THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

CINCINNATI PRECISION INSTRUMENTS
Cincinnati, OH

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. 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 18 June 2005*).

Presented this 16th day of December 2008.

President
For the Accreditation Council
Certificate Number 1570.01
Valid to December 31, 2010

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

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

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CALIBRATION

Valid until: December 31, 2010 Certificate Number: 1570.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1]:

I. Dimensional

Parameter/Equipment	Range	Best Uncertainty[2, 4] (±)	Comments
Gage Blocks	(0.01 to 4) in (4 to 20) in	(1.2 + 1.3*L*) µin (0.12 + 1.7*L*) µin	Federal comparator and gage blocks
Micrometers[3]	(1 to 12) in (12 to 24) in (24 to 36) in	(130 + 0.6*L*) µin (28 + 9*L*) µin (240 + 5*L*) µin	GageMaker Mic-Trac gage blocks
Calipers[3]	(2 to 12) in (12 to 24) in (24 to 36) in (36 to 80) in	(300 + 1.1*L*) µin (270 + 4*L*) µin (260 + 5*L*) µin (210 + 3*L*) µin	GageMaker Mic-Trac gage blocks Renishaw laser
2D Height Gages[3]	(0 to 36) in	(98 + 1.5*L*) µin	Surface plate and reference bar
Bore Gages[3]	Up to 2.0 in	(22 + 0.6*R*) µin	Ring gage and Indi-Check
Ring Gage – ID	(0.035 to 0.350) in (0.350 to 3) in (3 to 20) in	(14 + 38*L*) µin (8.1 + 1.1*L*) µin (4.2 + 2.4*L*) µin	Zeiss ULM and setting masters

Parameter/Equipment	Range	Best Uncertainty[2, 4] (±)	Comments
Thread Plugs	Up to 3.6 in	55 µin	Super Mic, thread wires and gage blocks
Pitch Diameter	(3.6 to 12) in	(24 + 2.4*L*) µin	Zeiss ULM, thread wires and gage blocks
Optical Comparator[3] –			J & L glass master scale Scale and square
Linear Scale	(0 to 30) in	140 µin	
Squareness of Scales	N/A	110 µin	
Cylindrical Plug/Disc	(0.05 to 20) in	(8.4 + 1.8*L*) µin	Zeiss ULM and gage blocks
Thread Wires	(0.003 to 0.25) in	5 µin	Zeiss ULM and gage blocks
Bench Micrometer[3]	(0 to 1) in	15 µin	Gage blocks
Dial Indicators[3]	(0.001 to 1) in (1 to 4) in	82 µin 330 µin	Indi-Check Mic-Trac
Digital Indicators[3]	(0 to 0.5) in (0.5 to 1) in (1 to 4) in	47 µin 290 µin 330 µin	Indi-Check Mic-Trac
Test Indicators[3]	(0 to 0.03) in (0.03 to 0.06) in	66 µin 220 µin	Indi-Check
Pin Gages[3]	Up to 2 in	(41 + 5*L*) µin	Laser micrometer and master disks
Indicator Calibrator	(0 to 2) in	10 µin	Renishaw laser
Mic-Trac[3]	(0 to 12) in (0 to 24) in (0 to 36) in	50 µin 76 µin 110 µin	Renishaw laser
Datum Balls	Up to 2 in	12 µin	Zeiss ULM & gage blocks

Parameter/Equipment	Range	Best Uncertainty[2, 4] (±)	Comments
Universal Measuring Machine[3]	Up to 20 in	(2.4 + 1.3*L*) µin	Gage blocks
Linear Rule	(0 to 80) in	120 µin	Renishaw laser
Micrometer Standard[3]	(1 to 72) in	(40 + 5*L*) µin	Renishaw laser and gage blocks
Surface Plate Flatness[3]	(0 to 120) in	(18 + 0.9*D*) µin	Federal leveling system
Precision Squares[3]	Up to 18 in	120 µin	Amplifier, granite surface plate
Micro Hite STD – Block Size and Parallelism Base Parallelism	Up to 1 in	12 µin 70 µin	Zeiss ULM, ring gage, amplifier and granite surface plate
Sine Plate[3]	Up to 5 in	160 µin	Gage blocks, amplifier and surface plate
Federal Levels[3]	± 1000 arc sec	3.8 arc sec	Gage blocks, sine plate, and granite surface plate

II. Electrical – DC & Low Frequency

Parameter/Equipment	Range	Best Uncertainty[2, 6, 8] (±)	Comments
DC Voltage – Measure[3]	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	7 µV/V + 1 µV 6 µV/V + 3 µV 6 µV/V + 5 µV 8 µV/V + 30 µV 8 µV/V + 0.1 mV	HP 3458A with Opt. 002 See Footnote 7

Parameter/Equipment	Range	Best Uncertainty[2, 5, 6, 8] (±)	Comments
DC Voltage – Generate[3]	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	20 μV/V + 1 μV 11 μV/V + 2 μV 12 μV/V + 20 μV 18 μV/V + 0.15 mV 18 μV/V + 1.5 mV	Fluke 5520A
DC Current – Measure[3]	(10 to 100) μA 100 μA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	25 μA/A + 8 parts in 10^6 25 μA/A + 5 parts in 10^6 25 μA/A + 5 parts in 10^6 40 μA/A + 5 parts in 10^6 0.012 % + 10 parts in 10^6	HP 3458A
DC Current – Generate[3]	(0 to 330) μA 330 μA 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) A	0.015 % + 0.02 μA 0.01 % + 0.05 μA 0.01 % + 0.25 μA 0.01 % + 2.5 μA 0.02 % + 40 μA 0.038 % + 40 μA 0.05 % + 0.50 mA 0.1 % + 0.75 mA	Fluke 5520A
DC Current[3] – Clamp-On	(20 to 150) A (150 to 550) A (550 to 1000) A	0.26 % + 0.05 A 0.26 % + 0.06 A 0.27 % + 0.06 A	Fluke 5520A with 50 turn coil
Resistance – Measure[3]	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	18 μΩ/Ω + 50 μΩ 15 μΩ/Ω + 0.50 mΩ 13 μΩ/Ω + 0.50 mΩ 13 μΩ/Ω + 5 mΩ 13 μΩ/Ω + 50 mΩ 18 μΩ/Ω + 2 Ω 53 μΩ/Ω + 0.10 kΩ 0.051 % + 1 kΩ 0.5 % + 10 kΩ	HP 3458A

Parameter/Equipment	Range	Best Uncertainty[2, 5, 6, 8] (±)	Comments
Resistance – Generate[3]	(0 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 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ	40 μΩ/Ω + 0.001 Ω 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 + 0.2 Ω 28 μΩ/Ω + 0.2 Ω 32 μΩ/Ω + 2 Ω 32 μΩ/Ω + 2 Ω 60 μΩ/Ω + 30 Ω 0.013 % + 50 Ω 0.025 % + 2.5 kΩ 0.05 % + 3 kΩ 0.3 % + 0.10 MΩ 1.5 % + 0.50 MΩ	Fluke 5520A
AC Voltage – Measure[3]			
(5 to 10) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.03 % + 3 μV 0.02 % + 1.1 μV 0.03 % + 1.1 μV 0.1 % + 1.1 μV 0.5 % + 1.1 μV 4 % + 2 μV	HP 3458A
(10 to 100) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	72 μV/V + 4 μV 72 μV/V + 2 μV 15 μV/V + 2 μV 0.03 % + 2 μV 0.08 % + 2 μV 0.3 % + 10 μV 1 % + 10 μV 1.5 % + 10 μV	
100 mV to 1 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	72 μV/V + 40 μV 72 μV/V + 20 μV 15 μV/V + 20 μV 0.03 % + 20 μV 0.08 % + 20 μV 0.3 % + 0.10 mV 1 % + 0.10 mV 1.5 % + 0.10 mV	

Parameter/Equipment	Range	Best Uncertainty[2, 5, 6, 8] (±)	Comments
AC Voltage – Measure[3] (cont)			
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	72 µV/V + 0.40 mV 72 µV/V + 0.20 mV 15 µV/V + 0.20 mV 0.03 % + 0.20 mV 0.08 % + 0.20 mV 0.3 % + 1.0 mV 1 % + 1.0 mV 1.5 % + 1.0 mV	HP 3458A
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.02 % + 4 mV 0.02 % + 2 mV 0.02 % + 2 mV 0.036 % + 2 mV 0.12 % + 2 mV 0.4 % + 10 mV 1.5 % + 10 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.04 % + 40 mV 0.04 % + 20 mV 0.06 % + 20 mV 0.12 % + 20 mV 0.3 % + 20 mV	
AC Voltage – Generate[3]			
(1 to 33) mV	(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	0.08 % + 6 µV 0.015 % + 6 µV 0.02 % + 6 µV 0.1 % + 6 µV 0.35 % + 12 µV 0.8 % + 50 µV	Fluke 5520A
(33 to 330) mV	(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	0.05 % + 8 µV 0.015 % + 8 µV 0.016 % + 8 µV 0.035 % + 8 µV 0.08 % + 32 µV 0.2 % + 70 µV	
(0.33 to 3.3) V	(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	0.03 % + 50 µV 0.015 % + 60 µV 0.019 % + 60 µV 0.03 % + 50 µV 0.07 % + 0.13 mV 0.24 % + 0.60 mV	

Parameter/Equipment	Range	Best Uncertainty[2, 5, 6, 8] (±)	Comments
AC Voltage – Generate[3] (cont)			
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.03 % + 0.65 mV 0.015 % + 0.60 mV 0.024 % + 0.60 mV 0.035 % + 0.60 mV 0.09 % + 1.6 mV	Fluke 5520A
(33 to 330) V	45 Hz to 1 kHz 1 kHz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.019 % + 2 mV 0.02 % + 6 mV 0.025 % + 6 mV 0.03 % + 6 mV 0.2 % + 50 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.03 % + 10 mV 0.025 % + 10 mV 0.03 % + 10 mV	
AC Current – Measure[3]			
(5 to 100) μA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.4 % + 30 nA 0.15 % + 30 nA 0.06 % + 30 nA 0.06 % + 30 nA	HP 3458A
100 μA to 1 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.4 % + 0.20 μA 0.15 % + 0.20 μA 0.06 % + 0.20 μA 0.03 % + 0.20 μA 0.06 % + 0.20 μA 0.4 % + 0.40 μA 0.55 % + 1.5 μA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.4 % + 2 μA 0.15 % + 2 μA 0.06 % + 2 μA 0.03 % + 2 μA 0.06 % + 2 μA 0.4 % + 4 μA 0.55 % + 15 μA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.4 % + 20 μA 0.15 % + 20 μA 0.06 % + 20 μA 0.03 % + 20 μA 0.06 % + 20 μA 0.4 % + 40 μA 0.55 % + 0.15 mA	

Parameter/Range	Frequency	Best Uncertainty[2, 5, 6, 8] (±)	Comments
AC Current – Measure[3] (cont)			
1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.4 % + 0.20 mA 0.16 % + 0.20 mA 0.08 % + 0.20 mA 0.1 % + 0.20 mA 0.3 % + 0.20 mA 1 % + 0.40 mA	HP 3458A
AC Current – Generate[3]			
(29 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	0.2 % + 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 5520A
330 µA 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	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 % + 0.6 µA	
(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	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 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 to 30) kHz	0.18 % + 20 µA 0.09 % + 20 µA 0.04 % + 20 µA 0.1 % + 50 µA 0.2 % + 0.10 mA 0.4 % + 0.20 mA	
33 mA to 3 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % + 0.10 mA 0.06 % + 0.10 mA 0.6 % + 1 mA 2.5 % + 5 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.06 % + 2 mA 0.1 % + 2 mA 3 % + 2 mA	

Parameter/Range	Frequency	Best Uncertainty[2, 5, 8] (±)	Comments
AC Current – Generate[3] (cont)			
(11 to 21) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % + 5 mA 0.15 % + 5 mA 3 % + 5 mA	Fluke 5520A
Clamp-On			
(20 to 1000) A	(45 to 440) Hz	0.28 % + 50 mA	Fluke 5520 with 50 turn coil
Capacitance – Generate[3]			
(0.19 to 0.4) nF	10 Hz to 10 kHz	0.5 % + 0.01 nF	Fluke 5520A
(0.4 to 1.1) nF	10 Hz to 10 kHz	0.5 % + 0.01 nF	
(1.1 to 3.3) nF	10 Hz to 3 kHz	0.5 % + 0.01 nF	
(3.3 to 11) nF	10 Hz to 1 kHz	0.25 % + 0.01 nF	
(11 to 33) nF	10 Hz to 1 kHz	0.25 % + 0.1 nF	
(33 to 110) nF	10 Hz to 1 kHz	0.25 % + 0.1 nF	
(110 to 330) nF	10 Hz to 1 kHz	0.25 % + 0.3 nF	
(0.33 to 1.1) μF	(10 to 600) Hz	0.25 % + 1 nF	
(1.1 to 3.3) μF	(10 to 300) Hz	0.25 % + 3 nF	
(3.3 to 11) μF	(10 to 150) Hz	0.25 % + 10 nF	
(11 to 33) μF	(10 to 120) Hz	0.4 % + 30 nF	
(33 to 110) μF	Up to 80 Hz	0.45 % + 0.10 μF	
(110 to 330) μF	Up to 50 Hz	0.45 % + 0.30 μF	
330 μF to 1.1 mF	Up to 20 Hz	0.45 % + 1 μF	
(1.1 to 3.3) mF	Up to 6 Hz	0.45 % + 3 μF	
(3.3 to 11) mF	Up to 2 Hz	0.45 % + 10 μF	
(11 to 33) mF	Up to 0.6 Hz	0.75 % + 30 μF	
(33 to 110) mF	Up to 0.2 Hz	1.1 % + 0.10 mF	
Leveled Sine Wave[3] –			
5 mV to 5.5 V	50 kHz reference	2 % + 0.30 mV	Fluke 5520A with SC600 option
Absolute	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	3.5 % + 0.30 mV 4 % + 0.30 mV 6 % + 0.30 mV	
Flatness	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	1.5 % + 0.10 mV 2 % + 0.10 mV 4 % + 0.10 mV	

Parameter/Equipment	Range	Best Uncertainty[2, 5, 8] (±)	Comments
AC Power[3] –			
Frequency (45 to 65) Hz			
w/ PF=1			
Volt Range	Current Range		
(33 to 330) mV	(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 3 A (3 to 11) A (11 to 20) A	0.14 % 0.1 % 0.14 % 0.1 % 0.13 % 0.11 % 0.13 % 0.16 %	Fluke 5520A
330 mV to 1020 V	(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 3 A (3 to 11) A (11 to 20) A	0.12 % 0.08 % 0.12 % 0.08 % 0.11 % 0.09 % 0.12 % 0.19 %	
Electrical Calibration of RTD Indicators and Indicating Systems[3] –			
Pt 385, 100 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C	0.05 °C 0.07 °C 0.1 °C 0.12 °C 0.23 °C	Fluke 5520A
Pt 3926, 100 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 400 °C 400 °C to 630 °C	0.05 °C 0.07 °C 0.1 °C 0.12 °C	
Pt 3916, 100 Ω	-200 °C to -190 °C -190 °C to 100 °C 100 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.25 °C 0.06 °C 0.09 °C 0.1 °C 0.23 °C	
Pt 385, 200Ω	-200 °C to 260 °C 260 °C to 600 °C 600 °C to 630 °C	0.05 °C 0.14 °C 0.16 °C	

Parameter/Equipment	Range	Best Uncertainty[2, 5] (±)	Comments
Electrical Calibration of RTD Indicators and Indicating Systems[3] – (cont)			
Pt 385, 500 Ω	-200 °C to 260 °C 260 °C to 600 °C 600 °C to 630 °C	0.06 °C 0.09 °C 0.11 °C	Fluke 5520A
Pt 385, 1000 Ω	-200 °C to 0 °C 0 °C to 300 °C 300 °C to 600 °C 600 °C to 630 °C	0.03 °C 0.06 °C 0.07 °C 0.23 °C	
Ni 120, 120 Ω	-80 °C to 100 °C 100 °C to 260 °C	0.08 °C 0.14 °C	
Cu 427, 10 Ω	-100 °C to 260 °C	0.3 °C	
Electrical Calibration of Thermocouple Indicators and Indicating Systems[3] –			
Type B	600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1550 °C 1550 °C to 1820 °C	0.44 °C 0.34 °C 0.3 °C 0.33 °C	Fluke 5520A
Type C	0 °C to 150 °C 150 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1800 °C 1800 °C to 2316 °C	0.3 °C 0.26 °C 0.31 °C 0.5 °C 0.84 °C	
Type E	-250 °C to -100 °C -100 °C to 650 °C 650 °C to 1000 °C	0.5 °C 0.16 °C 0.21 °C	
Type J	-210 °C to -100 °C -100 °C to 760 °C 760 °C to 1200 °C	0.27 °C 0.17 °C 0.23 °C	
Type K	-200 °C to -100 °C -100 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.33 °C 0.18 °C 0.26 °C 0.4 °C	

Parameter/Equipment	Range	Best Uncertainty[2, 5] (±)	Comments
Electrical Calibration of Thermocouple Indicators and Indicating Systems[3] – (cont)			
Type L	-200 °C to -100 °C -100 °C to 800 °C 800 °C to 900 °C	0.37 °C 0.26 °C 0.17 °C	Fluke 5520A
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 410 °C 410 °C to 1300 °C	0.4 °C 0.22 °C 0.19 °C 0.27 °C	
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.57 °C 0.35 °C 0.33 °C 0.4 °C	
Type S	0 °C to 250 °C 250 °C to 1400 °C 1400 °C to 1767 °C	0.47 °C 0.37 °C 0.46 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 12 0°C to 400 °C	0.63 °C 0.2 °C 0.16 °C 0.14 °C	
Type U	-200 °C to 0 °C 0 °C to 600 °C	0.56 °C 0.27 °C	

III. Mechanical

Parameter/Equipment	Range	Best Uncertainty[2, 4] (±)	Comments
Pressure[3]	(0 to 100) psi (100 to 1000) psi	0.1 psi + 0.6*R* 0.3 psi + 0.6*R*	Heise pressure calibrators and modules
Torque	(0 to 300) in•lb (0 to 1000) ft•lb	2.7 in•lb 7.3 ft•lb	AKO torque calibrator

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
Indirect Verification of Rockwell Hardness Testers[3]	HRC: Low, Middle, High HRB: Low, Middle, High HR15N: Low, Middle, High HR30N: Low, Middle, High HR45N: Low, Middle, High HR15T: Low, Middle, High HR30T: Low, Middle, High HR45T: Low, Middle, High	 1.4 HRC 1.4 HRB 1.4 HR15N 1.4 HR30N 1.4 HR45N 1.5 HR15T 1.5 HR30T 1.4 HR45T	Indirect verification method per ASTM E18

IV. Thermodynamics

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
Temperature – Measure	-40 °C to 250 °C 250 °C to 450 °C	0.025 °C 0.08 °C	PRT with indicator system
Temperature – Measuring Equipment[3]	-40 °C to 100 °C	0.07 °C	PRT with ASL temperature indicator and fluid bath

V. Time and Frequency

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
Frequency – Measure[3]	Up to 225 MHz	(0.96 + 10*f*) Hz	HP 53131A counter *f* = measured frequency in MHz
Frequency – Measuring Equipment[3]	10 Hz to 600 MHz	2.5 μHz/Hz + 5 μHz	Fluke 5520A
Time Marker in Oscilloscope Uncertainty[3] Cardinal Points at:	(2 and 5) ns (1, 2, 5, 10, 20, 50) μs (100, 200 and 500) μs (1, 2, 5, 10, 20, 50) ms (100, 200, 500) ms (1, 2 and 5) s	2.5 μs/s (25 + 1000*t*) μs/s	Fluke 5520A with: SC600 *t* = time in seconds Add 50 μs/s for markers not at cardinal points
Edge Rise Time Uncertainty[3] Into 50 Ω	≤ 300 ps	+ 0 ps -100 ps	Fluke 5520A / SC600

[1] This laboratory offers commercial calibration service and field calibration services.

[2] Best Uncertainties represent expanded uncertainties using a coverage factor of *k*=2 which provides a level of confidence of approximately 95 %. The uncertainties achievable on a customer's site can be expected to be larger than the Best Measurement Capabilities (BMC) that the accredited laboratory has been assigned as Best Uncertainty on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the calibration uncertainty being larger than the BMC

[3] Field calibration service is available for this calibration and this laboratory meets A2LA *R104 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the uncertainties achievable on a customer's site can normally be expected to be larger than the Best Measurement Capabilities (BMC) that the accredited laboratory has been assigned as Best Uncertainty on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the calibration uncertainty being larger than the BMC.

[4] In the statement of best uncertainty, *L* is the numerical value of the nominal length of the device measured in inches, *D* is the diagonal length of the device measured in inches, and *R* is the numerical value of the resolution of the device indicator.

[5] Based on using the standard at the temperature the Fluke 5520A was calibrated (tcal) within ± 5 °C and assuming the instrument is zeroed at least every seven days or when the ambient temperature changes more than 5 °C. For resistance, a zero calibration is performed at least every 12 hours within ± 1 °C of use. For AC Current, best uncertainties are determined with LCOMP Off. Best measurement uncertainty is based upon 1-year specifications and using the standard at ambient temperature that is within ± 5 °C of tcal.

[6] Based on using the standard at the temperature the HP 3458A was calibrated (tcal) within ± 5 °C and an auto-calibration (ACAL) was performed within the previous 24 hours (± 1 °C of ambient temperature). Best measurement uncertainty is based upon 1-year specifications and using the standard at ambient temperature that is within ± 5 °C of tcal. Where "ppm" appears in the best measurement uncertainty, it is equivalent to that part in one million.

[7] For $V_{IN} > 100$ V add 12 μV/V $(V_{IN}/1000)^2$

[8] In the statement of best uncertainty, percentage (%) refers to percent of reading unless otherwise noted.