



CERTIFICATE OF ACCREDITATION

ANSI National Accreditation Board
11617 Coldwater Road, Fort Wayne, IN 46845 USA

This is to certify that

Transcat-St. Louis

**895 Bolger Court
Fenton, MO 63026**

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

ISO/IEC 17025:2017

and national standard

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

while demonstrating technical competence in the field of

CALIBRATION

Refer to the accompanying Scope of Accreditation for information regarding the types of activities to which this accreditation applies

AC-2489.13

Certificate Number


ANAB Approval

Certificate Valid Through: 09/07/2021
Version No. 006 Issued: 11/08/2019



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).



ANSI National Accreditation Board

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

Transcat – St. Louis

895 Bolger Court
Fenton, MO 63026
Dennis Evans
636-349-7722

CALIBRATION

Valid to: **September 7, 2021**

Certificate Number: **AC-2489.13**

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		Multifunction Calibrator
	10 Hz to 20 Hz	0.032 % + 16 nA	
	20 Hz to 40 Hz	0.019 % + 10 nA	
	40 Hz to 1 kHz	0.014 % + 8 nA	
	1 kHz to 5 kHz	0.029 % + 12 nA	
	5 kHz to 10 kHz	0.11 % + 65 nA	
	220 μ A to 2.2 mA		
	10 Hz to 20 Hz	0.031 % + 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 % + 0.11 μ A	
	5 kHz to 10 kHz	0.11 % + 0.65 μ A	
	2.2 mA to 22 mA		
	10 Hz to 20 Hz	0.035 % + 0.4 μ A	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Measuring Equipment ¹	20 Hz to 40 Hz	0.019 % + 0.35 μ A	Multifunction Calibrator
	40 Hz to 1 kHz	0.015 % + 0.35 μ A	
	1 kHz to 5 kHz	0.022 % + 0.55 μ A	
	5 kHz to 10 kHz	0.11 % + 5 μ A	
	22 mA to 220 mA		
	10 Hz to 20 Hz	0.033 % + 4 μ A	
	20 Hz to 40 Hz	0.018 % + 3.5 μ A	
	40 Hz to 1 kHz	0.014 % + 2.5 μ A	
	1 kHz to 5 kHz	0.021 % + 3.5 μ A	
	5 kHz to 10 kHz	0.11 % + 10 μ A	
	220 mA to 2.2 A		Multifunction Calibrator / Amplifier
	20 Hz to 1 kHz	0.027 % + 35 μ A	
	1 kHz to 5 kHz	0.046 % + 80 μ A	
	5 kHz to 10 kHz	0.7 % + 0.16 mA	
	2.2 A to 11 A		
	40 Hz to 1 kHz	0.047 % + 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		Multifunction Calibrator
	45 Hz to 100Hz	0.097 % + 3.9 mA	
	100 Hz to 1 kHz	0.12 % + 3.9 mA	
	1 kHz to 5 kHz	2.3 % + 3.9 mA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Extended Frequency Ranges ¹	29 μ A to 330 μ A 10 kHz to 30 kHz	1.2 % + 0.31 μ A	Multifunction Calibrator
	330 μ A to 3.3 mA 10 kHz to 30 kHz	0.78 % + 0.47 μ A	
	3.3 mA to 33 mA 10 kHz to 30 kHz	0.31 % + 3 μ A	
	29 mA to 330 mA 10 kHz to 30 kHz	0.31 % + 0.16 mA	
Clamp-on Ammeter Toroidal Type ¹ Transformer Type	20 A to 150 A 45 Hz to 65 Hz	0.4 % + 26 mA	Multifunction Calibrator / Current Coil
	65 Hz to 440 Hz	0.97 % + 47 mA	
	150 A to 1000 A 45 Hz to 65 Hz	0.43 % + 0.12 A	
	65 Hz to 440 Hz	1.3 % + 0.22 A	
Clamp-on Ammeter Non-Toroidal Type ¹ Hall Effect Sensor	20 A to 150 A 45 Hz to 65 Hz	0.63 % + 0.25 A	Multifunction Calibrator / Coil
	65 Hz to 440 Hz	1.2 % + 0.25 A	
	150 A to 1000 A 45 Hz to 65 Hz	0.65 % + 0.9 A	
	65 Hz to 440 Hz	1.4 % + 0.92 A	
AC Current – Measure ¹	0 μ A to 100 μ A 10 Hz to 20 Hz	0.46 % + 35 nA	Precision Multimeter

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Measure ¹	20 Hz to 45 Hz	0.17 % + 35 nA	Precision Multimeter
	45 Hz to 100 Hz	0.072 % + 35 nA	
	100 Hz to 5 kHz	0.072 % + 35 nA	
	100 µA to 1 mA		
	10 Hz to 20 Hz	0.46 % + 230 nA	
	20 Hz to 45 Hz	0.17 % + 230 nA	
	45 Hz to 100 Hz	0.071 % + 230 nA	
	100 Hz to 5 kHz	0.038 % + 230 nA	
	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	0.071 % + 2.3 µA	
	100 Hz 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	0.071 % + 23 µA	
	100 Hz to 5 kHz	0.037 % + 23 µA	
	100 mA to 1 A		
	10 Hz to 20 Hz	0.46 % + 230 µA	
	20 Hz to 45 Hz	0.19 % + 230 µA	
	45 Hz to 100 Hz	0.097 % + 230 µA	
	100 Hz to 5 kHz	0.12 % + 230 µA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
DC Current – Measuring Equipment ¹	0 μ A to 220 μ A	45 μ A/A + 6 nA	Multifunction Calibrator
	220 μ A to 2.2 mA	39 μ A/A + 7 nA	
	2.2 mA to 22 mA	39 μ A/A + 40 nA	
	22 mA to 220 mA	58 μ A/A + 0.7 μ A	
	220 mA to 2.2 A	240 μ A/A + 12 μ A	
	2.2 A to 11 A	410 μ A/A + 480 μ A	Multifunction Calibrator / Amplifier
	11 A to 20.5 A	840 μ A/A + 0.58 mA	Multifunction Calibrator
Clamp-on Ammeter Non-Toroidal Type ¹ Hall Effect Sensor	20 A to 150 A	0.51 % + 0.14 A	Multifunction Calibrator / Current Coil
	150 A to 1 000 A	0.51 % + 0.5 A	
DC Current – Measure ¹	0 μ A to 100 μ A	33 μ A/A + 0.92 nA	Precision Multimeter
	100 μ A to 1 mA	30 μ A/A + 5.8 nA	
	1 mA to 10 mA	30 μ A/A + 58 nA	
	10 mA to 100 mA	41 μ A/A + 580 nA	
	100 mA to 1 A	130 μ A/A + 12 μ A	
	1 A to 3 A	0.15% + 0.7 mA	Multimeter
DC Resistance – Measuring Equipment and Measure ¹	0.01 Ω to 10 Ω	18 $\mu\Omega/\Omega$ + 58 $\mu\Omega$	Precision Multimeter with resistance sources
	10 Ω to 100 Ω	15 $\mu\Omega/\Omega$ + 0.58 m Ω	
	100 Ω to 1 k Ω	13 $\mu\Omega/\Omega$ + 0.58 m Ω	
	1 k Ω to 10 k Ω	13 $\mu\Omega/\Omega$ + 5.8 m Ω	
	10 k Ω to 100 k Ω	13 $\mu\Omega/\Omega$ + 58 m Ω	
	100 k Ω to 1 M Ω	21 $\mu\Omega/\Omega$ + 2.3 Ω	
	1 M Ω to 10 M Ω	62 $\mu\Omega/\Omega$ + 120 Ω	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
DC Resistance – Measuring Equipment and Measure ¹	10 MΩ to 100 MΩ	0.059 % + 1.2 kΩ	Precision Multimeter with resistance sources
	100 MΩ to 1 GΩ	0.58 % + 12 kΩ	
DC Resistance – Measuring Equipment ¹ (5 kV Maximum)	100 kΩ to <1 MΩ (230 V/step, 2 300 V max)	0.035 %	High Voltage Decade Box
	1 MΩ to <10 MΩ (1 kV/step, 5 000 V max)	0.035 % + 1.2 μΩ/Ω/V	
	10 MΩ to <100 MΩ	0.12 % + 1.2 μΩ/Ω/V	
	100 MΩ to <1 GΩ	0.30 % + 1.2 μΩ/Ω/V	
	1 GΩ to <10 GΩ	0.59 % + 1.2 μΩ/Ω/V	
	10 GΩ to <100 GΩ	1.2 % + 2.3 μΩ/Ω/V	
	100 GΩ to 1 TΩ	2.6 % + 5.8 μΩ/Ω/V	
DC Voltage – Measuring Equipment ¹	0 mV to 220 mV	9.6 μV/V + 0.4 μV	Multifunction Calibrator
	220 mV to 2.2 V	5.6 μV/V + 0.7 μV	
	2.2 V to 11 V	4.1 μV/V + 2.5 μV	
	11 V to 22 V	4.1 μV/V + 4 μV	
	22 V to 220 V	5.9 μV/V + 40 μV	
	220 V to 1.1 kV	7.6 μV/V + 400 μV	Multifunction Calibrator / Amplifier
DC Voltage – Measure ¹	0 mV to 100 mV	8.3 μV/V + 0.58 μV	Precision Multimeter
	100 mV to 1 V	5.3 μV/V + 0.58 μV	
	1 V to 10 V	5.1 μV/V + 0.58 μV	
	10 V to 100 V	7.6 μV/V + 35 μV	
	100 V to 500 V	11 μV/V + 0.12 mV	
	500 V to 800 V	16 μV/V + 0.12 mV	
	800 V to 1 kV	21 μV/V + 0.12 mV	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
DC Voltage – Measure ¹	0 kV to 10 kV	0.039 % + 0.035 V	Vitretek 4700
	0 kV to 35 kV	0.031 % + 0.57 V	Vitretek HVL-35
	0 kV to 70 kV	0.038 % + 0.7 V	Vitretek HVL-70
	0 kV to 100 kV	0.063 % + 0.8 V	Vitretek HVL-100
AC Voltage – Measuring Equipment ¹	0 mV to 2.2 mV		Multifunction Calibrator
	10 Hz to 20 Hz	0.16 % + 4 μ V	
	20 Hz to 40 Hz	0.1 % + 4 μ V	
	40 Hz to 20 kHz	0.077 % + 4 μ V	
	20 kHz to 50 kHz	0.13 % + 4 μ V	
	50 kHz to 100 kHz	0.17 % + 5 μ V	
	100 kHz to 300 kHz	0.33 % + 10 μ V	
	300 kHz to 500 kHz	0.47 % + 20 μ V	
	500 kHz to 1 MHz	0.58 % + 20 μ V	
	2.2 mV to 22 mV		
	10 Hz to 20 Hz	0.044 % + 4 μ V	
	20 Hz to 40 Hz	0.031 % + 4 μ V	
	40 Hz to 20 kHz	0.015 % + 4 μ V	
	20 kHz to 50 kHz	0.032 % + 4 μ V	
	50 kHz to 100 kHz	0.059 % + 5 μ V	
	100 kHz to 300 kHz	0.12 % + 10 μ V	
	300 kHz to 500 kHz	0.16 % + 20 μ V	
	500 kHz to 1 MHz	0.3 % + 20 μ V	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measuring Equipment ¹	22 mV to 220 mV		Multifunction Calibrator
	10 Hz to 20 Hz	0.028 % + 12 μ V	
	20 Hz to 40 Hz	0.011 % + 7 μ V	
	40 Hz to 20 kHz	0.008 6 % + 7 μ V	
	20 kHz to 50 kHz	0.021 % + 7 μ V	
	50 kHz to 100 kHz	0.047 % + 17 μ V	
	100 kHz to 300 kHz	0.092 % + 20 μ V	
	300 kHz to 500 kHz	0.14 % + 25 μ V	
	500 kHz to 1 MHz	0.28 % + 45 μ V	
	220 mV to 2.2 V		
	10 Hz to 20 Hz	0.028 % + 40 μ V	
	20 Hz to 40 Hz	0.01 % + 15 μ V	
	40 Hz to 20 kHz	0.004 8 % + 8 μ V	
	20 kHz to 50 kHz	0.008 2 % + 10 μ V	
	50 kHz to 100 kHz	0.012 % + 30 μ V	
	100 kHz to 300 kHz	0.043 % + 80 μ V	
	300 kHz to 500 kHz	0.1 % + 200 μ V	
	500 kHz to 1 MHz	0.18 % + 300 μ V	
	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 % + 0.05 mV	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measuring Equipment ¹	20 kHz to 50 kHz	0.008 3 % + 0.1 mV	Multifunction Calibrator
	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 % + 3.2mV	
	22 V to 220 V		Multifunction Calibrator / Amplifier
	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	0.009 % + 16 mV	
	300 kHz to 500 kHz	0.44 % + 40 mV	
	500 kHz to 1 MHz	0.8 % + 80 mV	
	220 V to 750 V		
	40 Hz to 1 kHz	0.011 % + 4 mV	
	1 kHz to 20 kHz	0.017 % + 6 mV	
	20 kHz to 30 kHz	0.061 % + 11 mV	
	30 kHz to 50 kHz	0.061 % + 11 mV	
	50 kHz to 100 kHz	0.23 % + 45 mV	
	750 V to 1 100 V		
	40 Hz to 1 kHz	0.011 % + 4 mV	
	1 kHz to 20 kHz	0.017 % + 6 mV	
	20 kHz to 30 kHz	0.061 % + 11 mV	

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 10 mV		Precision Multimeter
	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	
	10 mV to 100 mV		
	1 Hz to 40 Hz	0.013 % + 4.6 μ V	
	40 Hz to 1 kHz	0.009 4 % + 2.3 μ V	
	1 kHz to 20 kHz	0.017 % + 2.3 μ V	
	20 kHz to 50 kHz	0.037 % + 2.3 μ V	
	50 kHz to 100 kHz	0.093 % + 2.3 μ V	
	100 kHz to 300 kHz	0.36 % + 12 μ V	
	300 kHz to 1 MHz	1.2 % + 12 μ V	
	1 MHz to 2 MHz	1.9 % + 12 μ V	
	100 mV to 1 V		
	1 Hz to 40 Hz	0.009 8 % + 46 μ V	
	40 Hz to 1 kHz	0.009 4 % + 23 μ V	
	1 kHz to 20 kHz	0.017 % + 23 μ V	
	20 kHz to 50 kHz	0.036 % + 23 μ V	
	50 kHz to 100 kHz	0.093 % + 23 μ V	
	100 kHz to 300 kHz	0.35 % + 0.12 mV	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measure ¹	300 kHz to 1 MHz	1.2 % + 0.12 mV	Precision Multimeter
	1 MHz to 2 MHz	1.9 % + 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	1.1 % + 1.2 mV	
	1 MHz to 2 MHz	1.8 % + 1.2 mV	
	10 V to 100 V		
	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	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measure ¹	0 kV to 10 kV 50 to 60Hz	0.14 % + 0.15 V	Vitretek 4700
	0 kV to 30 kV 50 to 60Hz	0.064 % + 0.7 V	HVL-35
	0 kV to 50 kV 50 to 60Hz	0.091 % + 0.7 V	HVL-70
	0 kV to 70 kV 50 to 60Hz	0.14 % + 0.7 V	HVL-100
Capacitance – Measuring Equipment ¹	0.19 nF to 1.1 nF 10 Hz to 10 kHz	0.39 % + 7.8 pF	Multifunction Calibrator
	1.1 nF to 3.2 nF 10 Hz to 3 kHz	0.39 % + 7.8 pF	
	3.3 nF to 11 nF 10 Hz to 1 kHz	0.21 % + 7.8 pF	
	11 nF to 33 nF 10 Hz to 1 kHz	0.21 % + 78 pF	
	33 nF to 110 nF 10 Hz to 1 kHz	0.21 % + 78 pF	
	110 nF to 330 nF 10 Hz to 1 kHz	0.21 % + 0.23 nF	
	0.33 μF to 1.1 μF 10 Hz to 600 Hz	0.21 % + 0.78 nF	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Capacitance – Measuring Equipment ¹	1.1 μ F to 3.3 μ F 10 Hz to 300 Hz	0.21 % + 2.3 nF	Multifunction Calibrator
	3.3 μ F to 11 μ F 10 Hz to 150 Hz	0.2 % + 7.8 nF	
	11 μ F to 33 μ F 10 Hz to 120 Hz	0.32 % + 23 nF	
	33 μ F to 110 μ F 10 Hz to 80 Hz	0.35 % + 78 nF	
	110 μ F to 330 μ F DC to 50 Hz	0.35 % + 0.23 μ F	
	0.33 mF to 1.1 mF DC to 20 Hz	0.35 % + 0.78 μ F	
	1.1 mF to 3.3 mF DC to 6 Hz	0.35 % + 2.3 μ F	
	3.3 mF to 11 mF DC to 2 Hz	0.35 % + 7.8 μ F	
	11 mF to 33 mF DC to 0.6 Hz	0.58 % + 23 μ F	
	33 mF to 110 mF DC to 0.2 Hz	0.85 % + 78 μ F	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Electrical Simulation of Thermocouples ¹ Type J	-210 °C to -100 °C	0.21 °C	Multifunction Calibrator
	-100 °C to -30 °C	0.13 °C	
	-30 °C to 150 °C	0.11 °C	
	150 °C to 760 °C	0.13 °C	
	760 °C to 1 200 °C	0.18 °C	
Type K	-200 °C to -100 °C	0.26 °C	
	-100 °C to -25 °C	0.14 °C	
Type K	-25 °C to 120 °C	0.13 °C	
	120 °C to 1 000 °C	0.20 °C	
	1 000 °C to 1 372 °C	0.31 °C	
Type T	-250 °C to -150 °C	0.49 °C	
	-150 °C to 0 °C	0.19 °C	
	0 °C to 120 °C	0.13 °C	
	120 °C to 400 °C	0.11 °C	
Type E	-250 °C to -100 °C	0.39 °C	
	-100 °C to -25 °C	0.12 °C	
	-25 °C to 350 °C	0.11 °C	
	350 °C to 650 °C	0.12 °C	
	650 °C to 1 000 °C	0.16 °C	
Type R	0 °C to 250 °C	0.44 °C	
	250 °C to 400 °C	0.27 °C	
	400 °C to 1 000 °C	0.26 °C	
	1 000 °C to 1 767 °C	0.31 °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 S	0 °C to 250 °C	0.44 °C	Multifunction Calibrator
	250 °C to 1 000 °C	0.28 °C	
	1 000 °C to 1 400 °C	0.28 °C	
	1 400 °C to 1 767°C	0.36 °C	
Type N	-200 °C to -100 °C	0.31 °C	
	-200 °C to -100 °C	0.31 °C	
Type N	-100 °C to -25 °C	0.17 °C	
	-25 °C to 120 °C	0.15 °C	
	120 °C to 410 °C	0.14 °C	
	410 °C to 1 300 °C	0.21 °C	
Type B	600 °C to 800 °C	0.36 °C	
	800 °C to 1 000 °C	0.26 °C	
	1 000 °C to 1 550 °C	0.23 °C	
	1 550 °C to 1 820 °C	0.26 °C	
Power – Measuring Equipment DC Power ¹ 0.33 mA to 330 mA	11 µW to 1.1 mW	0.024 %	Multifunction Calibrator
	1.1 mW to 110 mW	0.027 %	
	0.11W to 110 W	0.024 %	
	110 W to 330 W	0.018 %	
0.33 A to 3 A	11 W to 110 mW	0.044 %	
	0.11 W to 990 W	0.053 %	
	1 W to 3 kW	0.009 6 %	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
3 A to 20.5 A	0.099 W to 0.99 W	0.088 %	Multifunction Calibrator
	0.99 W to 6.8 kW	0.07 %	
	6.8 W to 20.5 kW	0.04 %	
AC Power ³ (PF = 1) 3.3 mA to 9 mA	0.11 mW to 3 mW 10 Hz to 65 Hz	0.13 %	
	3 mW to 9 W 10 Hz to 65 Hz	0.077 %	
9 mA to 33 mA	0.3 mW to 10 mW 10 Hz to 65 Hz	0.089 %	
	10 mW to 33 W 10 Hz to 65 Hz	0.077 %	
33 mA to 90 mA	1 mW to 30 mW 10 Hz to 65 Hz	0.071 %	
	30 mW to 90 W 10 Hz to 65 Hz	0.057 %	
90 mA to 330 mA	3.0 mW to 100 mW 10 Hz to 65 Hz	0.089 %	
	100 mW to 300 W 10 Hz to 65 Hz	0.078 %	
0.33 A to 0.9 A	11 mW to 300 mW 10 Hz to 65 Hz	0.071 %	
	300 mW to 900 W 10 Hz to 65 Hz	0.081 %	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
0.9 A to 2.2 A	30 mW to 720 mW 10 Hz to 65 Hz	0.089 %	Multifunction Calibrator
0.9 A to 2.2 A	720 mW to 2 kW 10 Hz to 65 Hz	0.079 %	
2.2 A to 4.5 A	80 mW to 1.4 W 10 Hz to 65 Hz	0.088 %	
	1.4 W to 4.5 kW 10 Hz to 65 Hz	0.18 %	
4.5 A to 20.5 A	150 mW to 6.7 W 10 Hz to 65 Hz	0.17 %	
	6.7 W to 20 kW 10 Hz to 65 Hz	0.17 %	
LF Phase – Measuring Equipment ¹	0° to 180°		Multifunction Calibrator
	10 Hz to 65 Hz	0.11°	
	65 Hz to 500 Hz	0.2°	
	500 Hz to 1 kHz	0.39°	
	1 kHz to 5 kHz	1.9°	
	5 kHz to 10 kHz	3.9°	
	10 kHz to 20 kHz	7.8°	
Frequency Response ¹ 5 mV to 5.5 V	50 kHz to 100 MHz	1.7 % + 100 µV	Multifunction Calibrator
	100 MHz to 300 MHz	2.2 % + 100 µV	
	300 MHz to 600 MHz	4.1 % + 100 µV	
4 mV to 3.5 V	600 MHz to 1.1 GHz	5.1 % + 100 µV	



Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ⁵	Reference Standard, Method and/or Equipment
Micrometers and Calipers ¹	0 in to 6 in	(20 + 3.1L) μin	Comparison to Gage Blocks
	6 in to 12 in	(30 + 4.3L) μin	
Anvil Flatness ¹	0 in to 1 in	7.2 μin	Optical Flats
Dial and Digital Indicators ¹	0 in to 4 in	(75 + 0.6L) μin	Comparison to Gage Blocks
Distance Measuring Equipment	0 ft to 99 999 ft	(0.05 + 0.000 1D) ft	Cylindrical Square with Counter

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Torque – Measure ¹	5 lbf·in to 600 lbf·ft	1.0 %	Torque Transducers
Torque Screwdrivers – Measure ¹	4 lbf·in to 100 lbf·in	1.5 %	Torque Transducers
	20 ozf·in to 200 ozf·in	1.5 %	
Scales and Balances ¹	2 kg	17 mg	ASTM Class 1 Mass Standards
	1 kg	16 mg	
	500 g	12 mg	
	200 g	1.2 mg	
	100 g	1.2 mg	
	50 g	1.2 mg	
	20 g	1.2 mg	
	10 g	1.2 mg	
	5 g	1.2 mg	
	2 g	1.2 mg	
	1 g	1.2 mg	

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Scales and Balances ¹	500 mg	1.2 mg	ASTM Class 1 Mass Standards
	200 mg	1.2 mg	
	100 mg	1.2 mg	
Pressure – Gage ¹	-14.2 psi to 25 psi	0.0017 psi	Pneumatic Pressure Controller
	25 psi to 500 psi	0.006 5 %	
	-36 inH ₂ O to -22 inH ₂ O	0.009 % + 150 µinH ₂ O	Pneumatic Low Pressure Controller
	-22 inH ₂ O to 22 inH ₂ O	0.002 2 inH ₂ O	
	22 inH ₂ O to 60 inH ₂ O	0.009 % + 0.000 15 inH ₂ O	
	60 inH ₂ O to 72 inH ₂ O	0.006 7 inH ₂ O	
	72 inH ₂ O to 804 inH ₂ O	0.009 % + 0.000 15 inH ₂ O	
	500 psi to 15 000 psi	0.009 %	Hydraulic Deadweight Tester
Pressure – Absolute ¹	0 psi to 25 psi	0.001 9 psi	Pneumatic Pressure Controller
	25 psi to 500 psi	0.006 5 % + 0.001 psi	

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Temperature – Measure ¹	-100 °C to 660 °C	0.015 °C	SPRT and Indicator
Temperature – Measuring Equipment ¹	-30 °C to -20 °C	0.045 °C	SPRT, Indicator, Temperature Source
	-20 °C to 150 °C	0.021 °C	
	150 °C to 600 °C	0.23 °C	



Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Frequency Measuring Equipment	10 MHz	5.8 x 10 ⁻¹⁰ Hz/Hz	Rubidium Frequency Standard
Rise Time ¹	250 ps Nominal	51 ps ^{NOTE 4}	Multifunction Calibrator

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.
5. L is the nominal length of the DUT measured in inches, D is the measured length in feet.
6. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2489.13.

Vice President