



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005,  
ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006**

**The Meter Shop Inc.  
6934 Signat Dr.  
Houston, Texas 77041**

**Certification Number: L16-93**

**Valid to: 02/23/2016**

**CALIBRATION**

**Scope : Electrical , Mechanical**

In recognition of the successful completion of the PJLA evaluation process, accreditation is granted to this laboratory to perform the following calibrations:

CALIBRATION FIELD	MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE (AND SPECIFICATION WHERE APPROPRIATE)	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED	CALIBRATION TYPE In-house At CAB Location At Customer Location
Electrical	<b>DC Voltage – Generate</b>	(2mV to 220) mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	9.5 $\mu$ V/V + 0.40 $\mu$ V 6.0 $\mu$ V/V + 0.70 $\mu$ V 4.8 $\mu$ V/V + 2.5 $\mu$ V 6.8 $\mu$ V/V + 4.0 $\mu$ V 5.9 $\mu$ V/V + 40 $\mu$ V 8.7 $\mu$ V/V + 0.4 mV	Fluke 5520A	<b><i>In-House / Customer Location</i></b>
Electrical	<b>DC Voltage – Measure</b>	(2mV to 200) mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V	9.4 $\mu$ V/V + 0.10 $\mu$ V 4.2 $\mu$ V/V + 0.40 $\mu$ V 4.7 $\mu$ V/V + 4.0 $\mu$ V 6.4 $\mu$ V/V + 40 $\mu$ V 6.4 $\mu$ V/V + 0.50 mV	Fluke 8508A	<b><i>In-House / Customer Location</i></b>
Electrical	<b>DC Current – Generate</b>	(2 $\mu$ A to 220) $\mu$ A 220 $\mu$ A to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 20) A	52 $\mu$ A/A + 6.0 nA 45 $\mu$ A/A + 7.0 nA 46 $\mu$ A/A + 40 nA 0.39 mA/A + 0.50 mA 2.0 mA/A + 0.50 mA 2.0 % + 0.75 mA	Fluke 5520A	<b><i>In-House / Customer Location</i></b>
Electrical	<b>DC Current – Measure</b>	(1 $\mu$ A to 200) $\mu$ A 200 $\mu$ A to 2 mA (2 to 20) mA (2 to 200) mA (200 to 2000) mA (2 to 20) A	67 $\mu$ A/A + 0.40 nA 67 $\mu$ A/A + 4.0 nA 68 $\mu$ A/A + 40 nA 86 $\mu$ A/A + 0.80 $\mu$ A 0.021 % + 16 $\mu$ A 0.047 % + 0.4 mA	Fluke 8508A	<b><i>In-House / Customer Location</i></b>
Electrical	<b>DC Resistance-Generate</b>	(0 to 1) $\Omega$ (1 to 1.9) $\Omega$ (1.9 to 10) $\Omega$ (10 to 19) $\Omega$ (19 to 100) $\Omega$ (100 to 190) $\Omega$ (190 to 1000) $\Omega$ (1 to 1.9) k $\Omega$	0.013 % + 40 $\mu\Omega$ 0.014 % + 40 $\mu\Omega$ 30 $\mu\Omega/\Omega$ + 40 $\mu\Omega$ 43 $\mu\Omega/\Omega$ + 40 $\mu\Omega$ 14 $\mu\Omega/\Omega$ + 40 $\mu\Omega$ 18 $\mu\Omega/\Omega$ + 40 $\mu\Omega$ 13 $\mu\Omega/\Omega$ + 40 $\mu\Omega$ 14 $\mu\Omega/\Omega$ + 40 $\mu\Omega$	Fluke 5520A	<b><i>In-House / Customer Location</i></b>

		(1.9 to 10) kΩ (10 to 19) kΩ (19 to 100) kΩ (100 to 190) kΩ 190 kΩ to 1 MΩ (1 to 1.9) MΩ (1.9 to 10) MΩ (10 to 19) MΩ (19 to 100) MΩ	13 μΩ/Ω + 40 μΩ 14 μΩ/Ω + 40 μΩ 15 μΩ/Ω + 40 μΩ 14 μΩ/Ω + 40 μΩ 25 μΩ/Ω + 40 μΩ 28 μΩ/Ω + 40 μΩ 48 μΩ/Ω + 40 μΩ 62 μΩ/Ω + 40 μΩ 0.014 % + 40 μΩ		
<b>Electrical</b>	<b>DC Resistance – Measure</b>	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω (200 to 2000) Ω (2 to 20) kΩ (20 to 200) kΩ (0.2 to 2) MΩ (2 to 20) MΩ (20 to 200) MΩ (0.2 to 2) GΩ	25 μΩ/Ω + 4.0 μΩ 12 μΩ/Ω + 14 μΩ 9.4 μΩ/Ω + 50 μΩ 9.4 μΩ/Ω + 0.5 mΩ 9.4 μΩ/Ω + 5.0 mΩ 9.5 μΩ/Ω + 50 mΩ 14 μΩ/Ω + 1.0 Ω 57 μΩ/Ω + 0.10 kΩ 0.046 % + 10 kΩ 0.18 % + 0.10 MΩ	Fluke 8508A	<i><b>In-House / Customer Location</b></i>
<b>Electrical</b>	<b>Electrical Calibration of Thermocouple Indicators</b>				
	<b>Type B</b>	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.35 °C 0.27 °C 0.24 °C 0.26 °C	Fluke 5520A	<i><b>In-House / Customer Location</b></i>
	<b>Type E</b>	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.39 °C 0.14 °C 0.12 °C 0.14 °C 0.17 °C		
	<b>Type J</b>	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.22 °C 0.14 °C 0.12 °C 0.14 °C 0.19 °C		
	<b>Type K</b>	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.26 °C 0.15 °C 0.14 °C 0.21 °C 0.33 °C		
	<b>Type N</b>	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.31 °C 0.18 °C 0.16 °C 0.15 °C 0.22 °C		
<b>Electrical</b>	<b>Electrical Calibration of Thermocouple Indicators</b>				

	<b>Type R</b> (0 to 250) °C (350 to 400) °C (400 to 1000) °C (1000 to 1767) °C  <b>Type S</b> (0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C  <b>Type T</b> (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C  <b>Type U</b> (-200 to 0) °C (0 to 600) °C	0.45 °C 0.28 °C 0.26 °C 0.31 °C  0.37 °C 0.28 °C 0.29 °C 0.36 °C  0.49 °C 0.19 °C 0.14 °C 0.15 °C  0.44 °C 0.22 °C	Fluke 5520A	<b><i>In-House / Customer Location</i></b>
<b>Electrical</b>	<b>Oscilloscope</b>  <b>50 Ω Load</b> (1 to 24.999) mV 25 mV to 2.1999 V (2.2 to 130) V  <b>1 MΩ Load</b> (1 to 24.999) mV (25 to 109.99) mV 110 mV to 2.1999V (2.2 to 10.999) V (11 to 130) V  <b>Level Sine Wave</b>  <b>Amplitude (50 kHz Reference)</b> 50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz  <b>Flatness (50 kHz Reference)</b> 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz  <b>Time Markers: Source and Period into a 50 Ω Load</b> 5 s to 50 ms 20 ms to 2 ns  <b>Amplitude 1 MΩ</b> 1.8 mV to 55 V(pk pk) <b>50 Ω</b> 1.8 mV to 2.5 V(pk pk)  <b>Frequency</b> 10 Hz to 100 kHz	1.3 % of output + 40 μV 0.23 % of output + 40 μV 2.1 % of output + 40 μV  0.12 % of output + 40 μV 0.09 % of output + 40 μV 0.31 % of output + 40 μV 0.27 % of output + 40 μV 2.0 % of output + 40 μV  1.6 % + 300 μV 2.8 % + 300 μV 3.2 % + 300 μV 4.7 % + 300 μV 5.7 % + 300 μV  1.4 % + 100 μV 1.6 % + 100 μV 3.2 % + 100 μV 3.9 % + 100 μV  160 μs + <i>t</i> parts in 10 <sup>6</sup> s 64 μs + <i>t</i> parts in 10 <sup>6</sup> s  2.4 % + 100 μV 2.4 % + 100 μV  34 parts in 10 <sup>6</sup> Hz + 15	Fluke 5520A/SC600	<b><i>In-House / Customer Location</i></b>
			<i>t</i> = time in seconds	

			mHz		
Electrical	<b>AC Voltage – Generate</b> <b>(3.3 to 32.9999) V</b>	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.054 % + 650 µV 0.026 % + 600 µV 0.11 % + 600 µV 0.16 % + 600 µV 0.17 % + 1.6 mV	Fluke 5520A	<b>In-House / Customer Location</b>
	<b>(33 to 329.999) V</b>	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.024 % + 2.0 mV 0.24 % + 6.0 mV 0.25 % + 6.0 mV 0.40 % + 6.0 mV 0.43 % + 50 mV		
	<b>(330 to 1000) V</b>	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.41 % + 10 mV 0.41 % + 10 mV 0.40 % + 10 mV		
Electrical	<b>AC Voltage – Measure</b>			Fluke 8508A	<b>In-House / Customer Location</b>
	<b>Up to 10 mV</b>	(10 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.034 % + 3.0 µV 0.023 % + 1.1 µV 0.034 % + 1.1 µV 0.12 % + 1.1 µV 0.57 % + 1.1 µV 4.6 % + 2.0 µV		
	<b>(10 to 100) mV</b>	(10 to 40) Hz (40 to 1000) Hz (1 to 30) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.01 % + 4 µV 0.01 % + 2 µV 0.02 % + 2 µV 0.034 % + 2 µV 0.091 % + 2 µV 0.34 % + 10 µV 1.2 % + 10 µV 1.5 % + 10 µV		
	<b>(0.1 to 1) V</b>	(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	0.007 % + 40 µV 0.007 % + 20 µV 0.014 % + 20 µV 0.03 % + 20 µV 0.08 % + 20 µV 0.3 % + 100 µV 1.0 % + 100 µV 1.5 % + 100 µV		
	<b>(1 to 10) V</b>	(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	0.01 % + 400 µV 0.01 % + 200 µV 0.02 % + 200 µV 0.035 % + 200 µV 0.091 % + 200 µV 0.34 % + 1 mV 1.3 % + 1 mV 1.7 % + 1 mV		
<b>(10 to 100) V</b>	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz	0.063 % + 4 mV 0.035 % + 2 mV 0.023 % + 2 mV			

	<b>(100 to 1000) V</b>	(20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz  (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.06 % + 2 mV 0.14 % + 2 mV 0.46 % + 10 mV 1.7 % + 10 mV  0.07 % + 40 mV 1.9 % + 20 mV 2.6 % + 20 mV 0.14 % + 20 mV 0.36 % + 20 mV		
<b>Electrical</b>	<b>AC Current – Generate</b>  <b>220mA to 2.2A</b>  <b>1.1 to .99999A</b>  <b>3 to 10.9999A</b>  <b>11 to 20.5 A</b>	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz  (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz  (45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz  (45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.033 % + 35 µA 0.053 % + 80 µA 0.80 % + 0.16 mA  0.18 % + 100 µA 0.13 % + 100 µA 0.14 % + 1000 µA 2.0 % + 5000 µA  0.12 % + 2 mA 0.14 % + 2 mA 2.4 % + 2 mA  0.42 % + 5 mA 0.33 % + 5 mA 2.4 % + 5 mA	Fluke 5520A	<b><i>In-House / Customer Location</i></b>
<b>Electrical</b>	<b>AC Current – Measure</b>  <b>Up to 200 µA</b>  <b>200µA to 2 mA</b>  <b>2 to 20mA</b>  <b>20 to 200mA</b>  <b>200mA to 2A</b>  <b>2 to 20A</b>	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz  (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz  (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz  (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz  10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz  10 Hz to 2 kHz (2 to 10) kHz	0.034 % + 20 nA 0.030 % + 20 nA 0.030 % + 20 nA  0.040 % + 0.2 µA 0.030 % + 0.2 µA 0.030 % + 0.2 µA  0.040 % + 2 µA 0.040 % + 2 µA 0.040 % + 2 µA  0.040 % + 20 µA 0.030 % + 20 µA 0.070 % + 20 µA  0.070 % + 0.2 mA 0.080 % + 0.2 mA 0.68 % + 0.2 mA  0.090 % + 0.2 mA 0.57 % + 0.2 mA	Fluke 8508A	<b><i>In-House / Customer Location</i></b>
<b>Electrical</b>	<b>Capacitance – Generate</b>  <b>0.19 to 1.09 nF</b>	10 Hz to 10 kHz	0.55 % + 0.01 nF		

	<b>1.1 to 3.29 nF</b> <b>3.3 to 10.9 nF</b> <b>11 to 109.9 nF</b> <b>110 to 329.9 nF</b> <b>0.33 to 1.09 μF</b> <b>1.1 to 3.29 μF</b> <b>3.29 to 10.9 μF</b> <b>11 to 32.9 μF</b> <b>33 to 109.9 μF</b> <b>11 to 329.9 μF</b> <b>0.33 to 1.09 mF</b>	10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (10 to 50) Hz (10 to 20) Hz	0.43 % + 0.01 nF 0.19 % + 0.01 nF 0.19 % + 0.1 nF 0.19 % + 0.3 nF 0.19 % + 1 nF 0.19 % + 3 nF 0.19 % + 10 nF 0.31 % + 30 nF 0.35 % + 100 nF 0.35 % + 300 nF 0.35 % + 1 μF	Fluke 5520A	<b><i>In-House / Customer Location</i></b>
<b>Mechanical</b>	<b>Pressure Gauges</b>	300 to 15000 PSI	.1%± 0.577 PSI	Crystal Xp2i	<b><i>In-House / Customer Location</i></b>
<b>Mechanical</b>	<b>Torque Wrenches</b>	4 to 50 inlbs	.25% of rdg ± .18 inlb	CDI 2000-400-02	<b><i>In-House / Customer Location</i></b>
<b>Mechanical</b>	<b>Torque Wrenches</b>	30 to 400 inlbs	.25% of rdg ± 1.39 inlb	CDI 2000-400-02	<b><i>In-House / Customer Location</i></b>
<b>Mechanical</b>	<b>Torque Wrenches</b>	80 to 1000 inlbs	.25% of rdg ± 3.01 inlb	CDI 2000-400-02	<b><i>In-House / Customer Location</i></b>
<b>Mechanical</b>	<b>Torque Wrenches</b>	20-250 ftlbs	.25% of rdg ± .87 ftlb	CDI 2000-400-02	<b><i>In-House / Customer Location</i></b>
<b>Mechanical</b>	<b>Torque Wrenches</b>	60-600 ftlbs	.25% of rdg ± 2.08 ftlb	CDI 2000-12-02	<b><i>In-House / Customer Location</i></b>

<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> This laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for their Mobile Laboratory to perform the noted calibrations.

<sup>5</sup> The measurements stated are generated with the Fluke 5500 series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurement in the ranges

indicated. Calibration and Measurement Capability (CMC) are expressed as either a specific value that covers the full range or as a fraction/percentage of the reading plus a fixed floor specification.

<sup>6</sup> The measurements stated are measured with the Fluke 8508A series of instruments. This capability is suitable for the calibration of the devices intended to generate the measurement in the ranges indicated. Calibration and Measurement Capability (CMC) are expressed as either a specific value that covers the full range or as a combination of the fraction/percentage of the reading/output plus a range specification.

<sup>7</sup> In the statement of CMC, the value is defined as the percentage of reading unless otherwise indicated.

<sup>8</sup>  $L$  represents the length of displacement in inches.  $R$  represents the resolution of the unit under test.

<sup>9</sup> The measurands state are measured with Fluke 5520A. This capability is suitable for the calibration of the devices intended to generate the measurement in the ranges indicated. Calibration and Measurement Capability (CMC) are expressed as either a specific value that covers the full range or as a combination of the fraction/percentage of the reading/output plus a range specification.

<sup>10</sup> The measurands stated are measured with the Fluke 8508A. 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.

