



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

MODERN MACHINE & TOOL CO., INC.  
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CALIBRATION

Valid To: July 31, 2013

Certificate Number: 2836.01

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. Dimensional

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Micrometers – Outside – 0.0001 in increments 0.001 in increments	(0 to 12) in (0 to 48) in	0.00013 in 0.0013 in	Length standards
Inside	(2.5 to 48) in	0.0012 in	Rings or length standards
Depth	Up to 12 in	0.0012 in	Length standards
Micrometers Standards	(1 to 11) in (11 to 48) in	0.00059 in 0.00086 in	Length standards
Thread Micrometers	Up to 5 in	0.0010 in	60° standards
Pi Tapes	(2 to 48) in	0.0012 in	Ring gages
Gage Blocks	(0.05 to 20) in	0.00015 in	Length standards

Parameter/Equipment	Range	CMC <sup>2,5</sup> (±)	Comments
Plain Plugs	Up to 4 in	0.00011 in	Height master
Pin Gages	Up to 4 in	0.00025 in	Height master
Threaded Plug Gages	Up to 5 in	0.0013 in	Thread micrometer
Straight Edges & Rules	Up to 72 in	0.0012 in	CMM or trans check, surface plate
L Squares	Up to 36 in	0.00073 in	CMM
Levels, Precision Machinist	0.0005 in/increment/ft	0.00058 in	Surface plate
Indicators	Up to 12 in:  0.0001 in increments 0.001 in increments	0.00015 in 0.0012 in	Height master
Surface Plates	Up to (18 × 18) in	0.00011 in	Surface plate w/ trans check
Calipers	Up to 48 in	0.0012 in	Length standards
Height Gages	Up to 48 in	0.0012 in	Length standards
Differential Probes (LVDT)	Up to 2 in	0.006 % + 2.3 counts	Height master & 8842A multimeter
Protractors / Inclinometers, Mechanical, Digital	(0 to 180)°	0°: 5': 45" 0.1°	Surface plate, sine plate, gage blocks

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2,5,7</sup> (±)	Comments	
DC Voltage <sup>3</sup> – Measure	(10 to 100) mV	11 $\mu$ V/V + 0.4 $\mu$ V	Agilent 3458A	
	100 mV to 1 V	10 $\mu$ V/V + 0.4 $\mu$ V		
	(1 to 10) V	10 $\mu$ V/V + 0.6 $\mu$ V		
DC Voltage <sup>3</sup> – Measure	(10 to 100) V	12 $\mu$ V/V + 40 $\mu$ V	Agilent 3458A Fluke 80K40	
	(100 to 1000) V	12 $\mu$ V/V + 0.1 mV		
	(1 to 20) kV	2.3 %		
DC Voltage <sup>3</sup> – Measure	(20 to 35) kV	1.2 %	Agilent 3458A Fluke 80K40	
	(35 to 40) kV	2.3 %		
DC Voltage <sup>3</sup> – Generate	(10 to 100) mV	11 $\mu$ V/V + 0.4 $\mu$ V	Fluke 5440B with Agilent 3458A	
	100 mV to 1 V	10 $\mu$ V/V + 0.4 $\mu$ V		
	(1 to 10) V	10 $\mu$ V/V + 0.6 $\mu$ V		
	(10 to 100) V	12 $\mu$ V/V + 40 $\mu$ V		
	(100 to 1000) V	12 $\mu$ V/V + 0.1 mV		
Fixed Point	10 V	7 $\mu$ V/V	Fluke 732A	
DC Current <sup>3</sup> – Measure	(0 to 100) nA	44 $\mu$ A/A + 45 pA	Agilent 3458A	
	100 nA to 1 $\mu$ A	27 $\mu$ A/A + 45 pA		
	(1 to 10) $\mu$ A	27 $\mu$ A/A + 110 pA		
	(10 to 100) $\mu$ A	24 $\mu$ A/A + 0.9 nA		
	100 $\mu$ A to 1 mA	24 $\mu$ A/A + 6 nA		
	(1 to 10) mA	24 $\mu$ A/A + 60 nA		
	(10 to 100) mA	41 $\mu$ A/A + 600 nA		
	100 mA to 1 A	0.013 % + 12 $\mu$ A		
	(1 to 20) A	0.013 %		Agilent 3458A Fluke Y5020
	(20 to 50) A	110 mA		Agilent 3458A Rubicon 1600

Parameter/Equipment	Range	CMC <sup>2,5,7</sup> ( $\pm$ )	Comments
DC Current <sup>3</sup> – Generate	(0 to 100) nA	44 $\mu$ A/A + 45 pA	Fluke 5100B and current shunts with Agilent 3458A
	100 nA to 1 $\mu$ A	27 $\mu$ A/A + 45 pA	
	(1 to 10) $\mu$ A	27 $\mu$ A/A + 110 pA	
	(10 to 100) $\mu$ A	24 $\mu$ A/A + 0.9 nA	
	100 $\mu$ A to 1 mA	24 $\mu$ A/A + 6 nA	
	(1 to 10) mA	24 $\mu$ A/A + 60 nA	
	(10 to 100) mA	41 $\mu$ A/A + 600 nA	
	100 mA to 1 A	0.013 % + 12 $\mu$ A	
	(1 to 20) A	0.01 %	Current standards with Agilent 3458A and Fluke Y5020
	(20 to 50) A	110 mA	Current standards and shunts with Agilent 3458A
DC Clamp-On Ammeter <sup>3</sup> – Generate	(50 to 1000) A	0.94 %	Current standards, Fluke 5500A/Coil
Capacitance <sup>3</sup> – Generate, @ 1 kHz	(0.0001 to 0.5) $\mu$ F	0.12 % + 0.5 pF	Arco Electronics SS-32
Resistance <sup>3</sup> – Measure	(0 to 10) $\Omega$	18 $\mu\Omega/\Omega$ + 60 $\mu\Omega$	Agilent 3458A
	(10 to 100) $\Omega$	14 $\mu\Omega/\Omega$ + 0.6 m $\Omega$	
	100 $\Omega$ to 1 k $\Omega$	12 $\mu\Omega/\Omega$ + 0.6 m $\Omega$	
	(1 to 10) k $\Omega$	12 $\mu\Omega/\Omega$ + 6 m $\Omega$	
	(10 to 100) k $\Omega$	12 $\mu\Omega/\Omega$ + 60 m $\Omega$	
	100 k $\Omega$ to 1 M $\Omega$	18 $\mu\Omega/\Omega$ + 3 $\Omega$	
	(1 to 10) M $\Omega$	89 $\mu\Omega/\Omega$ + 110 $\Omega$	
	(10 to 100) M $\Omega$	0.078 % + 1.2 k $\Omega$	
	(100 to 1000) M $\Omega$	0.058 % + 12 k $\Omega$	
Resistance <sup>3</sup> – Generate	(0 to 10) $\Omega$	18 $\mu\Omega/\Omega$ + 60 $\mu\Omega$	Resistance standards monitored with Agilent 3458A
	(10 to 100) $\Omega$	14 $\mu\Omega/\Omega$ + 0.6 m $\Omega$	
	100 $\Omega$ to 1 k $\Omega$	12 $\mu\Omega/\Omega$ + 0.6 m $\Omega$	
	(1 to 10) k $\Omega$	12 $\mu\Omega/\Omega$ + 6 m $\Omega$	
	(10 to 100) k $\Omega$	12 $\mu\Omega/\Omega$ + 60 m $\Omega$	
	100 k $\Omega$ to 1 M $\Omega$	18 $\mu\Omega/\Omega$ + 3 $\Omega$	
	(1 to 10) M $\Omega$	89 $\mu\Omega/\Omega$ + 110 $\Omega$	
	(10 to 100) M $\Omega$	0.078 % + 1.2 k $\Omega$	
	(100 to 1000) M $\Omega$	0.58 % + 12 k $\Omega$	

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Resistance <sup>3</sup> – Generate (cont)			
Fixed Points	1 Ω	10 μΩ	Fluke 742A-1
	10 kΩ	50 mΩ	Fluke 742A-10K

Parameter/Range	Frequency	CMC <sup>2,7</sup> (±)	Comments
AC Voltage <sup>3</sup> – Measure			
(0 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 (0.3 to 1) MHz (1 to 4) MHz (4 to 8) MHz	0.03 % + 5 μV 0.02 % + 3.1 μV 0.03 % + 3.1 μV 0.12 % + 3.1 μV 0.58 % + 3.1 μV 4.6 % + 4 μV 1.4 % + 7 μV 8.1 % + 9 μV 23 % + 10 μV	Agilent 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 (0.3 to 1) MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz	0.01 % + 4 μV 0.01 % + 2 μV 0.017 % + 2 μV 0.04 % + 2 μV 0.1 % + 2 μV 0.35 % + 10 μV 1.2 % + 10 μV 1.8 % + 10 μV 4.6 % + 71 μV 4.6 % + 80 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 (0.3 to 1) MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	0.01 % + 41 μV 0.01 % + 21 μV 0.02 % + 21 μV 0.03 % + 21 μV 0.09 % + 21 μV 0.35 % + 0.1 mV 1.2 % + 0.1 mV 1.7 % + 0.1 mV 4.6 % + 0.7 mV 4.6 % + 0.8 mV 17 % + 1 mV	

Parameter/Range	Frequency	CMC <sup>2,5,7</sup> (±)	Comments
AC Voltage <sup>3</sup> – Measure (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 (0.3 to 1) MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	0.01 % + 410 μV 0.01 % + 210 μV 0.02 % + 210 μV 0.03 % + 210 μV 0.09 % + 210 μV 0.35 % + 1 mV 1.2 % + 1 mV 1.7 % + 1 mV 4.6 % + 7 mV 4.6 % + 7 mV 17 % + 10 mV	Agilent 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 (0.3 to 1) MHz	0.02 % + 4.1 mV 0.02 % + 2.1 mV 0.02 % + 2.1 mV 0.04 % + 2.1 mV 0.14 % + 2.1 mV 0.46 % + 10 mV 1.8 % + 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	0.05 % + 41 mV 0.05 % + 20 mV 0.07 % + 20 mV 0.14 % + 21 mV 0.35 % + 21 mV	
(1 to 28) kV	60 Hz	5.8 %	Agilent 3458A Fluke 80K40
AC Voltage <sup>3</sup> – Generate			
(0 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 (0.3 to 1) MHz (1 to 4) MHz (4 to 8) MHz	0.03 % + 5 μV 0.02 % + 3.1 μV 0.03 % + 3.1 μV 0.12 % + 3.1 μV 0.58 % + 3.1 μV 4.6 % + 4 μV 1.4 % + 7 μV 8.1 % + 9 μV 23 % + 10 μV	AC voltage standards monitored with Agilent 3458A

Parameter/Range	Frequency	CMC <sup>2,7</sup> (±)	Comments
AC Voltage <sup>3</sup> – Generate (cont)			
(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 (0.3 to 1) MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz	0.01 % + 4 μV 0.01 % + 2 μV 0.017 % + 2 μV 0.04 % + 2 μV 0.1 % + 2 μV 0.35 % + 10 μV 1.2 % + 10 μV 1.8 % + 10 μV 4.6 % + 71 μV 4.7 % + 80 μV	AC voltage standards monitored with Agilent 3458A
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 (0.3 to 1) MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	0.01 % + 41 μV 0.01 % + 21 μV 0.02 % + 21 μV 0.03 % + 21 μV 0.09 % + 21 μV 0.35 % + 0.1 mV 1.2 % + 0.1 mV 1.7 % + 0.1 mV 4.6 % + 0.7 mV 4.6 % + 0.8 mV 17 % + 1 mV	
(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 (0.3 to 1) MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	0.01 % + 410 μV 0.01 % + 210 μV 0.02 % + 210 μV 0.03 % + 210 μV 0.09 % + 210 μV 0.35 % + 1 mV 1.2 % + 1 mV 1.7 % + 1 mV 4.6 % + 7 mV 4.6 % + 7 mV 17 % + 10 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 (100 to 300) kHz (0.3 to 1) MHz	0.02 % + 4.1 mV 0.02 % + 2.1 mV 0.02 % + 2.1 mV 0.04 % + 2.1 mV 0.14 % + 2.1 mV 0.46 % + 10 mV 1.7 % + 10 mV	

Parameter/Range	Frequency	CMC <sup>2,7</sup> ( $\pm$ )	Comments
AC Voltage <sup>3</sup> – Generate (cont)  (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	0.05 % + 41 mV 0.05 % + 20 mV 0.07 % + 20 mV 0.14 % + 21 mV 0.35 % + 21 mV	AC voltage standards monitored with Agilent 3458A
AC Current <sup>3</sup> – Measure  (1 to 100) $\mu$ A  (0.1 to 1) mA  (1 to 10) mA  (10 to 100) mA  (0.1 to 1) A	(10 to 20) Hz (20 to 45) Hz 45 Hz to 5 kHz  (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz  (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz  (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz  (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz	0.46 % + 30 nA 0.17 % + 30 nA 0.07 % + 30 nA  0.46 % + 0.2 $\mu$ A 0.17 % + 0.2 $\mu$ A 0.07 % + 0.2 $\mu$ A 0.03 % + 0.2 $\mu$ A 0.07 % + 0.2 $\mu$ A 0.46 % + 0.4 $\mu$ A 0.64 % + 1.5 $\mu$ A  0.46 % + 2 $\mu$ A 0.17 % + 2 $\mu$ A 0.07 % + 2 $\mu$ A 0.04 % + 2 $\mu$ A 0.07 % + 2 $\mu$ A 0.46 % + 4 $\mu$ A 0.64 % + 15 $\mu$ A  0.46 % + 20 $\mu$ A 0.17 % + 20 $\mu$ A 0.07 % + 20 $\mu$ A 0.03 % + 20 $\mu$ A 0.07 % + 20 $\mu$ A 0.46 % + 40 $\mu$ A 0.64 % + 0.15 mA  0.46 % + 200 $\mu$ A 0.19 % + 200 $\mu$ A 0.09 % + 200 $\mu$ A 0.12 % + 200 $\mu$ A 0.35 % + 200 $\mu$ A 1.2 % + 400 $\mu$ A	Agilent 3458A and current shunts

Parameter/Range	Frequency	CMC <sup>2, 5, 7</sup> (±)	Comments
AC Current <sup>3</sup> – Measure (cont)			
(1 to 20) A	DC to 1 kHz (1 to 5) kHz	0.033 % 0.043 %	Agilent 3458A and current shunts
(20 to 50) A	60 Hz	0.70 %	
AC Current <sup>3</sup> – Generate			
(1 to 100) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 5 kHz	0.46 % + 30 nA 0.17 % + 30 nA 0.07 % + 30 nA	AC current standards and shunts monitored with Agilent 3458A
(0.1 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.46 % + 0.2 µA 0.17 % + 0.2 µA 0.07 % + 0.2 µA 0.03 % + 0.2 µA 0.07 % + 0.2 µA 0.46 % + 0.4 µA 0.64 % + 1.5 µA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.46 % + 2 µA 0.17 % + 2 µA 0.07 % + 2 µA 0.04 % + 2 µA 0.07 % + 2 µA 0.46 % + 4 µA 0.64 % + 15 µA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.46 % + 20 µA 0.17 % + 20 µA 0.07 % + 20 µA 0.03 % + 20 µA 0.07 % + 20 µA 0.46 % + 40 µA 0.64 % + 0.15 mA	
(0.1 to 1) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz	0.46 % + 200 µA 0.19 % + 200 µA 0.09 % + 200 µA 0.12 % + 200 µA 0.35 % + 200 µA 1.2 % + 400 µA	

Parameter/Range	Frequency	CMC <sup>2,5,7</sup> (±)	Comments
AC Current <sup>3</sup> – Generate (cont) (1 to 20) A  (20 to 50) A	DC to 1 kHz (1 to 5) kHz  60 Hz	0.033 % 0.043 %  0.70 %	AC current standards and shunts monitored with Agilent 3458A
AC Clamp On Ammeter – Generate  Up to 1000 A Up to 260 A	60 Hz 400 Hz	0.36 % 0.29 %	Current standards, Fluke 5500A/Coil
Oscilloscope Calibration –  Square Wave Signal  Edge – Generate  Time Marker	(10 to 100) kHz  (0.4 to 100) ns  10 ns to 5 s	0.29 % + 1.4 µV  12 ps  0.01 %	Tektronix CG5001

### III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC <sup>2,5</sup> (±)	Comments
Frequency Modulation – Measure  Rate: 20 Hz to 10 kHz  50 Hz to 100 kHz  20 Hz to 200 kHz	250 kHz to 10 MHz  (10 to 1300) MHz  (10 to 1300) MHz	3.6 %  3 %  6.4 %	Agilent 8901A  ± 1 digit for all measurements
Phase Modulation – Measure	(10 to 1300) MHz	4.5 %	Agilent 8901A  ± 1 digit for all measurements

Parameter/Range	Frequency	CMC <sup>2,5</sup> (±)	Comments
Amplitude Modulation – Measure  Rate: 50 Hz to 10 kHz Depths: 5 % to 99 %  Rate: 20 Hz to 10 kHz Depths: 5 % to 99 %  Rate: 50 Hz to 50 kHz Depths: 5 % to 99 %  Rate: 20 Hz to 100 kHz Depths: 5 % to 99 %	150 kHz to 10 MHz  150 kHz to 10 MHz  (10 to 1300) MHz  (10 to 1300) MHz	2.4 %  3.5 %  1.2 %  3.5 %	Agilent 8901A  ± 1 digit for all measurements
RF Power <sup>4,8</sup> – Measure  (+20 to -30) dBm 50 Ω  (-70 to -20) dBm 50 Ω	100 kHz to 4.2 GHz 10 MHz to 18 GHz  10 MHz to 18 GHz	0.16 db 0.23 db  0.53 db	Agilent 436A/8482A Agilent 436A/8481A  Agilent 436A/8484A
RF Power <sup>4,8</sup> – Generate  (+20 to -30) dBm 50 Ω  (-70 to -20) dBm 50 Ω	100 kHz to 4.2 GHz 10 MHz to 18 GHz  10 MHz to 18 GHz	0.23 db 0.23 db  0.53 db	Signal generators monitored with  Agilent 436A/8482A  Agilent 436A/8481A  Agilent 436A/8484A
Distortion – Measure	10 Hz to 20 kHz (20.1 to 50) kHz (50.1 to 110) kHz	1.2 db 2.3 db 3.5 db	Sound Technology 1700B OPT 003, 005
Attenuation <sup>8</sup> – Measure  10 MHz to 18 GHz	(0 to 100) dB (-100 to -110) dB (-110 to -120) dB	2.4 % 5.2 % 17 %	Weinschel 8850

#### IV. Fluid Quantities

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Viscosity Cups –  G10 G20 G35 G60 G100 G200 G350	17.71 cts 34.07 cts 64.77 cts 117.7 cts 228.2 cts 396.8 cts 715.7 cts	0.094 s 0.083 s 0.15 s 0.15 s 0.15 s 0.21 s 0.36 s	Thermometer, stop watch, viscosity oils
Weight / Gallon Cups –	(0 to 410.00) g	0.022 g	Thermometer, scale, distilled water

#### V. Mechanical

Parameter/Equipment	Range	CMC <sup>2, 5</sup> (±)	Comments
Torque Wrenches <sup>3</sup>	Up to 20 in·lb (20 to 240) in·lb (50 to 2400) in·lb  (100 to 2500) ft·lb (100 to 5000) ft·lb	0.1 % ± 0.002 in·lb 0.1 % ± 0.03 in·lb 0.1 % ± 0.1 in·lb  0.1 % ± 0.3 ft·lb 0.15 %	Torque cell Torque cell Torque cell  Torque cell Torque cell
Contact Tachometers	Up to 5000 rpm	1.2 %	Gen Rad 1531-AB
Rotational Speed, Optical Tachometers	Up to 25 000 rpm	0.2 rpm	HP 5345A/HP 58503A Gen Rad 1531-AB
Pressure Gages	(4 to 600) inH <sub>2</sub> O  (1 to 300) psi (5 to 10 000) psi	0.2 %  0.1 % 0.1 %	Ametek RK  Mansfield Green

Parameter/Equipment	Range	CMC <sup>2,6</sup> (±)	Comments
Vacuum Gages	(0 to 28) inHg	0.6 inHg	Manometer
Force <sup>3</sup> , Tension <sup>3</sup> , & Compression <sup>3</sup>	Up to 32 000 lb	0.01 % FS	Class F weights
	(100 to 100 000) lbf	0.01 % FS	Load cells
Scales & Balances <sup>3</sup>	1 mg to 100 g 100 g to 1 kg (1 to 100) kg	0.00004 g 0.013 g 0.017 g	Class S weights
	(0.01 to 2000) lbs (2001 to 30 000) lbs	0.013 % FS 0.013 % FS	Class S & F weights
Mass	1 mg to 205 g (206 to 5000) g	0.00004 g 0.013 g	Comparison with mass standards
	(5001 to 64 000) g	0.17 g	Analytical balance
	(200 to 2000) lb	0.013 % FS	Load cell

#### VI. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Temperature – Measure	(18 to 220) °F (220 to 400) °F (400 to 760) °F	0.33 °F 0.62 °F 1.2 °F	Comparisons w/ liquid filled thermometers

#### VII. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Frequency / Time – Measure & Measuring Equipment	Up to 500 MHz 500 MHz to 18 GHz	3.1 mHz 1.3 Hz	Comparison w/ frequency counters or signal generators referenced to HP GPS 58503A

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

<sup>2</sup> 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.

<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> Exclusive of SWR effects and connector repeatability.

<sup>5</sup> In the statement of CMC, percentages are to be read as percent of reading, unless otherwise noted.

<sup>6</sup> In the statement of CMC, "FS" represents "full scale".

<sup>7</sup> The measurands stated are measured with the Agilent 3458A. This capability is suitable for the calibration of the devices intended to generate the measurand in the ranges indicated. CMCs 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.

<sup>8</sup> The CMC does not include  $M$ , which represents the mismatch source.



The American Association for Laboratory Accreditation

World Class Accreditation

## Accredited Laboratory

A2LA has accredited

**MODERN MACHINE & TOOL CO., INC.**

*Newport News, VA*

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 17<sup>th</sup> day of August 2011.



  
\_\_\_\_\_  
Peter Meyer

President & CEO  
For the Accreditation Council  
Certificate Number 2836.01  
Valid to July 31, 2013

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