mV + 0.09 mV/V 0.19 mV + 0.07 mV/V 0.19 mV + 0.09 mV/V 0.38 mV + 0.22 mV/V 1.9 mV + 0.53 mV/V 20 mV + 3.2 mV/V 0.2 V + 11 mV/V	
AC Voltage – Measure	(20 to 200) V (1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 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	12 mV + 0.15 mV/V 2 mV + 0.11 mV/V 2 mV + 90 μ V/V 2 mV + 16 μ V/V 2 mV + 89 μ V/V 4 mV + 0.22 mV/V 20 mV + 0.53 mV/V 0.2 V + 3.2 mV/V 2 V + 11 mV/V	
AC Voltage – Measure	(200 to 1 000) V (1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.38 mV/V + 21 mV 0.12 mV/V + 20 mV 0.3 mV/V + 10 mV 0.2 mV/V + 40 mV 0.000 5 mV/V + 0.21 mV	Fluke 8508A Multimeter 300 V, add 0.00004 (reading - 300) ² μ V/V



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(1 to 15) kV @ 60Hz	5 mV/V + 3 V	Ross Divider & HP 34401A Multimeter
AC Voltage – Measure ¹	(1 to 100) kV @ 60Hz	5 V/kV + 2 V	Hipotronics KVM 100 High Voltage Meter
AC Voltage – Measure ¹	(20 to 200) kV @ 60Hz	5 V/kV + 20 V	Hipotronics KVM 200 High Voltage Meter
Electrical Simulation of Thermocouple Indicating Devices ¹	Type B (600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °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 Type E (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C Type J (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C 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	0.44 °C 0.34 °C 0.3 °C 0.33 °C 0.3 °C 0.26 °C 0.31 °C 0.5 °C 0.84 °C 0.5 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C 0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C 0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.4 °C	Fluke 5520A/SC1100 Multi Product Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices ¹	Type N		Fluke 5520A/SC1100 Multi Product Calibrator
	(-200 to -100) °C	0.4 °C	
	(-100 to -25) °C	0.22 °C	
	(-25 to 120) °C	0.19 °C	
	(120 to 410) °C	0.18 °C	
	(410 to 1 300) °C	0.27 °C	
	Type R		
	(0 to 250) °C	0.57 °C	
	(250 to 400) °C	0.57 °C	
	(400 to 1 000) °C	0.33 °C	
	(1 000 to 1 767) °C	0.4 °C	
	(1 400 to 1 767) °C	0.46 °C	
	Type S		
	(0 to 250) °C	0.47 °C	
	(250 to 1 000) °C	0.36 °C	
	(1 000 to 1 400) °C	0.37 °C	
Type T			
(-250 to -150) °C	0.63 °C		
(-150 to 0) °C	0.24 °C		
(0 to 120) °C	0.16 °C		
(120 to 400) °C	0.14 °C		
Amplitude – DC Signal 50 Ω ¹ (1 mV to 6.6 V)	1 mV to 6.6 V	0.000 16 mV + 0.002 8 mV/V	Fluke 5520A/SC1100 Multi Product Calibrator
Amplitude – DC Signal 1MΩ ¹ (1 mV to 6.6 V)	1 mV to 130 V	0.000 6 mV + 0.000 50 mV/V	
Amplitude – Square Wave (peak to peak) 50 Ω ¹ (1 mV to 6.6 V)	10 Hz to 10kHz	2.5 μV/V + 0.04 μV	
Amplitude – Square Wave (peak to peak) 1 MΩ ¹	(1 mV to 130 Vpp) (0.01 to 1) kHz (1 to 10) kHz	1 μV/V + 0.04 μV 2.5 μV/V + 0.04 μV	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Leveled Sine Wave Amplitude (@ 50 kHz ref.) ¹	5 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	20 μV/V + 0.33 μV 40 μV/V + 0.31 μV 60 μV/V + 0.31 μV	Fluke 5520A/SC1100 Multi Product Calibrator
	5 mV to 3.5 V (600 to 1 100) MHz	70 μV/V + 0.3 μV	
Flatness (@ 50 kHz ref.) ¹	5 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	15 μV/V + 0.1 μV 20 μV/V + 0.1 μV 40 μV/V + 0.1 μV	
	4 mV to 3.5 V (600 to 1 100) MHz	50 μV/V + 0.1 μV	
Time Marker ¹	1 ns to 20 ms 50 ms 0.1 s 0.2 s 0.5 s 1 s 2 s 5 s	5 ps/μs 4.3 μs 0.13 μs 0.23 ms 0.53 ms 1 ms 2 ms 5 ms	
Rise Time ¹	1 kHz to 2 MHz (200 to 300) ps (2 to 10) MHz (200 to 350) ps	321 ps 321 ps	

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Caliper Masters ²	(0.5 to 12) in	(16 + 9L) μin	P&W Labmaster Universal
	(13 to 60) in	(200 + 0.4L) μin	Gauging Amplifier, Gauge Blocks



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Cylindrical Plug Gauges ^{2,12}	(0 to 12) in	$(2 + 4L) \mu\text{in}$	P&W Labmaster Universal
Cylindrical Ring Gauges ^{2,14}	(0.02 to 0.04) in (0.04 to 0.125) in (0.125 to 0.250) in (0.250 to 1.00) in (1 to 13) in	4.7 μin $(4.4 + 2.7L) \mu\text{in}$ $(4.3 + 0.47L) \mu\text{in}$ $(4.4 + 0.4L) \mu\text{in}$ $(3.8 + 1L) \mu\text{in}$	P&W Labmaster Universal
Depth Micrometer Master ²	(0.5 to 11.5) in	$(28 + 1L) \mu\text{in}$	Comparator and Gauge Blocks
End Measuring Rods ²	(0.5 to 12) in	$(16 + 9L) \mu\text{in}$	P&W Labmaster Universal
	(12 to 24) in	$(9 + 7.4L) \mu\text{in}$	P&W ULM
	(24 to 60) in	$(200 + 0.4L) \mu\text{in}$	Comparator and Gauge Blocks
Feeler Gauges (Leaf-Style) ¹	(0 to 0.25) in	76 μin	Bench Micrometer
Gauge Balls ² (size only)	(0.062 5 to 2) in	$(10 + 4L) \mu\text{in}$	P&W Labmaster Universal
Gauge Blocks ^{2,6}	(0.05 to 4) in	$(3.7 + 0.8L) \mu\text{in}$	Mahr 130-B24 Comparator & Gauge Blocks
	(5 to 12) in	$(1.4 + 2L) \mu\text{in}$	P&W Labmaster Universal
Micrometer Masters ²	(0 to 12) in	$(2 + 4L) \mu\text{in}$	P&W Labmaster Universal
Optical Flats & Parallels	Flatness to 4 in diameter	4.3 μin	Optical Flat & Monochromatic Light
	Parallelism to 2 in thickness	4.5 μin	Mahr 130-B24 Comparator
Parallels	(0 to 36) in	66 μin	Gauge Blocks, Surface Plate & Gauging Amplifier
Pin Gauges – Class ZZ ^{1,2}	(0.011 to 1) in	$(88 + 0.4L) \mu\text{in}$	P&W Labmaster Universal

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Riser Blocks ²	(6 to 24) in	(19 + 7L) μin	Federal 832 Amplifier, Gauge Blocks
Snap Gauges ²	(0.02 to 13) in	(15 + 1L) μin	P&W Labmaster Universal
Squares- Perpendicularity ²	(0 to 36) in	(65 + 3L) μin	Indi-Square, Gauge Blocks, Amplifier, Tri-Square
Tapered Plugs ²	(0 to 2) in	(13 + 12L) μin	P&W Labmaster Universal, Gauge Blocks, Plug Gauges
Tapered Rings ²	(0 to 2) in	(15 + 5.3L) μin	P&W Labmaster Universal, Gauge Blocks
Thickness (Film) Gauge Standards (Non-Ferrous)	(0 to 0.050) in	9.7 μin	P&W Labmaster Universal
Thread Measuring Wires ^{2,10}	Unified 60° (4 to 80) TPI Acme 29° (1 to 20) TPI	(10 + 0.03L) μin	P&W Labmaster Universal
Thread Micrometer Standards ²	(1 to 6) in	(170 + 1L) μin	P&W Labmaster Universal
Angle Blocks	(1 to 60) °	0.002 2 °	Master Angle Blocks, Sine Plate, Gauging Amplifier
Angle Gauges (Leaf Style)	(0 to 90) °	3.7 min	Starrett Optical Comparator
Electronic Differential Levels	1 000 arc s	1.4 arc s	Brunson 470 Angle Generator
Functional Gauges & Fixtures	Linear (0 to 12) in	190 μin	STI Optical Comparator
	Angle (0 to 90) °	0.065°	



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Radius Gauges (Leaf Style)	Up to 1 in	210 μ in	STI Optical Comparator
Sine Bars & Plates	Angle (1 to 60) °	6.1 arc s	Gauge Blocks, Starrett Angle Blocks & Gauging Amplifier
Thread Pitch Gauges ¹⁰ (Leaf Style)	(4 to 84) TPI	160 μ in	Starrett Optical Comparator
Tri-Blocks	Length (1 to 6) in	38 μ in	Gauge Blocks and Gauging Amplifier
	Flatness	22 μ in	Gauging Amplifier
	Perpendicularity	59 μ in	Indi-Square and Gauging Amplifier
V-Blocks	Parallelism	22 μ in	Gauging Amplifier
	Perpendicularity	59 μ in	Indi-Square
	V-Centrality	41 μ in	Gauging Amplifier and Master Plugs
Surface Plates ^{1,2,13}	Overall Flatness Up to (16 x 16) ft	(52 + 1D _L) μ in	Optodyne LDDM per ASME B89.3.7
	Local Variation In Flatness	29 μ in	Repeat-O-Meter per ASME B89.3.7
Pipe Thread Plugs ^{2,10}	(4 to 80 TPI) Simple Pitch Diameter	(100 + 3L) μ in	P&W Labmaster Universal, Sine Plug
	Up to 1 in	(3.1 + 20L) μ in	Comparator and Gauge Blocks
	(0 to 2) in Standoff	23 μ in	Gauge Blocks & Gauging Amp

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Plugs – Setting ^{2,5,10}	(4 to 80 TPI) Simple Pitch Diameter	$(84 + 4L) \mu\text{in}$	P&W Labmaster Universal, Thread Measuring Wires
	(0.06 to 4) in Major Diameter	$(16 + 8.6L) \mu\text{in}$	P&W Labmaster Universal
	Root Radius & Minor Diameter	210 μin	STI Optical Comparator
Thread Plugs - Working ^{2,5,10}	(4 to 80 TPI) Simple Pitch Diameter	$(160 + 2L) \mu\text{in}$	P&W Labmaster Universal, Thread Measuring Wires
Thread Plugs - Working ^{2,5,10}	(0.060 to 4) in Major Diameter	$(26 + 5L) \mu\text{in}$	P&W Labmaster Universal
	Root Radius & Minor Diameter	210 μin	STI Optical Comparator
Bench Micrometers ¹	(0 to 2) in	12 μin	Gauge Blocks
Bench Micrometer Anvil Flatness ¹	Up to 0.5 in	9.4 μin	Optical Flat, He-Ne Monochromatic Light
Bore Gauges (2 point) ¹	(0 to 8) in	$(91 + 4L) \mu\text{in}$	P&W Labmaster Universal, Ring Gauges
Bore Gauges (3 point) ¹	(0 to 8) in	$(63 + 80L) \mu\text{in}$	Ring Gauges
Calipers Inside & Outside ^{1,2,3}	(0 to 20) in (21 to 40) in (41 to 60) in	$(280 + 10L) \mu\text{in}$ $(380 + 7L) \mu\text{in}$ $(960 + 3L) \mu\text{in}$	Gauge Blocks and Accessories
Chamfer Gauges ^{1,2}	(0 to 1) in	$(74 + 29L) \mu\text{in}$	Modified Ring Gauges
Gauging Amplifiers & LVDT Heads	(0 to 0.001) in	5.1 μin	P&W Labmaster Universal
Height Gauges ^{1,2}	(0 to 24) in (24 to 40) in	$(290 + 2L) \mu\text{in}$ $(250 + 4L) \mu\text{in}$	Gauge Blocks, Surface Plate
Height Masters ² (Length)	(0 to 24) in	$(24 + 6L) \mu\text{in}$	Gauge Blocks, Gauging Amplifier



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Height Masters Block (Parallelism)	(0 to 0.001) in	15 μin	Gauge Blocks, Gauging Amplifier
Indicators ^{1,2,7}	(0 to 0.001) in (0 to 0.01) in	6.9 μin 43 μin	P&W Labmaster Universal
	(0.01 to 8) in ¹	(56 + 66L) μin	Gauge Blocks ¹
Micrometer Heads (Length)	(0 to 1) in	33 μin	P&W Labmaster Universal
Micrometer Heads (Anvil Flatness)	Up to 3 in Diameter	7.6 μin	Optical Flat, He-Ne Monochromatic Light
Micrometers, Depth (Length) ^{1,2}	(0 to 12) in	(45 + 5L) μin	Gauge Blocks
Micrometers, Depth (Base Flatness)	(0 to 3) in	7.6 μin	Optical Flat and He-Ne Monochromatic Light
Micrometers, Inside ^{1,2}	(0 to 4) in	(32 + 8L) μin	Gauge Blocks & Accessories
	(5 to 20) in	(46 + 7L) μin	
	(21 to 40) in	(350 + 3L) μin	
	(41 to 60) in	(580 + 4L) μin	
Micrometers, Outside ^{1,2}	(0 to 4) in	(32 + 8L) μin	Gauge Blocks
	(5 to 20) in	(46 + 7L) μin	
	(21 to 40) in	(350 + 3L) μin	
	(41 to 60) in	(580 + 4L) μin	
Micrometer Anvil (Flatness) ¹	Up to 3 in Diameter	9.4 μin	Optical Flat and He-Ne Monochromatic Light
Micrometers, Screw Thread ^{1,2,4}	(0 to 1) in	(160 + 10L) μin	Thread Setting Plugs
Micrometers, V-Anvil ^{1,2}	(0.0625 to 2) in	(53 + 7L) μin	Gauge Balls
Steel Rules Tape Measures ¹¹	(0 to 12) in	0.014 in	Optical Comparator
	(1 to 300) ft.	(1 400 + 5L) μin	Optodyne LDDM



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thickness Gauges (Dial & Digital) ¹	(0 to 0.5) in	60 μin	Gauge Blocks
Optical Comparators & Vision Measuring Machines ¹	Magnification 10X, 20X, 31.25X, 50X and 62.5X	0.001 2 in	Magnification Checker, Glass Scale
	Linear Length/ X/Y Axis Length (0 to 6) in	113 μin	Glass Scale
Optical Comparators & Vision Measuring Machines ¹	(6 to 8) in	130 μin	Gauge Blocks
	Angle (0 to 90) °	0.021 °	Starrett AG8.TR
Protractors & Inclinometers	(0 to 90) °	2.9 min	Gauge Blocks, Cylindrical Square & Sine Plate
Levels	Up to 1 000 arc s	2.9 arc s	Brunson 470 Angle Generator

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force (Tension & Compression)	(0 to 5) lbf (5 to 50) lbf (50 to 600) lbf	0.000 2 lbf + 0.2 % of reading 0.009 lbf + 0.01 % of reading 0.06 lbf + 0.01 % of reading	NIST Class F Deadweights
Cable/Wire Tensiometers	(1 to 600) lbf	0.06 lbf + 0.01 % of reading	NIST Class F Deadweights
	(600 to 1 000) lbf	0.16 lbf + 0.3 % of reading	CDI 2000
Durometer Indenter	Angle Diameter Radius	0.065 ° 220 μin 250 μin	STI Optical Comparator



Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Durometer Force	Type A, B, E, O Type C, D, & DO	0.05 N 0.1 N	Rex RDC-1 Durometer Calibrator
Durometer Calibrator Force	Type A, B, E, O Type C, D, & DO	0.018 N 0.23 N	ASTM Class 1 Weights
Absolute – Measure and Generate	(0.2 to 1 015) psia	0.002 3 % of reading	Ruska 2465 Deadweight Tester
Hydraulic – Measure and Generate	(20 to 6 000) psig	0.009 1 % of reading	Ruska 5100 Deadweight Tester
Low Pressure / Vacuum – Measure and Generate	(0 to 2) inH ₂ O	0.000 8 inH ₂ O	Dwyer 1430 Microtector
	(-10 to +10) inH ₂ O	0.002 3 inH ₂ O	Meriam 34FBT2M Manometer
	(-20 to +20) inH ₂ O	0.003 1 inH ₂ O	
Pneumatic – Measure and Generate	(0.2 to 1 000) psi	0.002 3 % of reading	Ruska 2465 Deadweight Tester
Pressure – Measure and Generate ¹	(0 to 15) psi (-14.4 to 30) psi (0 to 100) psi (0 to 500) psi (0 to 1 000) psi (0 to 10 000) psi	0.01 psi 0.026 psi 0.06 psi 0.3 psi 0.66 psi 10 psi	Fluke 700 Series Pressure Transducers
Vacuum – Measure & Generate	(-14.4 to -0.2) psi	0.0023 % of reading	Ruska 2465 Deadweight Tester
Vacuum – Measure & Generate ¹	(-14.4 to 0) psi	0.013 psi	Fluke 700 Series Pressure Transducer
Scales & Balances ¹	(0 to 610) g 610 g to 35 kg	0.9 mg + 0.02 mg/mg 0.056 g + 0.002 g/kg	ASTM Class 1 Weights
	(0.5 to 600) lb	0.082 lb + 0.000 05 lb/lb	NIST 105-1 Class F Weights

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque – Measure	(20 to 200) ozf·in ¹ (4 to 50) lbf·in ¹ (30 to 400) lbf·in ¹ (80 to 1 000) lbf·in ¹ (20 to 250) lbf·ft ¹ (100 to 1 000) lbf·ft	0.05 ozf·in + 0.3 % of reading 0.009 lbf·in + 0.3 % of reading 0.05 lbf·in + 0.3 % of reading 0.95 lbf·in + 0.22 % of reading 0.07 lbf·ft + 0.27 % of reading 0.01 lbf·ft + 0.63 % of reading	CDI 2000 Torque Tester
Torque – Source	(20 to 200) ozf·in (4 to 50) lbf·in (30 to 400) lbf·in (80 to 1 000) lbf·in (20 to 250) lbf·ft (250 to 1 000) lbf·ft	0.03 ozf·in + 0.09 % of reading 0.007 3 lbf·in + 0.08 % of reading 0.001 lbf·in + 0.1 % of reading 0.14 lbf·in + 0.09 % of reading 0.006 4 lbf·ft + 0.09 % of reading 0.2 lbf·ft + 0.01 % of reading	CDI Torque Arms & Wheels NIST Class F Weights

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity – Measure ¹	(10 to 90) %RH	1.1 %RH + 0.14 % of reading	Rotronic HC2A Humidity Probe
Humidity – Generate	(10 to 90) %RH	0.57 %RH + 0.24 % of reading	Thunder Scientific 2500LT Chamber
Infrared – Source ¹	(50 to 500) °C	0.47 °C + 0.14 % of reading	Fluke 9132 Blackbody $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$
Temperature - Generate ^{1,8}	-196 °C	0.023 °C	Fluke 7196 LN2 Calibrator Fluke 5628 PRT
	Ice Point	0.158 °C	Kaye X0240 Ice Point
Temperature - Generate ⁸	(-50 to 0) °C (0 to 100) °C (-100 to 250) °C	0.056 °C + 0.004 % of reading 0.055 °C + 0.002 % of reading 0.007 °C + 0.05 % of reading	Fluidized Baths Fluke 5610 Thermistor Fluke 5628 PRT
	(-15° to 350) °C ¹	0.26 °C + 0.15 % of reading	Hart 9009 Drywell
	(-95° to 140) °C	0.028 °C	Fluke 9190A Drywell Fluke 5628 PRT
	(-45° to 140) °C	0.097 °C + 0.01 % of reading	Fluke 9170 Drywell
	(50° to 700) °C	0.158 °C + 0.04 % of reading	Fluke 9173 Drywell



Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature - Generate	(-10° to 70) °C	0.14 °C	Thunder Scientific 2500LT Chamber
Temperature - Measure	(-200 to 660) °C	0.013 °C + 0.004 % of reading	Hart Scientific 1560 Readout Fluke 5628 SPRT
	(0 to 100) °C	0.009 °C + 0.003 % of reading	Fluke 1586 Scanner 5610 Thermistor
Dew Point	(-35 to 69) °C	0.14 °C	Thunder Scientific 2500LT Chamber

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ¹	10 Hz to 1.3 GHz	6.9 parts in 10 ¹¹	Counter & Efratom M-100 Oscillator
Frequency Measuring Equipment	10 MHz	5 parts in 10 ¹²	HP 58503A GPS Receiver
Frequency Measuring Equipment ¹	10 MHz	2.3 parts in 10 ¹¹	Efratom M-100 Oscillator
Tachometers ¹ (Contact Type)	(1 to 40 000) rpm	0.88 rpm	Quantum Dynamics N-11-ECS/3A Tachometer
Tachometers ¹ (Non-Contact Type)	(25 to 90 000) rpm	0.29 rpm + 3 μrpm/rpm	Frequency Counter
Stopwatches & Timers	(2 to 86 400) s/day	0.058 s/day	Helmut Klein 4500 Timometer

Testing

Dimensional Measurement

Specific Tests and / or Properties Measured ⁹	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Length Measures – External ²	(0 to 12) in	(4 + 10L) μin	P&W Labmaster Universal
Length Measures – Internal ²	(0.02 to 13) in	(15 + 1L) μin	
Length Measures – Hand Tools ²	(0 to 2) in	(92 + 6L) μin	Digital Micrometers
	(0 to 8) in	(1400 + 5L) μin	Digital Caliper
Angle	(0 to 360) °	0.065°	STI Optical Comparator
2D Length	X/Y Axis: 0 to 8 in	190 μin	



Services performed at satellite location

3695 N. 126th Street
 Brookfield, WI 53005
 Alex Cimaroli 708-596-5800

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source	(0.19 to 0.4) nF (0.4 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 (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 (0.33 to 1.1) mF (1.1 mF to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.005 nF / nF + 0.01 nF 0.005 nF / nF + 0.01 nF 0.005 nF / nF + 0.01 nF 0.002 nF / nF + 0.1 nF 0.002 nF / nF + 0.1 nF 0.003 nF / nF + 0.088 nF 0.002 nF / nF + 0.3 nF 0.003 μF / μF + 0.98 nF 0.003 μF / μF + 3 nF 0.003 μF / μF + 10 nF 0.004 μF / μF + 30 nF 0.005 μF / μF + 0.1 μF 0.005 μF / μF + 0.3 μF 0.005 μF / μF + 1 μF 0.9 mF / mF + 57 μF 3 μF / mF + 55 μF 7 μF / mF + 48 μF 10 μF / mF + 0.1 mF	Fluke 5520A/SC1100 Multi Product Calibrator
AC Current - Source	(22 to 220) uA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (0.22 to 2.2) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.7 nA/A + 25 nA 0.36 nA/A + 20 nA 0.14 nA/A + 16 nA 0.6 nA/A + 40 nA 1.6 nA/A + 80 nA 0.7 nA/μA + 41 nA 0.35 nA/μA + 37 nA 0.14 nA/μA + 39 nA 0.6 nA/μA + 40 nA 1.6 nA/μA + 80 nA	Fluke 5520A/SC1100 Multi Product Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current - Source	(2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.7 nA/μA + 0.4 μA 0.35 nA/μA + 0.35 μA 0.17 nA/μA + 0.3 μA 0.6 nA/μA + 4 μA 1.6 nA/μA + 8 μA	Fluke 5520A/SC1100 Multi Product Calibrator
	(22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.7 nA/μA + 4.1 μA 0.38 nA/μA + 2.8 μA 0.14 nA/μA + 3.8 μA 0.6 nA/μA + 40 μA 1.6 nA/μA + 80 μA	
DC Current - Source	(0.22 to 2.2) A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.35 nA/μA + 36 μA 0.75 nA/μA + 81 μA 8.5 nA/μA + 160 μA	Fluke 5520A/SC1100 Multi Product Calibrator
	(0 to 220) μA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	50 μA/A + 8.7 nA 50 μA/A + 8.3 nA 50 μA/A + 80 nA 69 μA/A + 0.6 μA 0.12 mA/A + 0.24 mA	
DC Current – Source ¹	0 μA to 330 μA 0.3 mA to 3.3 mA 3.3 mA to 33 mA 33 mA to 330 mA 0.33 A to 1.1 A 1.1 A to 3 A 3.0 A to 11 A 11 A to 20 A	0.14 nA/μA + 27 nA 0.1 μA/μA + 52 nA 0.1 μA/μA + 0.28 μA 0.1 μA/μA + 2.5 μA 0.2 mA/A + 40 μA 0.38 mA/A + 40 μA 0.5 mA/A + 0.5 mA 1 mA/A + 0.75 mA	Fluke 5520A/SC1100 Multi Product Calibrator
	(20 to 100) A	0.4 mA / A + 22 mA	
DC Source – Current Clamps ¹	(10 to 150) A (150 to 1 025) A	3.6 mA / A + 1.5 mA 3.4 mA / A + 0.11 A	Fluke 5520A/SC1100 Multi Product Calibrator with Fluke 50-turn coil



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(30 to 330) μ A		Fluke 5520A/SC1100 Multi Product Calibrator
	(10 to 20) Hz	2 nA/ μ A + 0.1 μ A	
	(20 to 45) Hz	1.5 nA/ μ A + 0.1 μ A	
	45 Hz to 1 kHz	1.2 nA/ μ A + 0.1 μ A	
	(1 to 5) kHz	3 nA/ μ A + 0.15 μ A	
	(5 to 10) kHz	8 nA/ μ A + 0.2 μ A	
	(10 to 30) kHz	16 nA/ μ A + 0.4 μ A	
	(0.33 to 3.3) mA		
	(10 to 20) Hz	2 μ A/mA + 0.15 μ A	
	(20 to 45) Hz	1.2 μ A/mA + 0.15 μ A	
	45 Hz to 1 kHz	1 μ A/mA + 0.15 μ A	
	(1 to 5) kHz	2 μ A/mA + 0.2 μ A	
	(5 to 10) kHz	5 μ A/mA + 0.3 μ A	
	(10 to 30) kHz	10 μ A/mA + 0.6 μ A	
	(3.3 to 33) mA		
	(10 to 20) Hz	1.8 μ A/mA + 2 μ A	
	(20 to 45) Hz	0.9 μ A/mA + 2 μ A	
	45 Hz to 1 kHz	0.4 μ A/mA + 2 μ A	
	(1 to 5) kHz	0.8 μ A/mA + 2 μ A	
	(5 to 10) kHz	2 μ A/mA + 3 μ A	
	(10 to 30) kHz	4 μ A/mA + 4 μ A	
	(33 to 330) mA		
	(10 to 20) Hz	1.8 μ A/mA + 20 μ A	
	(20 to 45) Hz	0.9 μ A/mA + 20 μ A	
	45 Hz to 1 kHz	0.4 μ A/mA + 20 μ A	
	(1 to 5) kHz	1 μ A/mA + 50 μ A	
	(5 to 10) kHz	2 μ A/mA + 0.1 mA	
	(10 to 30) kHz	4 μ A/mA + 0.2 mA	
	(0.33 to 1.1) A		
	(10 to 45) Hz	1.6 μ A/mA + 0.18 mA	
45 Hz to 1 kHz	0.44 μ A/mA + 0.12 mA		
(1 to 5) kHz	5.2 μ A/mA + 1.3 mA		
(5 to 10) kHz	2.2 μ A/mA + 0.61 mA		
(1.1 to 3) A			
(10 to 45) Hz	1.8 mA/A + 0.1 mA		
45 Hz to 1 kHz	0.6 mA/A + 0.1 mA		
(1 to 5) kHz	6 mA/A + 1 mA		
(5 to 10) kHz	25 mA/A + 5 mA		
(3 to 11) A			
(45 to 100) Hz	0.6 mA/A + 2 mA		
100 Hz to 1 kHz	1 mA/A + 2 mA		
(1 to 5) kHz	30 mA/A + 2 mA		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(11 to 20) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (20 to 100) A 45 Hz to 1 kHz	1.2 mA/A + 5 mA 1.5 mA/A + 5 mA 30 mA/A + 5 mA 1.8 mA / A + 0.12 A	Ballantine 1620A Transconductance Amplifier
AC Current Source – Current Clamps ¹ (45 to 65) Hz	(10 to 16.5) A (16.5 to 150) A (150 to 1 025) A	0.2 mA / A + 0.3 A 2.7 mA / A + 0.25 A 3.8 mA / A + 0.15 A	Fluke 5520A/SC1100 Multi Product Calibrator with Fluke 50-turn coil
AC Current Source – Current Clamps ¹ (65 to 440) Hz	(10 to 16.5) A (16.5 to 150) A (150 to 1 025) A	0.27 mA / A + 0.28 A 8.7 mA / A + 0.18 A 9.5 mA / A + 0.14 A	
Inductance – Generate Fixed Points (400 Hz, 1kHz) ¹	100 μH 500 μH 1 mH 10 mH 50 mH 100 mH 200 mH 1 H	0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading	GenRad Standard Inductors
DC Power ¹	(0 to 336) W (336 to 3 060) W (3 060 to 20 910) W	0.04 % of output 0.054 % of output 0.13 % of output	Fluke 5520A/SC1100 Multi Product Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power (45 to 65) Hz ¹	(0.11 to 3) mW	0.14 % of output	Fluke 5520A/SC1100 Multi Product Calibrator
	(3 to 11) mW	0.1 % of output	
	(11 to 30) mW	0.16 % of output	
	(30 to 110) mW	0.12 % of output	
	(110 to 300) mW	0.15 % of output	
	(300 to 730) mW	0.13 % of output	
	(0.73 to 1.5) W	0.15 % of output	
	(1.5 to 6.8) W	0.14 % of output	
	(6.8 to 9.2) W	0.14 % of output	
	(9.2 to 34) W	0.1 % of output	
	(34 to 92) W	0.14 % of output	
	(92 to 337) W	0.1 % of output	
	(337 to 918) W	0.13 % of output	
	(918 to 2 244) W	0.11 % of output	
(2 244 to 4 590) W	0.14 % of output		
(4 590 to 11 220) W	0.12 % of output		
Resistance – Source ¹	(0 to 11) Ω	40 μΩ / Ω + 1 mΩ	Fluke 5520A/SC1100 Multi Product Calibrator
	(11 to 33) Ω	30 μΩ / Ω + 1.5 mΩ	
	(33 to 110) Ω	28 μΩ / Ω + 1.4 mΩ	
	(110 to 330) Ω	28 μΩ / Ω + 2.1 mΩ	
	(330 to 1 100) Ω	28 μΩ / Ω + 2 mΩ	
	(1.1 to 3.3) kΩ	28 μΩ / Ω + 200 mΩ	
	(3.3 to 11) kΩ	30 μΩ / Ω + 200 mΩ	
	(11 to 33) kΩ	30 μΩ / Ω + 210 mΩ	
	(33 to 110) kΩ	28 μΩ / Ω + 240 mΩ	
	(110 to 330) kΩ	32 μΩ / Ω + 2 Ω	
	(0.33 to 1.1) MΩ	32 μΩ / Ω + 2 Ω	
	(1.1 to 3.3) MΩ	69 μΩ / Ω + 21 Ω	
	(3.3 to 11) MΩ	130 μΩ / Ω + 50 Ω	
	(11 to 33) MΩ	250 μΩ / Ω + 2.5 kΩ	
	(33 to 110) MΩ	0.5 mΩ / Ω + 3 kΩ	
	(110 to 330) MΩ	3 mΩ / Ω + 100 kΩ	
(330 to 1 100) MΩ	15 mΩ / Ω + 0.5 MΩ		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices ¹	Pt 385, 100 Ω		Fluke 5520A/SC1100 Multi Product Calibrator
	(-200 to -80) °C	0.052 °C	
	(-80 to 0) °C	0.052 °C	
	(0 to 100) °C	0.07 °C	
	(100 to 300) °C	0.091 °C	
	(300 to 400) °C	0.1 °C	
	(400 to 630) °C	0.12 °C	
	(630 to 800) °C	0.23 °C	
	Pt 385, 200 Ω		
	(-200 to -80) °C	0.043 °C	
	(-80 to 0) °C	0.043 °C	
	(0 to 100) °C	0.043 °C	
	(100 to 260) °C	0.052 °C	
	(260 to 300) °C	0.12 °C	
	(300 to 400) °C	0.13 °C	
	(400 to 600) °C	0.14 °C	
	(600 to 630) °C	0.16 °C	
	Pt 385, 500 Ω		
	(-200 to -80) °C	0.043 °C	
	(-80 to 0) °C	0.052 °C	
	(0 to 100) °C	0.052 °C	
	(100 to 260) °C	0.062 °C	
	(260 to 300) °C	0.081 °C	
	(300 to 400) °C	0.081 °C	
(400 to 600) °C	0.091 °C		
(600 to 630) °C	0.11 °C		
Pt 385, 1000 Ω			
(-200 to -80) °C	0.034 °C		
(-80 to 0) °C	0.034 °C		
(0 to 100) °C	0.043 °C		
(100 to 260) °C	0.052 °C		
(260 to 300) °C	0.062 °C		
(300 to 400) °C	0.072 °C		
(400 to 600) °C	0.072 °C		
(600 to 630) °C	0.23 °C		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices ¹	Pt 3916, 100 Ω		Fluke 5520A/SC1100 Multi Product Calibrator
	(-200 to -190) °C	0.25 °C	
	(-190 to -80) °C	0.043 °C	
	(-80 to 0) °C	0.053 °C	
	(0 to 100) °C	0.062 °C	
	(100 to 260) °C	0.072 °C	
	(260 to 300) °C	0.082 °C	
	(300 to 400) °C	0.092 °C	
	(400 to 600) °C	0.1 °C	
	(600 to 630) °C	0.23 °C	
	Pt 3926, 100 Ω		
	(-200 to -80) °C	0.053 °C	
(-80 to 0) °C	0.053 °C		
(0 to 100) °C	0.072 °C		
(100 to 300) °C	0.092 °C		
(300 to 400) °C	0.1 °C		
(400 to 630) °C	0.12 °C		
PtNi 385, 120 Ω			
(-80 to 0) °C	0.083 °C		
(0 to 100) °C	0.083 °C		
(100 to 260) °C	0.14 °C		
Cu 427, 10 Ω			
(-100 to 260) °C	0.3 °C		
DC Voltage - Source ¹	(0 to 330) mV	0.018 μV/mV + 2.1 V	Fluke 5520A/SC1100 Multi Product Calibrator
	(0.3 to 3.3) V	11 μV/V + 3.8 μV	
	(3.3 to 33) V	12 μV/V + 35 μV	Hipotronics KVM 100 High Voltage Meter
	(33 to 330) V	18 μV/V + 260 μV	
	(330 to 1 000) V	18 mV/V + 1.5 mV	
AC Voltage - Source ¹	(1 to 33) mV	0.8 μV/mV + 6 μV	Fluke 5520A/SC1100 Multi Product Calibrator
	(10 to 45) Hz	0.15 μV/mV + 6.3 μV	
	45 Hz to 10 kHz	0.2 μV/mV + 6.3 μV	
	(10 to 20) kHz	1 μV/mV + 6.2 μV	
	(20 to 50) kHz	3.5 μV/mV + 12 μV	
	(50 to 100) kHz	8 μV/mV + 50 μV	
	(100 to 500) kHz		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Source ¹	(33 to 330) mV (10 to 45) Hz	0.3 μV/mV + 8.1 μV	Fluke 5520A/SC1100 Multi Product Calibrator
	45 Hz to 10 kHz (10 to 20) kHz	0.15 μV/mV + 8.1 μV	
	(20 to 50) kHz	0.16 μV/mV + 8.1 μV	
	(50 to 100) kHz	0.35 μV/mV + 8.1 μV	
	(100 to 500) kHz	0.8 μV/mV + 32 μV	
	(0.33 to 3.3) V (10 to 45) Hz	2 μV/mV + 70 μV	
	45 Hz to 10 kHz (10 to 20) kHz	300 μV/V + 50 μV	
	(20 to 50) kHz	150 μV/V + 60 μV	
	(50 to 100) kHz	190 μV/V + 60 μV	
	(100 to 500) kHz	300 μV/V + 50 μV	
	(3.3 to 33) V (10 to 45) Hz	700 μV/V + 130 μV	
	45 Hz to 10 kHz (10 to 20) kHz	2.4 mV/V + 0.6 mV	
	(20 to 50) kHz	0.3 mV/V + 0.65 mV	
	(50 to 100) kHz	0.3 mV/V + 0.65 mV	
	(33 to 330) V 45 Hz to 1 kHz (1 to 10) kHz	0.24 mV/V + 0.6 mV	
	(10 to 20) kHz	0.35 mV/V + 0.6 mV	
	(20 to 50) kHz	0.9 mV/V + 1.6 mV	
(50 to 100) kHz	0.19 mV/V + 2 mV		
(330 to 1 000) V (45 to 1) kHz	0.2 mV/V + 6 mV		
(1 to 5) kHz	0.25 mV/V + 6 mV		
(5 to 10) kHz	0.25 mV/V + 6 mV		
(5 to 10) kHz	0.3 mV/V + 6 mV		
	2 mV/V + 50 mV		
	0.3 mV/V + 10 mV		
	0.25 mV/V + 10 mV		
	0.3 mV/V + 10 mV		
DC Voltage – Measure ¹	(1 to 100) kV	5 V / kV + 2 V	Hipotronics KVM 100 High Voltage Meter
	(20 to 200) kV	5 V / kV + 20 V	Hipotronics KVM 200 High Voltage Meter
AC Voltage – Measure	(1 to 10) kV @ 60Hz	5 mV / V + 3 V	Ross Divider & HP 34401A Multimeter



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	(1 to 100) kV	5 V / kV + 2 V	KVM 100 High Voltage Meter
	(20 to 200) kV	5 V / kV + 20 V	KVM 200 High Voltage Meter
Electrical Simulation of Thermocouple Indicating Devices ¹	Type B (600 to 800) °C	0.44 °C	Fluke 5520A/SC1100 Multi Product Calibrator
	(800 to 1 000) °C	0.34 °C	
	(1 000 to 1 550) °C	0.3 °C	
	(1 550 to 1 820) °C	0.33 °C	
	Type C (0 to 150) °C	0.3 °C	
	(150 to 650) °C	0.26 °C	
	(650 to 1 000) °C	0.31 °C	
	(1 000 to 1 800) °C	0.5 °C	
	(1 800 to 2 316) °C	0.84 °C	
	Type E (-250 to -100) °C	0.5 °C	
	(-100 to -25) °C	0.16 °C	
	(-25 to 350) °C	0.14 °C	
	(350 to 650) °C	0.16 °C	
	(650 to 1 000) °C	0.21 °C	
	Type J (-210 to -100) °C	0.27 °C	
	(-100 to -30) °C	0.16 °C	
	(-30 to 150) °C	0.14 °C	
	(150 to 760) °C	0.17 °C	
	(760 to 1 200) °C	0.23 °C	
	Type K (-200 to -100) °C	0.33 °C	
(-100 to -25) °C	0.18 °C		
(-25 to 120) °C	0.16 °C		
(120 to 1 000) °C	0.26 °C		
(1 000 to 1 372) °C	0.4 °C		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices ¹	Type N		Fluke 5520A/SC1100 Multi Product Calibrator
	(-200 to -100) °C	0.4 °C	
	(-100 to -25) °C	0.22 °C	
	(-25 to 120) °C	0.19 °C	
	(120 to 410) °C	0.18 °C	
	(410 to 1 300) °C	0.27 °C	
	Type R		
	(0 to 250) °C	0.57 °C	
	(250 to 400) °C	0.57 °C	
	(400 to 1 000) °C	0.33 °C	
	(1 000 to 1 767) °C	0.4 °C	
	Type S		
	(0 to 250) °C	0.47 °C	
	(250 to 1 000) °C	0.36 °C	
	(1 000 to 1 400) °C	0.37 °C	
	(1 400 to 1 767) °C	0.46 °C	
Type T			
(-250 to -150) °C	0.63 °C		
(-150 to 0) °C	0.24 °C		
(0 to 120) °C	0.16 °C		
(120 to 400) °C	0.14 °C		
Amplitude – Square Wave (peak to peak) ¹ 50 Ω	(1 mV to 6.6 V)	2.5 μV / V + 0.04 μV	Fluke 5520A/SC1100 Multi Product Calibrator
1 MΩ	(1 mV to 130 Vpp) (0.01 to 1) kHz (1 to 10) kHz	1 μV / V + 0.04 μV 2.5 μV / V + 0.04 μV	
Leveled Sine Wave Amplitude ¹ (@ 50 kHz ref.)	5 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1 100) MHz	20 μV / V + 0.33 μV 40 μV / V + 0.31 μV 60 μV / V + 0.31 μV 70 μV / V + 0.3 μV	
Flatness ¹ (@ 50 kHz ref.)	5 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1 050) MHz	15 μV / V + 0.1 μV 20 μV / V + 0.1 μV 40 μV / V + 0.1 μV 50 μV / V + 0.1 μV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Time Marker ¹	1 ns to 20 ms	5 ps / μ s	Fluke 5520A/SC1100 Multi Product Calibrator
	50 ms	75 μ s	
	0.1 s	0.13 μ s	
	0.2 s	0.23 ms	
	0.5 s	0.53 ms	
	1 s	1 ms	
	2 s	2 ms	
Rise Time ¹	1 kHz to 2 MHz (200 to 300) ps	321 ps	
	(2 to 10) MHz (200 to 350) ps	321 ps	

Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure – Measure & Generate ¹	(0 to 15) psi	0.01 psig	Pressure Transducers
	(-15 to 30) psi	0.026 psig	
	(0 to 100) psi	0.06 psig	
	(0 to 500) psi	0.3 psig	
	(0 to 1 000) psi	0.66 psig	
Vacuum – Measure & Generate ¹	(0 to 10 000) psi	10 psig	Pressure Transducer
	(-14 to 0) psi	0.013 psig	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity – Measure ¹	(10 to 80) %RH	1.4 %RH	Thermo-hygrometer

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Generate ^{1, 8}	(33° to 300) °C	0.35°C + 0.003 °C / °C	Dry-well & RTD

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure	10 Hz to 1.3 GHz	6.9 parts in 10 ¹¹	Counter & Rubidium Oscillator
Frequency Measuring Equipment	10 MHz	2.3 parts in 10 ¹¹	Rubidium Oscillator
Tachometers ¹ (Non-Contact Type)	(25 to 90 000) rpm	0.29 rpm + 3 μrpm / rpm	Frequency Counter
Stopwatches & Timers	Up to 24 hr	0.058 s/day	Universal Counter

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k=2$), corresponding to a confidence level of approximately 95%.



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Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. L = length in inches, DL = Diagonal Length
3. Measurements include the following measurement functions: Outside, Inside, Step and Depth Extension Rods
4. Inch thread setting plugs only with 60° Included Angle
5. Includes 60° Metric, Unified and 55° Whitworth pitch gauges
6. Uncertainty is for Steel Blocks. Carbide and Ceramic blocks may have a different uncertainty due to deformation coefficients and different coefficients of thermal expansion
7. Includes dial, digital and test indicators
8. Includes Liquid-in-Glass Thermometers, RTDs, Thermocouples, Bi-metallic Thermometers, etc. Liquid-in-Glass Thermometers are only calibrated in fluidized baths to ensure correct immersion depth and stem effect corrections
9. Metric equivalencies for this type of equipment are available and converted by 1 in equals 25.4 mm exactly
10. TPI indicates Threads per inch
11. Verification performed in 12 ft. increments before repositioning
12. Includes Master Setting Discs and Progressive Diameter Plugs
13. This instrument/parameter has been characterized to lower the uncertainty
14. The stated uncertainty is associated with a primary calibration which utilizes a comparison datum set with gauge blocks rather than a master ring.
15. This scope is formatted as part of a single document including Certificate of Accreditation No. L-2216.



Vice President