



# PERRY JOHNSON LABORATORY ACCREDITATION, INC.

## *Certificate of Accreditation*

*Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:*

***The Meter Shop***  
***6934 Signat Drive, Houston Texas***

*(Hereinafter called the Organization) and hereby declares that Organization 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 (as outlined by the joint ISO-ILAC-IAF Communiqué dated January 2009):

***Electrical and Mechanical Calibration***  
***(As detailed in the supplement)***

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

*Initial Accreditation Date:*

February 23, 2016

*Issue Date:*

February 23, 2016

*Expiration Date:*

April 30, 2018

*Accreditation No.:*

83790

*Certificate No.:*

L16-93

Tracy Szerszen  
President/Operations Manager

Perry Johnson Laboratory  
Accreditation, Inc. (PJLA)  
755 W. Big Beaver, Suite 1325  
Troy, Michigan 48084

*The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: [www.pjllabs.com](http://www.pjllabs.com)*



# Certificate of Accreditation: Supplement

## The Meter Shop

6934 Signat Drive, Houston Texas  
John Brown Phone: 713-957-8586

Accreditation is granted to the facility to perform the following calibrations:

### Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Output DC Voltage <sup>FO</sup>	2 mV to 220 mV	9.5 $\mu$ V/V + 0.40 $\mu$ V	Fluke 5520A
	0.22 V to 2.2 V	6.0 $\mu$ V/V + 0.70 $\mu$ V	
	2.2 V to 11 V	4.8 $\mu$ V/V + 2.5 $\mu$ V	
	11 V to 22 V	6.8 $\mu$ V/V + 4.0 $\mu$ V	
	22 V to 220 V	5.9 $\mu$ V/V + 40 $\mu$ V	
	220 V to 1 100 V	8.7 $\mu$ V/V + 0.4 mV	
Equipment to Measure DC Voltage <sup>FO</sup>	2 mV to 200 mV	9.4 $\mu$ V/V + 0.10 $\mu$ V	Fluke 8508A
	200 mV to 2 V	4.2 $\mu$ V/V + 0.40 $\mu$ V	
	2 V to 20 V	4.7 $\mu$ V/V + 4.0 $\mu$ V	
	20 V to 200 V	6.4 $\mu$ V/V + 40 $\mu$ V	
	200 V to 1 000 V	6.4 $\mu$ V/V + 0.50 mV	
	(1kV to 40kV)	.11 %	
Equipment to Output DC Current <sup>FO</sup>	2 $\mu$ A to 22 $\mu$ A	52 $\mu$ A/A + 6.0 mA	Fluke 5520A
	220 $\mu$ A to 2.2 mA	45 $\mu$ A/A + 7.0 mA	
	2.2 mA to 22 mA	46 $\mu$ A/A + 40 mA	
	22 mA to 220 mA	0.39 mA/A + 0.50 mA	
	220 mA to 2.2 A	2.0 mA/A + 0.50 mA	
	2.2 A to 20 A	4 mA/A + 0.75 mA	
	(20 to 150) A Turns	0.50% + 0.15 A	
(150 to 1000) A Turns	0.52% + 0.55 A		
Equipment to Measure DC Current <sup>FO</sup>	1 $\mu$ A to 200 $\mu$ A	67 $\mu$ A/A + 0.40 mA	Fluke 8508A
	200 $\mu$ A to 2 mA	67 $\mu$ A/A + 4.0 mA	
	2 mA to 20 mA	68 $\mu$ A/A + 40 mA	
	2 mA to 200 mA	86 $\mu$ A/A + 0.80 $\mu$ A	
	200 mA to 2 000 mA	58 $\mu$ A/A + 16 $\mu$ A	
	2 A to 20 A	58 mA/A + 0.4 mA	
Equipment to Output DC Resistance <sup>FO</sup>	0 $\Omega$ to 1 $\Omega$	13 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	Fluke 5520A
	1 $\Omega$ to 1.9 $\Omega$	14 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	1.9 $\Omega$ to 10 $\Omega$	30 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	10 $\Omega$ to 19 $\Omega$	43 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	19 $\Omega$ to 100 $\Omega$	14 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	100 $\Omega$ to 190 $\Omega$	18 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	190 $\Omega$ to 1 000 $\Omega$	13 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	1 k $\Omega$ to 1.9 k $\Omega$	14 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	1.9 k $\Omega$ to 10 k $\Omega$	13 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	10 k $\Omega$ to 19 k $\Omega$	14 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	19 k $\Omega$ to 100 k $\Omega$	15 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	100 k $\Omega$ to 190 k $\Omega$	14 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	190 M $\Omega$ to 1 M $\Omega$	25 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	
	1 M $\Omega$ to 1.9 M $\Omega$	28 $\mu$ $\Omega$ / $\Omega$ + 40 $\mu$ $\Omega$	



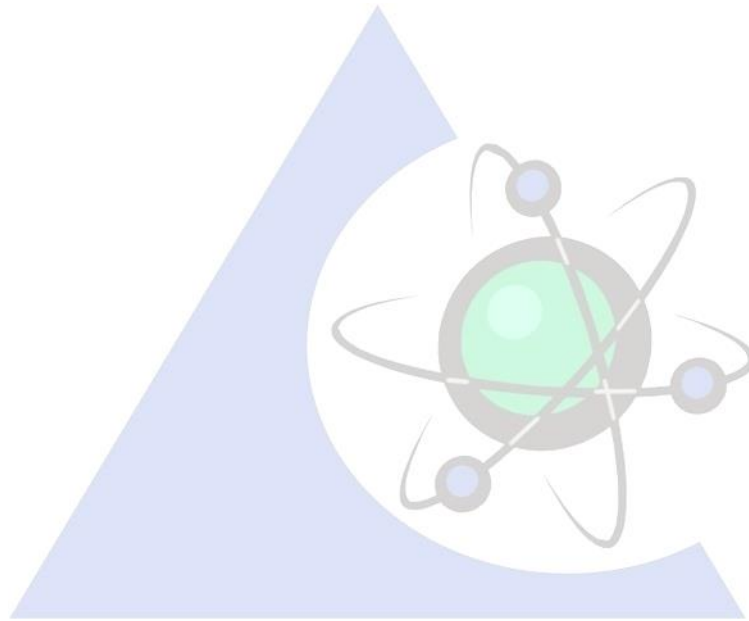
# Certificate of Accreditation: Supplement

## The Meter Shop

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John Brown Phone: 713-957-8586

Accreditation is granted to the facility to perform the following calibrations:

	1.9 MΩ to 10 MΩ	48 μΩ/Ω + 40 μΩ	
	10 MΩ to 19 MΩ	62 μΩ/Ω + 40 μΩ	
	19 MΩ to 100 MΩ	14 μΩ/Ω + 40 μΩ	





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Equipment to Measure DC Resistance <sup>FO</sup>	0 $\Omega$ to 2 $\Omega$	25 $\mu\Omega/\Omega$ + 4.0 $\mu\Omega$	Fluke 8508A
	2 $\Omega$ to 20 $\Omega$	12 $\mu\Omega/\Omega$ + 14 $\mu\Omega$	
	20 $\Omega$ to 200 $\Omega$	9.4 $\mu\Omega/\Omega$ + 50 $\mu\Omega$	
	200 $\Omega$ to 2 000 $\Omega$	9.4 $\mu\Omega/\Omega$ + 0.5 m $\Omega$	
	2 $\Omega$ to 20 k $\Omega$	9.4 $\mu\Omega/\Omega$ + 5.0 m $\Omega$	
	20 $\Omega$ to 200 k $\Omega$	9.5 $\mu\Omega/\Omega$ + 50 m $\Omega$	
	0.2 $\Omega$ to 2 M $\Omega$	14 $\mu\Omega/\Omega$ + 1.0 $\Omega$	
	2 $\Omega$ to 20 M $\Omega$	57 $\mu\Omega/\Omega$ + 0.10 k $\Omega$	
	20 $\Omega$ to 200 M $\Omega$	92 $\mu\Omega/\Omega$ + 10 k $\Omega$	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type B <sup>FO</sup>	600 $^{\circ}\text{C}$ to 800 $^{\circ}\text{C}$	0.35 $^{\circ}\text{C}$	Fluke 5520A Electrical Simulation of Thermocouple Output
	800 $^{\circ}\text{C}$ to 1 000 $^{\circ}\text{C}$	0.27 $^{\circ}\text{C}$	
	1 000 $^{\circ}\text{C}$ to 1 550 $^{\circ}\text{C}$	0.24 $^{\circ}\text{C}$	
	1 550 $^{\circ}\text{C}$ to 1 820 $^{\circ}\text{C}$	0.26 $^{\circ}\text{C}$	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type E <sup>FO</sup>	-250 $^{\circ}\text{C}$ to -100 $^{\circ}\text{C}$	0.39 $^{\circ}\text{C}$	
	-100 $^{\circ}\text{C}$ to -25 $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
	-25 $^{\circ}\text{C}$ to 350 $^{\circ}\text{C}$	0.12 $^{\circ}\text{C}$	
	350 $^{\circ}\text{C}$ to 650 $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type J <sup>FO</sup>	650 $^{\circ}\text{C}$ to 1 000 $^{\circ}\text{C}$	0.17 $^{\circ}\text{C}$	
	-210 $^{\circ}\text{C}$ to -100 $^{\circ}\text{C}$	0.22 $^{\circ}\text{C}$	
	-100 $^{\circ}\text{C}$ to -30 $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
	-30 $^{\circ}\text{C}$ to 150 $^{\circ}\text{C}$	0.12 $^{\circ}\text{C}$	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K <sup>FO</sup>	150 $^{\circ}\text{C}$ to 760 $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
	760 $^{\circ}\text{C}$ to 1 200 $^{\circ}\text{C}$	0.19 $^{\circ}\text{C}$	
	-200 $^{\circ}\text{C}$ to -100 $^{\circ}\text{C}$	0.26 $^{\circ}\text{C}$	
	-100 $^{\circ}\text{C}$ to -25 $^{\circ}\text{C}$	0.15 $^{\circ}\text{C}$	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type N <sup>FO</sup>	-25 $^{\circ}\text{C}$ to 120 $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
	120 $^{\circ}\text{C}$ to 1 000 $^{\circ}\text{C}$	0.21 $^{\circ}\text{C}$	
	1 000 $^{\circ}\text{C}$ to 1 372 $^{\circ}\text{C}$	0.33 $^{\circ}\text{C}$	
	-200 $^{\circ}\text{C}$ to -100 $^{\circ}\text{C}$	0.31 $^{\circ}\text{C}$	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type N <sup>FO</sup>	-100 $^{\circ}\text{C}$ to -25 $^{\circ}\text{C}$	0.18 $^{\circ}\text{C}$	
	-25 $^{\circ}\text{C}$ to 120 $^{\circ}\text{C}$	0.16 $^{\circ}\text{C}$	
	120 $^{\circ}\text{C}$ to 410 $^{\circ}\text{C}$	0.15 $^{\circ}\text{C}$	
	410 $^{\circ}\text{C}$ to 1 300 $^{\circ}\text{C}$	0.22 $^{\circ}\text{C}$	



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Electrical Calibration of Thermocouple Indicators <sup>FO</sup>			Fluke 5520A Electrical Simulation of Thermocouple Output
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type R <sup>FO</sup>	0 °C to 250 °C	0.45 °C	
	350 °C to 400 °C	0.28 °C	
	400 °C to 1 000 °C	0.26 °C	
	1 000 °C to 1 767 °C	0.31 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type S <sup>FO</sup>	0 °C to 250 °C	0.37 °C	
	250 °C to 1 000 °C	0.28 °C	
	1 000 °C to 1 400 °C	0.29 °C	
	1 400 °C to 1 767 °C	0.36 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type T <sup>FO</sup>	-250 °C to -150 °C	0.49 °C	
	-150 °C to 0 °C	0.19 °C	
	0 °C to 120 °C	0.14 °C	
	120 °C to 400 °C	0.15 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type U <sup>FO</sup>	-200 °C to 0 °C	0.44 °C	
	0 °C to 600 °C	0.22 °C	
50 $\Omega$ Load <sup>FO</sup>	1 mV to 24.999 mV	1.3 % of output + 40 $\mu$ V	Fluke 5520A/SC600
	25 mV to 2.199 9 V	0.23 % of output + 40 $\mu$ V	
	2.2 V to 130 V	2.1 % of output + 40 $\mu$ V	
1 M $\Omega$ Load <sup>FO</sup>	1 mV to 24.999 mV	0.12 % of output + 40 $\mu$ V	
	25 mV to 109.99 mV	0.09 % of output + 40 $\mu$ V	
	110 mV to 2.199 9 V	0.31 % of output + 40 $\mu$ V	
	2.2 V to 10.999 V	0.27 % of output + 40 $\mu$ V	
	11 V to 130 V	2.0 % of output + 40 $\mu$ V	
Level Sine Wave <sup>FO</sup>			
Amplitude (50 kHz Reference) <sup>FO</sup>	50 kHz	1.6 % + 300 $\mu$ V	
	50 kHz to 100 MHz	2.8 % + 300 $\mu$ V	
	100 MHz to 300 MHz	3.2 % + 300 $\mu$ V	
	300 MHz to 600 MHz	4.7 % + 300 $\mu$ V	
	600 MHz to 1 100 MHz	5.7 % + 300 $\mu$ V	



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Flatness 50 kHz Reference <sup>FO</sup>	50 kHz to 100 MHz	1.4 % + 100 $\mu$ Hz	Fluke 5520A/SC600
	100 MHz to 300 MHz	1.6 % + 100 $\mu$ Hz	
	300 MHz to 600 MHz	3.2 % + 100 $\mu$ Hz	
	600 MHz to 1 100 MHz	3.9 % + 100 $\mu$ Hz	
Time Markers: Source and Period into a 50 $\Omega$ Load <sup>FO</sup>	5 ms to 50 ms	160 $\mu$ s + $t$ parts in 106 s	
	20 ms to 2 ms	64 $\mu$ s + $t$ parts in 106 s	
Equipment to Measure Amplitude at the listed frequencies <sup>FO</sup>			
1 M $\Omega$	1.8 mV(pk – pk) to 55 V(pk – pk)	2.4 % + 100 $\mu$ V	
50 $\Omega$	1.8 mV(pk – pk) to 2.5 V(pk – pk)	2.4 % + 100 $\mu$ V	
Frequency <sup>FO</sup>	10 kHz to 100 kHz	34 parts in 106 Hz + 15 mHz	
Equipment to Measure AC Voltage Output At the listed frequencies <sup>FO</sup>			
45 kHz to 1 kHz	3.3 V to 32.999 9 V	0.054 % + 650 $\mu$ V	Fluke 5520A
1 kHz 10 kHz	3.3 V to 32.999 9 V	0.026 % + 600 $\mu$ V	
10 kHz to 20 kHz	3.3 V to 32.999 9 V	0.11 % + 600 $\mu$ V	
20 kHz to 50 kHz	3.3 V to 32.999 9 V	0.16 % + 600 $\mu$ V	
50 kHz to 100 kHz	3.3 V to 32.999 9 V	0.17 % + 1.6 mV	
Equipment to Measure AC Voltage Output At the listed frequencies <sup>FO</sup>			
45 kHz to 1 kHz	33 V to 329.999 V	0.024 % + 2.0 mV	
1 kHz to 10 kHz	33 V to 329.999 V	0.24 % + 6.0 mV	
10 kHz to 20 kHz	33 V to 329.999 V	0.25 % + 6.0 mV	
20 kHz to 50 kHz	33 V to 329.999 V	0.4 % + 6.0 mV	
50 kHz to 100 kHz	33 V to 329.999 V	0.43 % + 50 mV	
Equipment to Measure AC Voltage Output At the listed frequencies <sup>FO</sup>			
45 kHz to 1 kHz	330 V to 1 000 V	0.41 % + 10 mV	
1 kHz to 5 kHz	330 V to 1 000 V	0.41 % + 10 mV	
5 kHz to 10 kHz	330 V to 1 000 V	0.4 % + 10 mV	
Equipment to Measure AC Voltage At the list frequencies <sup>FO</sup>			Fluke 8508A
10 Hz to 40 Hz	1 mV to 10 mV	0.034 % + 3.0 $\mu$ V	
40 Hz to 1 000 Hz	1 mV to 10 mV	0.023 % + 1.1 $\mu$ V	



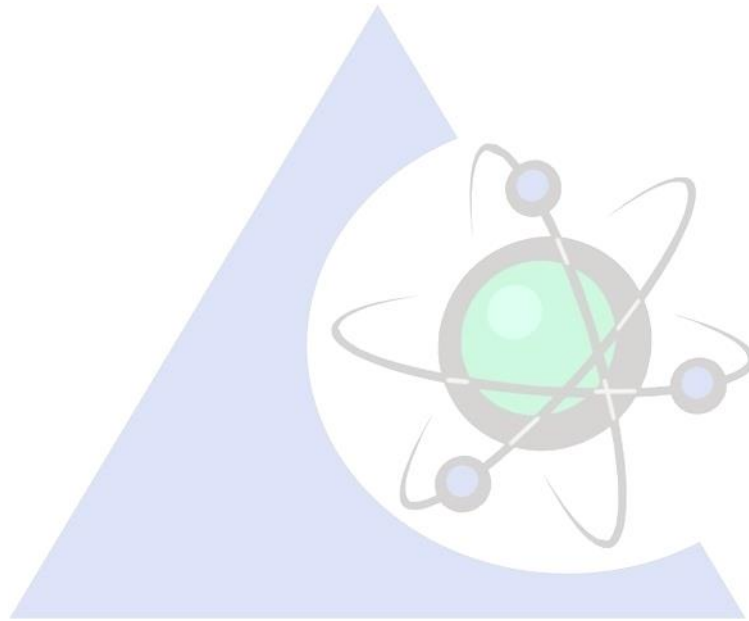
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1 kHz to 20 kHz	1 mV to 10 mV	0.034 % + 1.1 $\mu$ V	
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Equipment to Measure AC Voltage At the list frequencies <sup>FO</sup>			Fluke 8508A
20 kHz to 50 kHz	2 mV to 10 mV	0.12 % + 1.1 $\mu$ V	
50 kHz to 100 kHz	2 mV to 10 mV	0.57 % + 1.1 $\mu$ V	
100 kHz to 300 kHz	2 mV to 10 mV	4.6 % + 2.0 $\mu$ V	
Equipment to Measure AC Voltage At the list frequencies <sup>FO</sup>			
10 Hz to 40 Hz	10 mV to 100 mV	0.01 % + 4 $\mu$ V	
40 Hz to 1 000 Hz	10 mV to 100 mV	0.01 % + 2 $\mu$ V	
1 kHz to 30 kHz	10 mV to 100 mV	0.02 % + 2 $\mu$ V	
20 kHz to 50 kHz	10 mV to 100 mV	0.034 % + 2 $\mu$ V	
50 kHz to 100 kHz	10 mV to 100 mV	0.091 % + 2 $\mu$ V	
100 kHz to 300 kHz	10 mV to 100 mV	0.34 % + 10 $\mu$ V	
300 kHz to 1 MHz	10 mV to 100 mV	1.2 % + 10 $\mu$ V	
1MHz to 2 MHz	10 mV to 100 mV	1.5 % + 10 $\mu$ V	
Equipment to Measure AC Voltage At the list frequencies <sup>FO</sup>			
1 Hz to 40 Hz	0.1 V to 1 V	0.007 % + 40 $\mu$ V	
40 Hz to 1 kHz	0.1 V to 1 V	0.007 % + 20 $\mu$ V	
1 kHz to 20 kHz	0.1 V to 1 V	0.014 % + 20 $\mu$ V	
20 kHz to 50 kHz	0.1 V to 1 V	0.03 % + 20 $\mu$ V	
50 kHz to 100 kHz	0.1 V to 1 V	0.08 % + 20 $\mu$ V	
100 kHz to 300 kHz	0.1 V to 1 V	0.3 % + 100 $\mu$ V	
0.3 MHz to 1 MHz	0.1 V to 1 V	1.0 % + 100 $\mu$ V	
1 MHz to 2 MHz	0.1 V to 1 V	1.5 % + 100 $\mu$ V	
Equipment to Measure AC Voltage At the list frequencies <sup>FO</sup>			
1 Hz to 40 Hz	1 V to 10 V	0.01 % + 400 $\mu$ V	
40 Hz to 1 kHz	1 V to 10 V	0.01 % + 200 $\mu$ V	
1 kHz to 20 kHz	1 V to 10 V	0.02 % + 200 $\mu$ V	
20 kHz to 50 kHz	1 V to 10 V	0.035 % + 200 $\mu$ V	
50 kHz to 100 kHz	1 V to 10 V	0.091 % + 200 $\mu$ V	
100 kHz to 300 kHz	1 V to 10 V	0.34 % + 1 mV	
300 kHz to 1 MHz	1 V to 10 V	1.3 % + 1 mV	
1 MHz to 2 MHz	1 V to 10 V	1.7 % + 1 mV	
Equipment to Measure AC Voltage At the list frequencies <sup>FO</sup>			
1Hz to 40 Hz	10 V to 100 V	0.063 % + 4 mV	
40 Hz to 1 kHz	10 V to 100 V	0.035 % + 2 mV	
1 kHz to 20 kHz	10 V to 100 V	0.023 % + 2 mV	
20 kHz to 50 kHz	10 V to 100 V	0.06 % + 2 mV	
50 kHz to 100 kHz	10 V to 100 V	0.14 % + 2 mV	





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Equipment to Measure AC Voltage At the list frequencies <sup>FO</sup>			Fluke 8508A
100 kHz to 300 kHz	10 V to 100 V	0.46 % + 10 mV	
300 kHz to 1 MHz	10 V to 100 V	1.7 % + 10 mV	
Equipment to Measure AC Voltage At the list frequencies <sup>FO</sup>			Direct measurements using Fluke 80K-40 Probe/Fluke 8508A
1Hz to 40 Hz	100 V to 1 000 V	0.07 % + 40 mV	
40 Hz to 1 kHz	100 V to 1 000 V	1.9 % + 20 mV	
1 kHz to 20 kHz	100 V to 1 000 V	2.6 % + 20 mV	
20 kHz to 50 kHz	100 V to 1 000 V	0.14 % + 20 mV	
50 kHz to 100 kHz	100 V to 1 000 V	0.36 % + 20 mV	
60 Hz	1kV to 40kV)	0.68 %	
Equipment to measure AC Current At the listed frequencies <sup>FO</sup>			Fluke 5520A
20 kHz to 1 kHz	220 mA to 2.2 A	0.033 % + 35 $\mu$ A	
1 kHz to 5 kHz	220 mA to 2.2 A	0.053 % + 80 $\mu$ A	
5 kHz to 10 kHz	220 mA to 2.2 A	0.8 % + 0.16 mA	
Equipment to measure AC Current At the listed frequencies <sup>FO</sup>			
10 Hz to 45 Hz	1.1 A to 2.99999 A	0.18 % + 100 $\mu$ A	
45 kHz to 1 kHz	1.1 A to 2.99999 A	0.13 % + 100 $\mu$ A	
1 kHz to 5 kHz	1.1 A to 2.99999 A	0.14 % + 1 000 $\mu$ A	
5 kHz to 10 kHz	1.1 A to 2.99999 A	2 % + 5 000 $\mu$ A	
Equipment to measure AC Current At the listed frequencies <sup>FO</sup>			
45 kHz to 100 Hz	3 A to 10.9999 A	0.12 % + 2 mA	
0.1 kHz to 1 kHz	3 A to 10.9999 A	0.14 % + 2 mA	
1 kHz to 5 kHz	3 A to 10.9999 A	2.4 % + 2 mA	
Equipment to measure AC Current At the listed frequencies <sup>FO</sup>			
45 kHz to 100 Hz	11 A to 20.5 A	0.42 % + 5 mA	
0.1 kHz to 1 kHz	11 A to 20.5 A	0.33 % + 5 mA	
1 kHz to 5 kHz	11 A to 20.5 A	2.4 % + 5 mA	
Equipment to measure AC Current At the listed frequencies <sup>FO</sup>			Fluke 8508A
1 kHz to 10 kHz	2 $\mu$ A to 200 $\mu$ A	0.034 % + 20 nA	
10 kHz to 10 kHz	2 $\mu$ A to 200 $\mu$ A	0.03 % + 20 nA	
10 kHz to 30 kHz	2 $\mu$ A to 200 $\mu$ A	0.03 % + 20 nA	
Equipment to measure AC Voltage At the listed frequencies <sup>FO</sup>			



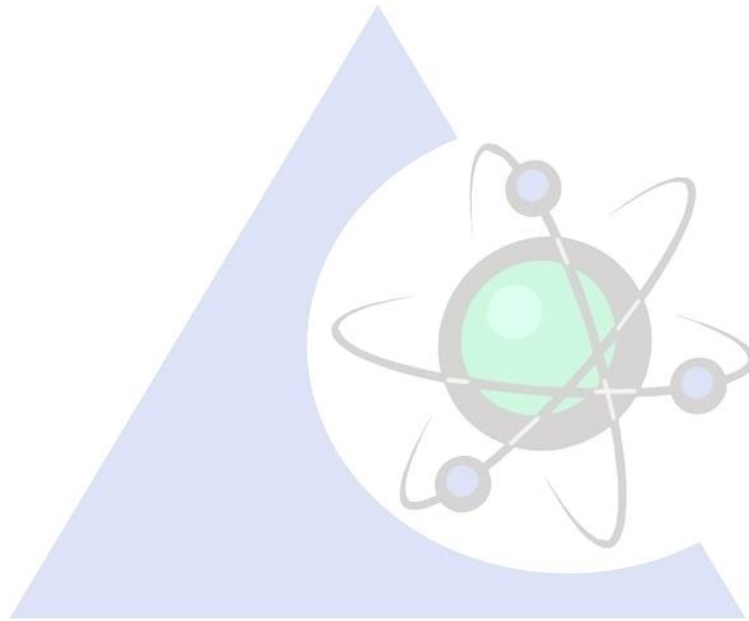
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1 kHz to 10 kHz	200 $\mu$ A to 2 $\mu$ A	0.04 % + 0.2 $\mu$ A	
10 kHz to 10 kHz	200 $\mu$ A to 2 $\mu$ A	0.03 % + 0.2 $\mu$ A	
10 kHz to 30 kHz	200 $\mu$ A to 2 $\mu$ A	0.03 % + 0.2 $\mu$ A	





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Equipment to measure AC Current At the listed frequencies <sup>FO</sup>			Fluke 8508A
1 kHz to 10 kHz	2 mA to 20 mA	0.04 % + 2 $\mu$ A	
10 kHz to 10 kHz	2 mA to 20 mA	0.04 % + 2 $\mu$ A	
10 kHz to 30 kHz	2 mA to 20 mA	0.04 % + 2 $\mu$ A	
Equipment to measure AC Current At the listed frequencies <sup>FO</sup>			
1 kHz to 10 kHz	20 mA to 200 mA	0.04 % + 20 $\mu$ A	
10 kHz to 10 kHz	20 mA to 200 mA	0.03 % + 20 $\mu$ A	
10 kHz to 30 kHz	20 mA to 200 mA	0.07 % + 20 $\mu$ A	
Equipment to measure AC Current At the listed frequencies <sup>FO</sup>			
10 kHz to 2 kHz	200 mA to 2 mA	0.07 % + 0.2 mA	
2 kHz to 10 kHz	200 mA to 2 mA	0.08 % + 0.2 mA	
10 kHz to 30 kHz	200 mA to 2 mA	0.68 % + 0.2 mA	
Equipment to measure AC Current At the listed frequencies			
10 kHz to 2 kHz	2 mA to 20 mA	0.09 % + 0.2 mA	
2 kHz to 10 kHz	2 mA to 20 mA	0.57 % + 0.2 mA	
Equipment to measure AC Capacitance At the listed frequencies <sup>FO</sup>			Fluke 5520A
10 Hz to 10 kHz	0.19 nF to 1.09 nF	0.55 % + 0.01 nF	
10 Hz to 3 kHz	1.1 nF to 3.29 nF	0.43 % + 0.01 nF	
10 Hz to 1 kHz	3.3 nF to 10.9 nF	0.19 % + 0.01 nF	
10 Hz to 1 kHz	11 nF to 109.9 nF	0.19 % + 0.1 nF	
10 Hz to 1 kHz	110 nF to 329.9 nF	0.19 % + 0.3 nF	
Equipment to measure AC Capacitance At the listed frequencies <sup>FO</sup>			
10 Hz to 600 Hz	0.33 $\mu$ F to 1.09 $\mu$ F	0.19 % + 1 nF	
10 Hz to 300 Hz	1.1 $\mu$ F to 3.29 $\mu$ F	0.19 % + 3 nF	
10 Hz to 150 Hz	3.29 $\mu$ F to 10.9 $\mu$ F	0.19 % + 10 nF	
10 Hz to 120 Hz	11 $\mu$ F to 32.9 $\mu$ F	0.31 % + 30 nF	
10 Hz to 80 Hz	33 $\mu$ F to 109.9 $\mu$ F	0.35 % + 100 nF	
10 Hz to 50 Hz	11 $\mu$ F to 329.9 $\mu$ F	0.35 % + 300 nF	
10 Hz to 20 Hz	0.33 $\mu$ F to 1.09 $\mu$ F	0.35 % + 1 $\mu$ F	



# Certificate of Accreditation: Supplement

## The Meter Shop

6934 Signat Drive, Houston Texas  
John Brown Phone: 713-957-8586

Accreditation is granted to the facility to perform the following calibrations:

### Mechanical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY ( $\pm$ )	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Pressure Gauges <sup>FO</sup>	1500 psi to 15 000 psi	0.577 psi $\pm$ 0.00036 PSI	Crystal Xp2i
Torque Wrenches <sup>FO</sup>	4 in·lb to 50 in·lb	0.25 % of reading + 0.18 in·lb	CDI 2000-400-02
	30 in·lb to 400 in·lb	0.25 % of reading + 1.39 in·lb	
	80 in·lb to 1 000 in·lb	0.25% of reading + 3.01 in·lb	
	20ft·lb to 250 ft·lb	0.25% of reading + 0.87 ft·lb	
	60 ft·lb to 600 ft·lb	0.25% of reading + 2.08 ft·lb	CDI 2000-12-02

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represents the smallest measurement uncertainty attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is typically expressed at a confidence level of 95 % using a coverage factor  $k$  (usually equal to 2). The actual measurement uncertainty associated with a specific calibration performed by the laboratory will typically be larger than the CMC for the same calibration since capability and performance of the device being calibrated and the conditions related to the calibration may reasonably be expected to deviate from ideal to some degree.
2. The laboratories range of calibration capability for all disciplines for which they are accredited is the interval from the smallest calibrated standard to the largest calibrated standard used in performing the calibration. The low end of this range must be an attainable value for which the laboratory has or has access to the standard referenced. Verification of an indicated value of zero in the absence of a standard is common practice in the procedure for many calibrations but by its definition it does not constitute calibration of zero capacity.
3. The presence of a superscript FO means that the laboratory performs calibration of the indicated parameter both at its fixed location and onsite at customer locations. Example: Outside Micrometer<sup>FO</sup> would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.
4. Measurement uncertainties obtained for calibrations performed at customer sites can be expected to be larger than the measurement uncertainties obtained at the laboratories fixed location for similar calibrations. This is due to the effects of transportation of the standards and equipment and upon environmental conditions at the customer site which are typically not controlled as closely as at the laboratories fixed location.
5. The term D represents diameter in inches or millimeters as appropriate to the uncertainty statement.



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*Accreditation is granted to the facility to perform the following calibrations:*

6. The term DL represents diagonal length in inches or millimeters as appropriate to the uncertainty statement.

*Note that Diameter and Diagonal both use the same designation "D". This is not a problem unless a laboratory is accredited for both however the usage is common and should be retained when possible and modified in the few cases where a laboratory is accredited for both. In those cases continue to use D for diameter and use DL for Diagonal Length. This note is intended for internal office use only and is to be removed during preparation of draft documents.*

7. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.
8. The term P represents pressure in units appropriate to the uncertainty statement.
9. The term R represents radius in inches or millimeters as appropriate to the uncertainty statement.
10. The term T represents temperature in °C or °F as appropriate to the uncertainty statement.
11. The term T represents torque in N•m (including SI multiple and submultiple units) for the international system of units (the SI) or ozf•in, lbf•in and lbf•ft for the USC system of units.

*Note that temperature and torque both use the same designation "T". This is not a problem unless a laboratory is accredited for both however the usage is common and should be retained when possible and modified in the few cases where a laboratory is accredited for both. In those cases continue to use T for temperature and use Tr for torque. This note is intended for internal office use only and is to be removed during preparation of draft documents.*

12. The term Wt represents weight in pounds or grams (including SI multiple and submultiple units) appropriate to the uncertainty statement.
13. The term "X" preceded by a number represents the number of times a lense system magnifies an image relative to its actual size. CMC stated as "% of magnification" represents the CMC of magnification expressed as a percentage of the total magnification.