



# CERTIFICATE OF ACCREDITATION

## ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

**Accu-Chek, Inc.**

**1015 Old Forest Road**

**Corydon, IN 47112**

**(and satellite location as listed on the scope)**

has been assessed by ANAB

and meets the requirements of international standard

**ISO/IEC 17025:2005**

and national standard

**ANSI/NCSL Z540-1-1994 (R2002)**

while demonstrating technical competence in the fields of

**CALIBRATION & TESTING**

Refer to the accompanying Scope of Accreditation for information regarding the types of calibrations/tests to which this accreditation applies.

ACT-1317

Certificate Number

  
ANAB Approval

Certificate Valid: 02/27/2018-03/01/2020

Version No. 005 Issued: 02/27/2018



This laboratory 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 (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 AND ANSI/NCSL Z540-1-1994 (R2002)

Accu-Chek, Inc.
1015 Old Forest Road
Corydon, IN 47112

President: Don Smith Email: Donald.Smith@aciquality.com Phone: 812-734-1234, ext. 113
Quality Manager: David Smith Email: David.Smith@aciquality.com Phone: 812-734-1234, ext. 112

Satellite Location
11145 Luscek Drive
Cincinnati, OH 45241

Lead Technician: Dennis Gill Email: Dennis.Gill@aciquality.com Phone: 513-489-1113

CALIBRATION AND TESTING

Valid to: March 1, 2020

Certificate Number: ACT-1317

Calibration

Chemical Quantities

Table with 4 columns: Parameter/Equipment, Range, Expanded Uncertainty of Measurement (+/-), Reference Standard, Method, and/or Equipment. Rows include pH Meters and Refractometers.

Electrical – DC/Low Frequency

Table with 4 columns: Parameter/Equipment, Range, Expanded Uncertainty of Measurement (+/-), Reference Standard, Method, and/or Equipment. Row includes DC Voltage - Source.



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage - Measure	(10 to 100) mV	3.3 $\mu$ V/V + 0.74 $\mu$ V	Precision Digital Multimeter
	100 mV to 1 V	2.1 $\mu$ V/V + 1.3 $\mu$ V	
	(1 to 10) V	2.4 $\mu$ V/V + 5.8 $\mu$ V	
	(10 to 100) V	3.8 $\mu$ V/V + 96 $\mu$ V	
	100 V to 1 kV	14 $\mu$ V/V - 1.1 mV	
DC High Voltage - Measure	Up to 6 kV	5.8 mV/V + 6.1 V	DMM, HV Probe
	Up to 40 kV	30 mV/V	
DC Current - Source	Up to 330 $\mu$ A	0.12 $\mu$ A/A + 16 nA	Multi-Product Calibrator with 50 Turn Coil
	330 $\mu$ A to 3.3 mA	74 nA/A + 60 nA	
	(3.3 to 33) mA	77 nA/A + 0.2 $\mu$ A	
	(33 to 330) mA	80 nA/A + 3.1 $\mu$ A	
	330 mA to 1.1 A	0.16 mA/A + 32 $\mu$ A	
	(1.1 to 3) A	0.3 mA/A + 31 $\mu$ A	
	(3 to 11) A	0.39 mA/A + 0.39 mA	
	(11 to 20) A	1 mA/A + 0.75 mA	
	(20 to 200) A	7.8 mA/A + 0.36 A	
	200 A to 1 kA	3.9 mA/A + 0.51 A	
DC Current - Measure	Up to 100 nA	0.58 nA	Precision Digital Multimeter
	100 nA to 1 $\mu$ A	0.58 nA	
	(1 to 10) $\mu$ A	0.59 nA	
	(10 to 100) $\mu$ A	0.77 nA	
	100 $\mu$ A to 1 mA	8.4 nA/A + 7.1 nA	
	(1 to 10) mA	8.4 nA/A + 71 nA	Precision Digital Multimeter w/ Shunt
	(10 to 100) mA	18 nA/A + 0.68 $\mu$ A	
	100 mA to 1 A	66 $\mu$ A/A + 9.6 $\mu$ A	
	(1 to 60) A	0.6 mA/A	Clamp-on Meter
	(60 to 1 000) A	15 mA/A + 2 A	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
Resistance - Source	Up to 11 Ω	15 μΩ/Ω + 0.96 mΩ	Multi-Product Calibrator	
	(11 to 33) Ω	23 μΩ/Ω + 1.2 mΩ		
	(33 to 110) Ω	22 μΩ/Ω + 1.1 mΩ		
	(110 to 330) Ω	22 μΩ/Ω + 1.6 mΩ		
	330 Ω to 1.1 kΩ	22 μΩ/Ω + 1.6 mΩ		
	(1.1 to 3.3) kΩ	25 μΩ/Ω + 16 mΩ		
	(3.3 to 11) kΩ	22 μΩ/Ω + 16 mΩ		
	(11 to 33) kΩ	22 μΩ/Ω + 0.16Ω		
	(33 to 110) kΩ	22 μΩ/Ω + 0.16Ω		
	(110 to 330) kΩ	25 μΩ/Ω + 1.6 Ω		
	330 kΩ to 1.1 MΩ	25 μΩ/Ω + 1.6 Ω		
Resistance - Source	(1.1 to 3.3) MΩ	47 μΩ/Ω + 24 Ω	Multi-Product Calibrator	
	(3.3 to 11) MΩ	0.1 mΩ/Ω + 39 Ω		
	(11 to 33) MΩ	0.2 mΩ/Ω + 1.9 kΩ		
	(33 to 110) MΩ	0.39 mΩ/Ω + 2.3 kΩ		
Resistance - Measure	(110 to 330) MΩ	2.3 mΩ/Ω + 78 kΩ	Precision Digital Multimeter	
	330 MΩ to 1.1 GΩ	12 mΩ/Ω + 0.38 MΩ		
	Up to 10 Ω	0.6 mΩ/Ω + 94 μΩ		
	(10 to 100) Ω	7.9 μΩ/Ω + 0.43 mΩ		
	100 Ω to 1 kΩ	6.6 μΩ/Ω + 0.92 mΩ		
Electrical Simulation of Thermocouple Devices	(1 to 10) kΩ	6.6 μΩ/Ω + 9.3 mΩ	Multi-Product Calibrator	
	(10 to 100) kΩ	6.6 μΩ/Ω + 0.13 Ω		
	100 kΩ to 1 MΩ	10 μΩ/Ω + 2.5 Ω		
	(1 to 10) MΩ	33 μΩ/Ω + 0.12 kΩ		
	(10 to 100) MΩ	0.32 mΩ/Ω + 8.5 kΩ		
	100 MΩ to 1 GΩ	3.3 mΩ/Ω + 0.24 MΩ		
	Type B			
	(600 to 800) °C	0.34 °C		
	(800 to 1 000) °C	0.27 °C		
	(1 000 to 1 550) °C	0.23 °C		
(1 550 to 1 820) °C	0.26 °C			
Type C				
(0 to 150) °C	0.23 °C			
(150 to 650) °C	0.2 °C			
(650 to 1 000) °C	0.24 °C			
(1 000 to 1 800) °C	0.39 °C			
(1 800 to 2 316) °C	0.66 °C			

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Devices	Type E		Multi-Product Calibrator
	(-250 to -100) °C	0.39 °C	
	(-100 to 650) °C	0.12 °C	
	(650 to 1 000) °C	0.16 °C	
	Type J		
	(-210 to -100) °C	0.21 °C	
	(-100 to 760) °C	0.13 °C	
	(760 to 1 200) °C	0.18 °C	
	Type K		
	(-200 to -100) °C	0.26 °C	
	(-100 to 120) °C	0.14 °C	
	(120 to 1 000) °C	0.2 °C	
	(1 000 to 1 372) °C	0.31 °C	
	Type N		
	(-250 to -100) °C	0.31 °C	
	(-100 to -25) °C	0.17 °C	
	(-25 to 410) °C	0.15 °C	
	(410 to 1 300) °C	0.21 °C	
	Type R		
	(0 to 250) °C	0.44 °C	
	(250 to 400) °C	0.27 °C	
	(400 to 1 000) °C	0.26 °C	
	(1 000 to 1 767) °C	0.31 °C	
	Type S		
(0 to 250) °C	0.37 °C		
(250 to 1 400) °C	0.28 °C		
(1 400 to 1 767) °C	0.36 °C		
Type T			
(-250 to -150) °C	0.49 °C		
(-150 to 0) °C	0.19 °C		
(0 to 120) °C	0.12 °C		
(120 to 400) °C	0.11 °C		
Type U			
(-200 to 0) °C	0.43 °C		
(0 to 600) °C	0.21 °C		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Devices	Cu 427, 10 Ω (-100 to 260) °C	0.24 °C	Multi-Product Calibrator
	Pt 385, 100 Ω (-200 to 0) °C	0.003 6 %X + 0.08 °C	
	(0 to 100) °C	0.009 6 %X + 0.08 °C	
	(100 to 400) °C	0.003 3 %X + 0.09 °C	
	(400 to 630) °C	0.11 °C	
	(630 to 800) °C	-0.002 4 %X + 0.21 °C	
	Pt 385, 200 Ω (-200 to 0) °C	0.008 %X + 0.08 °C	
	(0 to 260) °C	0.008 %X + 0.08 °C	
	(260 to 400) °C	0.016 %X + 0.09 °C	
	(400 to 630) °C	0.004 1 %X + 0.14 °C	
	Pt 385, 500 Ω (-200 to 260) °C	0.002 2 %X + 0.07 °C	
	(260 to 400) °C	0.004 7 %X + 0.08 °C	
	(400 to 630) °C	0.006 4 %X + 0.07 °C	
	Pt 385, 1000 Ω (-200 to 260) °C	0.002 4 %X + 0.07 °C	
	(260 to 400) °C	0.009 8 %X + 0.05 °C	
	(400 to 600) °C	0.08 °C	
	(600 to 630) °C	0.19 °C	
	Pt 3916, 100 Ω (-200 to -190) °C	0.007 3 %X + 0.22 °C	
	(-190 to 100) °C	0.07 °C	
	(100 to 400) °C	0.005 7 %X + 0.07 °C	
	(400 to 600) °C	-0.002 3 %X + 0.11 °C	
	(600 to 630) °C	0.019 %X + 0.07 °C	
	Pt 3926, 100 Ω (-200 to 0) °C	-0.003 2 %X + 0.07 °C	
	(0 to 100) °C	0.008 6 %X + 0.08 °C	
	(100 to 400) °C	0.004 5 %X + 0.09 °C	
	(400 to 630) °C	0.12 %X °C	
	PtNi 385, 120 Ω (-80 to 100) °C	0.09 °C	
	(100 to 260) °C	-0.003 4 %X + 0.13 °C	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Source	(1 to 33) mV		Multi-Product Calibrator
	(10 to 45) Hz	47 nV/V + 9.1 μV	
	45 Hz to 10 kHz	48 nV/V + 5.8 μV	
	(10 to 20) kHz	1.4 nV/V + 6.2 μV	
	(20 to 50) kHz	12 μV	
	(50 to 100) kHz	36 μV	
	(100 to 500) kHz	0.1 mV	
	(33 to 330) mV		
	(10 to 45) Hz	-10 nV/V + 15 μV	
	45 Hz to 10 kHz	10 μV	
	(10 to 20) kHz	11 μV	
	(20 to 50) kHz	16 μV	
	(50 to 100) kHz	47 μV	
	(100 to 500) kHz	0.11 mV	
	330 mV to 3.3 V		
	(10 to 45) Hz	-86 nV/V + 120 μV	
	45 Hz to 10 kHz	87 μV	
	(10 to 20) kHz	98 μV	
	(20 to 50) kHz	-0.74 nV/V + 0.12 mV	
	(50 to 100) kHz	-0.21 nV/V + 0.29 mV	
	(100 to 500) kHz	1.1 mV	
	(3.3 to 33) V		
	(10 to 45) Hz	-0.61 μV/V + 1.3 mV	
	45 Hz to 10 kHz	2.5 nV/V + 0.87 mV	
	(10 to 20) kHz	-32 nV/V + 1.1 mV	
	(20 to 50) kHz	-1.9 nV/V + 1.4 mV	
	(50 to 100) kHz	0.21 nV/V + 3.7 mV	
	(33 to 330) V		
(10 to 45) Hz	0.11 mV/V + 5.6 mV		
45 Hz to 10 kHz	-0.36 μV/V + 11 mV		
(10 to 20) kHz	-0.13 μV/V + 13 mV		
(20 to 50) kHz	-0.1 mV/V + 95 mV		
(50 to 100) kHz	2 mV/V + 50 mV		
330 V to 1.02 kV			
45 Hz to 10 kHz	75 μV/V + 89 mV		





Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Measure	(1 to 10) mV		Precision Digital Multimeter
	(1 to 40) Hz	-31 nV/V + 3.3 μV	
	40 Hz to 1 kHz	-1.1 nV/V + 2.1 μV	
	(1 to 20) kHz	-3.9 nV/V + 1.6 μV	
	(20 to 50) kHz	0.36 nV/V + 2.7 μV	
	(50 to 100) kHz	1.9 nV/V + 7.5 μV	
	(100 to 300) kHz	5.5 μV	
	(10 to 100) mV		
	(1 to 40) Hz	0.11 μV/V + 3.3 μV	
	40 Hz to 1 kHz	-2.6 nV/V + 5.8 μV	
	(1 to 20) kHz	2.3 nV/V + 4 μV	
	(20 to 50) kHz	1.8 nV/V + 8 μV	
	(50 to 100) kHz	8.5 nV/V + 12 μV	
	(100 to 300) kHz	59 μV	
	(0.3 to 1) MHz	0.1 mV	
	(1 to 2) MHz	15 mV/V + 10 μV	
	100 mV to 1 V		
	(1 to 40) Hz	-0.35 μV/V + 39 μV	
	40 Hz to 1 kHz	-0.47 nV/V + 25 μV	
	(1 to 20) kHz	30 μV	
	(20 to 50) kHz	42 μV	
	(50 to 100) kHz	80 μV	
	(100 to 300) kHz	0.31 mV	
	300 kHz to 1 MHz	0.87 mV	
(1 to 2) MHz	15 mV/V + 10 μV		
(1 to 10) V			
(1 to 40) Hz	-6.5 μV/V + 0.56 mV		
40 Hz to 1 kHz	0.24 mV		
(1 to 20) kHz	-3 nV/V + 0.29mV		
(20 to 50) kHz	1.2 nV/V + 0.44 mV		
(50 to 100) kHz	-0.23 nV/V + 0.81 mV		
(100 to 300) kHz	5.8 mV		
300 kHz to 1 MHz	8.7 mV		
(1 to 2) MHz	15 mV/V + 10 μV		







Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Measure	(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 300 kHz to 1 MHz	12 nV/V + 3.4 mV 0.26 nV/V + 3.5 mV 0.26 nV/V + 3.5 mV 12 nV/V + 4.8 mV -2.2 nV/V + 11 mV 4 mV/V + 10 mV 15 mV/V + 10 mV	Precision Digital Multimeter
	(100 to 700) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 200) kHz (20 to 50) kHz (50 to 100) kHz	0.40 mV/V + 40 mV -0.45 nV/V + 47 mV 0.6 mV/V + 20 mV 1.3 mV/V + 20 mV 3 mV/V + 20 mV	
	Up to 6 kV Up to 500 Hz Up to 6 kV 500 Hz to 1 kHz Up to 40 kV 60 Hz	6.3mV/V + 6.7 mV 30 mV/V 75 mV/V	DMM, HV Probe
AC Current - Source	(29 to 330) $\mu$ A (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 330 $\mu$ A 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 (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	1.7 $\mu$ A/A + 58 nA 1.2 $\mu$ A/A + 78 nA 0.97 $\mu$ A/A + 78 nA 2.3 $\mu$ A/A + 0.12 $\mu$ A 6.2 $\mu$ A/A + 0.15 $\mu$ A 16 mA/A + 0.4 $\mu$ A 1.6 $\mu$ A/A + 0.12 $\mu$ A 0.97 $\mu$ A/A + 0.12 $\mu$ A 0.77 $\mu$ A/A + 0.12 $\mu$ A 1.6 $\mu$ A/A + 0.15 $\mu$ A 3.9 $\mu$ A/A + 0.23 $\mu$ A 10 mA/A + 0.6 $\mu$ A 1.4 $\mu$ A/A + 1.6 $\mu$ A 0.7 $\mu$ A /A + 1.5 $\mu$ A 0.31 $\mu$ A /A + 1.5 $\mu$ A 0.62 $\mu$ A /A + 1.5 $\mu$ A 1.6 $\mu$ A/A + 2.3 $\mu$ A 4 mA/A + 4 $\mu$ A	Multi-Product Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current - Source	(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 330 mA to 3 A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (3 to 11) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.4 mA/A + 16 $\mu$ A 0.7 mA /A + 16 $\mu$ A 0.31 mA /A + 16 $\mu$ A 0.77 mA/A + 39 $\mu$ A 1.6 mA/A + 78 $\mu$ A 4 mA/A + 0.2 mA 1.4 mA/A + 80 $\mu$ A 0.34 mA /A + 0.45 mA 5.5 mA/A – 1.7 mA 25 mA/A + 5 mA 0.6 mA/A + 2 mA 1 mA/A + 2 mA 30 mA/A + 2 mA 1.2 mA/A + 5 mA 1.5 mA/A + 5 mA 30 mA/A + 5 mA	Multi-Product Calibrator
AC Current - Source Clamp On Ammeters	(20 to 40) A (45 to 400) Hz (40 to 400) A (45 to 400) Hz 400 A to 1 kA (45 to 100) Hz	0.28 mA/A + 0.29 mA 6.1 mA/A + 0.11 A 4.4 mA/A + 0.77 A	Multi-Product Calibrator with 50 turn coil
AC Current – Measure	(5 to 100) $\mu$ A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz 100 $\mu$ A to 1 mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	2.7 nA/A + 21 nA 1 nA/A + 21 nA 0.39 nA/A + 22 nA 0.39 nA/A + 22 nA 2.7 $\mu$ A/A + 0.15 $\mu$ A 0.99 $\mu$ A/A + 0.15 $\mu$ A 0.38 $\mu$ A/A + 0.16 $\mu$ A 0.19 $\mu$ A/A + 0.16 $\mu$ A 0.38 $\mu$ A/A + 0.16 $\mu$ A 2.7 $\mu$ A/A + 0.28 $\mu$ A 6 mA/A + 1.5 $\mu$ A	Precision Digital Multimeter

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment		
AC Current – Measure	(1 to 10) mA		Precision Digital Multimeter		
	(10 to 20) Hz	2.7 $\mu$ A/A + 1.4 $\mu$ A			
	(20 to 45) Hz	0.99 $\mu$ A/A + 1.5 $\mu$ A			
	(45 to 100) Hz	0.38 $\mu$ A/A + 1.6 $\mu$ A			
	100 Hz to 5 kHz	0.19 $\mu$ A/A + 1.6 $\mu$ A			
	(5 to 20) kHz	0.38 $\mu$ A/A + 1.6 $\mu$ A			
	(20 to 50) kHz	2.7 $\mu$ A/A + 2.7 $\mu$ A			
	(50 to 100) kHz	6 mA/A + 15 $\mu$ A			
	(10 to 100) mA				
	(10 to 20) Hz	2.7 $\mu$ A/A + 15 $\mu$ A			
	(20 to 45) Hz	0.99 $\mu$ A/A + 15 $\mu$ A			
	(45 to 100) Hz	0.38 $\mu$ A/A + 16 $\mu$ A			
	100 Hz to 5 kHz	0.19 $\mu$ A/A + 16 $\mu$ A			
	(5 to 20) kHz	0.38 $\mu$ A/A + 16 $\mu$ A			
	(20 to 50) kHz	2.7 $\mu$ A/A + 28 $\mu$ A			
(50 to 100) kHz	6 mA/A + 0.15 mA				
100 mA to 1 A	(10 to 20) Hz	2.7 mA/A + 0.15 mA	Clamp-on Meter		
	(20 to 45) Hz	1.1 mA/A + 0.16 mA			
	(45 to 100) Hz	0.51 mA/A + 0.16 mA			
	100 Hz to 1 kHz	0.65 mA/A + 0.16 mA			
	(5 to 20) kHz	2 mA/A + 0.15 mA			
	(20 to 50) kHz	10 mA/A + 0.4 mA			
	20 A to 2 kA	(60 to 100) Hz		53 mA/A + 4.5 A	
	Capacitance - Source	(190 to 400) pF		5 mF/F + 1 pF	Multi-Product Calibrator
		400 pF to 1.1 nF		4 mF/F	
(1.1 to 3.3) nF		3.6 mF/F			
(3.3 to 11) nF		1.9 mF/F			
(11 to 33) nF		1.7 mF/F			
(33 to 110) nF		1.9 mF/F			
(110 to 330) nF		1.4 mF/F + 0.57 nF			
330 nF to 1.1 $\mu$ F		1.9 mF/F + 0.91 nF			
(1.3 to 3.3) $\mu$ F		1.5 mF/F + 5.6 nF			
(3.3 to 11) $\mu$ F		2 mF/F + 8.8 nF			
(11 to 33) $\mu$ F		2.6 mF/F + 53 nF			
(33 to 110) $\mu$ F		3.4 mF/F + 88 nF			
(110 to 330) $\mu$ F		2.9 mF/F + 0.52 $\mu$ F			



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance - Source	330 $\mu$ F to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	3.4 mF/F + 0.88 $\mu$ F 3.2 mF/F + 4.9 $\mu$ F 3.7 mF/F + 8 $\mu$ F 11 mF/F - 20 $\mu$ F 27 mF/F + 0.53 mF	Multi-Product Calibrator
Oscilloscopes Amplitude DC Signal: 50 $\Omega$	(1 to 25) mV (25 to 110) mV 110 mV to 2.2 V (2.2 to 6.6) V	2.3 mV/V + 30 $\mu$ V 2 mV/V + 35 $\mu$ V 2.2 mV/V - 0.63 $\mu$ V 1.8 mV/V + 0.91mV	Multi-Product Calibrator
1 M $\Omega$	(1 to 25) mV (25 to 110) mV 110 mV to 2.2 V (2.2 to 5) V (5 to 11) V (11 to 130) V	0.72 mV/V + 30 $\mu$ V 0.62 mV/V + 29 $\mu$ V 0.87 mV/V - 18 $\mu$ V 56 $\mu$ V/V + 2.8 mV 0.98 mV/V - 1.9 mV 0.32 mV/V + 4.3 mV	
Amplitude Square Wave: 50 $\Omega$	(1 to 25) mV (25 to 110) mV 110 mV to 2.2 V (2.2 to 6.6) V	2 mV/V + 31 $\mu$ V 2.1 mV/V + 28 $\mu$ V 2.2 mV/V + 18 $\mu$ V 1.8 mV/V + 0.88 mV	
Amplitude Square Wave: 1M $\Omega$	(1 to 25) mV (25 to 110) mV 110 mV to 2.2 V (2.2 to 11) V (11 to 130) V	0.87 mV/V + 32 $\mu$ V 0.99 mV/V + 32 $\mu$ V 1.1 mV/V + 16 $\mu$ V 1.1 mV/V + 73 $\mu$ V 0.7 mV/V + 5.2 mV	
Leveled Sine Wave: 5mV to 5.5V	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	16 mV/V + 0.23 mV 31 mV/V + 0.23 mV 47 mV/V + 0.23 mV	
Time Marker: Sine Wave	1 ns 5 ns 10 ns	2.1 E -12 s 7 E -12 s 8.3 E -12 s	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes Time Marker: Square Wave	10 ns	6.1 E-12 s	Multi-Product Calibrator
	10 μs	5.8 E -9 s	
	20 ms	5.8 E -9 s	
	50 ms	6.5 E -6 s	
	100 ms	5.9 E -5 s	
	200 ms	6.8 E -5 s	
	500 ms	2.1 E -4 s	
	1 s	9.8 E -4 s	
	2 s	3.2 E -3 s	
	5 s	2 E -2 s	
	Time Marker: Spike	20 ns	
20 μs		5.8 E -9 s	
20 ms		5.8 E -6 s	
50 ms		6.5 E -6 s	
100 ms		5.9 E -5 s	
200 ms		6.8 E -5 s	
500 ms		2.1 E -4 s	
1 s		9.8 E -4 s	
2 s		3.2 E -3 s	
5 s		2 E -2 s	
20% Duty Cycle Square	100 ns	5.8 E-11 s	
	100 μs	5.8 E -9 s	
	20 ms	5.8 E -6 s	
Edge Specs into 50Ω Load: Rise Time	1 kHz to 1MHz	1 E -10 s	
	(5 to 250) mV	20 mV/V + 0.2 mV	
Amplitude (p-p)	250 mV to 2.5 V	0.11 V/V – 22 mV	



**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes Wave Generator: Amplitude (10Hz to 10KHz) Square, Sine Triangle Into 1 MΩ Square, Sine, Triangle Into 50 Ω Frequency: 50 Ω 1 MΩ	1.8 mV to 55 V  1.8 mV to 2.5 V  10 Hz to 10 kHz 10 Hz to 10 kHz	23 mV/V + 78 μV  23 mV/V + 80 μV  0.58 mHz/Hz + 7.4 mHz 0.58 mHz/Hz + 7.4 mHz	Multi-Product Calibrator
Magnetometer / Gaussmeter & Hall Effect Probes <sup>1</sup>	(0 to 100) G	(0.074 + 0.01X) G	Helmholtz Coil, Current Source

**Multi-Discipline Testing Equipment**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Extrusion Plastometers Temperature Bore Diameter Piston Diameter / Length	(-30 to 660) °C Up to 0.25 in Up to 1 in	0.12 °C 0.000 13 in 0.000 1 in	PRT, Depth Micrometers, Caliper, Pin Gages, Gage Blocks
Magnetic Particle Unit Amp meter Timer Black Light White Light	(0 to 20 000) A (0.01 to 9.99) s (0 to 19 990) μW/cm <sup>2</sup> (0 to 199.9) fc	8.3 A 0.002 s (3.1 + 0.05X) μW/cm <sup>2</sup> (0.8 + 0.05X) fc	Current Timer, Digital Radiometer

**Length – Dimensional metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Autocollimators <sup>1,2</sup>	Up to 30 min	(0.49 + 0.001 8X) arc sec	Angle Generator
Bore Gages <sup>2</sup>	Up to 8 in	(2.1 + 4.4L) μin	Master Ring, Indicator Checker, ULM



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers <sup>2</sup>	Up to 6 in (6 to 24) in (24 to 72) in	(290 + 0.27L) μin (290 + 0.92L) μin (250 + 2.6L) μin	Gage Blocks
CMMs <sup>2</sup> Linear Accuracy Volumetric Accuracy Repeatability	Up to 120 in	(55 + 5L) μin (122 + 5L) μin (53 + 5L) μin	Laser Interferometer, Ball Bar, Sphere
Electronic Levels	± 1 000 arc sec	0.7 arc sec	Gage Blocks, Sine Plate
Extensometers	(0 to 1) in	0.000 1 in	Extensometer Calibrator
Gage Blocks <sup>1,2</sup>	Up to 1 in (1 to 4) in	2.6 μin (1.6 + 0.94L) μin	Comparator, Master Gage Blocks
	(4 to 20) in	(4.4 + 0.63L) μin	LVDT, Master Gage Blocks
Glass Masters <sup>1,2</sup>	Up to 12 in	(9.1 + 2.3L) μin	Measuring Microscope, Gage Blocks
Height Gages <sup>2</sup>	Up to 24 in (24 to 72) in	(44 + 3.4L) μin (550 + 1.5L) μin	Gage Blocks, Surface Plate
Indicators <sup>2</sup> 0.000 02 in 0.000 05 in (Resolution) 0.000 1 in 0.000 5 in 0.001 in	Up to 12 in	(3.8 + 91L) μin (3.6 + 4.3L) μin (3.7 + 2.7L) μin (3.4 + 4.2L) μin (580 + 0.25L) μin	Gage Blocks, ULM
Dial Test Indicators <sup>2</sup> (Resolution) 0.001 in 0.000 5 in 0.000 1 in 0.000 05 in	Up to 0.25 in	(580 + 0.005 2L) μin (290 + 0.01L) μin (58 + 0.047L) μin (29 + 0.093L) μin	Gage Blocks
Levels, Machinist <sup>1</sup>	Up to 15 in Up to 72 in	0.000 15 in 0.000 73 in	Surface Plate
Measuring Microscopes <sup>2</sup>	Up to 12 in	(25 + 1.3L) μin	Laser Interferometer, Gage Blocks
Micrometers <sup>2</sup>	Up to 6 in (6 to 24) in (24 to 72) in	(21 + 0.58L) μin (44 + 3.4L) μin (550 + 1.5L) μin	Gage Blocks, ULM
Optical Comparators <sup>2</sup> Linearity X-Y Axis Squareness	Up to 20 in Up to 30 in	(95 + 19L) μin (59 + 3L) μin	Glass Master





Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Comparators Magnification	10x, 20x, 31.25x, 50x, 61.25x, 100x	0.000 8 in	Glass Master, Glass Rule
Pi Tapes <sup>1,2</sup>	Up to 96 in diameter	$(78 + 6D) \mu\text{in}$	Cylindrical Masters, CMM
Pin Gages <sup>2</sup>	Up to 1 in	$(42 + 1.4L) \mu\text{in}$	Bench Micrometer
Plain Plug Gages <sup>1,2</sup>	Up to 20 in	$(3.6 + 3.6D) \mu\text{in}$	ULM, Gage Blocks
Thread Plug Gages <sup>1,2</sup> Major Diameter	Up to 8 in	$(3.6 + 3.6D) \mu\text{in}$	ULM, Thread Wires
Pitch Diameter	Up to 8 in	77 $\mu\text{in}$	
Plain Ring Gages <sup>1,2</sup>	(0.08 to 18) in	$(12 + 0.21D) \mu\text{in}$	ULM, Master Rings
Roughness Standards	Up to 250 $\mu\text{in}$	4.7 $\mu\text{in}$	Profilometer
Steel Rules Linear Scales <sup>1,2</sup>	Up to 72 in	$(76 + 11L) \mu\text{in}$	Measuring Microscope
Surface Analyzers <sup>1,2</sup>	Up to 123 $\mu\text{in}$	$(4 + 0.002 7X) \mu\text{in}$	Roughness Standard
Surface Plates <sup>2</sup> Overall Flatness	(6 x 6) to (18 x 18) in (18 x 24) to (72 x 144) in	$4.3\sqrt{DL} \mu\text{in}$	Height Stand – LVDT, Electronic Levels, Autocollimator
Local Area Flatness (repeat reading)	0.002 in	30 $\mu\text{in}$	
Tape Measures <sup>2</sup>	Up to 300 ft	$(76 + 11L) \mu\text{in}$	Measuring Microscope
Thread Measuring Wires <sup>1</sup>	Up to 80 TPI	11 $\mu\text{in}$	ULM, 0.750 Roll, 0.125 Roll
Solid Thread Rings <sup>1,2</sup> Minor Diameter Pitch Diameter	Up to 8 in	$(38 + 0.88D) \mu\text{in}$ 84 $\mu\text{in}$	ULM
Adjustable Thread Rings <sup>2</sup> Minor Diameter Pitch Diameter	Up to 8 in	$(38 + 0.88D) \mu\text{in}$	ULM, Master Setting Plugs In accordance with ASME B1.2, para 5.1.1: the ring is sized to a plug, with the plug's uncertainty given.



Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Durocalibrators <sup>1</sup> A-Scale D-Scale	(0 to 822) gf (0 to 10) gf	0.072 gf 0.42 gf	Gram Weights
Durometers <sup>2</sup> Spring Force	Scales A & D	(0.33 + 0.001 4X) units	Durocalibrator
Force (Compression / Tension)	(0 to 2 000) lbf	0.015 %X	Class F Weights
	(0 to 150 000) lbf	0.11 %X	Load Cell
Brinell Hardness Testers	3 000 kgf 1 500 kgf 500 kgf	8.4 HBW 3.7 HBW 1.1 HBW	Indirect Verification per ASTM E10 Hardness Test Blocks
Knoop Hardness Tester <sup>2</sup>	(100 to 940) HK Repeatability under force Error	0.31 %X 0.69 %X 0.15 μm	Indirect Verification per ASTM E92 Hardness Test Blocks
Rockwell and Rockwell Superficial Hardness Testers	(20 to 65) HRA	0.29 HRA	Indirect Verification per ASTM E18 Hardness Test Blocks
	(70 to 78) HRA	0.24 HRA	
	(80 to 84) HRA	0.29 HRA	
	(40 to 59) HRBW	0.82 HRBW	
	(60 to 79) HRBW	0.66 HRBW	
	(80 to 100) HRBW	0.59 HRBW	
	(20 to 30) HRC	0.42 HRC	
	(35 to 55) HRC	0.34 HRC	
	(60 to 65) HRC	0.31 HRC	
	(40 to 48) HRD	0.63 HRD	
	(51 to 67) HRD	0.55 HRD	
	(71 to 75) HRD	0.51 HRD	
	(70 to 79) HRE	0.55 HRE	
	(84 to 90) HRE	0.58 HRE	
	(93 to 100) HRE	0.57 HRE	
	(60 to 75) HRF	0.69 HRF	
(80 to 90) HRF	0.58 HRF		
(94 to 100) HRF	0.54 HRF		



Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell and Rockwell Superficial Hardness Testers	(30 to 50) HRG	0.58 HRG	Indirect Verification per ASTM E18 Hardness Test Blocks
	(55 to 75) HRG	0.53 HRG	
	(80 to 94) HRG	0.45 HRG	
	HRR Low	0.58 HRR	
	HRR High	0.44 HRR	
	HRS Low	0.66 HRS	
	HRS High	0.5 HRS	
	HRT	1.2 HRT	
	(70 to 77) HR15N	0.48 HR15N	
	(78 to 88) HR15N	0.42 HR15N	
	(90 to 92) HR15N	0.39 HR15N	
	(42 to 50) HR30N	0.57 HR30N	
	(55 to 73) HR30N	0.46 HR30N	
	(77 to 82) HR30N	0.42 HR30N	
	(20 to 31) HR45N	0.62 HR45N	
	(37 to 61) HR45N	0.52 HR45N	
	(66 to 72) HR45N	0.47 HR45N	
	(74 to 80) HR15TW	0.72 HR15TW	
	(81 to 86) HR15TW	0.62 HR15TW	
	(87 to 93) HR15TW	0.46 HR15TW	
(43 to 56) HR30TW	0.72 HR30TW		
(57 to 69) HR30TW	0.6 HR30TW		
(70 to 83) HR30TW	0.54 HR30TW		
(13 to 32) HR45TW	0.64 HR45TW		
(33 to 52) HR45TW	0.58 HR45TW		
(53 to 73) HR45TW	0.57 HR45TW		
Vickers Hardness Tester <sup>2</sup>	(100 to 940) HV Repeatability under force Error	0.86 %X 0.086 %X 0.16 μm	Indirect Verification per ASTM E92 Hardness Test Blocks



Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass	(1 to 200) g (200 to 500) g 500 g to 5 lb (5 to 10) lb (10 to 50) lb (50 to 100) lb	(0.0022 + 0.002 8 g) mg (0.25 + 0.001 8 g) mg (-0.87 + 0.003 5 g) mg (4.2 + 0.002 5 lb) mg (5.5 + 0.76 kg) mg (-110 + 5.9 kg) mg	Balance Class 1 thru Class 3 Weights
	(1 to 1 000) lb	0.36 lb	Load Cell
Pressure Gages and Transducers	(-15 to 15) psi (10 to 50) psi (50 to 500) psi (200 to 800) psi (800 to 16 000) psi	0.002 psi 0.004 psi 0.043 psi 0.016 psi 2 psi	Pressure Calibrator, Deadweight Tester
Scales and Balances	Up to 80 g (80 to 200) g Up to 5 100 g	(0.058 + 0.001 8X) mg (0.13 + 0.000 9X) mg (1.7 + .000 9X) mg	Class 1 thru Class 3 Weights
	Up to 2 000 lb Up to 4 000 lb Up to 10 000 lb	(0.58 + 5.9E-6X) lb (0.58 + 0.000 5X) lb (-11 + 0.003 5X) lb	Class F Weights
Torque Analyzers <sup>2</sup>	(20 to 110) ozf·in (5 to 60) lbf·in (40 to 450) lbf·in (100 to 1 150) lbf·in (25 to 280) lbf·ft (60 to 680) lbf·ft (200 to 1 200) lbf·ft (1 200 to 2 000) lbf·ft	0.083 ozf·in 0.008 lbf·in (0.009 3 + 9.1E-5X) lbf·in (0.047 + 0.000 1X) lbf·in (0.009 + 9.3E-5X) lbf·ft (0.013 + 9E-5X) lbf·ft (-0.1 + 0.001X) lbf·ft (1.3 + 5E-5X) lbf·ft	Torque Arms, Torque Wheels, Class F Weights
Torque Wrenches <sup>2</sup>	Up to 100 ozf·in 15 lbf·in to 400 lbf·ft Up to 250 lbf·ft (100 to 600) lbf·ft (400 to 2 000) lbf·ft	(-0.02 + 0.007 9X) ozf·in (0.053 + 0.002 8X) lbf·in (0.016 + 0.002 6X) lbf·ft (0.054 + 0.002 5X) lbf·ft (1.5 + 0.01X) lbf·ft	Torque Analyzer
Viscosity Cups	(34 to 120) cSt	1 cSt + 0.44 % X	Viscosity Standards
Volumetric Dispensers	Up to 100 mL Up to 600 mL (600 to 1 000) mL	0.003 1 mL (0.11 + 3.5E-8X) mL (0.053 + 9.9E-5X) mL	Analytical Balance



**Photometry and Radiometry**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
UV-A Light Meters <sup>1</sup> (typical for NDT Testing)	(0 to 19 990) $\mu\text{W}/\text{cm}^2$	$(3.1 + 0.05x) \mu\text{W}/\text{cm}^2$	Digital Radiometer ASTM E1444 NADCAP Audit Criteria AC7114/2 rev. G
Visible Light Meters <sup>1</sup> (typical for NDT Testing)	Up to 4 000 fc	$(0.19 + 0.05x) \text{fc}$	

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
IR Non-Contact Equipment <sup>1</sup>	(35 to 500) $^{\circ}\text{C}$	$(0.67 + 0.002 5X) ^{\circ}\text{C}$	Black Body
Relative Humidity Measure	(5 to 90) %RH	0.5 %RH	Chilled Mirror
Temperature - Measure	(-200 to 660) $^{\circ}\text{C}$	0.03 $^{\circ}\text{C}$	PRT, Calibrator
Temperature - Source	(-40 to 660) $^{\circ}\text{C}$	0.5 $^{\circ}\text{C}$	Dry Block

**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency	Up to 1.3 GHz	$1.1 \times 10^{-11} \text{Hz}$	GPS Reference, Frequency Calibrator
Timers, Stopwatches	Up to 24 hrs	4.4 ms	GPS Reference, Frequency Counter, Function Generator

Testing

Dimensional Measurement

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Angle <sup>1,2</sup>	(0 to 360) °	0.03 °	CMM
		1.5 arc sec	Sine Plate
		16 arc sec	Optical Comparator
		(8.4 + 0.28X) arc sec	Measuring Microscope
Diameter <sup>1,2</sup>	Up to 40 in	(99 + 8.9D) μin	CMM
	Up to 16 in	(140 + 40D) μin	Optical Comparator
	Up to 8 in	(34 + 1.3D) μin	Measuring Microscope
Flatness	Up to 0.02 μin	73 μin/ft	CMM
Flatness <sup>2</sup>	Up to 0.02 in	4 μin	Optical Flat
		45 μin	Autocollimator
		48 μin	Electronic Levels
		(20 + 0.007L) μin	Height Stand – LVDT
		30 μin	Laser Interferometer
		(20 + 0.007L) μin	Height Stand - LVDT
Length <sup>1,2</sup> X Axis Y Axis Z Axis	Up to 40 in Up to 80 in Up to 40 in	(200 + 4L) μin (200 + 4L) μin (200 + 5L) μin	CMM
Volumetric <sup>1</sup>	40 in × 80 in × 40 in	350 μin	CMM
Length <sup>1,2</sup> X Axis Y Axis	Up to 8 in	(16 + 6.9L) μin	Measuring Microscope
Length <sup>1</sup> X Axis Y Axis	Up to 12 in Up to 8 in	150 μin 90 μin	Optical Comparator



Dimensional Measurement

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Length <sup>2</sup>	Up to 24 in	$(44 + 3.5L) \mu\text{in}$	Height Gage
	Up to 6 in Up to 240 in	$(17 + 1.3L) \mu\text{in}$ $(160 + 1.8L) \mu\text{in}$	Laser Interferometer
	Up to 20 in	$(1.5 + 3.9L) \mu\text{in}$	ULM
	Up to 1 in	$(43 + .011L) \mu\text{in}$	Bench Micrometer
Parallelism <sup>2</sup>	( 0 to 0.02) in	$(22 + 0.036L) \mu\text{in}$	CMM, Height Stand, LVDT, Measuring Microscope
Roundness <sup>1</sup>	(0 to 0.02) in	10 $\mu\text{in}$	CMM, Roundness Tester
Sphericity <sup>1</sup>	(0 to 0.02) in	180 $\mu\text{in}$	CMM
Squareness <sup>2</sup>	(0 to 0.02) in	77 $\mu\text{in}/\text{ft}$	CMM
		86 $\mu\text{in}$	Height Stand – LVDT
		18 $\mu\text{in}$	Laser Interferometer
		$(8.9 + 0.005X) \text{ arc sec}$	Measuring Microscope
Straightness <sup>2</sup>	(0 to 0.02) in	47 $\mu\text{in}$	CMM
		14 $\mu\text{in}$	Laser Interferometer
		$(43 + 0.95L) \mu\text{in}$	Measuring Microscope





**Services performed at satellite location**

11145 Luschek Drive  
Cincinnati, OH 45241

Lead Technician: Dennis Gill Email: Dennis.Gill@aciquality.com

Phone: 513-489-1113

**Length – Dimensional metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Bore Gages <sup>2</sup>	Up to 8 in	(2.1 + 4.4L) μin	Master Ring, Indicator Checker, ULM
Calipers <sup>2</sup>	Up to 6 in (6 to 24) in (24 to 72) in	(290 + 0.27L) μin (290 + 0.92L) μin (250 + 2.6L) μin	Gage Blocks
Gage Blocks <sup>1,2</sup>	Up to 1 in (1 to 4) in	2.6 μin (1.6 + 0.94L) μin	Comparator, Master Gage Blocks
	(4 to 20) in	(4.4 + 0.63L) μin	LVDT, Master Gage Blocks
Height Gages <sup>2</sup>	Up to 24 in (24 to 72) in	(44 + 3.4L) μin (550 + 1.5L) μin	Gage Blocks, Surface Plate
Indicators <sup>2</sup> 0.000 02 in 0.000 05 in (Resolution) 0.000 1 in 0.000 5 in 0.001 in	Up to 12 in	(3.8 + 91L) μin (3.6 + 4.3L) μin (3.7 + 2.7L) μin (3.4 + 4.2L) μin (580 + 0.25L) μin	Gage Blocks, ULM
Dial Test Indicators <sup>2</sup> 0.001 in (Resolution) 0.000 5 in 0.000 1 in 0.000 05 in	Up to 0.25 in	(580 + 0.005 2L) μin (290 + 0.01L) μin (58 + 0.047L) μin (29 + 0.093L) μin	Gage Blocks
Levels, Machinist <sup>1</sup>	Up to 15 in Up to 72 in	0.000 15 in 0.000 73 in	Surface Plate
Linear Scales <sup>1,2</sup> Steel Rules	Up to 72 in	(76 + 11L) μin	Measuring Microscope
Micrometers <sup>2</sup>	Up to 6 in (6 to 24) in (24 to 72) in	(21 + 0.58L) μin (44 + 3.4L) μin (550 + 1.5L) μin	Gage Blocks, ULM
Pin Gages <sup>2</sup>	Up to 1 in	(42 + 1.4L) μin	Bench Micrometer
Plain Plug Gages <sup>1,2</sup>	Up to 20 in	(3.6 + 3.6D) μin	ULM, Gage Blocks



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Plug Gages <sup>1,2</sup> Major Diameter	Up to 8 in	$(3.6 + 3.6D) \mu\text{in}$	ULM, Thread Wires
Pitch Diameter	Up to 8 in	77 $\mu\text{in}$	
Plain Ring Gages <sup>1,2</sup>	(0.08 to 18) in	$(12 + 0.21D) \mu\text{in}$	ULM, Master Rings
Adjustable Thread Rings <sup>1,2</sup> Minor Diameter Pitch Diameter	Up to 8 in	$(38 + 0.88D) \mu\text{in}$	ULM, Master Setting Plugs In accordance with ASME B1.2, para 5.1.1: the ring is sized to a plug, with the plug's uncertainty given.
Thread Measuring Wires <sup>1</sup>	Up to 80 TPI	11 $\mu\text{in}$	ULM, 0.750 Roll, 0.125 Roll
Roughness Standards <sup>1</sup>	Up to 250 $\mu\text{in}$	4.7 $\mu\text{in}$	Profilometer
Surface Analyzers <sup>1,2</sup>	Up to 123 $\mu\text{in}$	$(4 + 0.002 7X) \mu\text{in}$	Roughness Standard

Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Wrenches <sup>2</sup>	Up to 100 ozf·in 15 lbf·in to 400 lbf·ft Up to 250 lbf·ft (100 to 600) lbf·ft (400 to 2 000) lbf·ft	$(-0.02 + 0.007 9X) \text{ ozf}\cdot\text{in}$ $(0.053 + 0.002 8X) \text{ lbf}\cdot\text{in}$ $(0.016 + 0.002 6X) \text{ lbf}\cdot\text{ft}$ $(0.054 + 0.002 5X) \text{ lbf}\cdot\text{ft}$ $(1.5 + 0.01X) \text{ lbf}\cdot\text{ft}$	Torque Analyzer

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ( $k=2$ ), corresponding to a confidence level of approximately 95%.

Notes:

1. Only in-lab calibration service is available for this parameter whereas most parameters can be performed on-site, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2.  $L$  = length in inches,  $D$  = diameter in inches,  $DL$  = diagonal length in inches,  $R$  = resolution of the unit under test,  $X$  = unit under test reading.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. ACT-1317.

  
 Vice President