



CERTIFICATE OF ACCREDITATION

ANSI National Accreditation Board
11617 Coldwater Road, Fort Wayne, IN 46845 USA

This is to certify that

M&M Metrology
272 South Military Trail
Deerfield Beach, FL 33442

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)

while demonstrating technical competence in the field of

CALIBRATION

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

AC-1474
Certificate Number


ANAB Approval

Certificate Valid Through: 08/05/2020
Version No. 007 Issued: 01/29/2019



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).



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

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CALIBRATION

Valid to: **August 5, 2020**

Certificate Number: **AC-1474**

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Voltage Measurement ¹	100 mV 1 V 10 V 100V 1 000 V	0.38 μ V 2 μ V 16 μ V 180 μ V 1.9 mV	HP 3458A Digital Multimeter
AC Voltage Measurement ¹	100 mV Range (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 1 V Range (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	4.7 μ V 2.5 μ V 0.82 μ V 4.2 μ V 9.5 μ V 37 μ V 120 μ V 170 μ V 59 μ V 44 μ V 46 μ V 55 μ V 102 μ V 370 μ V 1.2 mV 1.7 mV	HP 3458A Digital Multimeter



ANSI National Accreditation Board

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Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage Measurement ¹	10 V Range		HP 3458A Digital Multimeter
	(1 to 40) Hz	470 μ V	
	40 Hz to 1 kHz	250 μ V	
	(1 to 20) kHz	280 μ V	
	(20 to 50) kHz	420 μ V	
	(50 to 100) kHz	950 μ V	
	(100 to 300) kHz	3.7 mV	
	300 kHz to 1 MHz	12 mV	
	(1 to 2) MHz	17 mV	
	100 V Range		
	(1 to 40) Hz	6.1 mV	
	40 Hz to 1 kHz	3.3 mV	
	(1 to 20) kHz	3.3 mV	
	(20 to 50) kHz	4.7 mV	
	(50 to 100) kHz	15 mV	
(100 to 300) kHz	48 mV		
300 kHz to 1 MHz	170 mV		
1 000 V Range			
(1 to 40) Hz	320 mV		
40 Hz to 1 kHz	320 mV		
(1 to 20) kHz	330 mV		
(20 to 50) kHz	350 mV		
(50 to 100) kHz	470 mV		
DC Current Measurement ¹	100 μ A	0.97 nA	HP 3458A Digital Multimeter
	1 mA	8.7 nA	
	10 mA	65 nA	
	100 mA	0.74 μ A	
	1 A	30 μ A	
4 Wire Resistance Measurement ¹	10 Ω	120 $\mu\Omega$	HP 3458A Digital Multimeter
	100 Ω	1.2 m Ω	
	1 k Ω	2.4 m Ω	
	10 k Ω	24 m Ω	
	100 k Ω	240 m Ω	
	1 M Ω	6.3 Ω	
	10 M Ω	670 Ω	
Resistance Source ¹	(0 to 11) Ω	12 $\mu\Omega$	Fluke 5522A Multifunction Calibrator
	(11 to 33) Ω	420 $\mu\Omega$	
	(33 to 110) Ω	960 $\mu\Omega$	
	(110 to 330) Ω	1.8 m Ω	



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Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Resistance Source ¹	(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 (.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 (300 to 1 100) MΩ	6.8 mΩ 12 mΩ 65 mΩ 120 mΩ 800 mΩ 1.9 Ω 12 Ω 32 Ω 380 Ω 860 Ω 10 kΩ 280 kΩ 1.4 MΩ	Fluke 5730A Multifunction Calibrator
DC Voltage Source ¹	220 mV 2.2 V 11 V 22 V 220 V 1 100 V	0.48 μV 0.67 μV 2.5 μV 4 μV 41 μV 430 μV	Fluke 5730A Multifunction Calibrator
AC Voltage Source ¹	2.2 mV Range (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 to 1 MHz 22 mV Range (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 to 1 MHz	4.2 μV 4.2 μV 4.2 μV 4.2 μV 5.3 μV 9.6 μV 20 μV 20 μV 4.7 μV 4.4 μV 4.4 μV 4.4 μV 4.7 μV 6.3 μV 12 μV 24 μV 27 μV	Fluke 5730A Multifunction Calibrator



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage Source ¹	220 mV Range		Fluke 5730A Multifunction Calibrator
	(10 to 20) Hz	20 μ V	
	(20 to 40) Hz	11 μ V	
	40 Hz to 20 kHz	10 μ V	
	(20 to 50) kHz	11 μ V	
	(50 to 100) kHz	25 μ V	
	(100 to 300) kHz	37 μ V	
	(300 to 500) kHz	60 μ V	
	500 kHz to 1 MHz	110 μ V	
	2.2 V Range		
	(10 to 20) Hz	120 μ V	
	(20 to 40) Hz	39 μ V	
	40 Hz to 20 kHz	24 μ V	
	(20 to 50) kHz	29 μ V	
	(50 to 100) kHz	64 μ V	
	(100 to 300) kHz	150 μ V	
	(300 to 500) kHz	410 μ V	
	500 kHz to 1 MHz	690 μ V	
	22 V Range		
	(10 to 20) Hz	1.20 mV	
	(20 to 40) Hz	680 μ V	
	40 Hz to 20 kHz	610 μ V	
	(20 to 50) kHz	630 μ V	
	(50 to 100) kHz	700 μ V	
	(100 to 300) kHz	1.1 mV	
	(300 to 500) kHz	1.4 mV	
	500 kHz to 1 MHz	6.5 mV	
220 V Range			
(10 to 20) Hz	13 mV		
(20 to 40) Hz	6.3 mV		
40 Hz to 20 kHz	4.3 mV		
(20 to 50) kHz	4.8 mV		
(50 to 100) kHz	10 mV		
(100 to 300) kHz	36 mV		
(300 to 500) kHz	130 mV		
500 kHz to 1 MHz	250 mV		
1 100 V Range			
(15 to 50) Hz	80 mV		
50 Hz to 1 kHz	27 mV		



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Current Source ¹	220 μ A 2.2 mA 22 mA 220 mA 2.2 A	5.4 nA 15 nA 150 nA 860 nA 22 μ A	Fluke 5730A Multifunction Calibrator
	(1.1 to 3) A (0 to 11) A (11 to 20) A	32 μ A 380 μ A 7.2 mA	Fluke 5522A Multifunction Calibrator
AC Current Source ¹	220 μ A Range (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	20 nA 14 nA 8.3 nA 12 nA 63 nA	Fluke 5730A Multifunction Calibrator
AC Current Source ¹	2.2 mA Range (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 22 mA Range (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 220 mA Range (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 2.2 A Range 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	140 nA 110 nA 100 nA 170 nA 850 nA 1.6 μ A 1.1 μ A 1 μ A 1.3 μ A 7 μ A 16 μ A 11 μ A 10 μ A 14 μ A 35 μ A 150 μ A 210 μ A 1.5 mA	Fluke 5522A Multifunction Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Current Source ¹	(1.1 to 3) A		Fluke 5522A Multifunction Calibrator
	(10 to 45) Hz	1.6 mA	
	45 Hz to 1 kHz	650 μ A	
	(1 to 5) kHz	5.9 mA	
	(5 to 10) kHz	25 mA	
	(3 to 11) A		
	(45 to 100) Hz	3.1 mA	
	100 Hz to 1 kHz	4 mA	
	(1 to 5) kHz	71 mA	
	(11 to 20.5) A		
	(45 to 100) Hz	14 mA	
	100 Hz to 1 kHz	17 mA	
(1 to 5) kHz	260 mA		
Capacitance ¹	(220 to 400) pF	9.8 pF	Fluke 5522A Multifunction Calibrator
	(0.4 to 1.1) nF	10 pF	
	(1.1 to 3.3) nF	13 pF	
	(3.3 to 11) nF	15 pF	
	(11 to 33) nF	32 pF	
	(33 to 110) nF	87 pF	
	(110 to 330) nF	280 pF	
	(.33 to 1.1) μ F	1.5 nF	
	(1.1 to 3.3) μ F	4.7 nF	
	(3.3 to 11) μ F	15 nF	
	(11 to 33) μ F	60 nF	
	(33 to 110) μ F	210 nF	
	(110 to 330) μ F	620 nF	
	(.33 to 1.1) mF	1.9 μ F	
	(1.1 to 3.3) mF	6.2 μ F	
	(3.3 to 11) mF	20 μ F	
(11 to 33) mF	87 μ F		
(33 to 110) mF	360 μ F		

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Force Gages and Load Cells ¹	1/32 ozf to 10 lbf (5 to 500) lbf	0.012 % of reading 0.01 % of reading	Class 6 Weights



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Pressure Gages ¹	(1 to 10 000) psig	(0.0074 % of reading + 0.0013 <i>P</i>) psi	Ametek RK300 Dead Weight Tester Mensor CPB5800 Dead Weight Tester Heise HQS-2 Module Heise PTE-2 Reader
Vacuum Gages ¹	(0 to 29.5) inHg	0.004 inHg	Mensor CPG2500 Mensor CPR Module Heise HQS-2 Module Heise PTE-2 Reader
Torque Analyzers and Transducers ¹	2.5 lbf·in to 2 000 lbf·ft	0.02 % of reading	Class 6 Weights Test Bars and Wheels
Torque Wrenches, Watches and Drivers ¹	(5 to 50) lbf·in	0.28 % of reading	CDI 2800 Multitest Premiere Tester Precision Instruments TMH600F/1310 Torque Analyzer
	(30 to 400) lbf·in	0.3 % of reading	
	(80 to 1 000) lbf·in	0.3 % of reading	
	(20 to 250) lbf·ft	0.35 % of reading	
	(60 to 600) lbf·ft	0.28 % of reading	
Cable Tension Measurement	(30 to 600) lbf	0.29 % of reading	CDI 2800 Multitest Premiere Tester
	(200 to 2 000) lbf	0.29 % of reading	

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Temperature Liquid Filled, Bi-Metal and Digital Thermometers ¹	(-100 to 155) °C	0.006 °C	Ametek/Jofra RTC-159 Dry Block Calibrator
	(33 to 700) °C	0.006 °C	Ametek/Jofra RTC-700 Dry Block Calibrator PRT
IR Thermometers ¹	(35 to 550) °C	(0.25% of reading + 0.19 <i>T</i>) °C	Fluke 4181 IR Thermometer Calibrator

Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Frequency Measurement ¹	(1 to 40) Hz	0.0006 Hz	HP 3458A Digital Multimeter
	40 Hz to 10 MHz	0.005 Hz	
	10 MHz to 26.5 GHz	0.97 Hz	HP 53151A



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Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Frequency Source ¹	0.01 Hz to 2 MHz	0.0058 Hz	Fluke 5522A/5730A Multifunction Calibrators
	2 MHz to 6 GHz	0.47 Hz	Agilent N5181A Signal Generator
	(6 to 26.5) GHz	3.5 Hz	HP 8363B Signal Generator

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. P = pressure in psi, T = temperature in degrees C
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1474.



Vice President