



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

JM TEST SYSTEMS, INC.
1020 N. Texas Ave.
Odessa, TX 79761
Jerry Kraus Phone: 432 580 7040

CALIBRATION

Valid To: May 31, 2019

Certificate Number: 1995.04

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 ^{2,7} (\pm)	Comments
Micrometers ³	Up to 48 in	$(35L + 5) \mu\text{in}$	Gage blocks
Length Standards	Up to 48 in	$(30 + 9L) \mu\text{in}$	Gage blocks and ULM
Calipers ³	Up to 24 in	$(300 + 6L) \mu\text{in}$	Gage blocks
Digital, Dial, and Test Indicators ³	Up to 1 in	91 μin	Indicator calibrator

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage ³ – Generate	(0 to 330) mV (0.33 to 33) V (3.3 to 33) V (33 to 330) V (330 to 1020) V	74 $\mu\text{V}/\text{V}$ + 3 μV 59 $\mu\text{V}/\text{V}$ + 5 μV 59 $\mu\text{V}/\text{V}$ + 50 μV 65 $\mu\text{V}/\text{V}$ + 500 μV 65 $\mu\text{V}/\text{V}$ + 1500 μV	Fluke 5502A
DC Current ³ – Generate	Up to 330 μA (0.33 to 3.3) 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 0.073 % + 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
Resistance ³ – Generate	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω (0.33 to 1.1) M Ω (1.1 to 33) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω (330 to 1100) M Ω	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 k Ω 0.58 % + 3 k Ω 0.58 % + 0.1 M Ω 1.7 % + 0.5 M Ω	Fluke 5502A



Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Generate			
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	
(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	
(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	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
AC Current ³ – Generate			
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
(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 0.092 % + 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	
(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	
(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 mA 0.058 % + 0.1 mA 0.069 % + 1 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.21 % + 0.1 mA 0.058 % + 0.1 mA 0.069 % + 1 mA	

Parameter/Range	Frequency	CMC ^{2,4} (\pm)	Comments
AC Current ³ – Generate (cont)			
Up to 330 μ A	(10 to 100) Hz 100 Hz to 1 kHz	0.29 % + 0.2 μ A 0.69 % + 0.5 μ A	Fluke 5502A with LCOMP On
(0.33 to 3.3) mA	(10 to 100) Hz 100 Hz to 1 kHz	0.29 % + 0.3 μ A 0.69 % + 0.8 μ A	
(3.3 to 33) mA	(10 to 100) Hz 100 Hz to 1 kHz	0.29 % + 0.2 μ A 0.69 % + 0.5 μ A	
(33 to 330) mA	(10 to 100) Hz 100 Hz to 1 kHz	0.092 % + 40 μ A 0.23 % + 10 μ A	
(0.33 to 3) A	(10 to 100) Hz (100 to 400) Hz	0.14 % + 0.2 μ A 0.35 % + 1 mA	
(3 to 20.5) A	(10 to 100) Hz (100 to 400) Hz	0.14 % + 2 mA 1.2 % + 5 mA	
(10 to 16.5) A	(45 to 65) Hz (65 to 440) Hz	0.029 % + 0.003 A 0.083 % + 0.003 A	Fluke 5502A, 50 turn coil
(16.5 to 150) A	(45 to 65) Hz (65 to 440) Hz	0.32 % + 0.025 A 0.87 % + 0.027 A	
(150 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.32 % + 0.09 A 1.5 % + 0.1 A	



Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Capacitance ³ – Source	(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
Electrical Calibration of Thermocouple Indicators ³ – 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	(-210 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	(-200 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	

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
Electrical Calibration of RTD Indicators ³ – Generate Pt 385, 100 Ω	(-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
DC Voltage ³ – Measure	(0 to 100) mV (0.10 to 1.0) V (1.0 to 10) V (10 to 100) V (100 to 1000) V	16 μV/V + 0.3 μV 12 μV/V + 0.3 μV 11 μV/V + 0.5 μV 14 μV/V + 30 μV 15 μV/V + 100 μV	Agilent 3458A
Resistance ³ – Measure	Up to 10 Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ	28 μΩ/Ω + 50 μΩ 18 μΩ/Ω + 0.5 mΩ 16 μΩ/Ω + 0.5 mΩ 16 μΩ/Ω + 5 mΩ 18 μΩ/Ω + 50 mΩ 27 μΩ/Ω + 2 Ω 77 μΩ/Ω + 100 Ω 0.060 % + 1 kΩ	Agilent 3458A
DC Current ³ – Measure	Up to 100 μA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	33 μA/A + 0.8 nA 29 μA/A + 5 nA 35 μA/A + 50 nA 49 μA/A + 0.5 μA 0.015 % + 10 μA	Agilent 3458A

III. Mechanical

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Mass	Up to 12 kg	0.0005 g or 0.0015 %, whichever is greater	Double substitution weighing

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Pressure – Hydraulic Effective Area Determination of High Accuracy Piston-Cylinder Unit (PCU) Calibration of Transfer Standards and Pressure Devices	(40 to 4000) psi (4000 to 40 000) psi (40 to 4000) psi (4000 to 40 000) psi	0.0040 % 0.0035 % 0.0045 % 0.0040 %	Cross float method per NCSL International RISP 4 Ruska deadweight testers
Pressure – Pneumatic Effective Area Determination of High Accuracy Piston-Cylinder Unit (PCU) or Ball-Nozzle Units (BNU) Calibration of Transfer Standards and Pressure Devices	(0.2 to 25) psi (10 to 100) psi (100 to 1000) psi (0.2 to 25) psi (10 to 100) psi (100 to 1000) psi	0.0014 % 0.0013 % 0.0017 % 0.0014 % 0.0013 % 0.0016 %	Direct cross-float method per NCSL International RISP 4 Direct comparison method to Ruska 2465
Torque Wrenches	25 in·lbf to 1000 ft·lbf	0.65 %	Torque tester
Temperature – Measure and Measuring Devices	0 °C to 200 °C	0.054 °C	Temperature bath and PRT



IV Time & Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measure ³	0.1 Hz to 225 MHz	2.4 parts in 10 ⁷	Fluke PM 6680
Time Interval – Timers, Stop Watches ³			NIST SP 960-12
Time Base	(0 to 24) hour	0.0016 s/day	Fluke PM6680
Totalize Method	(0 to 24) hour	0.038 s	Fluke PM6680, function generator

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

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 Generate. 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. Field environmental conditions are limited to 15 °C to 30 °C and <80% relative humidity to 30 °C.

⁴ Fluke 5502A CMCs are based upon the temperature the standard was calibrated ($t_{cal} \pm 5$ °C) and assuming the instrument is zeroed at least every seven days or when the ambient temperature changes more than 5 °C. For Resistance, a zero calibration is performed at least every 12 hours within ± 1 °C of use. For AC Current, CMCs are determined with the LCOMP off and ON. CMCs are also based upon 1-year floor specifications. CMCs 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 Agilent 3458A CMCs are based upon the temperature the standard was calibrated ($t_{cal} \pm 5$ °C) and an auto calibration (ACAL) was performed within the previous 24 hours (± 1 °C of ambient temperature.) CMCs are also based upon 1-year floor specifications. CMCs are expressed as either a specific value that covers the full range or as a combination of a percent or the fraction of the reading/output plus a range specification.

⁶ In the statement of CMC, percentages are percentages of reading, unless otherwise indicated.



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

A handwritten signature in black ink, appearing to be 'L. L. L.', located at the bottom center of the page.



Accredited Laboratory

A2LA has accredited

JM TEST SYSTEMS, INC.

Odessa, TX

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 R205 – Specific Requirements: Calibration Laboratory Accreditation Program. 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 3rd day of October 2017.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 1995.04
Valid to May 31, 2019

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