



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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CALIBRATION

Valid until: May 31, 2018

Certificate Number: 3601.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations<sup>1</sup>:

I. Electrical DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2, 4</sup> (±)	Comments
DC Voltage – Generate <sup>3</sup>	(0 to 330) mV (0.33 to 33) V (3.3 to 33) V (33 to 330) V (330 to 1020) V	74 μV/V + 3 μV 59 μV/V + 5 μV 59 μV/V + 50 μV 65 μV/V + 500 μV 65 μV/V + 1500 μV	Fluke 5502A
DC Current – Generate <sup>3</sup>	(0 to 330) μA (0.33 to 33) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 1.1) A (1.1 to 3) A (3 to 11) A (11 to 20.5) A  (10 to 16.5) A (16.5 to 150) A (150 to 1025) A	0.017 % + 0.02 μA 0.015 % + 0.05 μA 0.012 % + 0.25 μA 0.015 % + 2.5 μA 0.044 % + 44 μA 0.045 % + 44 μA 0.075 % + 0.5 mA 0.12 % + 0.75 mA  0.25 % + 0.002 A 0.26 % + 0.015 A 0.28 % + 0.05 A	Fluke 5502A          Fluke 5502A, 50 turn coil

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
DC Voltage – Measure <sup>3</sup>	(0 to 200) mV (0 to 2) V (0 to 20) V (0 to 200) V (0 to 1000) V	16 μV/V + 0.78 μV 9.9 μV/V + 0.85 μV 12 μV/V + 5.3 μV 16 μV/V + 38 μV 16 μV/V + 1.1 mV	Fluke 8508A
DC Current – Measure <sup>3</sup>	(0 to 200) μA (0 to 2) mA (0 to 20) mA (0 to 200) mA (0 to 2) A (0 to 20) A	0.012 % + 0.01 μA 78 μA/A + 0.04 μA 78 μA/A + 0.20 μA 89 μA/A + 1.8 μA 0.038 % + 51 μA 0.054 % + 370 μA	Fluke 8508A

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup>			
Up 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	0.17 % + 20 μV 0.12 % + 20 μV 0.17 % + 20 μV 0.23 % + 20 μV 0.4 % + 33 μV 1.2 % + 60 μV	Fluke 5502A
(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	0.058 % + 20 μV 0.035 % + 20 μV 0.081 % + 20 μV 0.12 % + 20 μV 0.27 % + 40 μV 0.58 % + 170 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	0.058 % + 60 μV 0.035 % + 60 μV 0.081 % + 60 μV 0.12 % + 60 μV 0.27 % + 0.2 mV 0.58 % + 0.9 mV	
(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	0.058 % + 0.8 mV 0.035 % + 0.6 mV 0.081 % + 0.6 mV 0.12 % + 0.6 mV 0.27 % + 0.2 mV	

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup> (cont)			
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.058 % + 3 mV 0.092 % + 9 mV 0.1 % + 9 mV 0.14 % + 9 mV 0.28 % + 80 mV	Fluke 5502A
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.058 % + 20 mV 0.092 % + 20 mV 0.1 % + 20 mV	
AC Current – Generate <sup>3</sup>			
Up 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	0.23 % + 0.1 µA 0.17 % + 0.1 µA 0.14 % + 0.1 µA 0.35 % + 0.15 µA 0.92 % + 0.2 µA 1.8 % + 0.4 µA	Fluke 5502A with LCOMP OFF
(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	0.23 % + 0.15 µA 0.14 % + 0.15 µA 0.12 % + 0.15 µA 0.23 % + 0.2 µA 0.58 % + 0.3 µA 1.2 % + 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	0.21 % + 2 µA 0.1 % + 2 µA 0.046 % + 2 µA 0.12 % + 2 µA 0.23 % + 3 µA 0.46 % + 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	0.21 % + 20 µA 0.1 % + 20 µA 0.046 % + 20 µA 0.12 % + 50 µA 0.23 % + 0.1 mA 0.46 % + 0.2 mA	

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Current – Generate <sup>3</sup> (cont)			
(0.33 to 1.1) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.21 % + 0.1 mA 0.058 % + 0.1 mA 0.069 % + 1 mA 2.9 % + 5 mA	Fluke 5502A with LCOMP OFF
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.21 % + 0.1 mA 0.058 % + 0.1 mA 0.069 % + 1 mA 2.9 % + 5 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.21 % + 0.1 mV 0.058 % + 0.1 mV 0.069 % + 1 mV	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.21 % + 0.1 mV 0.058 % + 0.1 mV 0.069 % + 1 mV	
AC Voltage –Measure			
(0 to 200) mV	(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	0.027 % + 7.3 μV 0.016 % + 7.2 μV 0.016 % + 6.0 μV 0.017 % + 7.0 μV 0.049 % + 6.4 μV 0.12 % + 30 μV	Fluke 8508A
(0 to 2) V	(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	0.026 % + 36 μV 0.015 % + 41 μV 0.014 % + 43 μV 0.016 % + 39 μV 0.037 % + 82 μV 0.097 % + 390 μV 0.30 % + 420 μV 0.44 % + 5.4 mV	
(0 to 20) V	(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	0.026 % + 460 μV 0.015 % + 400 μV 0.014 % + 420 μV 0.016 % + 380 μV 0.041 % + 970 μV 0.13 % + 6.2 mV	

Parameter/Range	Frequency	CMC <sup>2, 4, 5</sup> (±)	Comments
AC Voltage – Measure (cont)			
(0 to 200) V	(40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.017 % + 1.4 mV 0.021 % + 2.8 mV 0.019 % + 4.0 mV 0.034 % + 2.4 mV 0.31 % + 250 mV	Fluke 8508A
(0 to 1000) V	40 Hz to 5 kHz	0.024 % + 250 mV	
AC Current – Measure			
(0 to 200) μA	10 Hz to 10 kHz (10 To 30) kHz	0.072 % 0.087 %	Fluke 8508A
(0 to 2) mA	10 Hz to 10 kHz (10 to 30) kHz	0.051 % 0.087 %	
(0 to 20) mA	10 Hz to 10kHz (10 to 30) kHz	0.051 % 0.087 %	
(0 to 200) mA	10 Hz to 10 kHz (10 to 30) kHz	0.05 % 0.82 %	
(0 to 2) A	10 Hz to 2 kHz (2 to 10) kHz	0.092 % 0.28 %	
(0 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.097 % 0.23 %	

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Capacitance – Generate <sup>3</sup>	(220 to 400) pF (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 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.58 % + 0.01 nF 0.58 % + 0.01 nF 0.58 % + 0.01 nF 0.29 % + 0.01 nF 0.29 % + 0.1 nF 0.29 % + 0.1 nF 0.29 % + 0.3 nF 0.29 % + 1 nF 0.29 % + 3 nF 0.29 % + 10 nF 0.46 % + 30 nF 0.52 % + 0.1 μF 0.52 % + 0.3 μF 0.52 % + 1 μF 0.52 % + 3 μF 0.52 % + 10 μF 0.87 % + 30 μF 1.2 % + 100 μF	Fluke 5502A
Resistance – Generate <sup>3</sup>	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 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 (0.33 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 to 1.1) MΩ	0.015 % + 0.001 Ω 0.014 % + 0.0015 Ω 0.01 % + 0.0014 Ω 0.01 % + 0.002 Ω 0.01 % + 0.002 Ω 0.01 % + 0.02 Ω 0.01 % + 0.02 Ω 0.01 % + 0.2 Ω 0.013 % + 0.2 Ω 0.014 % + 2 Ω 0.017 % + 2 Ω 0.017 % + 30 Ω 0.069 % + 50 Ω 0.12 % + 2.5 kΩ 0.58 % + 3 kΩ 0.58 % + 0.1 MΩ 1.7 % + 0.5 MΩ	Fluke 5502A
Resistance – Measure	Up to 2 Ω Up to 20 Ω Up to 200 Ω Up to 2 kΩ Up to 20 kΩ Up to 200 kΩ Up to 2 MΩ Up to 20 MΩ Up to 200 MΩ Up to 2 GΩ	31 μΩ /Ω + 7.6 mΩ 0.028 % + 6.4 mΩ 22 μΩ /Ω + 12 mΩ 0.012 % + 31 mΩ 68 μΩ /Ω + 150 mΩ 72 μΩ /Ω + 1.7 Ω 0.013 % + 43 Ω 0.034 % + 990 Ω 0.35 % + 15 kΩ 1.2 % + 450 kΩ	Fluke 8508A

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Calibration of Thermocouple Indicators <sup>3</sup> – Generate & Measure			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.59 °C 0.23 °C 0.21 °C 0.23 °C 0.28 °C	Fluke 5502A
Type J	(-250 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.34 °C 0.23 °C 0.21 °C 0.24 °C 0.30 °C	
Type K	(-250 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.38 °C 0.25 °C 0.23 °C 0.33 °C 0.48 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.74 °C 0.31 °C 0.23 °C 0.21 °C	
Electrical Calibration of RTD Indicators <sup>3</sup> – Generate			
Pt385, 100 °	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.06 °C 0.06 °C 0.08 °C 0.11 °C 0.12 °C 0.14 °C 0.27 °C	Fluke 5502A

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Oscilloscope <sup>3</sup> –			
DC Volt Function Into 50Ω	0 V to 6.6 V	0.0044 μV	Fluke 5502A/SC600
Into 1MΩ	1 mV to 2.5 mV	0.02 μV	
	2.5 mV to 500 mV	0.018 μV	
	1 V to 2.2 V	0.00079 μV	
	2.3 V to 11 V	0.0016 μV	
	12 V to 130 V	0.0041 μV	
Square Wave Signal 10 Hz to 10 kHz Into 50Ω	1 mV to 6.6 V	0.0041 μV	
Into 1MΩ	1 mV to 25 mV	0.012 μV	
	26 mV to 110 mV	0.094 μV	
	111 mV to 500 mV	0.3 μV	
	1 V to 2.2 V	2.2 μV	
	2.3 V to 11 V	5.1 μV	
	11 V to 130 V	54 μV	
Level Sinewave Signal 5 mV to 5.5 V Into 50Ω	50 kHz	0.22 mV	
	51 kHz to 100 MHz	0.38 mV	
	101 MHz to 300 MHz	0.44 mV	
	301 MHz to 600 MHz	0.66 mV	
Time Markers Into 50Ω 1 V-pk	5 s to 2 ns	0.01 ns	



II. Mechanical

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments	
Scales and Balances <sup>3</sup>	100 g	44 µg	Class 0 weights	
	50 g	21 µg		
	(10 to 20) g	10 µg		
	5 g	5.5 µg		
	2 g	5.0 µg		
	1 g	4.0 µg		
	(10 to 500) mg	1.6 µg		
	(1 to 5) mg	1.5 µg		
	22.7 kg (50 lb)	13 mg		Class 1 weights
	11.34 kg (25 lb)	5 mg		
	4.54 kg (10 lb)	1.5 mg		
	2.27 kg (5 lb)	0.57 mg		
	25 kg	12 mg		
	20 kg	10 mg		
	10 kg	1.4 mg		
	5 kg	0.96 mg		
	2 kg	0.46 mg		
	1 kg	0.10 mg		
	100 g	0.031 mg		
	50 g	0.017 mg		
	20 g	9.0 mg		
	10 g	7.7 µg		
	5 g	5.8 µg		
	2 g	2.9 µg		
	1 g	1.9 µg		
	500 mg	1.4 µg		
	200 mg	1.0 µg		
100 mg	1.0 µg			
50 mg	1.0 µg			
20 mg	0.88 µg			
10 mg	0.88 µg			
5 mg	0.96 µg			
2 mg	0.34 µg			
1 mg	0.31 µg			

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Scales and Balances <sup>3</sup> (cont)	453.6 kg (1000 lb) 226.8 kg (500 lb) 22.7 kg (50 lb) 11.34 kg (25 lb) 4.54 kg (10 lb) 2.27 kg (5 lb) 0.91 kg (2 lb) 0.46 kg (1 lb)	12 g 2.8 g 280 mg 210 mg 55 mg 27 mg 7.2 mg 4.9 mg	Class F weights
	0.23 kg (0.5 lb)  500 kg 200 kg 25 kg 20 kg 10 kg 5 kg 2 kg	4.7 mg  7 g 3 g 630 mg 280 mg 110 mg 0.77 mg 0.43 mg	
Torque – Measuring Equipment	(5 to 50) in·lbf (50 to 550) in·lbf (25 to 250) ft·lbf (250 to 2500) ft·lbf	0.3 in·lbf 2.3 in·lbf 0.98 ft·lbf 9.8 ft·lbf	Mountz torque transducers
	(250 to 2500) ft·lbf (750 to 7500) ft·lbf (2500 to 25 000) ft·lbf	8.6 ft·lbf 42 ft·lbf 140 ft·lbf	AWS torque transducers
Force –			
Compression	(0 to 20 000) lbf (0 to 200 000) lbf	2 lbf 4.2 lbf	Force transducers
Tension	(0 to 20 000) lbf (0 to 200 000) lbf	1.3 lbf 4.2 lbf	

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Mass, Fixed Points	22.7 kg (50 lb) 11.34 kg (25 lb) 4.54 kg (10 lb) 2.27 kg (5 lb)  25 kg 20 kg 10 kg 5 kg	1.6 g 740 mg 300 mg 160 mg  1.7 g 1.4 g 670 mg 334 mg	Class 1 Weights
Pressure	(0 to 10 000) psi (0 to 1000) psi	1.7 psig 0.31 psig	Pressure transducers

### III. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Temperature – Measure	(-197 to 0) °C (0 to 157) °C (157 to 232) °C (232 to 420) °C	0.007 °C 0.009 °C 0.011 °C 0.015 °C	Fluke 8508A, 5616 PRT

### IV. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Frequency – Measuring Equipment	10 Hz to 10 kHz 10 kHz to 2 MHz	0.0018 % + 7 mHz 0.014 % + 620 mHz	Fluke 5502A

<sup>1</sup> This laboratory offers commercial calibration service and field calibration service.

<sup>2</sup> Calibration and Measurement Capability Uncertainty (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. CMCs 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.

<sup>3</sup> 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.

<sup>4</sup> The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

<sup>5</sup> In the statement of CMC, percent is to be read as percent of reading.



# Accredited Laboratory

A2LA has accredited

**G.T. MICHELLI COMPANY, INC.**

*Harahan, LA*

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 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 31<sup>st</sup> day of March 2016.



A handwritten signature in blue ink, appearing to read "J. C. Burt".

Senior Director of Quality and Communications  
For the Accreditation Council  
Certificate Number 3601.01  
Revised on September 2, 2016  
Valid to May 31, 2018

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