



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Accu-Chek LLC
1015 Old Forest Road NW
Corydon, IN 47112
(and satellite site as shown on the scope)

Fulfills the requirements of

ISO/IEC 17025:2017

and national standards

ANSI/NCSL Z540-1-1994 (R2002)

In the fields of

CALIBRATION and DIMENSIONAL MEASUREMENT

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

Jason Stine, Vice President
Expiry Date: 01 March 2026
Certificate Number: ACT-1317



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
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 17025:2017

AND

ANSI/NCSL Z540-1-1994 (R2002)

Accu-Chek LLC
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CALIBRATION AND DIMENSIONAL MEASUREMENT

Valid to: **March 1, 2026**

Certificate Number: **ACT-1317**

CALIBRATION

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters ^{1,4}	4 pH 7 pH 10 pH	0.02 pH 0.02 pH 0.03 pH	Accredited pH Solutions
Refractometers ^{1,4}	0 Brix	0.000 6 Brix	Distilled Water

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source ¹	Up to 330 mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1 000) V	15 μ V/V + 1 μ V 8.1 μ V/V + 3.7 μ V 9.3 μ V/V + 16 μ V 14 μ V/V + 0.12 mV 14 μ V/V + 1.2 mV	Multiproduct Calibrator
DC Voltage – Measure ¹	(10 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1 000) V	3.3 μ V/V + 0.74 μ V 2.1 μ V/V + 1.3 μ V 2.4 μ V/V + 5.8 μ V 3.8 μ V/V + 96 μ V 14 μ V/V - 1.1 mV	Precision Digital Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC High Voltage – Measure ¹	Up to 6 kV (6 to 40) kV	5.8 mV/V + 6.1 V 30 mV/V	Digital Multimeter, High Voltage Probe
DC Current – Source ¹	Up to 330 μ A (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) A	0.12 μ A/A + 16 nA 74 nA/A + 60 nA 77 nA/A + 0.2 μ A 80 nA/A + 3.1 μ A 0.16 mA/A + 32 μ A 0.3 mA/A + 31 μ A 0.39 mA/A + 0.39 mA 1 mA/A + 0.75 mA	Multiproduct Calibrator
DC Current Clamp-on Meters ¹	(20 to 200) A (200 to 1 000) A	7.8 mA/A - 0.36 A 3.9 mA/A + 0.51 A	Multiproduct Calibrator, 50-turn Coil
DC Current – Measure ¹	Up to 100 nA (0.1 to 1) μ A (1 to 10) μ A (10 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	0.58 nA 0.58 nA 0.59 nA 0.77 nA 8.4 nA/A + 7.1 nA 8.4 nA/A + 71 nA 18 nA/A + 0.68 μ A 66 μ A/A + 9.6 μ A	Precision Digital Multimeter
DC Current – Measure ¹	(1 to 60) A	0.6 mA/A	Precision Digital Multimeter w/ Shunt
DC Current – Measure ¹	(60 to 1 000) A	15 mA/A + 2 A	Clamp-on Meter
Resistance – Source ¹ (Simulation)	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 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω (0.33 to 1.1) G Ω	15 $\mu\Omega/\Omega$ + 0.96 m Ω 23 $\mu\Omega/\Omega$ + 1.2 m Ω 22 $\mu\Omega/\Omega$ + 1.1 m Ω 22 $\mu\Omega/\Omega$ + 1.6 m Ω 22 $\mu\Omega/\Omega$ + 1.6 m Ω 22 $\mu\Omega/\Omega$ + 16 m Ω 22 $\mu\Omega/\Omega$ + 16 m Ω 22 $\mu\Omega/\Omega$ + 0.16 Ω 22 $\mu\Omega/\Omega$ + 0.16 Ω 25 $\mu\Omega/\Omega$ + 1.6 Ω 25 $\mu\Omega/\Omega$ + 1.6 Ω 46 $\mu\Omega/\Omega$ + 24 Ω 0.1 m Ω/Ω + 39 Ω 0.2 m Ω/Ω + 1.9 k Ω 0.39 m Ω/Ω + 2.3 k Ω 2.3 m Ω/Ω + 78 k Ω 12 m Ω/Ω + 0.38 M Ω	Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Measure ¹	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 (0.1 to 1) GΩ	0.6 mΩ/Ω + 94 μΩ 7.9 μΩ/Ω + 0.43 mΩ 6.6 μΩ/Ω + 0.92 mΩ 6.6 μΩ/Ω + 9.3 mΩ 6.6 μΩ/Ω + 0.13 Ω 10 μΩ/Ω + 2.5 Ω 33 μΩ/Ω + 0.12 kΩ 0.32 mΩ/Ω + 8.5 kΩ 3.3 mΩ/Ω + 0.24 MΩ	Precision Digital Multimeter
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure ¹	Type B (600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °C Type C (0 to 150) °C (150 to 650) °C (650 to 1 000) °C (1 000 to 1 800) °C (1 800 to 2 316) °C Type E (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C Type J (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C Type K (-200 to -100) °C (-100 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C	0.34 °C 0.26 °C 0.23 °C 0.26 °C 0.23 °C 0.2 °C 0.24 °C 0.39 °C 0.65 °C 0.38 °C 0.12 °C 0.11 °C 0.12 °C 0.16 °C 0.21 °C 0.12 °C 0.11 °C 0.13 °C 0.18 °C 0.25 °C 0.13 °C 0.2 °C 0.31 °C	Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure ¹	Type N		Multiproduct Calibrator
	(-200 to -100) °C	0.31 °C	
	(-100 to -25) °C	0.17 °C	
	(-25 to 120) °C	0.15 °C	
	(120 to 410) °C	0.14 °C	
	(410 to 1 300) °C	0.21 °C	
	Type R		
	(0 to 250) °C	0.44 °C	
	(250 to 400) °C	0.26 °C	
	(400 to 1 000) °C	0.26 °C	
	(1 000 to 1 767) °C	0.31 °C	
	Type S		
	(0 to 250) °C	0.36 °C	
	(250 to 1 000) °C	0.28 °C	
	(1 000 to 1 400) °C	0.29 °C	
	(1 400 to 1 767) °C	0.35 °C	
Type T			
(-250 to -150) °C	0.48 °C		
(-150 to 0) °C	0.12 °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 Simulation of RTD Indicating Devices – Source ¹	Cu 427, 10 Ω		Multiproduct Calibrator
	(-100 to 260) °C	0.24 °C	
	Pt 385, 100 Ω		
	(-200 to 0) °C	0.003 6 % of reading + 0.08 °C	
	(0 to 100) °C	0.009 6 % of reading + 0.08 °C	
	(100 to 400) °C	0.003 3 % of reading+ 0.09 °C	
	(400 to 630) °C	0.11 °C	
	(630 to 800) °C	0.007 6 % of reading + 0.21 °C	
	Pt 385, 200 Ω		
	(-200 to 0) °C	0.008 % of reading + 0.08 °C	
	(0 to 260) °C	0.008 % of reading + 0.08 °C	
	(260 to 400) °C	0.016 % of reading + 0.09 °C	
(400 to 630) °C	0.004 1 % of reading + 0.14 °C		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
Electrical Simulation of RTD Indicating Devices – Source ¹	Pt 385, 500 Ω		Multiproduct Calibrator	
	(-200 to 260) °C	0.002 2 % of reading + 0.07 °C		
	(260 to 400) °C	0.004 7 % of reading + 0.08 °C		
	(400 to 630) °C	0.006 4 % of reading + 0.07 °C		
	Pt 385, 1 kΩ			
	(-200 to 260) °C	0.002 4 % of reading + 0.07 °C		
	(260 to 400) °C	0.009 8 % of reading + 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 % of reading + 0.22 °C		
	(-190 to 100) °C	0.07 °C		
	(100 to 400) °C	0.005 7 % of reading + 0.07 °C		
	(400 to 600) °C	0.007 7 % of reading + 0.11 °C		
	(600 to 630) °C	0.019 % of reading + 0.07 °C		
	Pt 3926, 100 Ω			
(-200 to 0) °C	0.006 8 % of reading + 0.07 °C			
(0 to 100) °C	0.008 6 % of reading + 0.08 °C			
(100 to 400) °C	0.004 5 % of reading + 0.09 °C			
(400 to 630) °C	0.12 % of reading			
Ni 385, 120 Ω				
(-80 to 100) °C	0.09 °C			
(100 to 260) °C	0.006 6 % of reading + 0.13 °C			
AC Voltage – Source ¹	(1 to 33) mV		Multiproduct 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	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		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source ¹	(0.33 to 3.3) V		Multiproduct Calibrator
	(10 to 45) Hz	0.12 mV	
	45 Hz to 10 kHz	87 μV	
	(10 to 20) kHz	98 μV	
	(20 to 50) kHz	0.12 mV	
	(50 to 100) kHz	0.29 mV	
	(100 to 500) kHz	1.1 mV	
	(3.3 to 33) V		
	(10 to 45) Hz	1.3 mV	
	45 Hz to 10 kHz	0.87 mV	
	(10 to 20) kHz	1.1 mV	
	(20 to 50) kHz	1.4 mV	
	(50 to 100) kHz	3.7 mV	
	(33 to 330) V		
	(10 to 45) Hz	0.11 mV/V + 5.6 mV	
45 Hz to 10 kHz	0.64 μV/V + 11 mV		
(10 to 20) kHz	0.87 μV/V + 13 mV		
(20 to 50) kHz	0.9 mV/V + 95 mV		
(50 to 100) kHz	2 mV/V + 50 mV		
(330 to 1 020) V			
45 Hz to 10 kHz	75 μV/V + 89 mV		
AC Voltage – Measure ¹	(1 to 10) mV		Precision Digital Multimeter
	(1 to 40) Hz	69 nV/V + 3.3 μV	
	40 Hz to 1 kHz	-1.12 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		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	(0.1 to 1) V		Precision Digital Multimeter
	(1 to 40) Hz	0.65 μ V/V + 39 μ V	
	40 Hz to 1 kHz	0.53 nV/V + 25 μ V	
	(1 to 20) kHz	30 μ V	
	(20 to 50) kHz	42 μ V	
	(50 to 100) kHz	80 μ V	
	(100 to 300) kHz	0.31 mV	
	300 kHz to 1 MHz	0.87 mV	
	(1 to 2) MHz	15 mV/V + 10 μ V	
	(10 to 100) V		
	(1 to 40) Hz	12 nV/V + 3.4 mV	
	40 Hz to 1 kHz	0.26 nV/V + 3.5 mV	
	(1 to 20) kHz	0.26 nV/V + 3.5 mV	
	(20 to 50) kHz	12 nV/V + 4.8 mV	
	(50 to 100) kHz	97.8 nV/V + 11 mV	
(100 to 300) kHz	4 mV/V + 10 mV		
300 kHz to 1 MHz	15 mV/V + 10 mV		
AC High Voltage – Measure ¹	Up to 6 kV		Digital Multimeter, High Voltage Probe
	Up to 500 Hz	6.3 mV/V + 6.7 mV	
	Up to 6 kV		
	500 Hz to 1 kHz	30 mV/V	
	Up to 40 kV		
60 Hz	75 mV/V		
AC Current – Source ¹	(29 to 330) μ A		Multiproduct Calibrator
	(10 to 20) Hz	1.7 μ A/A + 58 nA	
	(20 to 45) Hz	1.2 μ A/A + 78 nA	
	45 Hz to 1 kHz	0.97 μ A/A + 78 nA	
	(1 to 5) kHz	2.3 μ A/A + 0.12 μ A	
	(5 to 10) kHz	6.2 μ A/A + 0.15 μ A	
	(10 to 30) kHz	16 mA/A + 0.4 μ A	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(0.33 to 3.3) mA		Multiproduct Calibrator
	(10 to 20) Hz	1.6 μ A/A + 0.12 μ A	
	(20 to 45) Hz	0.97 μ A/A + 0.12 μ A	
	45 Hz to 1 kHz	0.77 μ A/A + 0.12 μ A	
	(1 to 5) kHz	1.6 μ A/A + 0.15 μ A	
	(5 to 10) kHz	3.9 μ A/A + 0.23 μ A	
	(10 to 30) kHz	10 mA/A + 0.6 μ A	
	(3.3 to 33) mA		
	(10 to 20) Hz	1.4 μ A/A + 1.6 μ A	
	(20 to 45) Hz	0.7 μ A /A + 1.5 μ A	
	45 Hz to 1 kHz	0.31 μ A /A + 1.5 μ A	
	(1 to 5) kHz	0.62 μ A /A + 1.5 μ A	
	(5 to 10) kHz	1.6 μ A/A + 2.3 μ A	
	(10 to 30) kHz	4 mA/A + 4 μ A	
	(33 to 330) mA		
	(10 to 20) Hz	1.4 mA/A + 16 μ A	
	(20 to 45) Hz	0.7 mA /A + 16 μ A	
	45 Hz to 1 kHz	0.31 mA /A + 16 μ A	
	(1 to 5) kHz	0.77 mA/A + 39 μ A	
	(5 to 10) kHz	1.6 mA/A + 78 μ A	
(10 to 30) kHz	4 mA/A + 0.2 mA		
(0.33 to 3) A			
(10 to 45) Hz	1.4 mA/A + 80 μ A		
45 Hz to 1 kHz	0.34 mA /A + 0.45 mA		
(1 to 5) kHz	5.5 mA/A – 1.7 mA		
(5 to 10) kHz	25 mA/A + 5 mA		
(3 to 11) A			
(10 to 45) Hz	0.6 mA/A + 2 mA		
45 Hz to 1 kHz	1 mA/A + 2 mA		
(1 to 5) kHz	30 mA/A + 2 mA		
(11 to 20.5) A			
(45 to 100) Hz	1.2 mA/A + 5 mA		
100 Hz to 1 kHz	1.5 mA/A + 5 mA		
(1 to 5) kHz	30 mA/A + 5 mA		
AC Current Clamp-on Meters ¹	(20 to 40) A		Multiproduct Calibrator, 50-turn Coil
	(45 to 400) Hz	0.28 mA/A + 0.29 mA	
	(40 to 400) A		
	(45 to 400) Hz	6.1 mA/A + 0.11 A	
(400 to 1 000) A			
(45 to 100) Hz	4.4 mA/A + 0.77 A		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure ¹	(5 to 100) μ A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (0.1 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 (1 to 10) 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 μ A/A + 0.15 μ A 0.99 μ A/A + 0.15 μ A 0.38 μ A/A + 0.16 μ A 0.19 μ A/A + 0.16 μ A 0.38 μ A/A + 0.16 μ A 2.7 μ A/A + 0.28 μ A 6 mA/A + 1.5 μ A 2.7 μ A/A + 1.4 μ A 0.99 μ A/A + 1.5 μ A 0.38 μ A/A + 1.6 μ A 0.19 μ A/A + 1.6 μ A 0.38 μ A/A + 1.6 μ A 2.7 μ A/A + 2.7 μ A 6 mA/A + 15 μ A	Precision Digital Multimeter
AC Current – Measure ¹	(10 to 100) 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 (0.1 to 1) A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz (5 to 20) kHz (20 to 50) kHz	2.7 μ A/A + 15 μ A 0.99 μ A/A + 15 μ A 0.38 μ A/A + 16 μ A 0.19 μ A/A + 16 μ A 0.38 μ A/A + 16 μ A 2.7 μ A/A + 28 μ A 6 mA/A + 0.15 mA 2.7 mA/A + 0.15 mA 1.1 mA/A + 0.16 mA 0.51 mA/A + 0.16 mA 0.65 mA/A + 0.16 mA 2 mA/A + 0.15 mA 10 mA/A + 0.4 mA	Precision Digital Multimeter
AC Current – Measure ¹	(20 to 2 000) A (60 to 100) Hz	53 mA/A + 4.5 A	Clamp-on Meter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source ¹	(190 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 (1.3 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	5 mF/F + 1 pF 4 mF/F 3.6 mF/F 1.9 mF/F 1.7 mF/F 1.9 mF/F 1.4 mF/F + 0.57 nF 1.9 mF/F + 0.91 nF 1.5 mF/F + 5.6 nF 2 mF/F + 8.8 nF 2.6 mF/F + 53 nF 3.4 mF/F + 88 nF 2.9 mF/F + 0.52 μF 3.4 mF/F + 0.88 μF 3.2 mF/F + 4.9 μF 3.7 mF/F + 8 μF 11 mF/F - 20 μF 27 mF/F + 0.53 mF	Multiproduct Calibrator
Oscilloscopes ¹ Amplitude DC Signal into 50 Ω load into 1 MΩ load	(1 to 25) mV (25 to 110) mV (0.11 to 2.2) V (2.2 to 6.6) V (1 to 25) mV (25 to 110) mV (0.11 to 2.2) V (2.2 to 5) V (5 to 11) V (11 to 130) V	2.3 mV/V + 30 μV 2 mV/V + 35 μV 2.2 mV/V - 0.63 μV 1.8 mV/V + 0.91mV 0.72 mV/V + 30 μV 0.62 mV/V + 29 μV 0.87 mV/V - 18 μV 56 μV/V + 2.8 mV 0.98 mV/V – 1.9 mV 0.32 mV/V + 4.3 mV	Multiproduct Calibrator with Scope Option

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes ¹			
Amplitude Square Wave into 50 Ω load	(1 to 25) mV (25 to 110) mV 110 mV to 2.2 V (2.2 to 6.6) V	2 mV/V + 31 μV 2.1 mV/V + 28 μV 2.2 mV/V + 18 μV 1.8 mV/V + 0.88 mV	Multiproduct Calibrator with Scope Option
into 50 Ω load	(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 μV 0.99 mV/V + 32 μV 1.1 mV/V + 16 μV 1.1 mV/V + 73 μV 0.7 mV/V + 5.2 mV	
Leveled Sine Wave (50 kHz reference) into 50 Ω load	5 mVp-p to 5.5 Vp-p 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 ps 7 ps 8.3 ps	
Square Wave	10 ns 10 μs 20 ms 50 ms 100 ms 200 ms 500 ms	6.1 ps 5.8 ns 5.8 ns 6.5 μs 59 μs 68 μs 0.21 m	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
Oscilloscopes ¹ Time Marker Spike	20 ns 20 μs 20 ms 50 ms 100 ms 200 ms 500 ms 1 s 2 s 5 s	5.8 ps 5.8 ns 5.8 μs 6.5 μs 59 μs 68 μs 0.21 ms 0.98 ms 3.2 ms 20 ms	Multiproduct Calibrator with Scope Option	
20 % Duty Cycle-Square	100 ns 100 μs 20 ms	58 ps 5.8 ns 5.8 μs		
Edge Rise Time into 50 Ω load	1 kHz to 1 MHz	0.1 ns		
Amplitude into 50 Ω load	(5 to 250) mVp-p 250 mVp-p to 2.5 Vp-p	20 mV/V + 0.2 mV 0.11 V/V – 22 mV		
Wave Generator Amplitude (Sine, Square, Triangle) into 1 MΩ load	10 Hz to 10 kHz 1.8 mV to 55 V	23 mV/V + 78 μV		
into 50 Ω load	10 Hz to 10 kHz 1.8 mV to 2.5 V	23 mV/V + 80 μV		
Frequency into 50 Ω load	10 Hz to 10 kHz	0.58 mHz/Hz + 7.4 mHz		
into 1 MΩ load	10 Hz to 10 kHz	0.58 mHz/Hz + 7.4 mHz		
Magnetometer/Gaussmeter, Hall-effect Probes	Up to 100 G	1 % of reading + 0.074 G		Helmholtz Coil. Current Source

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Magnetic Particle Unit ^{1,3} DC Current Meter	Up to 20 000 A	8.3 A	Current Timer/Meter

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Autocollimators ²	Up to 30 in	(0.25 - 0.001X)''	Angle Generator
Bore Gages ^{1,2}	Up to 8 in	(4.2 + 4.5L) μin	Master Ring, Indicator Checker, Universal Length Measuring Machine
Calipers ^{1,2}	Up to 6 in (6 to 24) in (24 to 72) in	(290 + 0.27L) μin (280 + 1.1L) μin (240 + 2.8L) μin	Gage Blocks
Coordinate Measuring Machines ^{1,2}			
Linear Accuracy	Up to 120 in	(38 + 1.7L) μin	Laser Interferometer, Ball Bar, Sphere
Volumetric Accuracy	Up to 120 in	(12 + 5.1L) μin	
Repeatability	Up to 120 in	22 μin	
Articulated Arm Coordinate Measurement Machine			Per ASME B89.4.22-2004 at 5.2, 5.3, and 5.4 using Ball Bar.
Volumetric Performance	Up to 18 in	120 μin	
Effective Diameter	Up to 1 in	43 μin	
Electronic Levels ^{1,2}	± 1 000''	0.6''	Gage Blocks, Sine Plate
Extensometers ¹	(0 to 1) in	100 μin	Extensometer Calibrator
Extrusion Plastometers ¹			Depth Micrometers, Caliper, Pin Gages, Gage Blocks
Bore Diameter	Up to 0.25 in	130 μin	
Piston Diameter / Length	Up to 1 in	100 μin	
Gage Blocks ²	Up to 1 in (1 to 4) in	(2.8 - 0.25L) μin (0.9 + 1.6L) μin	Comparator, Master Gage Blocks
Long Gage Blocks ²	(4 to 20) in	(6.1 + 0.74L) μin	LVDT, Master Gage Blocks

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Glass Scales ²	Up to 12 in	$(9.1 + 2.3L) \mu\text{in}$	Measuring Microscope, Gage Blocks, ULM
Height Gages ^{1,2}	Up to 24 in (24 to 72) in	$(44 + 3.4L) \mu\text{in}$ $(550 + 1.7L) \mu\text{in}$	Gage Blocks, Surface Plate
Indicators ^{1,2} (0.000 02 in resolution)	Up to 12 in	$(5.2 - 0.095L) \mu\text{in}$	Gage Blocks, Universal Length Measuring Machine
(0.000 05 in resolution)	Up to 12 in	$(5.2 + 3.6L) \mu\text{in}$	
(0.000 1 in resolution)	Up to 12 in	$(5.2 + 3.8L) \mu\text{in}$	
(0.000 5 in resolution)	Up to 12 in	$(5.1 + 4.5L) \mu\text{in}$	
(0.001 in resolution)	Up to 12 in	$(580 + 0.49L) \mu\text{in}$	
Dial Test Indicators ^{1,2} (0.001 in resolution)	Up to 0.25 in	$(580 + 0.005 2L) \mu\text{in}$	Gage Blocks
(0.000 5 in resolution)	Up to 0.25 in	$(290 + 0.01L) \mu\text{in}$	
(0.000 1 in resolution)	Up to 0.25 in	$(58 + 0.047L) \mu\text{in}$	
(0.000 05 in resolution)	Up to 0.25 in	$(29 + 0.093L) \mu\text{in}$	
Machinist Levels ¹	Up to 15 in Up to 72 in	73 μin 320 μin	Surface Plate, Gage Blocks,
Measuring Microscopes ^{1,2}	Up to 6 in (6 to 12) in	$(17 + 4.2L) \mu\text{in}$ $(9.4L - 14) \mu\text{in}$	Laser Interferometer, Gage Blocks, Glass Master
Micrometers ^{1,2}	Up to 6 in (6 to 24) in (24 to 72) in	$(21 + 0.58L) \mu\text{in}$ $(44 + 3.4L) \mu\text{in}$ $(550 + 1.7L) \mu\text{in}$	Gage Blocks, Universal Length Measuring Machine
Optical Comparators ^{1,2} Linearity	Up to 20 in	$(95 + 19L) \mu\text{in}$	Glass Scales
X-Y Axis Squareness	Up to 30 in	$(59 + 3L) \mu\text{in}$	Glass Scales
Magnification	10x, 20x, 31.25x, 61.25x, 100x	800 μin	Glass Scales, Glass Rule
Pi Tapes ²	Up to 96 in diameter	$(78 + 6D) \mu\text{in}$	Cylindrical Masters, CMM
Pin Gages ^{1,2}	Up to 1 in	$(8.6 + 8.8L) \mu\text{in}$	Bench Micrometer

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Plain Plug Gages ²	Up to 20 in	$(4.6 + 2.3D) \mu\text{in}$	Gage Blocks, Universal Length Measuring Machine
Thread Plug Gages ² Major Diameter	Up to 8 in	$(4.4 + 2.5D) \mu\text{in}$	Universal Length Measuring Machine, Thread Wires
Pitch Diameter	Up to 8 in	$(42 - 1.8D) \mu\text{in}$	
Plain Ring Gages ²	Up to 8 in (8 to 18) in	$(6 + 1.2D) \mu\text{in}$ $(14 + 0.16D) \mu\text{in}$	Universal Length Measuring Machine, Master Rings
Roughness Standards ¹	Up to 250 μin	3.6 μin	Profilometer
Steel Rules, Linear Scales ^{1,2}	Up to 72 in	$(9.9 + 11L) \mu\text{in}$	Measuring Microscope
Surface Analyzers ^{1,2}	Up to 123 μin	$(3.4 + 0.005L) \mu\text{in}$	Roughness Standard
Surface Plates ^{1,2} Overall Flatness	(6×6) to (18×18) in (18×24) to (72×144) in	$4.3\sqrt{DL} \mu\text{in}$	In accordance with Fed Spec GGG-P-463 using Height Stand – LVDT Electronic Levels, Autocollimator Repeat O Meter
Local Area Flatness (repeat readings)	0.002 in	30 μin	
Tape Measures ^{1,2}	Up to 300 ft	$(76 + 11L) \mu\text{in}$	Measuring Microscope
Thread Measuring Wires	Up to 80 TPI	5.8 μin	Universal Length Measuring Machine, 0.750 Roll, 0.125 Roll
Solid Thread Rings Minor Diameter	Up to 8 in	45 μin	Universal Length Measuring Machine
Pitch Diameter		100 μin	
Adjustable Thread Rings Minor Diameter	Up to 8 in	45 μin	Universal Length Measuring Machine, 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.
Pitch Diameter		Based on Setting Plug	

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Universal Length Measuring Machines ²			
Linearity	Up to 20 in	$(2.7 + 0.85L) \mu\text{in}$	Master Gage Blocks
Anvil Parallelism	Up to 0.5 in	14 μin	Reference Sphere
Anvil Force	Up to 8 ozf	0.35 ozf	Force Gage
Coating Thickness Gages ²	Up to 156 mils	$(0.0073 + 0.00059l)$ mils	Thickness Standards
Indicator Checker	Up to 1 in	53 μin	Gage Blocks, Universal Length Measuring Machine

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Duro-calibrators			
A-Scale	(0 to 822) gf	0.07 gf	Master Weights
D-Scale	(0 to 10) gf	0.42 gf	
Durometers ^{2,5} (Types A & D) Indenter Dimensions			Direct Verification per ASTM D2240 using Measuring Microscope
Extension	0.25 in	21 μin	
Diameter	0.25 in	21 μin	
Angle	(0 to 35)°	4.6"	
Spring Force	(0 to 100) Duro	0.21 Duro	Duro-calibrator
Force Measuring Instruments ¹ (Compression / Tension)	Up to 1 000 gf	0.058 gf	ASTM E617 Class 1 thru Class 6 Weights
	Up to 10 lbf	0.01 % of reading	
	(10 to 50) lbf	0.0064 % of reading + 0.0005 lbf	
	(50 to 2 000) lbf	0.0069 % of reading + 0.005 lbf	
Force Measuring Instruments ¹ (Compression / Tension)	Up to 10 lbf	0.01 lbf	Comparison to Master Load Cell
	(10 to 50) lbf	0.061 lbf	
	(50 to 1 000) lbf	0.55 lbf	
	(1 000 to 5 000) lbf	2.5 lbf	
	(5 000 to 15 000) lbf	7 lbf	
	(15 000 to 50 000) lbf	23 lbf	
	(50 000 to 150 000) lbf	61 lbf	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Brinell Hardness Testers ¹	3 000 kgf 1 500 kgf 500 kgf	8.4 HBW 3.7 HBW 1.1 HBW	Indirect Verification per ASTM E10 using Hardness Test Blocks.
Knoop Hardness Tester ¹	(100 to 940) HK Repeatability under force Error	0.31 % of reading 0.69 % of reading 0.15 µm	Indirect Verification per ASTM E92 using Hardness Test Blocks,
Leeb Hardness Tester ¹	783 HLD	16 HLD	Indirect Verification per ASTM A596 using Leeb Test Block.
Rockwell Hardness and Superficial Hardness Testers ¹	(20 to 65) HRA (70 to 78) HRA (80 to 84) HRA (40 to 59) HRBW (60 to 79) HRBW (80 to 100) HRBW (20 to 30) HRC (35 to 55) HRC (60 to 65) HRC (40 to 48) HRD (51 to 67) HRD (71 to 75) HRD (70 to 79) HRE (84 to 90) HRE (93 to 100) HRE (60 to 75) HRF (80 to 90) HRF (94 to 100) HRF 30 to 50) HRG (55 to 75) HRG (80 to 94) HRG	0.29 HRA 0.24 HRA 0.29 HRA 0.82 HRBW 0.66 HRBW 0.59 HRBW 0.42 HRC 0.34 HRC 0.31 HRC 0.63 HRD 0.55 HRD 0.51 HRD 0.55 HRE 0.58 HRE 0.57 HRE 0.69 HRF 0.58 HRF 0.54 HRF 0.58 HRG 0.53 HRG 0.45 HRG	Indirect Verification per ASTM E18 using Hardness Test Blocks.

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness and Superficial Hardness Testers ¹	HRR Low	0.58 HRR	Indirect Verification per ASTM E18 using Hardness Test Blocks.
	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 ¹	(100 to 940) HV	0.86 % of reading	Indirect Verification per ASTM E92 using Hardness Test Blocks.
	Repeatability under force	0.086 % of reading	
	Error	0.16 μ m	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass Determination	1 g 100 g 200 g 500 g 5 lb 10 lb 20 lb 50 lb 100 lb	64 µg 74 µg 95 µg 1 mg 0.73 mg 2 mg 8.1 mg 15 mg 0.17 g	Single Substitution using ASTM E617 Class 1 weights, ASTM E617 Class 2 weights, ASTM E617 Class 3 weights, and Precision Balances.
Mass Determination	Up to 600 lb (600 to 1 250) lb	0.27 lb 0.045 % of reading + 0.003 4 lb	Comparison to Master Load Cell
Pressure Gages and Transducers ¹	(-15 to 15) psig (10 to 50) psig (50 to 500) psig (500 to 1 000) psig (1 000 to 16 000) psig	0.000 95 psi 0.001 6 psi 0.014 psi 0.018 psi 0.064 psi	Pressure Calibrator, Deadweight Tester
Deadweight Pressure Testers Low Pressure High Pressure	Up to 1 500 psi Up to 16 000 psi	0.008 5 % of reading 0.003 9 % of reading	Comparison to ASTM E617 Class 1 thru Class 3 weights using Precision Balances and the Universal Length Measuring Machine for the Effective Area determination for each Piston.
Scales and Balances ^{1,6} (SI)	Up to 1 g (1 to 5) g (5 to 50) g (50 to 500) g (500 to 1 000) g (1 to 2) kg (2 to 5) kg (5 to 20) kg	0.000 18 % of reading + 6.2 µg 0.000 35 % of reading + 20 µg 0.000 09 % of reading + 33 µg 0.000 17 % of reading – 3.8 µg 0.000 18 % of reading – 84 µg 0.000 15 % of reading + 0.22 mg 0.000 46 % of reading – 6 mg 0.000 15 % of reading + 9.6 mg	ASTM E617 Class 1 weights and NIST Handbook 44 utilized for the calibration of the weighing system.
Weighing Systems ^{1,6} (Avoirdupois)	Up to 1 500 lb (1 500 to 2 000) lb (2 000 to 6 000) lb	0.006 2 % of reading 0.07 % of reading – 0.96 lb 0.04 % of reading – 0.36 lb	NIST Class F weights and NIST Handbook 44 utilized for the calibration of the weighing system.

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Analyzers ¹	(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	0.014 % of reading + 0.0047 ozf·in 0.012 % of reading + 0.000 09 lbf·in 0.011% of reading + 0.002 9 lbf·in 0.007 2 % of reading + 0.052 lbf·in 0.011 % of reading + 0.004 lbf·ft 0.011 % of reading + 0.002 lbf·ft 0.01 % of reading + 0.012 lbf·ft 0.01 % of reading + 0.025 lbf·ft	Torque Arms, Torque Wheels, NIST Class F Weights
Torque Wrenches ¹	Up to 100 ozf·in Up to 50 lbf·in (50 to 400) lbf·in Up to 250 lbf·ft (100 to 600) lbf·ft (400 to 2 000) lbf·ft	0.018 % of reading + 0.13 ozf·in 0.001 7 % of reading + 0.049 lbf·in 0.000 9 % of reading + 0.12 lbf·in 0.005 6 % of reading + 0.041 lbf·ft 0.000 4% of reading + 0.043 lbf·ft 0.12 % of reading + 1 lbf·ft	Torque Analyzer
Viscosity Cups ¹	(34 to 120) cSt	0.44 % of reading + 1 cSt	Viscosity Standards
Volumetric Dispensers	Up to 100 mL Up to 600 mL (600 to 1 000) mL	0.003 1 mL 0.11 mL 0.009 9 % of reading + 0.053 mL	Analytical Balance

Photometry and Radiometry

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
UV-A Light Meters (typical for NDT Testing)	Up to 19 990 $\mu\text{W}/\text{cm}^2$	5.1 % of reading + 0.008 $\mu\text{W}/\text{cm}^2$	Comparison to Master Digital Radiometer per ASTM E1444 and NADCAP Audit Criteria AC7114/2 rev. G.
Visible Light Meters (typical for NDT Testing)	Up to 4 000 fc	4.9 % of reading + 0.000 002 fc	
Magnetic Particle Unit ^{1,2,3} Black Light	Up to 19 990 $\mu\text{W}/\text{cm}^2$	4.6 % of reading + 14 $\mu\text{W}/\text{cm}^2$	Comparison to Digital Radiometer
White Light	Up to 199.9 fc	3.7 % of reading + 2.8 fc	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Extrusion Plastometers ¹ Temperature	(-30 to 660) °C	0.12 °C	PRT, Temperature Indicator
Infrared Thermometer (non-contact)	(35 to 50) °C (50 to 300) °C (300 to 500) °C	0.35 °C 0.84 °C 1.3 °C	Black Body Source (flat plate) $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$
Humidity – Measure ¹	(5 to 90) %RH	0.5 %RH	Comparison to Chilled Mirror
Temperature – Measure ¹	(-200 to 660) °C	0.03 °C	Comparison to PRT, Calibrator
Temperature – Source ¹ (Temperature Indicating Devices)	(-40 to 660) °C	0.5 °C	Dry Block

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source/Measure ¹	Up to 1.3 GHz	0.11 nHz	GPS Reference
Timers, Stopwatches ¹	Up to 24 hr	4.4 ms	GPS Reference, Frequency Counter, Function Generator
Magnetic Particle Unit ^{1,3} Timer	10 ms to 9.99 s	27 ms	Comparison to Current Timer/Meter

DIMENSIONAL MEASUREMENT

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement – 1D ²	Up to 24 in	(44 + 3.5L) μin	Height Measurements utilizing a Height Gage for Dimensional Inspection.
	Up to 20 in	(3.8 + 6.9L) μin	Length Measurements utilizing a ULM for Dimensional Inspection.

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement – 1D ²	Up to 1 in	$(47 - 1.4L) \mu\text{in}$	Length Measurements utilizing a Bench Micrometer for Dimensional Inspection.
	Up to 8 in	$(16 + 6.9L) \mu\text{in}$	Length Measurements utilizing a Measuring Microscope for Dimensional Inspection.
	X-axis: Up to 12 in Y-axis: Up to 8 in	150 μin 90 μin	Length Measurements utilizing a Optical Comparator for Dimensional Inspection.
	Up to 0.02 in	$(22 + 0.036L) \mu\text{in}$	Parallelism Measurements utilizing a Height Gage or LVDT for Dimensional Inspection.
	Up to 0.02 in	31 μin	Parallelism Measurements utilizing a Measuring Microscope for Dimensional Inspection.
	Up to 0.02 in	86 μin	Squareness Measurements utilizing a Height Gage or LVDT for Dimensional Inspection.
	Up to 0.02 in	18 μin	Squareness Measurements utilizing Laser Interferometer for Dimensional Inspection.
	Up to 0.02 in	14 μin	Straightness Measurements utilizing Laser Interferometer for Dimensional Inspection.
	Up to 0.02 in	$(20 + 0.007L) \mu\text{in}$	Flatness Measurements utilizing a Height Gage or LVDT for Dimensional Inspection.
	Up to 0.02 in	45 μin	Flatness Measurements utilizing an Autocollimator for Dimensional Inspection.

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement – 1D ²	Up to 0.02 in	3.3 μin	Flatness Measurements utilizing Optical Flats for Dimensional Inspection.
	Up to 0.02 in	10 μin	Roundness Measurements utilizing a Roundness Tester for Dimensional Inspection.
	Up to 4 in (4 to 160) in	(3.6 to 1.2L) μin (3.9 + 1.1L) μin	Length Measurements utilizing Gage Blocks for Dimensional Inspection.

2 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement – 2D ²	Up to 0.02 in	(8.9 + 0.005L) μin	Squareness Measurements utilizing a Measuring Microscope for Dimensional Inspection.
	Up to 0.02 in	(43 + 0.95L) μin	Straightness Measurements utilizing a Measuring Microscope for Dimensional Inspection.
	Up to 360°	(8.4 + 0.28X)°	Angle Measurements utilizing a Measuring Microscope for Dimensional Inspection.
	Up to 8 in	(34 + 1.3D) μin	Diameter Measurements utilizing a Measuring Microscope for Dimensional Inspection.

3 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement – 3D ²	X-axis: Up to 40 in Y-axis: Up to 80 in Z-axis: Up to 40 in	(200 + 4L) μin (200 + 4L) μin (200 + 5L) μin	CMM utilized for Dimensional Inspection.

3 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement – 3D ²	Up to 360°	0.03°	Angle Measurements utilizing a CMM for Dimensional Inspection
	Up to 40 in	$(99 + 8.9D) \mu\text{in}$	Diameter Measurements utilizing a CMM for Dimensional Inspection.
	Up to 0.02 in	73 $\mu\text{in}/\text{ft}$	Flatness Measurements utilizing a CMM for Dimensional Inspection.
	Up to 0.02 in	$(22 + 0.036L) \mu\text{in}$	Parallelism Measurements utilizing a CMM for Dimensional Inspection.
	Up to 0.02 in	180 μin	Sphericity Measurements utilizing a CMM for Dimensional Inspection.
	Up to 0.02 in	77 $\mu\text{in}/\text{ft}$	Squareness Measurements utilizing a CMM for Dimensional Inspection.
	Up to 0.02 in	47 μin	Straightness Measurements utilizing a CMM for Dimensional Inspection.
Dimensional Measurement – 3D	Up to 9 ft	0.003 7 in	Articulating Arm CMM utilized for Dimensional Inspection
	Up to 9 ft	0.004 3 in	Articulating Arm CMM utilized for Dimensional Inspection

Services performed at satellite location

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Cincinnati, OH 45241

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Bore Gages ²	Up to 8 in	$(4.2 + 4.5L) \mu\text{in}$	Master Ring, Indicator Checker, ULM
Calipers ²	Up to 6 in (6 to 24) in (24 to 72) in	$(290 + 0.27L) \mu\text{in}$ $(280 + 1.1L) \mu\text{in}$ $(240 + 2.8L) \mu\text{in}$	Gage Blocks
Gage Blocks ²	Up to 1 in (1 to 4) in	$(1.7 - 0.17L) \mu\text{in}$ $(0.55 + 0.95L) \mu\text{in}$	Comparator, Master Gage Blocks
Gage Blocks ²	(4 to 20) in	$(1.2 + 0.72L) \mu\text{in}$	LVDT, Master Gage Blocks
Height Gages	Up to 24 in (24 to 72) in	$(44 + 3.4L) \mu\text{in}$ $(550 + 1.7L) \mu\text{in}$	Gage Blocks, Surface Plate
Indicators ² (0.000 02 in resolution) (0.000 05 in resolution) (0.000 1 in resolution) (0.000 5 in resolution) (0.001 in resolution)	Up to 12 in	$(5.2 - 0.095L) \mu\text{in}$ $(5.2 + 3.6L) \mu\text{in}$ $(5.2 + 3.8L) \mu\text{in}$ $(5.1 + 4.5L) \mu\text{in}$ $(580 + 0.49L) \mu\text{in}$	Gage Blocks, ULM
Dial Test Indicators ² (0.001 in resolution) (0.000 5 in resolution) (0.000 1 in resolution) (0.000 05 in resolution)	Up to 0.25 in	$(580 + 0.005 2L) \mu\text{in}$ $(290 + 0.01L) \mu\text{in}$ $(58 + 0.047L) \mu\text{in}$ $(29 + 0.093L) \mu\text{in}$	Gage Blocks
Machinist Levels	Up to 15 in Up to 72 in	0.000 073 in 0.000 32 in	Surface Plate, Gage Blocks
Linear Scales, Steel Rules ²	Up to 72 in	$(9.9 + 11L) \mu\text{in}$	Measuring Microscope
Micrometers ²	Up to 6 in (6 to 24) in (24 to 72) in	$(21 + 0.58L) \mu\text{in}$ $(44 + 3.4L) \mu\text{in}$ $(550 + 1.7L) \mu\text{in}$	Gage Blocks, ULM
Pin Gages ²	Up to 1 in	$(8.6 + 8.8L) \mu\text{in}$	Bench Micrometer
Plain Plug Gages	Up to 20 in	$(4.1 + 2.2D) \mu\text{in}$	ULM, Gage Blocks

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Length ²	Up to 4 in Up to 48 in Up to 60 in	(7.4 + 6.4L) μin (3.4 + 7.6L) μin (7.5 + 7.6L) μin	ULM, Length Comparator, Gage Blocks
Thread Plug Gages ² Major Diameter Pitch Diameter	Up to 8 in	(4.1 + 2.3D) μin (15 + 1.3D) μin	ULM, Thread Wires
Plain Ring Gages ²	(0.08 to 18) in	(5.8 + 0.8D) μin	ULM, Master Rings
Adjustable Thread Rings ² Minor Diameter Pitch Diameter	Up to 8 in	(1.4 + 4.4D) μin	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	Up to 80 TPI	7.1 μin	ULM, 0.750 Roll, 0.125 Roll
Roughness Standards	Up to 250 μin	3.6 μin	Profilometer
Surface Analyzers ²	Up to 123 μin	1 μin	Roughness Standard

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Wrenches	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	0.55 % of reading + 0.008 3 ozf·in 0.25 % of reading + 0.004 4 lbf·in 0.26 % of reading + 0.008 2 lbf·ft 0.26 % of reading + 0.021 lbf·ft 1 % of reading + 0.081 lbf·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. On-site calibration service is available for this parameter, 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; " = arc-second; X = unit under test reading; D = diameter in inches; DL = diagonal length in inches; l = length in mils.
 3. The parameter, Magnetic Particle Unit, is found in three major parameters: Electrical – DC/Low Frequency; Photo and Radiometry; Time and Frequency.
 4. The values presented in the Range column represent a Nominal value. During calibration, the actual value will be utilized along with the corresponding inherent uncertainty.
 5. Durometers that are calibrated onsite are a Partial Verification for the Spring Force only. Duro = Duro units.
 6. The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The CMC presented here does not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
 7. This scope is formatted as part of a single document including Certificate of Accreditation No. ACT-1317.



Jason Stine, Vice President

