



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

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

This is to certify that

Technical Maintenance, Inc.
425 Hayden Station Road, Suite B
Windsor, CT 06095

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 field of

CALIBRATION

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

AC-2080.04

Certificate Number


ANAB Approval

Certificate Valid: 09/27/2017-09/20/2019
Version No. 003 Issued: 09/27/2017



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)**

Technical maintenance, Inc.
425 Hayden Station Road, Suite B
Windsor, CT 06095
Scott Chamberlain 860-219-0046

CALIBRATION

Valid to: **September 20, 2019**

Certificate Number: **AC-2080.04**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage ¹ – Generate	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (100 to 1 000) V	24 μ V/V + 1 μ V 14 μ V/V + 2 μ V 15 μ V/V + 20 μ V 22 μ V/V + 0.15 mV 22 μ V/V + 1.5 mV	Fluke 5522A
DC Voltage ¹ – Measure	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1 000) V	17 μ V/V + 0.3 μ V 12 μ V/V + 0.3 μ V 11 μ V/V + 0.5 μ V 52 μ V/V + 30 μ V 61 μ V/V + 0.1 mV	HP 3458A
	(1 to 60) kV	0.12 % of reading	Ross VD60-6.2Y-A-LB-AL
DC Current – Generate ¹	Up to 330 μ A 330 μ A 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 20.5) A	0.18 mA/A + 0.02 μ A 0.12 mA/A + 0.05 μ A 0.12 mA/A + 0.25 μ A 0.24 mA/A + 2.5 μ A 0.24 mA/A + 40 μ A 0.44 mA/A + 40 μ A 0.6 mA/A + 0.5 mA 1.6 mA/A + 0.75 mA	Fluke 5522A



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Measure	Up to 100 nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 3mA (10 to 100) mA 1 mA to 1 A	35 µA/A + 0.04 nA 24 µA/A + 0.04 nA 24 µA/A + 0.1 nA 24 µA/A + 0.8 nA 24 µA/A + 0.05 nA 42 µA/A + 0.5 µA 0.15 mA/A + 10 µA	HP 3458A
AC Voltage – Generate ¹	(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 (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 330 mV 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	0.95 mV/V + 6 µV 0.19 mV/V + 6 µV 0.24 mV/V + 6 µV 1.2 mV/V + 6 µV 4 mV/V + 12 µV 9.3 mV/V + 50 µV 0.35 mV/V + 8 µV 0.17 mV/V + 8 µV 0.19 mV/V + 8 µV 0.41 mV/V + 8 µV 0.93 mV/V + 32 µV 2.3 mV/V + 70 µV 0.35 mV/V + 50 µV 0.18 mV/V + 60 µV 0.22 µV/V + 60 µV 0.35 mV/V + 50 µV 0.81 mV/V + 0.13 mV 2.8 mV/V + 0.6 mV	Fluke 5522A



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Generate ¹	(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 (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 (330 to 1 020) V 45 Hz to 10 kHz	0.36 mV/V + 0.65 mV 0.2 mV/V + 0.6 mV 0.47 mV/V + 0.6 mV 0.42 mV/V + 0.6 mV 1 mV/V + 1.6 mV 0.85 mV/V + 2 mV 0.85 mV/V + 6 mV 0.87 mV/V + 6 mV 0.9 mV/V + 6 mV 2.5 mV/V + 50 mV 8.2 mV/V + 10 mV	Fluke 5522A
AC Voltage – Measure	Up 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 10 mV 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 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	0.044 % of reading + 0.003 mV 0.026 % of reading + 0.0011 mV 0.044 % of reading + 0.0011 mV 0.11 % of reading + 0.0011 mV 0.5 % of reading + 0.0011 mV 4 % of reading + 0.002 mV 0.019 % of reading + 0.004 mV 0.019 % of reading + 0.002 mV 0.027 % of reading + 0.002 mV 0.045 % of reading + 0.002 mV 0.09 % of reading + 0.002 mV 0.31 % of reading + 0.01 mV 1 % of reading + 0.01 mV 1.5 % of reading + 0.01 mV 0.019 % of reading + 0.04 mV 0.019 % of reading + 0.02 mV 0.027 % of reading + 0.02 mV 0.045 % of reading + 0.02 mV 0.09 % of reading + 0.02 mV 0.31 % of reading + 0.1 mV 1 % of reading + 0.1 mV 1.5 % of reading + 0.1 mV	HP 3458A

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	1 V to 10 V		HP 3458A
	(1 to 40) Hz	0.19 % of reading + 0.4 mV	
	40 Hz to 1 kHz	0.019 % of reading + 0.2 mV	
	(1 to 20) kHz	0.027 % of reading + 0.2 mV	
	(20 to 50) kHz	0.045 % of reading + 0.2 mV	
	(50 to 100) kHz	0.09 % of reading + 0.2 mV	
	(100 to 300) kHz	0.31 % of reading + 1 mV	
	300 kHz to 1 MHz	1 % of reading + 1 mV	
	(1 to 2) MHz	1.5 % of reading + 1 mV	
	(10 to 100) V		
(1 to 40) Hz	0.026 % of reading + 0.002 V		
40 Hz to 1 kHz	0.041 % of reading + 0.002 V		
(1 to 20) kHz	0.038 % of reading + 0.002 V		
(20 to 50) kHz	0.048 % of reading + 0.002 V		
(50 to 100) kHz	0.13 % of reading + 0.002 V		
(100 to 300) kHz	0.4 % of reading + 0.01 V		
300 kHz to 1 MHz	1.5 % of reading + 0.01 V		
(100 to 700) V			
(1 to 40) Hz	0.05 % of reading + 0.04 V		
40 Hz to 1 kHz	0.05 % of reading + 0.02 V		
(1 to 20) kHz	0.07 % of reading + 0.02 V		
(20 to 50) kHz	0.13 % of reading + 0.02 V		
(50 to 100) kHz	0.3 % of reading + 0.02 V		
(1 to 42) kV			Ross VD60-6.2Y-A-LB-AL
Up to 60 Hz	0.6 % of reading		
AC Current – Generate ¹ 40 Hz to 1 kHz	(29 to 330) μ A 330 μ A to 3.3 mA (3.3 to 33) mA (33 mA to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	0.22 % of reading + 0.1 μ A 0.13 % of reading + 0.15 μ A 0.08 % of reading + 2 μ A 0.08 % of reading + 20 μ A 0.08 % of reading + 0.1 mA 0.09 % of reading + 0.1 mA 0.13 % of reading + 2 mA 0.18 % of reading + 5 mA	Fluke 5522A



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure	Up to 100 μ A		HP 3458A
	(10 to 20) Hz	0.41 % of reading + 0.03 pA	
	(20 to 45) Hz	0.16 % of reading + 0.03 pA	
	45 Hz to 1 kHz	0.07 % of reading + 0.03 pA	
	(0.1 to 1) mA		
	(10 to 20) Hz	0.41 % of reading + 0.2 mA	
	(20 to 45) Hz	0.16 % of reading + 0.2 mA	
	(45 to 100) Hz	0.069 % of reading + 0.2 mA	
	100 Hz to 5 kHz	0.038 % of reading + 0.2 mA	
	(5 to 20) kHz	0.069 % of reading + 0.2 mA	
	(20 to 50) kHz	0.41 % of reading + 0.2 mA	
	(50 to 100) kHz	0.56 % of reading + 1.5 mA	
	(1 to 10) mA		
	(10 to 20) Hz	0.41 % of reading + 2 mA	
	(20 to 45) Hz	0.16 % of reading + 2 mA	
	(45 to 100) Hz	0.069 % of reading + 2 mA	
	100 Hz to 5 Hz	0.038 % of reading + 2 mA	
	(5 to 20) kHz	0.41 % of reading + 4 mA	
	(20 to 50) kHz	0.56 % of reading + 15 mA	
	(10 to 100) mA		
	(10 to 20) Hz	0.41 % of reading + 20 mA	
	(20 to 45) Hz	0.16 % of reading + 20 mA	
	(45 to 100) Hz	0.069 % of reading + 20 mA	
	100 Hz to 5 Hz	0.038 % of reading + 20 mA	
(5 to 20) kHz	0.41 % of reading + 40 mA		
(20 to 50) kHz	0.56 % of reading + 150 mA		
(0.1 to 1) A			
(10 to 20) Hz	0.41 % of reading + 0.2 mA		
(20 to 45) Hz	0.16 % of reading + 0.2 mA		
(45 to 100) Hz	0.069 % of reading + 0.2 mA		
100 Hz to 5 Hz	0.038 % of reading + 0.2 mA		
(5 to 20) kHz	0.31 % of reading + 0.2 mA		
(20 to 50) kHz	1 % of reading + 0.4 mA		
Resistance – Generate ¹	Up to 11 Ω	51 $\mu\Omega/\Omega$ + 0.01 Ω	Fluke 5522A
	(11 to 33) Ω	42 $\mu\Omega/\Omega$ + 0.015 Ω	
	(33 to 110) Ω	34 $\mu\Omega/\Omega$ + 0.015 Ω	
	(110 to 330) Ω	33 $\mu\Omega/\Omega$ + 0.02 Ω	
	330 Ω to 1.1 k Ω	34 $\mu\Omega/\Omega$ + 0.02 Ω	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Generate ¹	(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 MΩ 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	34 μΩ/Ω + 0.2 Ω 34 μΩ/Ω + 0.1 Ω 34 μΩ/Ω + 1 Ω 34 μΩ/Ω + 1 Ω 41 μΩ/Ω + 10 Ω 39 μΩ/Ω + 10 Ω 71 μΩ/Ω + 150 Ω 150 μΩ/Ω + 250 Ω 300 μΩ/Ω + 2.5 kΩ 610 μΩ/Ω + 3 kΩ 3.5 mΩ/Ω + 0.1 MΩ 17 mΩ/Ω + 0.5 MΩ	Fluke 5522A
Resistance – Measure	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	27 μΩ/Ω + 50 μΩ 18 μΩ/Ω + 0.5 mΩ 15 μΩ/Ω + 0.5 mΩ 15 μΩ/Ω + 0.5 mΩ 16 μΩ/Ω + 50 mΩ 26 μΩ/Ω + 2 Ω 70 μΩ/Ω + 100 Ω 590 μΩ/Ω + 1 kΩ 0.78 % of reading + 10 kΩ	HP 3458A
Electrical Calibration of Thermocouple Indicating Devices ¹ –	Type E (230 to 1 000) °C Type J (-210 to 1 200) °C Type K (-200 to 1 372) °C Type T (-250 to 400) °C Type R (0 to 1 767) °C Type S (0 to 1 767) °C	0.60 °C 0.5 °C 0.49 °C 0.74 °C 0.76 °C 0.63 °C	Fluke 5522A

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Generate	(0.19 to 0.1099) nF (1.1 to 3.2999) nF (3.3 to 329.999) nF (0.33 to 1.09999) μF (1.1 to 3.29999) μF (3.3 to 10.9999) μF (11 to 32.999) μF (33 to 109.999) μF (110 to 329.999) μF (0.33 to 1.09999) mF (1.1 to 3.2999) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	1.2 % of reading + 0.01 nF 1.2 % of reading + 0.01 nF 0.38 % of reading + 0.3 nF 0.37 % of reading + 3 nF 0.37 % of reading + 3 nF 0.38 % of reading + 10 nF 0.53 % of reading + 30 nF 0.58 % of reading + 0.1 μF 0.58 % of reading + 0.3 μF 0.57 % of reading + 1 μF 0.58 % of reading + 3 μF 0.59 % of reading + 10 μF 0.65 % of reading + 30 μF 1.3 % of reading + 0.1 mF	Fluke 5522A
Oscilloscopes ^{1,2} – Amplitude – Square Wave (peak to peak) 50 Ω 1 MΩ Rise Time Flatness (50 kHz reference) Time Marker	1 mV to 6.6 V 1 mV to 130 V <350 ps 5 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1 100) MHz 1 nS to 20 mS 50 mS to 5 S	0.25 % of reading + 40 μV 0.1 % of reading + 40 μV + 13 ps / -0.120 ps 2.5 % of reading + 0.1 mV 3.4 % of reading + 0.1 mV 5.5 % of reading + 0.1 mV 6.9 % of reading + 0.1 mV 2.7 parts in 10 ⁶ S (25 + 1 000 <i>t</i>) parts in 10 ⁶ S	Fluke 5522A /SC1100

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gage Blocks ²	Up to 8 in	(5.2+ 2.3 <i>L</i>) μin	Master gage blocks, P&W UMM



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometers ^{1,2}	Up to 18 in	(29+ 5L) μin	Gage blocks
Laser Micrometer ¹	(0.5 to 1.5) in	170 μin	Pin Gages
Calipers ^{1,2}	Up to 20 in	(30 + 14L) μin	Gage blocks
Dial Indicators ¹	Up to 1 in	350 μin	Gage blocks
Cylindrical Gages ² – Rings	(0.02 to 8) in	(6.5 + 1.6D) μin	Master gage blocks, P&W UMM
Plain Pins, Plugs	(0 to 8) in	(3 + 7D) μin	
Linear Scales – Rulers ¹	Up to 36 in	0.013 in	Gage blocks
Pi Tapes ¹	Up to 3 in	450 μin	Plug Gages
Tape Measures ¹	Up to 150 ft	0.19 in	Master tape
Microscopes ¹	Up to 2 in	100 μin	Stage Micrometer

Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Scales & Balances ¹	(1 to 20) g (20 to 200) g (200 to 500) g	0.16 mg + 0.6R 1.4 mg + 0.6R 31 mg + 0.6R	ASTM E617 Class 1 weights
	Up to 400 lb	21 g + 0.6R	NIST Class F weights
Pressure ¹	(-14 to 0) psig Up to 1 000 psig	1.4 psig 1 psig	Fluke 700RG08 pressure gauge calibrator
Torque Wrenches ¹	4 lbf·in to 250 lbf·ft (250 to 1 000) lbf·ft	0.9 % of reading 1.3 % of reading	CDI 5000 ST torque tester



Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity Generate	(10 to 98) %RH	0.51 %RH	Thunder Scientific 2500
Relative Humidity Measure	(0 to 90) %RH	1.7 %RH	Vaisala M170/HMP75
Temperature – Measure ¹	(-25 to 0) °C (0 to 140) °C (140 to 600) °C	2.8 °C 0.21 °C 1.6 °C	Fluke 714 & 80PK-9 Fluke 2180A Fluke 714 & 80PK-9

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure	10 MHz	1 x 10 ⁻¹¹ Hz/Hz	Agilent 58503A/B GPS
Frequency – Measure ¹	0 to 100 MHz	2.1 x 10 ⁻⁷ Hz/Hz	HP 5334A

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%.

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, D = diameter in inches, R = resolution of device under test, t = time in seconds.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2080.04.



Vice President

