



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

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

Cal Tec Labs, Inc.
501 Mansfield Ave., Pittsburgh, PA 15205

(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):

***Dimensional, Electrical, Mechanical, Time & Frequency,
and Thermodynamic 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:

Tracy Szerszen
President/Operations Manager

Initial Accreditation Date:

November 23, 2013

Issue Date:

June 9, 2016

Expiration Date:

June 30, 2018

Revision Date:

April 4, 2017

Accreditation No.:

74269

Certificate No.:

L16-239-R1

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.pjilabs.com



Certificate of Accreditation: Supplement

Cal Tec Labs, Inc.

501 Mansfield Ave., Pittsburgh, PA 15205
 Contact Name: George Urban Phone: 412-919-1377

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

Dimensional

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
Micrometers Outside ^{FO}	0.05 in to 48 in	(50 + 15L) μ in	Gage Blocks, Scherr Tumico End Measuring Rod Standards
Micrometer Depth ^{FO}	0.05 in to 12 in	(95 + 9L) μ in	Gage Blocks Size Control Depth Master
Dial Indicators ^{FO}	0.1 in to 2 in	91 μ in	Mitutoyo Digital Micrometer Head
Calipers ^{FO} (OD, ID, Depth)	0.05 in to 24 in	(250 + 11L) μ in	Size Control Kalmaster Size Control Depth Master
Gage Blocks ^{FO}	0.005 in to 4 in	(2.5 + 3.3L) μ in	Gage Blocks Tesa Module Gage Block Calibrator
Length Standards ^{FO}	1 in to 48 in	(41 + 15L) μ in	Scherr Tumico End Measuring Rod Standards Micrometer Head Dial Indicator
Pin Gages / Pain Plug Gages ^{FO}	0.012 in to 2 in	76 μ in	Master Plug Gage Z- Mike Laser Micrometer
Surface Roughness Gages ^{FO}	16/118 μ L	7.4 μ in	Precision Roughness Specimen
	0.4/3 μ L		
Surface Finish Equipment / Profilometers ^{FO}	16 μ in Ra	3.1 μ in Ra	Mahr Precision Roughness Specimen
	118 μ in Ra		

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 Measure DC Voltage ^{FO}	0 mV to 320 mV	4.16 μ V/V + 35.9 μ V	Fluke 5520A
	320 mV to 3.2 V	41.6 μ V/V + 193 μ V	
	3.2 V to 32 V	41.6 μ V/V + 193 μ V	
	32 V to 320 V	4.48 mV/V + 3.2 mV	
	320 V to 1 000 V	19.95 mV/V + 69 mV	
Equipment to Output DC Voltage ^{FO}	0 mV to 100 mV	1 μ V/V + 7.6 μ V	Agilent 34401A
	100 mV to 1 V	0.6 μ V/V + 4.1 μ V	
	1V to 100 V	0.1 μ V/V + 4.1 μ V	
	10 V to 100 V	0.6 μ V/V + 6.6 μ V	
	100 V to 1 000 V	0.6 μ V/V + 6.6 μ V	



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Equipment to Measure AC Voltage At the Listed Frequencies ^{FO}			Fluke 5520A
10 Hz to 3 kHz	0.4 V to 10 mV	384 μ V/V + 95.2 μ V	
3 kHz to 10 kHz	0.4 V to 10 mV	512 μ V/V + 95.2 μ V	
10 kHz to 30 kHz	0.4 V to 10 mV	960 μ V/V + 95.3 μ V	
30 kHz to 50 kHz	0.4 V to 10 mV	1.96 mV/V + 130.4 μ V	
50 kHz to 100 kHz	0.4 V to 10 mV	5.12 mV/V + 141.5 μ V	
Equipment to Measure AC Voltage At the Listed Frequencies ^{FO}			
10 Hz to 3 kHz	10 mV to 32 mV	96 μ V/V + 95.9 μ V	
3 kHz to 10 kHz	10 mV to 32 mV	128 μ V/V + 95.9 μ V	
10 kHz to 30 kHz	10 mV to 32 mV	240 μ V/V + 96.9 μ V	
30 kHz to 50 kHz	10 mV to 32 mV	480 μ V/V + 133.2 μ V	
50 kHz to 100 kHz	10 mV to 32 mV	1.6 mV/V + 153.9 μ V	
Equipment to Measure AC Voltage At the Listed Frequencies ^{FO}			
10 Hz to 3 kHz	32 mV to 320 mV	19.2 μ V/V + 172 μ V	
3 kHz to 10 kHz	32 mV to 320 mV	25.6 μ V/V + 172 μ V	
10 kHz to 30 kHz	32 mV to 320 mV	48 μ V/V + 214.5 μ V	
30 kHz to 50 kHz	32 mV to 320 mV	96 μ V/V + 316.8 μ V	
50 kHz to 100 kHz	32 mV to 320 mV	256 μ V/V + 655.2 μ V	
Equipment to Measure AC Voltage At the Listed Frequencies ^{FO}			
10 Hz to 3 kHz	320 mV to 3.2 V	192 μ V/V + 114.9 mV	
3 kHz to 10 kHz	320 mV to 3.2 V	256 μ V/V + 114.9 mV	
10 kHz to 30 kHz	320 mV to 3.2 V	480 μ V/V + 97.7 mV	
30 kHz to 50 kHz	320 mV to 3.2 V	960 μ V/V + 131.9 mV	
50 kHz to 100 kHz	320 mV to 3.2 V	2.56 μ V/V + 130.6 mV	
Equipment to Measure AC Voltage At the Listed Frequencies ^{FO}			
10 Hz to 3 kHz	3.2 V to 32 V	1.96 mV/V + 120.9 mV	
3 kHz to 10 kHz	3.2 V to 32 V	2.56 mV/V + 121.7 mV	
10 kHz to 30 kHz	3.2 V to 32 V	4.8 mV/V + 122.7 mV	
30 kHz to 50 kHz	3.2 V to 32 V	9.6 mV/V + 176.7 mV	
50 kHz to 100 kHz	3.2 V to 32 V	9.6 mV/V + 176.7 mV	



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Equipment to Measure AC Voltage At the Listed Frequencies ^{FO}			Fluke 5520A
10 Hz to 3 kHz	32 V to 105 V	6.3 mV/V + 72.4 mV	
3 kHz to 10 kHz	32 V to 105 V	8.4 mV/V + 86.3 mV	
10 kHz to 30 kHz	32 V to 105 V	15.8 mV/V + 102.1 mV	
30 kHz to 50 kHz	32 V to 105 V	31.5 mV/V + 175.5 mV	
50 kHz to 100 kHz	32 V to 105 V	105 mV/V + 383.6 mV	
Equipment to Measure AC Voltage At the Listed Frequencies ^{FO}			
40 Hz to 1 kHz	105 V to 320 V	19.2 mV/V + 678.7 mV	
1 kHz to 3 kHz	105 V to 320 V	19.2 mV/V + 743.9 mV	
3 kHz to 10 kHz	105 V to 320 V	32 mV/V + 307.8 mV	
10 kHz to 20 kHz	105 V to 320 V	48 mV/V + 471.4 mV	
20 kHz to 30 kHz	105 V to 320 V	64 mV/V + 517.9 mV	
Equipment to Measure AC Voltage At the Listed Frequencies ^{FO}			
40 Hz to 1 kHz	320 V to 800 V	63 mV/V + 2.3 V	
1 kHz to 3 kHz	320 V to 800 V	63 mV/V + 2.5 V	
3 kHz to 10 kHz	320 V to 800 V	105 mV/V + 3.2 V	
10 kHz to 20 kHz	320 V to 800 V	158 mV/V + 3.4 V	
20 kHz to 30 kHz	320 V to 800 V	210 mV/V + 3.6 V	
Equipment to Measure AC Voltage At the Listed Frequencies ^{FO}			
40 Hz to 1 kHz	800 V to 1 050 V	126 mV/V + 2.6 V	
1 kHz to 3 kHz	800 V to 1 050 V	126 mV/V + 2.8 V	
3 kHz to 10 kHz	800 V to 1 050 V	210 mV/V + 2 V	
10 kHz to 20 kHz	800 V to 1 050 V	315 mV/V + 2.4 V	
Equipment to Output AC Voltage At the Listed Frequencies ^{FO}			Agilent 34401A
1 Hz to 10 Hz	1 mV to 100 mV	70 μ V/V + 123 μ V	
10 Hz to 40 Hz	1 mV to 100 mV	20 μ V/V + 123 μ V	
40 Hz to 100 Hz	1 mV to 100 mV	20 μ V/V + 105 μ V	
100 Hz to 2 kHz	1 mV to 100 mV	10 mV/V + 104 μ V	
2 kHz to 10 kHz	1 mV to 100 mV	20 mV/V + 103 μ V	
10 kHz to 30 kHz	1 mV to 100 mV	40 mV/V + 304 μ V	
30 kHz to 100 kHz	1 mV to 100 mV	100 mV/V + 706 μ V	



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Equipment to Output AC Voltage At the Listed Frequencies ^{FO}			Agilent 34401A
1 Hz to 10 Hz	1 mV to 100 mV	70 μ V/V + 123 μ V	
10 Hz to 40 Hz	1 mV to 100 mV	20 μ V/V + 123 μ V	
40 Hz to 100 Hz	1 mV to 100 mV	20 μ V/V + 105 μ V	
100 Hz to 2 kHz	1 mV to 100 mV	10 mV/V + 104 μ V	
2 kHz to 10 kHz	1 mV to 100 mV	20 mV/V + 103 μ V	
10 kHz to 30 kHz	1 mV to 100 mV	40 mV/V + 304 μ V	
30 kHz to 100 kHz	1 mV to 100 mV	100 mV/V + 706 μ V	
Equipment to Output AC Voltage At the Listed Frequencies ^{FO}			
1 Hz to 10 Hz	1 V to 100 V	60 μ V/V + 105 μ V	
10 Hz to 40 Hz	1 V to 100 V	10 μ V/V + 104 μ V	
40 Hz to 100 Hz	1 V to 100 V	10 μ V/V + 82 μ V	
100 Hz to 2 kHz	1 V to 100 V	10 mV/V + 63 μ V	
2 kHz to 10 kHz	1 V to 100 V	10 mV/V + 82 μ V	
10 kHz to 30 kHz	1 V to 100 V	20 mV/V + 201 μ V	
30 kHz to 100 kHz	1 V to 100 V	100 mV/V + 501 μ V	
Equipment to Output AC Voltage At the Listed Frequencies ^{FO}			
100 kHz to 300 kHz	1 V to 100 V	1.22 % range + 0.45 % reading	
300 kHz to 1 MHz	1 V to 100 V	3.06 % range + 1.41 % reading	
Equipment to Output AC Voltage At the Listed Frequencies ^{FO}			
1 Hz to 10 Hz	100 V to 1 000 V	104 μ V + 70 μ V/V	
10 Hz to 40 Hz	100 V to 1 000 V	104 μ V + 20 μ V/V	
40 Hz to 10 kHz	100 V to 1 000 V	85 μ V + 20 μ V/V	
10 kHz to 30 kHz	100 V to 1 000 V	284 μ V + 40 mV/V	
30 kHz to 100 kHz	100 V to 1 000 V	539 μ V + 200 mV/V	



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Temperature Calibration, Indication and Control Equipment used with Thermocouple Type E ^{FO}	-250 °C to 1 000 °C	1.9 °C	Fluke 5520A
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type J ^{FO}	-210 °C to 1 200 °C	1.9 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type K ^{FO}	-250 °C to 1 372 °C	2 °C	
Temperature Calibration, Indication and Control Equipment used with Thermocouple Type T ^{FO}	-250 °C to 400 °C	2 °C	
Equipment to Measure Resistance ^{FO}	100 m Ω to 40 Ω	500 $\mu\Omega/\Omega$ + 70 m Ω	
	40 Ω to 4 k Ω	150 $\mu\Omega/\Omega$ + 104 m Ω	
	4 k Ω to 40 k Ω	150 $\mu\Omega/\Omega$ + 802 m Ω	
	40 k Ω to 400 k Ω	180 $\mu\Omega/\Omega$ + 71 Ω	
	400 k Ω to 4 M Ω	200 $\mu\Omega/\Omega$ + 266 Ω	
	4 M Ω to 40 M Ω	500 $\mu\Omega/\Omega$ + 142 k Ω	
	40 M Ω to 400 M Ω	608 $\mu\Omega/\Omega$ + 161 k Ω	
Equipment to Output Resistance ^{FO}	50 m Ω to 10 Ω	2 $\mu\Omega/\Omega$ + 13 $\mu\Omega$	
	10 Ω to 100 Ω	3 $\mu\Omega/\Omega$ + 9 $\mu\Omega$	
	100 Ω to 1 k Ω	0.8 m $\Omega/k\Omega$ + 7 m Ω	
	1 k Ω to 10 k Ω	0.8 m $\Omega/k\Omega$ + 7 m Ω	
	10 k Ω to 100 k Ω	0.8 m $\Omega/k\Omega$ + 7 m Ω	
	100 k Ω to 1 M Ω	1.2 $\Omega/M\Omega$ + 12 Ω	
	1 M Ω to 10 M Ω	20 $\Omega/M\Omega$ + 13 Ω	
	10 M Ω to 100 M Ω	200 $\Omega/M\Omega$ + 47 Ω	
	100 M Ω to 1 G Ω	200 $\Omega/M\Omega$ + 47 Ω	



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Equipment to Measure DC Current ^{FO}	3.2 μ A to 32 μ A	11 mA/A + 500 mA	Fluke 5520A	
	32 μ A to 320 μ A	83 mA/A + 71 μ A		
	320 μ A to 3.2 mA	900 mA/A + 84 μ A		
	3.2 mA to 32 mA	9.6 μ A/A + 519 μ A		
	32 mA to 320 mA	118 μ A/A + 122 mA		
	0.32 A to 3.2 A	940 μ A/A + 107 mA		
	3.2 A to 10.5 A	4.5 mA/A + 142 mA		
	10.5 A to 20 A	2 % of reading		
Equipment to Output DC Current ^{FO}	20 A to 750 A	2 % of reading	Agilent 34401A	
	80 μ A to 100 μ A	2 μ A/A + 26 μ A		
	100 μ A to 1 mA	2 μ A/A + 26 μ A		
	1 mA to 10 mA	2 μ A/A + 26 μ A		
Equipment to Measure AC Current At the Listed Frequencies ^{FO}	10 mA to 100 mA	5 μ A/A + 51 μ A	Fluke 5520A	
	100 mA to 1 A	10 μ A/A + 151 μ A		
	10 Hz to 3 kHz	1 mA to 32 mA		3.2 μ A/A + 258 μ A
	3 kHz to 10 kHz	1 mA to 32 mA		6.4 μ A/A + 455 μ A
	10 kHz to 20 kHz	1 mA to 32 mA		12.8 μ A/A + 461 μ A
Equipment to Measure AC Current At the Listed Frequencies ^{FO}	20 kHz to 30 kHz	1 mA to 32 mA	22 μ A/A + 521 μ A	
	10 Hz to 3 kHz	32 mA to 320 mA	32 μ A/A + 758 μ A	
	3 kHz to 10 kHz	32 mA to 320 mA	48 μ A/A + 820 μ A	
Equipment to Measure AC Current At the Listed Frequencies ^{FO}	10 kHz to 20 kHz	32 mA to 320 mA	64 μ A/A + 768 μ A	
	20 kHz to 30 kHz	32 mA to 320 mA	96 μ A/A + 859 μ A	
Equipment to Measure AC Current At the Listed Frequencies ^{FO}	10 Hz to 3 kHz	320 mA to 3.2 A	480 μ A/A + 210 mA	
	3 kHz to 10 kHz	320 mA to 3.2 A	2.56 mA/A + 460 mA	
	10 Hz to 3 kHz	3.2 A to 10.5 A	3 mA/A + 320 mA	
Equipment to Measure AC Current At the Listed Frequencies ^{FO}	3 kHz to 10 kHz	3.2 A to 10.5 A	10 mA/A + 593 mA	



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Equipment to Measure AC Current At the Listed Frequencies ^{FO}			Fluke 5520A	
10 Hz to 3 kHz	10.5 A to 20 A	6.9 mA/A + 472 mA		
3 kHz to 10 kHz	10.5 A to 20 A	23 mA/A + 602 mA		
Equipment to Measure AC Current At the Listed Frequencies ^{FO}				
10 Hz to 30 kHz	20 A to 750 A	1.7 % of reading	Agilent 34401A	
Equipment to Output AC Current At the Listed Frequencies ^{FO}				
10 Hz to 5 kHz	1 mA to 10 mA	100 μ A/A + 216 μ A		
10 Hz to 5 kHz	10 mA to 100 mA	100 μ A/A + 216 μ A		
10 Hz to 1 kHz	100 mA to 1 A	200 μ A/A + 508 μ A		
Bandwidth ^{FO} At 50 kHz Reference 6 div	50 kHz to 600 MHz	5.1 % of reading		Fluke 5502a/sc600
Time Marker Output ^{FO}	2 ns to 100 ms	3.9 % of reading		
Amplitude ^{FO}	5 mV to 5.5 V _{p-p}	2.3 % of reading		

Mass, Force, and Weighing Devices

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
Balances ^O	1 g to 10 kg	260 mg	NIST Handbook 105-1 (Class F) Test Weights

Mechanical

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Pressure ^{FO}	5 psig to 300 psig	1.4 psig	Portable Pressure Calibrator (Druck DPI610PC)
	100 psi to 10 000 psi	0.82 % of reading	Deadweight Pressure System (Mansfield & Green T-100)
Torque ^{FO}	10 ft•lb to 100 ft•lb	1.1 ft•lb	Torque Calibrator Mark-10 Mtt03-100 SNAP-ON 10002-1-DTT
	60 ft•lb to 600 ft•lb	4.6 ft•lb	Torque Calibrator Mark-10 Mtt03-100 SNAP-ON 10002-1-DTT



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Torque Wrench ^{FO}	5 lbf•in to 25 lbf•in	1.3 lbf•in	Mark-10 TT02
	20 lbf•in to 100 lbf•in	1.8 lbf•in	Mark-10 TT03
	100 lbf•in to 200 lbf•in	3.9 lbf•in	CDI 10002-I-DTT
	200 lbf•in to 600 lbf•in	5 lbf•in	
	600 lbf•in to 1 000 lbf•in	6 lbf•in	
	60 lbf•ft to 300 lbf•ft	2 lbf•ft	CDI 6004-F-DTT
	300 lbf•ft to 600 lbf•ft	3.6 lbf•ft	

Time and Frequency

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Equipment to Measure Frequency ^{FO}	10 Hz to 100 Hz	0.15 Hz	Fluke 5520A	
	100 Hz to 1 kHz	0.16 Hz		
	1 kHz to 10 kHz	0.6 Hz		
	10 kHz to 100 kHz	6 Hz		
	100 kHz to 1 MHz	6 kHz		
	1 MHz to 10 MHz	6 kHz		Hewlett Packard 8648C Signal Generator
	10 MHz to 100 MHz	6 kHz		
	100 MHz to 300 MHz	6 kHz		
Equipment to Measure Frequency ^{FO}	1 MHz to 10 MHz	62 Hz	Tektronix FCA 3003 Timer/Counter/Analyzer	
	10 MHz to 100 MHz	610 Hz		
	100 MHz to 500 MHz	3.1 kHz		
	500 MHz to 1 GHz	6.1 kHz		
	1 GHz to 2 GHz	13 kHz		
	1 GHz to 3.2 GHz	13 kHz		
	10 Hz to 100 Hz	0.15 Hz		
	100 Hz to 1 kHz	0.16 Hz		
	1 kHz to 10 kHz	0.6 Hz		
	10 kHz to 100 kHz	6 Hz		
	100 kHz to 1 MHz	6 kHz		
	1 MHz to 10 MHz	6 kHz		
	10 MHz to 100 MHz	6 kHz		
	100 MHz to 300 MHz	6 kHz		



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Equipment to Measure Frequency ^{FO}	1 MHz to 10 MHz	62 Hz	Tektronix FCA 3003 Timer/Counter/Analyzer
	10 MHz to 100 MHz	610 Hz	
	100 MHz to 500 MHz	3.1 kHz	
	500 MHz to 1 GHz	6.1 kHz	
	1 GHz to 2 GHz	13 kHz	

Thermodynamics

Equipment to Measure Temperature ^{FO}	0 °C to 150 °C	1.6 °C	Fluke 725 Dry Block Calibrator Omega PT100-385 Temperature Probe
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- The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represent the smallest measurement uncertainties attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is 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.
- 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.
- The presence of a superscript ^O means that the laboratory performs calibration of the indicated parameter onsite at customer locations. Example: Outside Micrometer^O would mean that the laboratory performs this calibration onsite at the customer's location.
- 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^{FO} would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.
- 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.
- The term L represents length in inches or millimeters as appropriate to the uncertainty statement.