



# CERTIFICATE OF ACCREDITATION

## ANSI-ASQ National Accreditation Board

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

This is to certify that

**Productivity Quality, Inc. / Advanced Inspection Services, LLC**  
**15150 25<sup>th</sup> Avenue N., Suite 200**  
**Plymouth MN 55447**

has been assessed by ANAB  
and meets the requirements of international standard

## ISO/IEC 17025:2005

while demonstrating technical competence in the fields of

## CALIBRATION AND TESTING

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

ACT-1608

Certificate Number

  
ANAB Approval

Certificate Valid To: 01/15/2018  
Version No. 003 Issued: 05/23/2017



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 January 2009).

**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005****Productivity Quality, Inc. / Advanced Inspection Services, LLC**

15150 25th Ave N. Suite 200  
 Plymouth, MN 55447  
 Diana McNerny Phone: 763-249-8156

**CALIBRATION**Valid to: **January 15, 2018**Certificate Number: **ACT-1608**

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.

**Electrical – DC/Low Frequency**

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Voltage - Source	Up to 330 mV 330 mV to 3 V (3 to 33) V (30 to 330) V (100 to 1 020) V	0.78 uV + 16 uV/V 1.7 uV + 8.6 uV/V 17 uV + 9.3 uV/V 0.13 mV + 14 uV/V 1.3 mV + 14 uV/V	Fluke 5522A
DC Voltage - Measure	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V 200 V to 1 kV	0.1 uV + 5 uV/V 0.4 uV + 3.5 uV/V 4 uV + 3.5 uV/V 40 uV + 5.5 uV/V 0.5 mV + 5.5 uV/V	Fluke 8508A
DC Current - Source	Up to 330 uA 330 uA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	16 nA + 0.12 mA/A 40 nA + 78 uA/A 0.21 uA + 78 uA/A 2.1 uA + 78 uA/A 32 uA + 0.16 mA/A 32 uA + 0.3 mA/A 0.4 mA + 0.39 mA/A 0.59 mA + 0.78 mA/A	Fluke 5522A
	(20.5 to 150) A (150 to 550) A (550 to 1 000) A	0.14 A + 2.6 mA/A 0.5 A + 2.6 mA/A 0.5 A + 2.7 mA/A	Fluke 5522A and Fluke 50 Turn Current Coil
DC Current - Measure	Up to 200 uA 200 uA to 2 mA (2 mA to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A	0.4 nA + 12 uA/A 4 nA + 12 uA/A 40 nA + 14 uA/A 0.8 uA + 48 uA/A 16 uA + 0.19 mA/A 0.4 mA + 0.4 mA/A	Fluke 8508A



Electrical – DC/Low Frequency

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage - Source	(1 to 33) mV		Fluke 5522A
	(10 to 45) Hz	4.7 uV + 0.62 mV/V	
	45 Hz to 10 kHz	4.7 uV + 0.12 mV/V	
	(10 to 20) kHz	4.7 uV + 0.16 mV/V	
	(20 to 50) kHz	4.7 uV + 0.78 mV/V	
	(50 to 100) kHz	9.4 uV + 2.8 mV/V	
	(100 to 500) kHz	39 uV + 6.2 mV/V	
	(33 to 330) mV		
	(10 to 45) Hz	6.3 uV + 0.24 mV/V	
	45 Hz to 10 kHz	6.3 uV + 0.12 mV/V	
	(10 to 20) kHz	6.3 uV + 0.13 mV/V	
	(20 to 50) kHz	6.3 uV + 0.28 mV/V	
	(50 to 100) kHz	25 uV + 0.62 mV/V	
	(100 to 500) kHz	55 uV + 1.6 mV/V	
	330 mV to 3.3 V		
	(10 to 45) Hz	40 uV + 0.24 mV/V	
	45 Hz to 10 kHz	47 uV + 0.12 mV/V	
	(10 to 20) kHz	47 uV + 0.15 mV/V	
	(20 to 50) kHz	40 uV + 0.24 mV/V	
	(50 to 100) kHz	97 uV + 0.55 mV/V	
	(100 to 500) kHz	0.47 mV + 1.9 mV/V	
	(3.3 to 33) V		
	(10 to 45) Hz	0.51 mV + 0.24 mV/V	
	45 Hz to 10 kHz	0.47 mV + 0.12 mV/V	
(10 to 20) kHz	0.47 mV + 0.19 mV/V		
(20 to 50) kHz	0.47 mV + 0.28 mV/V		
(50 to 100) kHz	1.3 mV + 0.7 mV/V		
(33 to 330) V			
45 Hz to 1 kHz	1.7 mV + 0.15 mV/V		
(1 to 10) kHz	4.7 mV + 0.16 mV/V		
(10 to 20) kHz	4.7 mV + 0.2 mV/V		
(20 to 50) kHz	4.7 mV + 0.24 mV/V		
(50 to 100) kHz	39 mV + 1.6 mV/V		
(330 to 1 020) V			
45 Hz to 1 kHz	9.7 mV + 0.24 mV/V		
(1 to 5) kHz	9.7 mV + 0.2 mV/V		
(5 to 10) kHz	9.7 mV + 0.24 mV/V		
AC Voltage - Measure	Up to 200 mV		Fluke 8508A
	(1 to 10) Hz	14 uV + 0.17 mV/V	
	(10 to 40) Hz	4 uV + 0.14 mV/V	
	(40 to 100) Hz	4 uV + 0.12 mV/V	
	100 Hz to 2 kHz	2 uV + 0.11 mV/V	
	(2 to 10) kHz	4 uV + 0.14 mV/V	
	(10 to 30) kHz	8 uV + 0.64 mV/V	
	(30 to 100) kHz	20 uV + 0.77 mV/V	





Electrical – DC/Low Frequency

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage - Measure	200 mV to 2 V		Fluke 8508A
	(1 to 10) Hz	0.12 mV + 0.15 mV/V	
	(10 to 40) Hz	20 uV + 0.12 mV/V	
	(40 to 100) Hz	20 uV + 90 uV/V	
	100 Hz to 2 kHz	20 uV + 75 uV/V	
	(2 to 10) kHz	20 uV + 0.11 mV/V	
	(10 to 30) kHz	40 uV + 0.22 mV/V	
	(30 to 100) kHz	0.2 mV + 0.57 mV/V	
	(100 to 300) kHz	2 mV + 3 mV/V	
	300 kHz to 1 MHz	20 mV + 10 mV/V	
	(2 to 20) V		
	(1 to 10) Hz	1.2 mV + 0.15 mV/V	
	(10 to 40) Hz	0.2 mV + 0.12 mV/V	
	(40 to 100) Hz	0.2 mV + 90 uV/V	
	100 Hz to 2 kHz	0.2 mV + 75 uV/V	
	(2 to 10) kHz	0.2 mV + 0.11 mV/V	
	(10 to 30) kHz	0.4 mV + 0.22 mV/V	
	(30 to 100) kHz	2 mV + 0.57 mV/V	
	(100 to 300) kHz	20 mV + 3 mV/V	
	300 kHz to 1 MHz	0.2 V + 10 mV/V	
	(20 to 200) V		
	(1 to 10) Hz	12 mV + 0.15 mV/V	
	(10 to 40) Hz	2 mV + 0.12 mV/V	
	(40 to 100) Hz	2 mV + 90 uV/V	
100 Hz to 2 kHz	2 mV + 75 uV/V		
(2 to 10) kHz	2 mV + 0.11 mV/V		
(10 to 30) kHz	4 mV + 0.22 mV/V		
(30 to 100) kHz	20 mV + 0.57 mV/V		
(100 to 300) kHz	0.2 V + 3 mV/V		
300 kHz to 1 MHz	2 V + 10 mV/V		
(200 V to 1 000) V			
(1 to 10) Hz	70 mV + 0.15 mV/V		
(10 to 40) Hz	20 mV + 0.12 mV/V		
40 Hz to 10 kHz	20 mV + 0.12 mV/V		
(10 to 30) kHz	40 mV + 0.23 mV/V		
(30 to 100) kHz	0.2 V + 0.58 mV/V		
AC Current - Source	(29 to 330) uA		Fluke 5522A
	(10 to 20) Hz	78 nA + 1.6 mA/A	
	(20 to 45) Hz	78 nA + 1.2 mA/A	
	45 Hz to 1 kHz	78 nA + 0.97 mA/A	
	(1 to 5) kHz	0.12 uA + 2.4 mA/A	
	(5 to 10) kHz	0.16 uA + 6.2 mA/A	
(10 to 30) kHz	0.31 uA + 13 mA/A		





Electrical – DC/Low Frequency

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Current - Source	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 (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 1.1) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (1.1 to 3) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (3 to 11) A (45 to 100) Hz 100 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	0.12 $\mu$ A + 1.6 mA/A 0.12 $\mu$ A + 0.97 mA/A 0.12 $\mu$ A + 0.78 mA/A 0.16 $\mu$ A + 1.6 mA/A 0.24 $\mu$ A + 3.9 mA/A 0.47 $\mu$ A + 7.8 mA/A 1.6 $\mu$ A + 1.4 mA/A 1.6 $\mu$ A + 0.7 mA/A 1.6 $\mu$ A + 0.31 mA/A 1.6 $\mu$ A + 0.62 mA/A 1.6 $\mu$ A + 1.6 mA/A 1.6 $\mu$ A + 3.1 mA/A 16 $\mu$ A + 1.4 mA/A 16 $\mu$ A + 0.7 mA/A 16 $\mu$ A + 0.31 mA/A 39 $\mu$ A + 0.78 mA/A 78 $\mu$ A + 1.6 mA/A 0.16 mA + 3.1 mA/A 78 $\mu$ A + 1.4 mA/A 78 $\mu$ A + 0.39 mA/A 0.78 mA + 4.7 mA/A 3.9 mA + 20 mA/A 78 $\mu$ A + 1.4 mA/A 78 $\mu$ A + 0.47 mA/A 78 $\mu$ A + 4.7 mA/A 3.9 mA + 20 mA/A 1.6 mA + 0.47 mA/A 1.6 mA + 0.78 mA/A 1.6 mA + 24 mA/A 3.9 mA + 0.93 mA/A 3.9 mA + 1.2 mA/A 3.9 mA + 24 mA/A	Fluke 5522A
	(20.5 to 55) A (45 to 65) Hz (65 to 440) Hz (55 to 150) A (45 to 65) Hz (65 to 440) Hz (150 to 550) A (45 to 65) Hz (65 to 440) Hz	5.6 mA + 5.7 mA/A 10 mA + 11 mA/A 5.6 mA + 5.7 mA/A 10 mA + 11 mA/A 5.9 mA + 5.7 mA/A 11 mA + 11 mA/A	Fluke 5522A and Fluke 50 Turn Current Coil





Electrical – DC/Low Frequency

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Current - Source	(550 to 1 000) A (45 to 65) Hz (65 to 440) Hz	6.9 mA + 5.7 mA/A 11 mA + 11 mA/A	Fluke 5522A and Fluke 50 Turn Current Coil
AC Current - Measure	Up to 200 $\mu$ A (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz 200 $\mu$ A to 2 mA (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (2 to 20) mA (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (20 to 200) mA (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz 200 mA to 2 A 10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (2 to 20) A 10 Hz to 2 kHz (2 to 10) kHz	20 nA + 0.5 mA/A 20 nA + 0.5 mA/A 20 nA + 0.71 mA/A 20 nA + 4 mA/A 0.2 $\mu$ A + 0.31 mA/A 0.2 $\mu$ A + 0.3 mA/A 0.2 $\mu$ A + 0.71 mA/A 0.2 $\mu$ A + 4 mA/A 2 $\mu$ A + 0.31 mA/A 2 $\mu$ A + 0.3 mA/A 2 $\mu$ A + 0.71 mA/A 2 $\mu$ A + 4 mA/A 20 $\mu$ A + 0.31 mA/A 20 $\mu$ A + 0.29 mA/A 20 $\mu$ A + 0.63 mA/A 0.2 mA + 0.62 mA/A 0.2 mA + 0.74 mA/A 0.2 mA + 3 mA/A 2 mA + 0.82 mA/A 2 mA + 2.5 mA/A	Fluke 8508A
DC Power - Source	33mV to 1 020 V (0.33 to 330) mA 330 mA to 3 A (3 to 20.5) A	0.18 mW/W 0.18 mW/W 0.55 mW/W	Fluke 5522A
AC Power - Source	(33 to 330) mV (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 20.5) A	1.1 mW/W 0.78 mW/W 1.1 mW/W 0.78 mW/W 1.1 mW/W 0.86 mW/W 1.1 mW/W 0.86 mW/W	Fluke 5522A





Electrical – DC/Low Frequency

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Power - Source	330mV to 1 020 V (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 20.5) A	0.93 mW/W 0.62 mW/W 0.93 mW/W 0.62 mW/W 0.86 mW/W 0.7 mW/W 0.93 mW/W 0.78 mW/W	Fluke 5522A
Resistance - Source	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (330 to 1 100) MΩ	0.78 mΩ + 31 uΩ/Ω 1.2 mΩ + 24 uΩ/Ω 1.1 mΩ + 22 uΩ/Ω 1.6 mΩ + 22 uΩ/Ω 1.7 mΩ + 22 uΩ/Ω 16 mΩ + 22 uΩ/Ω 17 mΩ + 22 uΩ/Ω 0.16 Ω + 22 uΩ/Ω 0.17 Ω + 22 uΩ/Ω 1.6 Ω + 25 uΩ/Ω 1.7 Ω + 25 uΩ/Ω 24 Ω + 47 uΩ/Ω 40 Ω + 0.11 mΩ/Ω 2 kΩ + 0.2 mΩ/Ω 2.4 kΩ + 0.39 mΩ/Ω 78 kΩ + 2.4 mΩ/Ω 390 kΩ + 12 mΩ/Ω	Fluke 5522A
Resistance - Measure	Up to 2) Ω (2 to 20) Ω (20 to 200) Ω (0.2 to 2) kΩ (2 to 20) kΩ (20 to 200) kΩ (0.2 to 2) MΩ (2 to 20) MΩ (20 to 200) MΩ (0.2 to 2) GΩ	4 uΩ + 17 uΩ/Ω 14 uΩ + 9.5 uΩ/Ω 50 uΩ + 8 uΩ/Ω 0.5 mΩ + 8 uΩ/Ω 5 mΩ + 8 uΩ/Ω 50 mΩ + 8 uΩ/Ω 5.9 Ω + 9 uΩ/Ω 0.12 kΩ + 20 uΩ/Ω 10 kΩ + 0.12 mΩ/Ω 1 MΩ + 1.6 mΩ/Ω	Fluke 8508A
Capacitance - Source	(220 to 400) pF 10 Hz to 10kHz 400 pF to 1.1 nF 10 Hz to 10 kHz (1.1 to 3.3) nF 10 Hz to 3 kHz (3.3 to 11) nF 10 Hz to 1 kHz (11 to 33) nF 10 Hz to 1 kHz	7.8 pF + 3.9 mF/F 7.8 pF + 3.9 mF/F 7.8 pF + 3.9 mF/F 7.8 pF + 2 mF/F 7.8 pF + 2 mF/F	Fluke 5522A





Electrical – DC/Low Frequency

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Capacitance - Source	(33 to 110) nF 10 Hz to 1 kHz (110 to 330) nF 10 Hz to 1 kHz 330 nF to 1.1) μF (10 to 60)0 Hz (1.1 to 3.3) μF (10 to 300) Hz (3.3 to 11) μF (10 to 150) Hz (11 to 33) μF (10 to 120) Hz (33 to 110) μF (10 to 8)0 Hz (110 to 330) μF (0 to 50) Hz (330 to 1.1) mF (0 to 20) Hz (1.1 to 3.3) mF (0 to 6) Hz (3.3 to 11) mF (0 to 2) Hz (11 to 33) mF (0 to 0.6) Hz (33 to 110) mF (0 to 0.2) Hz	7.8 pF + 2 mF/F  24 pF + 2 mF/F  0.78 nF + 2 mF/F  2.4 nF + 2 mF/F  7.8 nF + 2 mF/F  24 nF + 3.1 mF/F  78 nF + 3.5 mF/F  0.24 uF + 3.5 mF/F  0.78 uF + 3.5 mF/F  2.4 uF + 3.5 mF/F  7.8 uF + 3.5 mF/F  24 uF + 5.9 mF/F  78 uF + 8.6 mF/F	Fluke 5522A
Electrical Simulation of Thermocouple – Source	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	0.35 °C 0.27 °C 0.24 °C 0.26 °C  0.24 °C 0.21 °C 0.24 °C 0.39 °C 0.66 °C  0.39 °C 0.13 °C 0.11 °C 0.13 °C 0.17 °C	Fluke 5522A







Electrical – DC/Low Frequency

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Electrical Simulation of Thermocouple – Source	Type J		
	(-210 to -100) °C	0.21 °C	
	(-100 to -30) °C	0.13 °C	
	(-30 to 150) °C	0.11 °C	
	(150 to 760) °C	0.14 °C	
	(760 to 1 200) °C	0.18 °C	
	Type K		
	(-200 to -100) °C	0.26 °C	
	(-100 to -25) °C	0.14 °C	
	(-25 to 120) °C	0.13 °C	
	(120 to 1 000) °C	0.21 °C	
	(1 000 to 1 372) °C	0.31 °C	
	Type L		
	(-200 to -100) °C	0.29 °C	
	(-100 to 800) °C	0.21 °C	
	(800 to 900) °C	0.14 °C	
	Type N		
	(-200 to -100) °C	0.31 °C	
	(-100 to -25) °C	0.18 °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	0.45 °C	
(250 to 1 000) °C	0.28 °C		
(1 000 to 1 400) °C	0.26 °C		
(1 400 to 1 767) °C	0.31 °C		
Type S			
(0 to 250) °C	0.37 °C		
(250 to 1 000) °C	0.28 °C		
(1 000 to 1 400) °C	0.29 °C		
(1 400 to 1 767) °C	0.36 °C		
Type T			
(-250 to -150) °C	0.49 °C		
(-150 to 0) °C	0.19 °C		
v0 to 120) °C	0.13 °C		
(120 to 400) °C	0.11 °C		
Type U			
(-200 to 0) °C	0.44 °C		
(0 to 600) °C	0.21 °C		
Electrical Simulation of RTDs – Source	Pt 385 100 Ω		
	(-200 to 0) °C	0.043 °C	
	(0 to 100) °C	0.057 °C	
	(100 to 300) °C	0.072 °C	
	(300 to 400) °C	0.08 °C	
	(400 to 630) °C	0.095 °C	
	(630 to 800) °C	0.18 °C	





Electrical – DC/Low Frequency

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Electrical Simulation of RTDs – Source	Pt 3926 100 Ω		Fluke 5522A
	(-200 to 0) °C	0.043 °C	
	(0 to 100) °C	0.057 °C	
	(100 to 300) °C	0.072 °C	
	(300 to 400) °C	0.08 °C	
	(400 to 630) °C	0.095 °C	
	Pt 3916 100 Ω		
	(-200 to -190) °C	0.2 °C	
	(-190 to -80) °C	0.036 °C	
	(-80 to 0) °C	0.043 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 260) °C	0.057 °C	
	(260 to 300) °C	0.065 °C	
	(300 to 400) °C	0.072 °C	
	(400 to 600) °C	0.08 °C	
	(600 to 630) °C	0.18 °C	
	Pt 385 200 Ω		
	(-200 to -80) °C	0.31 °C	
	(-80 to 100) °C	0.036 °C	
	(100 to 260) °C	0.043 °C	
	(260 to 300) °C	0.095 °C	
	(300 to 600) °C	0.11 °C	
	(600 to 630) °C	0.13 °C	
	Pt 385 500 Ω		
	(-200 to -80) °C	0.036 °C	
	(-80 to 100) °C	0.043 °C	
	(100 to 260) °C	0.05 °C	
	(260 to 300) °C	0.065 °C	
	(300 to 400) °C	0.065 °C	
	(400 to 600) °C	0.072 °C	
	(600 to 630) °C	0.087 °C	
	Pt 385 1000 Ω		
	(-200 to 0) °C	0.029 °C	
	(0 to 100) °C	0.036 °C	
(100 to 260) °C	0.043 °C		
(260 to 300) °C	0.05 °C		
(300 to 600) °C	0.057 °C		
(600 to 630) °C	0.18 °C		
PtNi 385 120 Ω			
(-80 to 0) °C	0.065 °C		
(0 to 100) °C	0.065 °C		
(100 to 260) °C	0.11 °C		
Cu 427 10 Ω			
(-100 to 260) °C	0.24 °C		





Electrical – DC/Low Frequency

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Oscilloscope Voltage – Source	(1 to 25) mV	31 uV + 2 mV/V	Fluke 5522A SC1100
DC Signal 50 Ω	(25 to 110) mV	32 uV + 2 mV/V	
	110 mV to 2.2 V	66 uV + 2 mV/V	
DC Signal 1 MΩ	(2.2 to 6.6) V	0.58 mV + 2 mV/V	
	(1 to 25) mV	31 uV + 0.39 mV/V	
	(25 to 110) mV	32 uV + 0.39 mV/V	
	110 mV to 2.2 V	66 uV + 0.39 mV/V	
Square Wave 50 Ω	(2.2 to 11) V	0.58 mV + 0.39 mV/V	
	(11 to 130) V	5.8 mV + 0.39 mV/V	
	(1 to 25) mV	31 uV + 2 mV/V	
Square Wave 1 MΩ	(25 to 110) mV	32 uV + 2 mV/V	
	110 mV to 2.2 V	66 uV + 2 mV/V	
	(2.2 to 11) V	0.58 mV + 2 mV/V	
	(11 to 130) V	5.8 mV + 2 mV/V	
Square Wave Frequency	(1 to 25) mV	31 uV + 0.78 mV/V	
	(25 to 110) mV	32 uV + 0.78 mV/V	
	110 mV to 2.2 V	66 uV + 0.78 mV/V	
Square Wave Frequency	(2.2 to 11) V	0.58 mV + 0.78 mV/V	
	(11 to 130) V	5.8 mV + 0.78 mV/V	
	(10 to 100) Hz	5.8 mHz + 2 uHz/Hz	
	100 Hz to 1 kHz	58 mHz + 2 uHz/Hz	
Oscilloscope Leveled Sine Wave – Source	(1 to 10) kHz	0.58 Hz + 2 uHz/Hz	
	(10 to 100) kHz	5.8 mHz + 2 uHz/Hz	
Amplitude	<b>5 mV to 5.5 V</b>		Fluke 5522A SC1100
	50 kHz (Reference)	0.24 mV + 16 mV/V	
	50 kHz to 100 MHz	0.24 mV + 28 mV/V	
	(100 to 300) MHz	0.24 mV + 31 mV/V	
(300 to 600) MHz	0.24 mV + 47 mV/V		
Frequency	<b>5 mV to 3.5 V</b>		
	(600 to 1 100) MHz	0.24 mV + 55 mV/V	
	50 kHz to 600) MHz	5.8 kHz + 2 uHz/Hz	
	(600 to 1 100) MHz	58 kHz + 2 uHz/Hz	





**Electrical – DC/Low Frequency**

Parameter / Equipment <sup>4</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Oscilloscope Pulse Generator – Source Pulse Width	(4 to 10) nS (10 to 500) nS	1.6 nS + 39 mS/S 1.7 nS + 39 mS/S	Fluke 5522A SC1100
Pulse Period	200 nS to 1 uS (1 to 10) uS (10 to 100) uS	58 pS + 2 uS/S 0.58 nS + 2 uS/S 5.8 nS + 2 uS/S	
	100 uS to 1 mS (1 to 10) mS (10 to 20) mS	58 nS + 2 uS/S 0.58 uS + 2 uS/S 5.8 uS + 2 uS/S	
Oscilloscope Wave Generator – Source  Amplitude p-p  Frequency	(1.8 to 100) mV (0.1 to 1) V (1 to 8) V (8 to 55) V  10 Hz to 1 kHz (1 to 10) kHz (10 to 100) kHz	97 uV + 24 mV/V 0.59 mV + 24 mV/V 5.8 mV + 24 mV/V 58 mV + 24 mV/V  13 mHz + 20 uHz/Hz 59 mHz + 20 uHz/Hz 5.8 Hz + 20 uHz/Hz	Fluke 5522A SC1100

**Length – Dimensional Metrology**

Parameter / Equipment <sup>2</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Micrometers- O.D., Blade, Point, Spline, Tube, Disc, Depth, Indicating, Interchangeable, Bench and Pitch <sup>1</sup>	Up to 48 in	(42 + 1.1L) μin	Gage Blocks w/ Optical Flats, and Parallels
Calipers <sup>1</sup>	Up to 72 in	(408 + 0.1L) μin	Gage Blocks
Indicator Gages <sup>1</sup>	Up to 6 in	(13 + 0.4L) μin	Gage Blocks
Electronic Indicator Gages/ LVDT <sup>1</sup>	Up to 4 in	(8.9 + 0.4L) μin	Gage Blocks
Height Gages <sup>1</sup>	Up to 48 in	(30 + 0.8L) μin	Gage Blocks
Height Masters <sup>1</sup>	Up to 1.5 in (1.5 to 24) in	40 μin (28 + 0.5L) μin	Gage Blocks
Step Gages	Up to 48 in	(28 + 0.8L) μin	Gage Blocks
Micrometer Length Standards <sup>1</sup>	Up to 40 in	(6 + 1.5L) μin	Universal Measuring Machine
Length – 1D <sup>1</sup>	Up to 40 in	(7 + 1.6L) μin	Universal Measuring Machine





**Length – Dimensional Metrology**

Parameter / Equipment <sup>2</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Long Gage Blocks	5 to 20 in	(11 + 1.2L) μin	Universal Measuring Machine
Steel Rule	Up to 72 in	2880 μin (66 + .5L) μin	Gage Block Video Measuring Machine
Tapes <sup>1</sup>	Up to 25 ft	(3600 + 0.1L) μin (133 + .6L) μin	Master Tape Video Measuring Machine
Plug Gages <sup>1</sup>	Up to 4 in (4 to 40) in	(6.3 + 1.1D) μin (6.6 + 1.5D) μin	Universal Measuring Machine
Spherical Diameters <sup>1</sup>	Up to 8 in	(6.6 + 1.2D) μin	Universal Measuring Machine
Thread Wires	Up to .6 in	(7.6 + 0.3D) μin	Universal Measuring Machine
Thread Plug / Set Plugs <sup>1</sup>			Universal Measuring Machine w/ Thread Wires
Major Diameter Pitch Diameter	Up to 12 in Up to 12 in	(11 + 1.2D) μin (70 + 0.3D) μin	
Thread Rings Pitch Diameter	Up to 4 in	(70 + 0.3D) μin	Thread Setting Plug
Ring Gages / Internal Diameter <sup>1</sup>	(0.012 to 20) in	(5 + 1.1D) μin	Universal Measuring Machine and Ring Gage Comparator
Feeler (Thickness) Gages	Up to 0.25 in	(7.6+0.6L)μin	Universal Measuring Machine
Gage Blocks	(0.01 to 4) inch	(1.4 + 0.9L) μin	Gage Block Comparator w/ Master Gage Blocks
Optical Comparators <sup>1</sup>	Up to 12 in	(70+ 3.3L) μin	Glass scales
Machine Tools <sup>1</sup>			
Linearity Volume	Up to 3 200 in Up to 24 in	(2.4 + 1.3L) μin 50 μin	Laser Interferometer Ball Bar System
Video Measuring Systems <sup>1</sup>			
X/Y Axes Z Axis	Up to 30 in Up to 4 in	(53 + 0.3L) μin (24 +0.8L) μin	Glass grid Z step gage
Horizontal Measuring Machine <sup>1</sup>	(0 to 8) in	(3 + 1L) μin	Gage Blocks



**Length – Dimensional Metrology**

<b>Parameter / Equipment<sup>2</sup></b>	<b>Range</b>	<b>Expanded Uncertainty of Measurement (+/-)</b>	<b>Reference Standard, Method and/or Equipment</b>
Coordinate Measuring Machines (CMM) <sup>1</sup>			
Linear Displacement Accuracy	Up to 26 in Up to 24.41 in Up to 3 200 in	(41 + 0.8L) μin (13 + 1.2L) μin (2.4 + 1.3L) μin	Step Gage Step Gage (Koba) Laser Interferometer
Volumetric Performance	Up to 36 in	(32 + 0.8L) μin	Ball Bar
Sphere Repeatability	(0.75 to 1) in	6.7 μin	Sphere
Probing and Scanning Form	1 to 1.18 in	(12 + 0.3L) μin	Sphere
Surface Finish Analyzers <sup>1</sup>	120 μin at 0.03 in cut-off	3.8 μin	Master Specimens
Surface Finish Specimen	(2 to 300) μin	3.7 μin	Surface Finish Analyzer
Surface Finish (RA)	Up to 120 μin	3.7 μin	Mitutoyo Surface Roughness Tester
Surface Plates <sup>1,3</sup>			
Overall Flatness Repeat Reading	(0 to 140) in (0 to 140) in	(.27+0.3d) μin 19 μin	Renishaw Laser Repeat-O-Meter
Vision (Z)	Up to 10 in	(76+ 0.8L) μin	OGP Quest 450
Two Dimensions (Vision) (X & Y) TouchProbe	Up to 25 in Up to 1 in Up to 8 in	(51 + 2.0L) μin 116 μin (110 +1.4L) μin	OGP Quest 450 Gage Pins OGP Flash
Three Dimensions Single Point Scanning Form	Up to 67 in Up to 99 in Up to 67 in Up to 99 in  Up to 100 μin (100 to 500) μin	(28 + 3.5L) μin (48 + 6.3L) μin (51 + 2.9L) μin (120 +5.2 L) μin  6.4 μin 53.2 μin	PMM-C 12107 B&S Xcel 122010 PMM-C 12107 B&S Xcel 122010  Mitutoyo RA2200 AH Roundness Tester



Mass

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Rockwell Hardness Testers <sup>1</sup>	HRBW Low Middle High  HRC: Low Middle High	0.71 HRBW 0.71 HRBW 0.71 HRBW  0.71 HRC 0.71 HRC 0.71 HRC	Indirect Verification per ASTM E18 using Hardness Test Blocks
Torque – Wrenches	(5 to 50) in ozf (4 to 50) in lbf (30 to 400) in lbf (80 to 1 000) in lbf (20 to 250) ft lbf (60-600) ft lbf	0.45% 0.37% 0.29% 0.35% 0.44% 0.50%	Torque Tester
Pressure Gages Pressure Transducers <sup>1</sup>	(0 to 1) inH <sub>2</sub> O (0 to 10) inH <sub>2</sub> O (0 to 10) PSI (0 to 100) PSI (-14.7 to 200) PSI	0.005 3 inH <sub>2</sub> O 0.011 inH <sub>2</sub> O 0.023 PSI 0.033 PSI 0.16 PSI	Ashcroft ATE-2 / AM2-1
	(0 to 1 000) PSI (0 to 3 000) PSI (0 to 10 000) PSI	0.54 PSI 2.5 PSI 8.8 PSI	Fluke 525A / 700 Series

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Temperature - Measure	(-197 to -38) °C (-38 to 0) °C (0 to 157) °C (157 to 232) °C (232 to 420) °C (420 to 660) °C	0.023 °C 0.024 °C 0.035 °C 0.037 °C 0.046 °C 0.061 °C	Fluke 5609 with Fluke 914X-P
	(-197 to -38) °C (-38 to 0) °C (0 to 157) °C (157 to 232) °C (232 to 420) °C (420 to 660) °C	0.023 °C 0.023 °C 0.032 °C 0.032 °C 0.036 °C 0.045 °C	Fluke 5609 with Fluke 8508A
Temperature - Source	(-25 to -12) °C (-12 to 75) °C (75 to 150) °C	0.069 °C 0.069 °C 0.084 °C	Fluke 9142





**Thermodynamic**

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Temperature - Source	(50 to 200) °C (200 to 330) °C (330 to 540) °C (540 to 660) °C	0.092 °C 0.22 °C 0.3 °C 0.42 °C	Fluke 9144

**TESTING**

**Dimensional**

Specific Tests and / or Properties Measured <sup>2</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Length- One Dimension	Up to 24 in Up to 12 in Up to 3.2 in Up to 0.008 in Up to 0.03 in Up to 2 in Up to 1 in	(590 + 0.2L) μin (512 + 0.2L) μin 124 μin 120 μin 310 μin 120 μin 116 μin	Dial Height Gage Calipers Micrometers Dial Indicator Dial Indicator Drop Indicator Gage Pins
Vision (Z)	Up to 2 in Up to 10 in	(188 + 1.0L) μin (80+ 1.0L) μin	Tool makers Microscope OGP Quest 450
Two Dimensions (Vision) (X & Y) TouchProbe	Up to 25 in Up to 1 in Up to 8 in	(69 + 1.7L) μin 116 μin (110 +1.4L) μin	OGP Quest 450 Gage Pins OGP Flash
Three Dimensions Single Point Scanning	Up to 67 in Up to 99 in Up to 67 in Up to 99 in	(28 + 3.5L) μin (48 + 6.3L) μin (51 + 2.9L) μin (120 +5.2 L) μin	PMM-C 12107 B&S Xcel 122010 PMM-C 12107 B&S Xcel 122010
Three Dimensional Length <sup>1</sup>	8 ft spherical volume Up to 708 in	(678 + 0.9L) μin (1 100 + 3.2L) μin	Romer Absolute CMM Leica Laser Tracker (MR) w/ T-probe
Depth	Up to 6 in	590 μin	Depth Micrometer







Dimensional

Specific Tests and / or Properties Measured <sup>2</sup>	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Form Roundness	Up to 100 μin (100 to 500) μin	4.8 μin 53 μin	Mitutoyo RA2200 AH Roundness Tester
Cylindricity	Up to 100 μin (100 to 500) μin	39 μin 66 μin	Mitutoyo RA2200 AH Roundness Tester
Surface Finish (RA)	Up to 120 μin	3.7 μin	Mitutoyo Surface Roughness Tester
Contour	Up to 4 in	(162 +11 L) μin	Mitutoyo Contracer

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. The use of (L) represents length in inches, the use of (D) represents diameter in inches, the use of (d) represents diagonal in inches
3. The expanded uncertainty for Surface Plate Overall Flatness represents the maximum closure error acceptable for Surface Plate Calibrations.
4. The expanded uncertainties for electrical parameters do not contain a contributor for a "best existing device. Reported uncertainties will reflect the resolution of the device under test.
5. This scope is formatted as part of a single document including Certificate of Accreditation No. ACT-1608.




---

Vice President

