



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Transcat – New England
230 Ballardvale Street
Wilmington, MA 01887

Fulfills the requirements of

ISO/IEC 17025:2017

and the national standards

ANSI/NCSL Z540-1-1994 (R2002) AND
ANSI/NCSL Z540.3-2006 (R2013)

In the field of

CALIBRATION

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.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 07 September 2021

Certificate Number: AC-2489.04



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,
ANSI/NCSL Z540-1-1994 (R2002) AND ANSI/NCSL Z540.3 (R2013)**

Transcat – New England

230 Ballardvale Street
Wilmington, MA 01887
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978-988-3910

CALIBRATION

Valid to: **September 7, 2021**

Certificate Number: **AC-2489.04**

Chemical Quantities

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
pH – Measuring Equipment ¹	4 pH	0.011 pH	Standard Buffer Solutions
	7 pH	0.01 pH	
	10 pH	0.012 pH	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current Measuring Equipment ¹	0 μ A to 220 μ A		Fluke 5720A
	10 Hz to 20 Hz	0.031 % + 16 nA	
	20 Hz to 40 Hz	0.019 % + 10 nA	
	40 Hz to 1 kHz	0.015 % + 8 nA	
	1 kHz to 5 kHz	0.03 % + 12 nA	
	5 kHz to 10 kHz	0.11 % + 65 nA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current Measuring Equipment ¹	220 µA to 2.2 mA		Fluke 5720A
	10 Hz to 20 Hz	0.03 % + 40 nA	
	20 Hz to 40 Hz	0.018 % + 35 nA	
	40 Hz to 1 kHz	0.014 % + 35 nA	
	1 kHz to 5 kHz	0.021 % + 110 nA	
	5 kHz to 10 kHz	0.11 % + 650 nA	
	2.2 mA to 22 mA		
	10 Hz to 20 Hz	0.039 % + 0.4 µA	
	20 Hz to 40 Hz	0.019 % + 0.35 µA	
	40 Hz to 1 kHz	0.014 % + 0.35 µA	
	1 kHz to 5 kHz	0.021 % + 0.55 µA	
	5 kHz to 10 kHz	0.11 % + 5 µA	
	22 mA to 220 mA		
	10 Hz to 20 Hz	0.033 % + 4 µA	
	20 Hz to 40 Hz	0.018 % + 3.5 µA	
	40 Hz to 1 kHz	0.014 % + 2.5 µA	
	1 kHz to 5 kHz	0.021 % + 3.5 µA	
	5 kHz to 10 kHz	0.11 % + 10 µA	
	220 mA to 2.2 A		
	20 Hz to 1 kHz	0.027 % + 35 µA	
1 kHz to 5 kHz	0.046 % + 80 µA		
5 kHz to 10 kHz	0.7 % + 0.16 mA		

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current Measuring Equipment ¹	2.2 A to 11 A		Fluke 5720A w/5725A
	40 Hz to 1 kHz	0.048 % + 0.17 mA	
	1 kHz to 5 kHz	0.096 % + 0.38 mA	
	5 kHz to 10 kHz	0.36 % + 0.75 mA	
	11 A to 20.5 A		
	45 Hz to 100 Hz	0.11 % + 3.9 mA	
	100 Hz to 1 kHz	0.14 % + 3.9 mA	Dual 5520A's in Parallel
	1 kHz to 5 kHz	2.7 % + 3.9 mA	
	20.5 A to 40 A		
	45 Hz to 100 Hz	0.14 % + 11 mA	
	100 Hz to 1 kHz	0.17 % + 11 mA	
	1 kHz to 5 kHz	3.3 % + 11 mA	
40 A to 100 A		Valhalla 2555A w/Fluke 5520A	
50 Hz to 100 Hz	0.12 % + 0.35 A		
100 Hz to 400 Hz	0.24 % + 0.47 A		
400 Hz to 1 kHz	0.35 % + 0.70 A		
Extended Frequency Ranges ¹	29 μA to 330 μA		Fluke 5520A
	10 kHz to 30 kHz	1.5 % + 0.31 μA	
	0.33 mA to 3.3 mA		
	10 kHz to 30 kHz	0.92 % + 0.47 μA	
	3.3 mA to 33 mA		
	10 kHz to 30 kHz	0.37 % + 3.1 μA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Extended Frequency Ranges ¹	33 mA to 330 mA	0.37 % + 0.16 mA	Fluke 5520A
	10 kHz to 30 kHz		
Clamp-on Ammeter Toroidal Type ¹ Transformer Type	20 A to 150 A 45 Hz to 65 Hz	0.35 % + 0.25 A	Fluke 5520A w/5500A/Coil
	20 A to 150 A 65 Hz to 440 Hz	0.94 % + 0.050 mA	
	150 A to 1 000 A 45 Hz to 65 Hz	0.34 % + 0.13 A	
	150 A to 1 000 A 65 Hz to 440 Hz	1.2 % + 0.23 A	
Clamp-on Ammeter Non- Toroidal Type Hall Effect Sensor	20 A to 150 A 45 Hz to 65 Hz	0.60 % + 0.29 A	Fluke 5520A w/5500A/Coil
	20 A to 150 A 65 Hz to 440 Hz	1.0 % + 0.29 A	
	150 A to 1 000 A 45 Hz to 65 Hz	0.57 % + 1.0 A	
	150 A to 1 000 A 65 Hz to 440 Hz	1.3 % + 1.1 A	
AC Current – Measure ¹	0 μA to 100 μA	0.46 % + 35 nA 0.18 % + 35 nA 0.072 % + 35 nA 0.072 % + 35 nA	Agilent 3458A opt 002
	10 Hz to 20 Hz		
	20 Hz to 45 Hz		
	45 Hz to 100 Hz		
	100 Hz to 5 kHz		

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Measure ¹	100 µA to 1 mA		Agilent 3458A
	10 Hz to 20 Hz	0.46 % + 0.23 µA	
	20 Hz to 45 Hz	0.17 % + 0.23 µA	
	45 Hz to 100 Hz	0.07 % + 0.23 µA	
	0.1 kHz to 5 kHz	0.038 % + 0.23 µA	
	1 mA to 10 mA		
	10 Hz to 20 Hz	0.46 % + 2.3 µA	
	20 Hz to 45 Hz	0.17 % + 2.3 µA	
	45 Hz to 100 Hz	0.07 % + 2.3 µA	
	0.1 kHz to 5 kHz	0.038 % + 2.3 µA	
	10 mA to 100 mA		
	10 Hz to 20 Hz	0.46 % + 23 µA	
	20 Hz to 45 Hz	0.17 % + 23 µA	
	45 Hz to 100 Hz	0.07 % + 23 µA	
	0.1 kHz to 5 kHz	0.037 % + 23 µA	
	0.1 A to 1 A		
	10 Hz to 20 Hz	0.46 % + 0.23 mA	
	20 Hz to 45 Hz	0.19 % + 0.23 mA	
	45 Hz to 100 Hz	0.096 % + 0.23 mA	
	0.1 kHz to 5 kHz	0.12 % + 0.23 mA	
1 to 3 A			
40 Hz to 1 kHz	0.18 % + 2.1 mA		
1 kHz to 5 kHz	0.20 % + 2.1 mA		

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Measure ¹	3 to 30 A		Agilent 34330A w/3458A
	40 Hz to 1 kHz	0.35 % + 2.3 mA	
	1 kHz to 5 kHz	5.8 % + 2.3 mA	
AC Resistance– Measure ¹ 1 kHz	0 Ω to 6.25 Ω	0.70 % + 0.010 Ω	Gen Rad 1689-9700
	6.25 Ω to 100 kΩ	0.024 % + 0.010 Ω	
	100 kΩ to 410 kΩ	0.30 % + 0.010 Ω	
Measuring Equipment and Measure ¹	0 Ω to 1 Ω	42 μΩ/Ω + 30 nΩ	Fluke 1595A
	1 Ω to 10 Ω	16 μΩ/Ω	
	10 Ω to 10 kΩ	13 μΩ/Ω	
	10 kΩ to 40 kΩ	16 μΩ/Ω	
	40 kΩ to 100 kΩ	23 μΩ/Ω	
	100 kΩ to 500 kΩ	81 μΩ/Ω	
	0 Ω to 10 Ω	19 μΩ/Ω + 58 μΩ	HP3458A w/Decade Resistor
	10 Ω to 100 Ω	15 μΩ/Ω + 0.58 mΩ	
	100 Ω to 1 kΩ	12 μΩ/Ω + 0.58 mΩ	
	1 kΩ to 10 kΩ	12 μΩ/Ω + 5.8 mΩ	
	10 kΩ to 100 kΩ	13 μΩ/Ω + 58 mΩ	
	100 kΩ to 1 MΩ	19 μΩ/Ω + 2.3 Ω	
	1 MΩ to 10 MΩ	62 μΩ/Ω + 0.12 kΩ	
	10 MΩ to 100 MΩ	0.059 % + 1.2 kΩ	
	100 MΩ to 1 GΩ	0.58 % + 12 kΩ	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Measuring Equipment ¹	333 $\mu\Omega$	0.12 %	Guildline 9711A
	1 m Ω	590 $\mu\Omega/\Omega$	
	10 m Ω	140 $\mu\Omega/\Omega$	
	100 m Ω	120 $\mu\Omega/\Omega$	
	1 Ω	120 $\mu\Omega/\Omega$	
Measuring Equipment ¹	10 Ω	120 $\mu\Omega/\Omega$	Guildline 9711A
	100 Ω	120 $\mu\Omega/\Omega$	
	1 k Ω	120 $\mu\Omega/\Omega$	
	10 k Ω	130 $\mu\Omega/\Omega$	
	25 Ω	9.4 $\mu\Omega/\Omega$	IET SRL-25
230 V/100 k Ω maximum 1 kV/1 M Ω maximum 5 kV maximum (up to 1T Ω)	100 k Ω to 1 M Ω	0.18 % + 2.3 Ω	IET HRRS-B-7-100k-5kV
	1 M Ω to 10 M Ω	0.21 % + 120 Ω + 1.2 Ω/V	
	10 M Ω to 100 M Ω	0.22 % + 1.2 k Ω + 12 Ω/V	
	100 M Ω to 1 G Ω	0.30 % + 32 k Ω + 120 Ω/V	
	1 G Ω to 10 G Ω	0.58 % + 480 k Ω + 1.2 k Ω/V	
	10 G Ω to 100 G Ω	1.2 % + 62 M Ω + 23 k Ω/V	
	100 G Ω to 1 T Ω	2.6 % + 15 G Ω + 580 k Ω/V	
DC Current – Measuring Equipment ¹	0 mA to 0.22 mA	41 $\mu A/A$ + 6 nA	Fluke 5700A w/5725A
	0.22 mA to 2.2 mA	36 $\mu A/A$ + 7 nA	
	2.2 mA to 22 mA	35 $\mu A/A$ + 40 nA	
	22 mA to 220 mA	48 $\mu A/A$ + 0.7 μA	
	220 mA to 2.2 A	197 $\mu A/A$ + 12 μA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
DC Current – Measuring Equipment ¹	2.2 A to 11A	400 μ A/A + 12 μ A	Fluke 5700A w/5725A
	11 A to 20.5 A	840 μ A/A + 0.58 mA	Fluke 5520A/SC1100
	20.5 A to 40 A	0.12 % + 0.82 mA	Dual 5520A's in parallel
	40 A to 100 A	0.037 % + 35 mA	Valhalla 2555A w/5520A
DC Current – Measure & Measuring Equipment ¹	0 to 100 μ A	26 μ A/A + 0.9 nA	HP 3458A with current source
	100 μ A to 1 mA	26 μ A/A + 5.8 nA	
DC Current – Measure & Measuring Equipment ¹	1 mA to 10 mA	26 μ A/A + 58 nA	HP 3458A with current source
	10 mA to 100 mA	43 μ A/A + 0.58 μ A	
	100 mA to 1 A	0.013 % + 12 μ A	
DC Current – Measure ¹	0 to 10 μ A	130 μ A/A + 58 pA	Guildline 9711A w/ 3458A
	10 μ A to 100 μ A	120 μ A/A + 580 pA	
	100 μ A to 1 mA	120 μ A/A + 5.8 nA	
	1 mA to 10 mA	120 μ A/A + 58 nA	
	10 mA to 100 mA	120 μ A/A + 580 nA	
	100 mA to 1 A	120 μ A/A + 5.8 μ A	
	1 A to 10 A	140 μ A/A + 58 μ A	
	10 A to 100 A	590 μ A/A + 580 μ A	
	100 A to 300 A	0.12 % + 0.0017 A	
	300 A to 1000 A	0.12 % + 0.0058 A	Meterman 1000-100 w/3458A
Clamp-on Ammeter Non-Toroidal Type ¹ Hall Effect Sensor	20 A to 150 A	0.51 % + 0.14 A	Fluke 5520A w/ 5500A/Coil
	150 A to 1000 A	0.51 % + 0.50 A	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
DC Voltage – Measure ¹	0 mV to 100 mV	7.1 μ V/V + 0.58 μ V	3458A Opt 002 w/5700A
	0.1 V to 1 V	5.0 μ V/V + 0.58 μ V	
	1 V to 10 V	5.1 μ V/V + 0.58 μ V	
	10 V to 100 V	7.6 μ V/V + 35 μ V	
	100 V to 500 V	11 μ V/V + 0.12 mV	
	500 V to 800 V	16 μ V/V + 0.12 mV	
	800 V to 1 kV	21 μ V/V + 0.12 mV	
DC Voltage – Measure ¹	1 kV to 10 kV	0.054 %	Vitretek 4700
	10 kV to 35 kV	0.093 %	Vitretek 4700 w/HVL-35
	35 kV to 70 kV	0.11 % + 8.1 V	Vitretek 4700 w/HVL-70
	70 kV to 100 kV	0.17 % + 1.3 V	Vitretek 4700 w/HVL-100
DC Voltage - Measuring Equipment ¹	0 V to 0.22 V	8.5 μ V/V + 0.40 μ V	Fluke 5720A w/5725A
	0.22 V to 2.2 V	5.1 μ V/V + 0.70 μ V	
	2.2 V to 11 V	4.0 μ V/V + 2.5 μ V	
	11 V to 22 V	3.9 μ V/V + 4.0 μ V	
	22 V to 220 V	6.2 μ V/V + 40 μ V	
	220 V to 1 100 V	7.6 μ V/V + 0.40 mV	
AC Voltage – Measure ¹	0 mV to 10 mV		Agilent 3458A opt 002
	1 Hz to 40 Hz	0.039 % + 3.5 μ V	
	40 Hz to 1 kHz	0.028 % + 1.2 μ V	
	1 kHz to 20 kHz	0.038 % + 1.2 μ V	
	20 kHz to 50 kHz	0.15 % + 1.2 μ V	
	50 kHz to 100 kHz	0.59 % + 1.2 μ V	
	100 kHz to 300 kHz	4.6 % + 2.3 μ V	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measure ¹	10 mV to 100 mV		Agilent 3458A opt 002
	1 Hz to 40 Hz	0.013 % + 4.6 μV	
	40 Hz to 1 kHz	0.009 5 % + 2.3 μV	
	1 kHz to 20 kHz	0.017 % + 2.3 μV	
	20 kHz to 50 kHz	0.037 % + 2.3 μV	
	50 kHz to 100 kHz	0.093 % + 2.3 μV	
	100 kHz to 300 kHz	0.36 % + 12 μV	
	300 kHz to 1 MHz	1.2 % + 12 μV	
	100 mV to 1 V		
	1 Hz to 40 Hz	0.009 8 % + 46 μV	
	40 Hz to 1 kHz	0.009 5 % + 23 μV	
	1 kHz to 20 kHz	0.017 % + 23 μV	
	20 kHz to 50 kHz	0.036 % + 23 μV	
	50 kHz to 100 kHz	0.093 % + 23 μV	
	100 kHz to 300 kHz	0.35 % + 0.12 mV	
	300 kHz to 1 MHz	1.2 % + 0.12 mV	
	1 V to 10 V		
	1 Hz to 40 Hz	0.009 5 % + 0.46 mV	
	40 Hz to 1 kHz	0.009 5 % + 0.23 mV	
	1 kHz to 20 kHz	0.017 % + 0.23 mV	
	20 kHz to 50 kHz	0.036 % + 0.23 mV	
50 kHz to 100 kHz	0.093 % + 0.23 mV		
100 kHz to 300 kHz	0.35 % + 1.2 mV		
300 kHz to 1 MHz	1.2 % + 1.2 mV		

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measure ¹	10 V to 100 V		Agilent 3458A opt 002
	1 Hz to 40 Hz	0.024 % + 4.6 mV	
	40 Hz to 1 kHz	0.024 % + 2.3 mV	
	1 kHz to 20 kHz	0.024 % + 2.3 mV	
	20 kHz to 50 kHz	0.041 % + 2.3 mV	
	50 kHz to 100 kHz	0.14 % + 2.3 mV	
	100 kHz to 300 kHz	0.46 % + 12 mV	
	300 kHz to 1 MHz	1.7 % + 12 mV	
	100 V to 700 V		
	1 Hz to 40 Hz	0.047 % + 46 mV	
	40 Hz to 1 kHz	0.047 % + 23 mV	
	1 kHz to 20 kHz	0.071 % + 23 mV	
	20 kHz to 50 kHz	0.14 % + 23 mV	
	50 kHz to 100 kHz	0.35 % + 23 mV	
	0.7 kV to 10 kV		Vitrek 4700
	60 Hz	0.14 %	
	10 kV to 30 kV		Vitrek 4700 w/HVL-35
	60 Hz	0.095 % + 17 V	
30 kV to 50 kV		Vitrek 4700 w/HVL-70	
60 Hz	0.16 % + 4.0 V		
50 kV to 70 kV		Vitrek 4700 w/HVL-100	
60 Hz	0.23 % + 1.4 V		

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measure ¹	0 mV to 1 mV		R&S URE3
	100 kHz to 1 MHz	2.0 % + 2.4 μV	
	1 MHz to 3 MHz	3.8 % + 2.4 μV	
	3 MHz to 10 MHz	10 % + 2.4 μV	
	10 MHz to 20 MHz	25 % + 2.4 μV	
	1 mV to 3 mV		
	100 kHz to 1 MHz	1.0 % + 2 μV	
	1 MHz to 3 MHz	3.8 % + 2 μV	
	3 MHz to 10 MHz	11 % + 2 μV	
	10 MHz to 20 MHz	25 % + 2 μV	
	3 mV to 100 mV		
	100 kHz to 1 MHz	0.98 % + 3 μV	
	1 MHz to 3 MHz	1.9 % + 3 μV	
	3 MHz to 10 MHz	3.2 % + 3 μV	
	10 MHz to 20 MHz	7.6 % + 3 μV	
20 MHz to 30 MHz	16 % + 3 μV		
AC Voltage – Measuring Equipment ¹	0 mV to 2.2 mV		Fluke 5720A
	10 Hz to 20 Hz	0.16 % + 4 μV	
	20 Hz to 40 Hz	0.10 % + 4 μV	
	40 Hz to 20 kHz	0.078 % + 4 μV	
	20 kHz to 50 kHz	0.13 % + 4 μV	
	50 kHz to 100 kHz	0.17 % + 5 μV	
	100 kHz to 300 kHz	0.33 % + 10 μV	
	300 kHz to 500 kHz	0.47 % + 20 μV	
	500 kHz to 1 MHz	0.58 % + 20 μV	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measuring Equipment ¹	2.2 mV to 22 mV		Fluke 5720A
	10 Hz to 20 Hz	0.042 % + 4 μV	
	20 Hz to 40 Hz	0.03 % + 4 μV	
	40 Hz to 20 kHz	0.014 % + 4 μV	
	20 kHz to 50 kHz	0.030 % + 4 μV	
	50 kHz to 100 kHz	0.058 % + 5 μV	
	100 kHz to 300 kHz	0.12 % + 10 μV	
	300 kHz to 500 kHz	0.16 % + 20 μV	
	500 kHz to 1 MHz	0.27 % + 20 μV	
	22 mV to 220 mV		
	10 Hz to 20 Hz	0.028 % + 12 μV	
	20 Hz to 40 Hz	0.011 % + 7 μV	
	40 Hz to 20 kHz	0.008 5 % + 7 μV	
	20 kHz to 50 kHz	0.021 % + 7 μV	
	50 kHz to 100 kHz	0.047 % + 17 μV	
	100 kHz to 300 kHz	0.091 % + 20 μV	
	300 kHz to 500 kHz	0.14 % + 25 μV	
	500 kHz to 1 MHz	0.28 % + 45 μV	
	220 mV to 2.2 V		
	10 Hz to 20 Hz	0.027 % + 40 μV	
	20 Hz to 40 Hz	0.01 % + 15 μV	
	40 Hz to 20 kHz	0.004 8 % + 8 μV	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measuring Equipment ¹	220 mV to 2.2 V	0.008 % + 10 μV	Fluke 5720A
	20 kHz to 50 kHz	0.012 % + 30 μV	
	50 kHz to 100 kHz	0.043 % + 0.08 mV	
	100 kHz to 300 kHz	0.1 % + 0.2 mV	
	300 kHz to 500 kHz	0.18 % + 0.3 mV	
	500 kHz to 1 MHz		
	2.2 V to 22 V		
	10 Hz to 20 Hz	0.028 % + 0.4 mV	
	20 Hz to 40 Hz	0.01 % + 0.15 mV	
	40 Hz to 20 kHz	0.004 9 % + 50 μV	
	20 kHz to 50 kHz	0.008 3 % + 0.1 mV	
	50 kHz to 100 kHz	0.012 % + 0.2 mV	
	100 kHz to 300 kHz	0.03 % + 0.6 mV	
	300 kHz to 500 kHz	0.1 % + 2 mV	
	500 kHz to 1 MHz	0.17 % + 3.2 mV	
	22 V to 220 V		
	10 Hz to 20 Hz	0.028 % + 4 mV	
	20 Hz to 40 Hz	0.01 % + 1.5 mV	
	40 Hz to 20 kHz	0.005 6 % + 0.6 mV	
	20 kHz to 50 kHz	0.009 3 % + 1 mV	
	50 kHz to 100 kHz	0.016 % + 2.5 mV	
	100 kHz to 300 kHz	0.09 % + 16 mV	
	300 kHz to 500 kHz	0.44 % + 40 mV	
	500 kHz to 1 MHz	0.8 % + 80 mV	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measuring Equipment ¹	220 V to 750 V 30 kHz to 50 kHz	0.061 % + 11 mV	Fluke 5720A
	50 kHz to 100 kHz	0.23 % + 45 mV	
	220 V to 1100 V 40 Hz to 1 kHz	0.011 % + 4.0 mV	Fluke 5720A w/ 5725A
	1 kHz to 20 kHz	0.017 % + 6.0 mV	
20 kHz to 30 kHz	0.061 % + 11 mV		
Capacitance Measure ¹	1 pF to 10 pF 1 kHz	0.47 % + 0.05 pF	GenRad 1689-9700
	10 pF to 100 pF 1 kHz	0.058 % + 0.05 pF	
	100 pF to 1 μF 1 kHz	0.024 % + 0.05 pF	
	1 μF to 100 μF 1 kHz	0.035 %	
	100 μF to 1 mF 1 kHz	0.24 %	
Capacitance Measure Equipment ¹	0.1 nF to 0.5 nF 0.1 kHz to 1 kHz	0.58 pF	Arco SS32
	0.5 nF to 1400 nF 0.1 kHz to 1 kHz	0.12 % + 0.018 pF	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Capacitance Measure Equipment ¹	0.19 nF to 1.1 nF 10 Hz to 10 kHz	0.39 % + 6.1 pF	5520A
	1.1 nF to 3.3 nF 10 Hz to 3 kHz	0.39 % + 6.1 pF	
	3.3 nF to 11 nF 10 Hz to 1 kHz	0.21 % + 6.1 pF	
	11 nF to 110 nF 10 Hz to 1 kHz	0.21 % + 61 pF	
	110 nF to 330 nF 10 Hz to 1 kHz	0.21 % + 0.18 nF	
	0.33 μF to 1.1 μF 10 Hz to 600 Hz	0.2 % + 0.61 nF	
	1.1 μF to 3.3 μF 10 Hz to 300 Hz	0.2 % + 1.9 nF	
	3.3 μF to 11 μF 10 Hz to 150 Hz	0.2 % + 6.1 nF	
	11 μF to 33 μF 10 Hz to 120 Hz	0.32 % + 18 nF	
	33 μF to 110 μF 10 Hz to 80 Hz	0.35 % + 61 nF	
	110 μF to 330 μF DC to 50 Hz	0.35 % + 0.18 μF	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Capacitance Measure Equipment ¹	0.33 mF to 1.1 mF DC to 20 Hz	0.35 % + 0.61 μF	5520A
	1.1 mF to 3.3 mF DC to 6 Hz	0.35 % + 1.8 μF	
	3.3 mF to 11 mF DC to 2 Hz	0.35 % + 6.1 μF	
	11 mF to 33 mF DC to 0.6 Hz	0.58 % + 18 μF	
	33 mF to 110 mF DC to 0.2 Hz	0.85 % + 61 μF	
Inductance Measure ¹	1 mH to 10 mH 1 kHz	0.024 % + 0.10 μH	GenRad 1689-9700
	10 mH to 10 H 1 kHz	0.024 % + 1.4 μH	
Inductance Measuring Equipment ¹	50 mH 1 kHz	0.12 % + 1.4 μH	Standard Inductor
	100 mH 1 kHz	0.12 % + 1.4 μH	Standard Inductor
Electrical Simulation of Thermocouples ¹ Type E	-270 °C to -245 °C	2.1 °C	Ectron 1140A
	-245 °C to -195 °C	0.2 °C	
	-195 °C to -155 °C	0.11 °C	
	-155 °C to -90 °C	0.09 °C	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Electrical Simulation of Thermocouples ¹ Type E	-90 °C to 0 °C	0.08 °C	Ectron 1140A
	0 °C to 15 °C	0.08 °C	
	15 °C to 890 °C	0.07 °C	
	890 °C to 1000 °C	0.08 °C	
Type J	-210 °C to -180 °C	0.13 °C	
	-180 °C to -120 °C	0.11 °C	
	-120 °C to -50 °C	0.09 °C	
	-50 °C to 990 °C	0.08 °C	
	990 °C to 1200 °C	0.08 °C	
Type K	-270 °C to -255 °C	2.3 °C	
	-255 °C to -195 °C	0.73 °C	
	-195 °C to -115 °C	0.14 °C	
	-115 °C to -55 °C	0.10 °C	
	-55 °C to 1000 °C	0.08 °C	
	1000 °C to 1372 °C	0.09 °C	
Type N	-270 °C to -260 °C	5.1 °C	
	-260 °C to -200 °C	1.1 °C	
	-200 °C to -140 °C	0.25 °C	
	-140 °C to -70 °C	0.16 °C	
	-70 °C to 25 °C	0.13 °C	
	25 °C to 160 °C	0.11 °C	
	160 °C to 1300 °C	0.10 °C	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Electrical Simulation of Thermocouples ¹ Type R	-50 °C to -30 °C	0.68 °C	Ectron 1140A
	-30 °C to -45 °C	0.58 °C	
	-45 °C to 160 °C	0.42 °C	
	160 °C to 380 °C	0.31 °C	
	380 °C to 775 °C	0.28 °C	
	775 °C to 1768 °C	0.23 °C	
Type S	-50 °C to -30 °C	0.65 °C	
	-30 °C to 45 °C	0.59 °C	
	45 °C to 105 °C	0.42 °C	
	105 °C to 310 °C	0.35 °C	
	310 °C to 615 °C	0.31 °C	
	615 °C to 1768 °C	0.27 °C	
Type T	-270 °C to -255 °C	1.8 °C	
	-255 °C to -240 °C	0.52 °C	
	-240 °C to -210 °C	0.32 °C	
	-210 °C to -150 °C	0.19 °C	
	-150 °C to -40 °C	0.13 °C	
	-40 °C to 100 °C	0.09 °C	
	100 °C to 400 °C	0.08 °C	
Power Measuring Equipment ¹ DC Power 0.33 mA to 330 mA	11 μW to 1.1 mW 1.1 mW to 110 mW 0.11W to 110 W 110 W to 330 W	0.024 % 0.027 % 0.024 % 0.018 %	Fluke 5520A

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment	
Power Measuring Equipment ¹ DC Power				
0.33 A to 3 A	11 W to 110 mW 0.11 W to 990 W 1 W to 3 kW	0.044 % 0.053 % 0.009 6 %	Fluke 5520A	
3 A to 20.5 A	0.099 W to 0.99 W 0.99 W to 6.8 kW 6.8 W to 20.5 kW	0.088 % 0.07 % 0.04 %		
AC Power ⁴ (PF=1)				
10 Hz to 65 Hz				
3.3 mA to 9 mA	0.11 mW to 3.0 mW 3.0 mW to 9.0 W	0.13% 0.077%	Fluke 5520A	
9 mA to 33 mA	0.3 mW to 10 mW 10 mW to 33W	0.089 % 0.077%		
33 mA to 90 mA	1 mW to 30 mW 30 mW to 90 W	0.071 % 0.057 %		
90 mA to 330 mA	3 mW to 100 mW 100 mW to 300 W	0.089 % 0.078 %		
0.33 A to 0.9 A	11 mW to 300 mW 300 mW to 900 W	0.071 % 0.081 %		
0.9 A to 2.2 A	30 mW to 720 mW 720 mW to 2 kW	0.089 % 0.079 %		
2.2 A to 4.5 A	80 mW to 1.4 W 1.4 W to 4.5 kW	0.088 % 0.18 %		
4.5 A to 20.5 A	150 mW to 6.7 W 6.7 W to 20 kW	0.17 % 0.17 %		

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Phase Meters – Measure Equipment ¹	0° to 180° 10 Hz to 65 Hz 65 Hz to 500 Hz 500 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 20 kHz	0.11° 0.20° 0.40° 1.9° 3.9° 7.8°	Fluke 5520A
Oscilloscopes ¹ Amplitude DC ¹ into 50 Ω Load into 1 MΩ Load Amplitude Square Wave ¹ into 50 Ω Load Rate: 10 Hz to 10 kHz into 1 MΩ Load Rate: 10 Hz to 1 kHz Rate: 1 kHz to 10 kHz	 (-6.6 to 6.6) V (-130 to 130) V 1 mV _(pk-pk) to 6.6 V _(pk-pk) 1 mV _(pk-pk) to 6.6 V _(pk-pk) 1 mV _(pk-pk) to 6.6 V _(pk-pk)	 0.2% + 31 μV 0.039% + 31 μV 0.19% + 31 μV 0.078% + 31 μV 0.19% + 31 μV	Fluke 5520A/SC1100
Timing - Generate ¹ 50 Ω Load	5 s 2 s 1 s 500 ms 200 ms 100 ms 50 ms 20 mS to 1 nS	0.30 % 0.12 % 0.062 % 0.032 % 0.014 % 0.0076 % 0.0046 % 0.00022 %	Fluke 5520A/SC1100
Rise Time – Generate ^{1,4} 50 Ω Load 5.0 mV _(pk-pk) to 2.5 V _(pk-pk) Rate: 1 kHz to 2 MHz Rate: 2 MHz to 10 MHz	250 ps (nominal) 250 ps (nominal)	50 ps 50 ps	Fluke 5520A/SC1100



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Leveled Sine Wave Generate ¹ 50 Ω Load 5.0 mV _(pk-pk) to 5.5 V _(pk-pk) 5.0 mV _(pk-pk) to 3.5 V _(pk-pk)	50 kHz 50 kHz to 100 MHz 100 MHz to 300 MHz 300 MHz to 600 MHz 600 MHz to 1 GHz	1.8 % + 230 μV 2.8 % + 230 μV 3.2 % + 230 μV 4.0 % + 230 μV 5.5 % + 230 μV	Fluke 5520A/SC1100
Bandwidth/Flatness Measure ¹ 50 Ω (50 kHz Reference) 5.0 mV _(pk-pk) to 5.5 V _(pk-pk) 5.0 mV _(pk-pk) to 3.5 V _(pk-pk)	50 kHz to 100 MHz 100 MHz to 300 MHz 300 MHz to 600 MHz 600 MHz to 1.1 GHz	1.4 % + 78 μV 1.8 % + 78 μV 3.2 % + 78 μV 4.0 % + 78 μV	Fluke 5520A/SC1100
Input Impedance Measure ¹ 50 Ω 1 MΩ	40 Ω to 60 Ω 500 kΩ to 1.5 MΩ	0.082 % 0.081 %	Fluke 5520A/SC1100
Input Capacitance Measure ¹	5 pF to 50 pF	3.9 % + 0.39 pF	Fluke 5520A/SC1100
Wave Generator – Source ¹ Amplitude (10 Hz to 10 kHz) Sine, Square, Triangle 50 Ω Load 1 MΩ Load	1.8 mV _(pk-pk) to 2.5 V _(pk-pk) 1.8 mV _(pk-pk) to 55 V _(pk-pk)	2.3 % + 78 μV _(pk-pk) 2.3 % + 78 μV _(pk-pk)	Fluke 5520A/SC1100
Wave Generator – Source ¹ Frequency Sine, Square, Triangle	10 Hz to 10 kHz	0.001 9% + 0.012 Hz	Fluke 5520A/SC1100

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ⁵	Reference Standard, Method and/or Equipment
Angle	< 90 °	12 arc seconds	Sine Bar, surface plate
	90°	3.7 arc seconds	Granite Square, surface plate
Micrometers & Calipers – Outside, Inside, Depth ¹	0.01 in to 0.4 in	(9.5 + 0.6L) μin	Comparison to Gage Blocks
	0.4 in to 1.0 in	(9.2 + 1.4L) μin	
	1 in to 9 in	(5 + 4.1L) μin	
	9 in to 40 in	(7.9 + 4.3L) μin	
Anvil Flatness ¹	0 in to 4 in	5 μin	Optical Flats
Anvil Parallelism ¹	0 in to 1 in	16 μin	Optical Parallels
Bore Gages	0.04 in to 1 in	83 μin	Characterized Rings
	1 in to 5 in	(82 + 1.9L) μin	
Digital/Dial Indicators, LVDT's, Gage amplifiers	0 in to 1 in	(6.1 + 1.1L) μin	Pratt & Whitney Labmaster
	1 in to 2 in	(4.2 + 3L) μin	
	2 in to 6 in	(0.9 + 4.8L) μin	
Single Axis - Outside	0 in to 1 in	(3.7 + 2L) μin	Pratt & Whitney Labmaster
	1 in to 2 in	(2.1 + 3.6L) μin	
	2 in to 4 in	(1.6 + 4.3L) μin	
	4 in to 12 in	(0.7 + 5L) μin	
	12 in to 24 in	(1+ 5.8L) μin	Pratt & Whitney Supermic
Micrometer Heads	0 in to 1 in	29 μin	Gaging amplifier/Blocks
	1 in to 2 in	31 μin	
Height Measuring Equipment	0 in to 12 in	(63 + 2L) μin	Gage Blocks/Surface Plate
	12 in to 24 in	(37 + 4.2L) μin	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ⁵	Reference Standard, Method and/or Equipment
Parallelism & Straightness	0 in to 36 in	89 μin	Gage Amp/Surface Plate
Crimp Tools – Crimp Height	0 in to 1 in	0.001 in	Crimp Height Micrometer
Squareness	90 °	(160 + 4.8L) μin	Granite square, surface plate w/gage amplifier
Length Measuring Equipment – Linear Displacement	0 ft to 12 ft	(1 + 2.1L) μin	Laser Interferometer
Thread Wire Sets	2 TPI to 120 TPI	12 μin	ULM
Plug Gages – Outer Diameter	0 in to 5 in	(8.8 + 2.9L) μin	ULM
Ring Gage – Inner Diameter	0.04 in to 0.5 in	(8.1 + 1.5L) μin	ULM
	0.5 in to 1 in	(8.5 + 1L) μin	
	1 in to 3 in	(1.5 + 8.4L) μin	
	3 in to 11 in	(16.6 + 4.2L) μin	
Laser Micrometers	0.011 in to 1 in	(13 + 1.8L) μin	Master Pins
Rulers	0 in to 12 in	(200 + 50L) μin	OGP Smartscope Flash 302
	12 in to 18 in	(210 + 71L) μin	
Thread Plug Gages Pitch Diameter 60° Thread	0 in to 4 in	83 μin	ULM
Major Diameter	0 in to 4 in	(8.8 + 2.9L) μin	ULM
Thread Ring Gage Inner Pitch Diameter	0 in to 4 in	83 μin	Master Plug Uncertainty
Gauges/Fixtures Two Axis (X-Y)	0 in to 12 in	(85 + 50L) μin	OGP Smartscope Flash 302
	12 in to 18 in	(120 + 71L) μin	
Z Axis	0 in to 10 in	(140 + 75L) μin	
Angle	0 to 12 in	0.003 3 °	
	12 in to 18 in	0.004 5 °	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ⁵	Reference Standard, Method and/or Equipment
Gauges/Fixtures Two Axis Perpendicularity	0 in to 12 in	(120 + 48L) μin	OGP Smartscope Flash 302
	12 in to 18 in	(123 + 71L) μin	
Radius	0 in to 5 in	(440 + 50L) μin	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method, and/or Equipment
Durometer (Spring Force)	Type A, B, E, O	0.57 duro	Durometer Calibrator
	Type D, C, DO	0.51 duro	
Durometer (Indenter length)	0 to 1 in	(85 + 50L) μin	OGP Flash 302
Force Measuring Equipment ¹	0.5 lb to 100 lb	0.025 %	NIST Class F
Torque Measure ¹	3.2 ozf·in to 80 ozf·in	1.2 % + 0.002 3 ozf·in	Torque Calibrator
	2 lbf·in to 10 lbf·in	1.4 %	
	10 lbf·in to 812 lbf·ft	1 %	
Torque – Measuring Equipment	2.5 ozf·in to 50 lbf·ft	0.12 %	Torque wheels & NIST Class F Weights
Balances & Scales ¹	25 kg	210 mg	ASTM Class 2
	10 kg	163 mg	
	5 kg	11 mg	
	2 kg	11 mg	
	1 kg	0.76 mg	
	500 g	0.78 mg	
	200 g	0.21 mg	ASTM Class 1
100 g	0.29 mg		

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method, and/or Equipment
Balances & Scales ¹	50 g	0.15 mg	ASTM Class 1
	20 g	50 µg	
	10 g	62 µg	
	5 g	23 µg	
	2 g	27 µg	
	1 g	23 µg	
	500 mg	20 µg	
	200 mg	20 µg	
	100 mg	20 µg	
	50 mg	20 µg	
	20 mg	20 µg	
	10 mg	20 µg	
	5 mg	20 µg	
	2 mg	20 µg	
	1 mg	20 µg	
Avoirdupois - Variable Points	1 lb to 100 lb	0.016 %	NIST Class F
	100 lb to 200 lb	0.027 %	
	200 lb to 300 lb	0.036 %	
Fixed Points	10 lb	0.000 97 lb	ASTM Class 5
	20 lb	0.002 4 lb	
Mass Standards - Metric	25 kg	0.32 g	Echelon III
	20 kg	0.29 g	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method, and/or Equipment
Mass Standards - Metric	10 kg	0.29 g	
Mass Standards – Avoirdupois	50 lb	0.32 g	Echelon III
	25 lb	0.29 g	
	20 lb	0.29 g	
Absolute Pressure Source - Pneumatic	0 psia to 25 psia	0.0019 psia	Ruska 7250xi
	25 psia to 500 psia	0.006 6 % + 0.001 psia	
Absolute Pressure Source - Hydraulic	50 psia to 150 psia	0.012 % + 0.012 psi	Ametek T150 w/7250xi
	150 psia to 15 000 psia	0.012 % + 0.002 psi	
Gage Pressure - Pneumatic	-36 inH ₂ O to -22 inH ₂ O	0.009 % + 150 µinH ₂ O	DHI PPC4-ui
	-22 inH ₂ O to 22 inH ₂ O	0.002 inH ₂ O	
	22 inH ₂ O to 60 inH ₂ O	0.009 % + 150 µinH ₂ O	
	60 inH ₂ O to 72 inH ₂ O	0.006 5 inH ₂ O	
	72 inH ₂ O to 804 inH ₂ O	0.009 % + 150 µinH ₂ O	Ruska 7250xi
	-15 psig to 25 psig	0.001 7 psi	
Pressure - Hydraulic	25 psig to 500 psig	0.006 5 %	Ametek T150
	50 psig to 150 psig	0.012 % + 0.012 psi	
	150 psig to 15 000 psig	0.012 %	

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Relative Humidity Generate (-10°C to 15°C)	(10 to 75) %RH (75 to 95) %RH	0.50 % RH 0.65 % RH	Humidity Generator

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment	
Relative Humidity (15°C to 35°C)	(10 to 95) %RH	0.5 % RH	Humidity Generator	
(35°C to 70°C)	(10 to 50) %RH (50 to 75) %RH (75 to 95) %RH	0.5 % RH 0.7 % RH 0.85 % RH		
Measure ¹ (10°C to 60°C)	(10 to 90) %RH	1.3 % RH		Vaisala HMI41
Temperature – Measure ¹	-195 °C to 0 °C	7.2 mK + 0.002 7 %		Hart 5628 w/Black Stack
	0 °C to 660 °C	10 mK + 0.002 7 %		
	660 °C to 1200 °C	2.9 °C + 0.46 %	DPI 620 w/GeoCorp 2-120N1U1	
SPRT Calibration by Comparison	-195 °C	5.4 mK	1595A w/LN2 Comparator	
	-78	4.4 mK	1595A w/Precision bath	
	-38.8	4.0 mK		
	0.01	2.9 mK	TPW fixed point	
	29.8	3.3 mK	1595A w/Precision bath	
	100 °C	3.9 mK		
	156 °C	7.6 mK		
	232 °C	8.2 mK		
	300 °C	8.8 mK	1595A w/Precision bath	
	420 °C	9.9 mK		
	500 °C	14 mK		
	-85°C to 500 °C	2.9 mK to 21 mK		

Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Frequency Dissemination Source and Measure	10 MHz	5.8×10^{-10}	Rubidium Standard
Rise Time (Measure)	≥ 700 ps	140 ps	TDS 3052C
Time – Measure	Up to 599 sec/month	0.058 sec/day	Timometer

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. Values listed with percent (%) are percent of reading or generated value unless otherwise noted.
3. The uncertainties shown are for the most favorable conditions. There is an increase in uncertainty that corresponds to the laboratory's AC voltage and current uncertainties at different frequencies other than the ones shown. Power factors (PF) other than the one shown contribute to the power uncertainty. PF is related to the cosine of phase. Therefore, uncertainties track the laboratory's phase uncertainty closely at PF near one, but are magnified heavily as PF approaches zero. The lab may also report reactive power, apparent power, and power factor under this accreditation. If needed, contact laboratory for more information regarding uncertainties at frequency and power factor combinations other than the ones shown.
4. The stated uncertainty is the laboratory's ability to source a fast rise pulse that is approximately 250 ps. In the typical application of measuring rise time of an oscilloscope, this value is one of the contributing factors, but other factors are derived from the DUT. The known source rise time is mathematically removed from the total measured rise time measured on the DUT.
5. L = length in inches.
6. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2489.04.



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