



World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

INDUSTRIAL PROCESS MEASUREMENT, INC.

Edison, NJ

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 8 January 2009*).

Presented this 15th day of July 2008.



A handwritten signature in black ink, appearing to read "Peter Abney".

President & CEO
For the Accreditation Council
Certificate Number 2733.01
Valid to August 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

INDUSTRIAL PROCESS MEASUREMENT, INC.
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CALIBRATION

Valid To: August 31, 2010

Certificate Number: 2733.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2, 6, 7} (±)	Comments
Outside Micrometers	(0 to 1) in (1 to 12) in	86 μin (80 + 3.3L + 0.6R) μin	Gage blocks
Calipers	(0 to 12) in	(240 + 1.4L + 0.6R) μin	Gage blocks

II. Electrical

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
DC Voltage ³ – Generate	(0 to 220mV (> 0.22 to 2.2) V (> 2.2 to 11) V (> 11 to 22) V (> 22 to 220) V (> 220 to 1100)V	9 μV/V + 0.8 μV 8 μV/V + 1.2 μV 8 μV/V + 4.0 μV 8 μV/V + 8.0 μV 9 μV/V + 100 μV 11 μV/V + 600 μV	Fluke 5700A

Peter Mlynar
 Page 1 of 16

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
DC Voltage ³ – Measure	(0 to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000)V	11 μV/V + 3 μV 10 μV/V + 0.3 μV 10 μV/V + 0.05 μV 12 μV/V + 35 μV 12 μV/V + 0.10 mV + 12 ppm (V _{IN} / 1000) ²	HP 3458A
	(>1000 to 5000)V (>5000 to 15000)V	0.12 % rdg + 1.2 V 0.12 % rdg + 3.5 V	HV Divider & Fluke 187
DC Current ³ – Generate	(0 to 220 μA > 220 μA to 2.2 mA (> 2.2 to 22) mA (> 22 to 220) mA (> 220 to 2.2)A (> 2.2 to 11)A (> 11 to 20)A	60 μA/A + 10 nA 60 μA/A + 10 nA 60 μA/A + 100 nA 70 μA/A + 1 μA 95 μA/A + 30 μA 0.06 % + 330 μA 280 μA/A + 1 mA	Fluke 5700A Fluke 5500A Fluke 5700A & 5220A
	(>20 to 110) A (>110 to 550) A (550 to 1000) A	6.3 mA/A + 0.6 A 5.8 mA/A + 0.6 A 6.3 mA/A + 580 mA	Fluke 5500A & Fluke 5500-A Coil Fluke 5700A, Fluke 5220A, Fluke 5500-A Coil
DC Current ³ – Measure	(0 to 100) nA > 100 nA to 1μA (> 1 to 10) μA (> 10 to 100) μA > 100 μA to 1 mA (> 1 to 10) mA (> 10 to 100) mA > 100mA to 1A	35 μA/A + 47 pA 20 μA/A + 47 pA 25 μA/A + 120 pA 25 μA/A + 1 nA 25 μA/A + 6 nA 25 μA/A + 6 nA 40 μA/A + 60 nA 0.012 % + 12 μA	HP 3458A
	(> 1 to 20) A	0.01 % of rdg	HP 3458A & Y5020
	(>20 to 400) A (>400 to 1000) A	15 mA/A + 0.3 A 15 mA/A + 3 A	LEM HEME LH2040
DC Resistance ³ – Measure	(0 to 10) Ω (>10 to 100) Ω >100Ω to 1kΩ (>1 to 10) kΩ (>10 to 100) kΩ >100 kΩ to 1MΩ (>1 to 10) MΩ (>10 to 100) MΩ >100 MΩ to 1GΩ	18 μΩ/Ω + 50 μΩ 15 μΩ/Ω + 500 μΩ 13 μΩ/Ω + 500 μΩ 13 μΩ/Ω + 5 mΩ 13 μΩ/Ω + 50 mΩ 18 μΩ/Ω + 2 Ω 53 μΩ/Ω + 100 Ω 0.05 % + 1 kΩ 0.5 % + 10 kΩ	HP 3458A

Peter Meyer

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
DC Resistance ³ – Generate	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1k Ω 1.9 k Ω 10 k Ω 19 k Ω 100 k Ω 190 k Ω 1M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	50 $\mu\Omega$ 0.011 % 0.011 % 33 $\mu\Omega/\Omega$ 31 $\mu\Omega/\Omega$ 20 $\mu\Omega/\Omega$ 20 $\mu\Omega/\Omega$ 15 $\mu\Omega/\Omega$ 15 $\mu\Omega/\Omega$ 14 $\mu\Omega/\Omega$ 14 $\mu\Omega/\Omega$ 16 $\mu\Omega/\Omega$ 16 $\mu\Omega/\Omega$ 23 $\mu\Omega/\Omega$ 24 $\mu\Omega/\Omega$ 46 $\mu\Omega/\Omega$ 55 $\mu\Omega/\Omega$ 0.13 % rdg	Fluke 5700A
	(0 to 10.9) Ω (11 to 32.9) Ω (33 to 109.9) Ω (110 to 329.9) 330 Ω to 1.09 k Ω (1.1 to 3.29) k Ω (3.3 to 10.9) k Ω (11 to 32.9) k Ω (33 to 109.9)k Ω (110 to 329) k Ω 330 k Ω to 1.09 M Ω (1.1 to 3.29) M Ω (3.3 to 10.9) M Ω (11 to 32.9) M Ω (33 to 109.9) M Ω (110 to 330) M Ω	0.02 % rdg + 0.01 Ω 0.02 % rdg + 0.02 Ω 0.01 % rdg + 0.02 Ω 0.01 % rdg + 0.02 Ω 0.01 % rdg+ 0.06 Ω 0.01 % rdg + 0.06 Ω 0.01 % rdg + 0.6 Ω 0.01 % rdg+ 0.6 Ω 0.02 % rdg + 6 Ω 0.02 % rdg + 6 Ω 0.02 % rdg + 55 Ω 0.02 % rdg + 55 Ω 0.06 % rdg + 550 Ω 0.1 % rdg + 550 Ω 0.5 % rdg + 5.5 k Ω 0.5 % rdg + 17 k Ω	Fluke 5500A

Peter Mlynski

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Generate			
(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 1MHz	0.06 % rdg + 5 μV 0.024 % rdg + 5 μV 0.012 % rdg + 5 μV 0.041 % rdg + 5 μV 0.095 % rdg + 8 μV 0.13 % rdg + 15 μV 0.18 % rdg + 30 μV 0.36 % rdg + 30 μV	Fluke 5700A
(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 1MHz	0.06 % rdg + 6 μV 0.024 % rdg + 6 μV 0.012 % rdg + 6 μV 0.041 % rdg + 6 μV 0.095 % rdg + 8 μV 0.13 % rdg + 15 μV 0.18 % rdg + 30 μV 0.36 % rdg + 30 μV	
(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 1MHz	0.06 % rdg + 16 μV 0.024 % rdg + 10 μV 0.011 % rdg + 10 μV 0.036 % rdg + 10 μV 0.09 % rdg + 30 μV 0.11 % rdg + 30 μV 0.18 % rdg + 40 μV 0.36 % rdg + 100 μV	
220 mV to 2.2 V	(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 1MHz	0.06 % rdg + 100 μV 0.018 % rdg + 30 μV 85 μV/V + 7 μV 0.014 % rdg + 20 μV 0.028 % rdg + 80 μV 0.048 % rdg + 150 μV 0.12 % rdg + 400 μV 0.24 % rdg + 1 mV	



Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ³ (cont) – Generate			
(2.2 to 22) V	(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 1MHz	0.06 % rdg + 1mV 0.018 % rdg + 300 μV 85 μV/V + 70 μV 0.014 % rdg + 200 μV 0.028 % rdg + 400 μV 0.060 % rdg + 1.7 mV 0.14 % rdg + 5 mV 0.30 % rdg + 9 mV	Fluke 5700A
(22 to 220) V	(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 1MHz	0.06 % rdg + 1mV 0.018 % rdg + 3 mV 90 μV/V + 1 mV 0.025 % rdg + 4 mV 0.06 % rdg + 10 mV 0.16 % rdg + 110 mV 0.54 % rdg + 110 mV 1.3 % rdg + 220 mV	
(220 to 1100) V	50 Hz to 1 kHz	90 μV/V + 4 mV	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage ³ – Measure			
(1 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 % rdg + 3 μV 0.02 % rdg + 1.1 μV 0.03 % rdg + 1.1 μV 0.10 % rdg + 1.1 μV 0.50 % rdg + 1.1 μV 4.0 % rdg + 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	70 μV/V + 4 μV 70 μV/V + 2 μV 0.014 % rdg + 2 μV 0.03 % rdg + 2 μV 0.08 % rdg + 2 μV 0.3 % rdg + 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	70 μV/V + 40 μV 70 μV/V + 20 μV 0.014 % rdg + 20 μV 0.03 % rdg + 20 μV 0.08 % rdg + 20 μV 0.3 % rdg + 100 μV	
(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	70 μV/V + 400 μV 70 μV/V + 200 μV 0.014 % rdg + 200 μV 0.03 % rdg + 200 μV 0.08 % rdg + 200 μV 0.3 % rdg + 1 mV	
(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	0.02 % rdg + 4 mV 0.02 % rdg + 2 mV 0.02 % rdg + 2 mV 0.035 % rdg + 2 mV 0.12 % rdg + 2 mV	
(100 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz	0.04 % rdg + 40 mV 0.04 % rdg + 20 mV	
(700 to 10 000) V	60 Hz	0.74 % rdg + 4.7 V	HV Divider & Fluke 187

Peter Meyer

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	Comments
AC Current ³ – Generate			
Up to 220 µA	(10 to 20) Hz (> 20 to 40) Hz > 40 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	0.80 % rdg + 30 nA 0.42 % rdg + 25 nA 0.16 % rdg + 20 nA 0.7 % rdg + 50 nA 0.18 % rdg + 100 nA	Fluke 5700A
(> 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	0.80 % rdg + 50 nA 0.42 % rdg + 40 nA 0.16 % rdg + 40 nA 0.7 % rdg + 500 nA 0.18 % rdg + 1 µA	
(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	0.80 % rdg + 500 nA 0.42 % rdg + 400 nA 0.16 % rdg + 400 nA 0.7 % rdg + 5 µA 0.18 % rdg + 10 µA	
(> 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	0.80 % rdg + 5 µA 0.42 % rdg + 4 µA 0.18 % rdg + 4 µA 0.70 % rdg + 50 µA 0.18 % rdg + 100 µA	
(> 0.22 to 2.2)A	40 Hz to 1 kHz (> 1 to 5) kHz (> 5 to 10) kHz	0.75 % rdg + 40 µA 0.85 % rdg + 100 µA 1.0 % rdg + 200 µA	
(> 2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz 500 Hz to 1kHz	0.06 % rdg + 2.0 mA 0.10 % rdg + 2.0 mA 0.33 % rdg + 2.0 mA	Fluke 5500A
(> 11 to 20) A	40 Hz to 1 kHz	0.65 % rdg + 1.1 mA	Fluke 5700A/5220A
AC Current ³ – Generate Toroidal			
(>20 to 110) A (>110 to 550) A	(45 to 65) Hz (45 to 65) Hz	4 mA/A + 0.6 A 3 mA/A + 0.6 A	Fluke 5500A & Fluke 5500-A Coil
(550 to 1000) A	(45 to 65) Hz	3.9 mA/A + 0.6 A	Fluke 5700A, Fluke 5220A, Fluke 5500-A Coil

Peter Mlynski

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Current ³ – Generate Non-Toroidal			
(>20 to 110) A	(45 to 65) Hz	6.4 mA/A + 0.6 A	Fluke 5500A & Fluke 5500-A Coil
(>110 to 550) A	(45 to 65) Hz	5.8 mA/A + 0.6 A	
(550 to 1000) A	(45 to 65) Hz	6.3 mA/A + 0.6 A	Fluke 5700A, Fluke 5220A, Fluke 5500-A Coil
AC Current ³ – Measure			
(5 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.46 % rdg + 30 nA 0.17 % rdg + 30 nA 0.07 % rdg + 30 nA 0.07 % rdg + 30 nA	HP 3458A
100 µA to 1mA	(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	0.46 % rdg + 200 nA 0.17 % rdg + 200 nA 0.07 % rdg + 200 nA 0.03 % rdg + 200 nA 0.07 % rdg + 200 nA 0.46 % rdg + 400 nA 0.64 % rdg + 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	0.46 % rdg + 2 µA 0.17 % rdg + 2 µA 0.07 % rdg + 2 µA 0.03 % rdg + 2 µA 0.07 % rdg + 2 µA 0.46 % rdg + 4 µA 0.64 % rdg + 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	0.46 % rdg + 20 µA 0.17 % rdg + 20 µA 0.07 % rdg + 20 µA 0.03 % rdg + 20 µA 0.07 % rdg + 20 µA 0.46 % rdg + 40 µA 0.64 % rdg + 150 µA	
100 mA to 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	0.47 % rdg + 200 µA 0.19 % rdg + 200 µA 0.1 % rdg + 200 µA 0.12 % rdg + 200 µA 0.35 % rdg + 200 µA 1.2 % rdg + 400 µA	
(> 1 to 20) A	(1 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz	0.07 % rdg 0.04 % rdg 0.06 % rdg	

Peter M. Meyer

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
AC Current ³ – Measure (cont) (>20 to 400) A (>400 to 1000) A	 (45 to 65) Hz (45 to 65) Hz	 15 mA/A + 0.3 A 15 mA/A + 3 A	LEM HEME LH2040
AC Power ³ – Generate (45 Hz to 65 Hz) PF=1 (33 to 329.999) mV 330 mV to 1020 V	 (3.3 to 8.999) mA (9 to 32.999) mA (33 to 89.99) mA (90 to 329.99) mA (0.33 to 0.8999) A (0.9 to 2.1999) A (2.2 to 4.4999) A (4.5 to 1) A (3.3 to 8.999) mA (9 to 32.999) mA (33 to 89.99) mA (90 to 329.99) mA (0.33 to 0.8999) A (0.9 to 2.1999) A (2.2 to 4.4999) A (4.5 to 11) A	 0.40 % of watts output 0.25 % of watts output 0.35 % of watts output 0.25 % of watts output 0.35 % of watts output 0.25 % of watts output 0.35 % of watts output 0.25 % of watts output 0.25 % of watts output 0.15 % of watts output 0.25 % of watts output 0.15 % of watts output 0.25 % of watts output 0.15 % of watts output 0.20 % of watts output 0.15 % of watts output	Fluke 5500A
Capacitance ³ – Generate	(0.33 to 0.4999) nF (0.5 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.999) nF (11 to 32.999) nF (33 to 109.99) nF (110 to 329.99) nF (0.33 to 1.0999) μF (1.1 to 3.2999) μF (3.3 to 10.999) μF (11 to 32.999) μF (33 to 109.99) μF (110 to 329.99) μF (330 to 1.1) mF	0.5 % + 0.01 nF 0.5 % + 0.01 nF 0.5 % + 0.01 nF 0.5 % + 0.01 nF 0.25 % + 0.1 nF 0.25 % + 0.1 nF 0.25 % + 0.3 nF 0.25 % + 1 nF 0.35 % + 3 nF 0.35 % + 10 nF 0.40 % + 30 nF 0.50 % + 100 nF 0.70 % + 300 nF 1 % + 300 nF	Fluke 5500A



Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measure	0.1 Hz to 3 GHz	4 x 10 ⁻¹⁰ , 24 hours	HP 53132A & Spectracomm 8194B
Frequency ³ – Measure	0.1 Hz to 3 GHz	8.6 x 10 ⁻⁶ , 1 year	HP 53132A
Frequency – Source	0.001 Hz to 61 MHz	4 x 10 ⁻¹⁰ , 24 hours	HP3325A & Spectracomm 8194B
Frequency ³ – Source	0.001 Hz to 61 MHz	2.6 x 10 ⁻⁶ , 1 year	HP 3325A
Leveled Sine Wave ³ – Generate			
50 kHz reference	5 mV to 5.5 V p-p	2.0 % + 300 μV	Fluke 5500A /SC300
(5 mV to 5.5 V) p-p	50 kHz to 100MHz	1.5 % + 100 μV	
Relative to 50 kHz ref.	(100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2 % + 100 μv 4 % + 100 μv 5 % + 100 μv	
Vertical Gain – DC			
Into 50Ω	(0 to 6.6) V	0.25 % + 40 μV	
Into 1 MΩ	(0 to 130) V	0.05 % + 40 μV	
AC			
Into 50Ω	(1mV to 6.6V) _{pk-pk}	0.25 % + 40 μV	
Into 1 MΩ	(1mV to 130V) _{pk-pk}	0.1 % + 40 μV	
Time Markers – Into 50Ω	1 ns to 20 ms 50 ms to 5 s	2.5 μs/s (25 + 1000*t) μs/s	
Rise Time – Generate (5 mV to 2.5 V) _{pk-pk}			
Up to 2 MHz	≤ 300 ps	+ 0 / - 100 ps	
(2 to 10) MHz	≤ 350 ps	+ 0 / - 100 ps	



Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Simulation of Thermocouples ³ –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.44 °C 0.34 °C 0.30 °C 0.33 °C	Fluke 5500A
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.30 °C 0.26 °C 0.31 °C 0.5 °C 0.84 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.50 °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 1200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.40 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900)	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 1300) °C	0.4 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.57 °C 0.35 °C 0.33 °C 0.40 °C	

Peter Mlynski

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Simulation of Thermocouples (cont.) –			
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C	Fluke 5500A
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 RTD's ³ –			
Pt 385, 100 Ω	(-200 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 0.07 °C 0.09 °C 0.10 °C 0.12 °C 0.23 °C	Fluke 5500A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.05 °C 0.07 °C 0.09 °C 0.10 °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 0.10 °C 0.23 °C	

Peter Mlynski

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Simulation of RTD's (cont.) –			
Pt 385, 200 Ω	(-200 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 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	Fluke 5500A
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, 1000 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	
PtNi, 120 Ω	(-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	

III. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Pressure	(1 to 30) in·Hg (0 to 15) psia (15 to 100) psia (0 to 10) in·H ₂ O (10 to 250) in·H ₂ O (2 to 500) psi (>500 to 5000) psi (>5000 to 15000) psi	0.03 % rdg + 0.6R 0.005 psia + 0.6R 0.04 psia + 0.6R 0.01 % rdg + 0.6R 0.02 % rdg + 0.6R 0.03 % rdg + 0.6R 0.03 % rdg + 0.6R 0.03 % rdg + 0.6R	T3500-3 DWT AQS Module AQS Module Ametek PKII DWT T3500-3 DWT Pressurements DWT SI Pressure DWT
Pressure ³	(0 to 25) in·Hg (0 to 15) in·H ₂ O (0 to 36) psi (0 to 3000) psi (3000 to 10000) psi	0.2 in·Hg (0.01 + 0.6R) in·H ₂ O 0.04 psi 2.2 psi 0.07 % full scale	Crystal 33 AQS Module Crystal 33 Crystal 33 PC6
Torque ³ – Measure	(5 to 10) in·lb (10 to 120) in·lb (10 to 20) in·lb (20 to 100) ft·lb (100 to 200) ft·lb (200 to 1000) ft·lb	1.4 % rdg + 0.6R 0.99 % rdg + 0.6R 1.4 % rdg + 0.6R 0.99 % rdg + 0.6R 1.4 % rdg + 0.6R 0.99 % rdg + 0.6R	Torque analyzer
Handheld Force Gages ³ (Tension)	Up to 100 lb	400 mg + 0.6R	Class F weights
Balances ³	Up to 1800g Up to 120 kg Up to 300 lb	0.14 mg + 0.6R 1200 mg + 0.6R 2500 mg + 0.6R	Class 1 weights Class F weights



IV. Thermodynamic

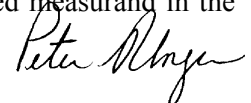
Parameter/Equipment	Range	CMC ² (±)	Comments
Temperature ³ – Measure	(-200 to 100) °C (100 to 400) °C (400 to 600) °C	0.026 °C 0.051 °C 0.11 °C	Hart Scientific 5626 PRT with 1521 readout
Temperature ³ – Measuring Equipment	(-20 to 150) °C (> 90 to 400) °C	0.033 °C 0.7 °C	Fluid bath Dryblock ETC-400A ³
Infrared Radiation Thermometry ³	(28 to 400) °C	0.7 °C	ETC-400R Black Body
Humidity	Up to 20 % RH (> 20 to 50) % RH (> 50 to 95) % RH	0.65 % RH 0.53 % RH 0.54 % RH	Thunder Scientific 1200
Humidity ³	(0 to 90) % RH (90 to 100) % RH	1.4 % RH 2.5 % RH	Vaisala

¹ This laboratory offers commercial calibration service and field calibration service.

² Calibration and Measurement Capability (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. Calibration and Measurement Capabilities represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

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 actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found 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 actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

⁴ The measurands stated are generated with the Fluke 5500A and 5700A series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the



ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.

⁵ The measurands stated are measured with the HP 3458A. This capability is suitable for the calibration of the devices intended to generate the measurand in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a combination of the fraction of the reading/output plus a range specification.

⁶ In the statement of CMC, R is the resolution of the unit under test.

⁷ In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches.

