



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Transcat – San Juan

281 Calle Matadero
Urb Puerto Nuevo
San Juan, PR 00920

Fulfills the requirements of

ISO/IEC 17025:2017

and the national standard

ANSI/NCSL Z540-1-1994 (R2002)

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-2489.05



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)

Transcat – San Juan

281 Calle Matadero
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San Juan, PR 00920
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CALIBRATION

Valid to: September 7, 2021

Certificate Number: AC-2489.05

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Generate ¹	29 to 329.99 μ A		Fluke 5520A
	10 Hz to 20 Hz	0.16 % + 0.08 μ A	
	20 Hz to 45 Hz	0.12 % + 0.08 μ A	
	45 Hz to 1 kHz	0.097 % + 0.12 μ A	
	1 kHz to 5 kHz	0.23 % + 0.16 μ A	
	5 kHz to 10 kHz	0.62 % + 0.16 μ A	
	10 kHz to 30 kHz	1.2 % + 0.31 μ A	
	0.33 to 3.299 9 mA		
	10 Hz to 20 Hz	0.16 % + 0.12 μ A	
	20 Hz to 45 Hz	0.097 % + 0.12 μ A	
	45 Hz to 1 kHz	0.078 % + 0.12 μ A	
	1 kHz to 5 kHz	0.16 % + 0.16 μ A	
	5 kHz to 10 kHz	0.39 % + 0.23 μ A	
	10 kHz to 30 kHz	0.78 % + 0.47 μ A	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Generate ¹	3.3 to 32.999 mA		Fluke 5520A
	10 Hz to 20 Hz	0.14 % + 1.6 µA	
	20 Hz to 45 Hz	0.07 % + 1.6 µA	
	45 Hz to 1 kHz	0.031 % + 1.6 µA	
	1 kHz to 5 kHz	0.062 % + 1.6 µA	
	5 kHz to 10 kHz	0.16 % + 2.3 µA	
	10 kHz to 30 kHz	0.31 % + 3.1 µA	
	33 to 329.99 mA		
	10 Hz to 20 Hz	0.14 % + 16 µA	
	20 Hz to 45 Hz	0.07 % + 16 µA	
	45 Hz to 1 kHz	0.031 % + 16 µA	
	1 kHz to 5 kHz	0.078 % + 39 µA	
	5 kHz to 10 kHz	0.16 % + 78 µA	
	10 kHz to 30 kHz	0.31 % + 160 µA	
	0.33 to 1.1 A		
	10 Hz to 45 Hz	0.14 % + 78 µA	
	45 Hz to 1 kHz	0.039 % + 78 µA	
	1 kHz to 5 kHz	0.47 % + 780 µA	
	5 kHz to 10 kHz	1.9 % + 4 mA	
	1.1 A to 3 A		
	10 Hz to 45 Hz	0.14 % + 78 µA	
	45 Hz to 1 kHz	0.049 % + 78 µA	
	1 kHz to 5 kHz	0.47 % + 780 µA	
	5 kHz to 10 kHz	1.9 % + 4 mA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Generate ¹	3 A to 11 A		Fluke 5520A
	45 Hz to 100 Hz	0.049 % + 2 mA	
	100 Hz to 1 kHz	0.08 % + 2 mA	
	1 kHz to 5 kHz	2.3 % + 2 mA	
	11 A to 20.5 A		
	45 Hz to 100 Hz	0.094 % + 4 mA	
	100 Hz to 1 kHz	0.11 % + 4 mA	
	1 kHz to 5 kHz	2.3 % + 4 mA	
Clamp-on Ammeter (Toroidal Type) Transformer Type ¹	20 A to 150 A		Fluke 5520A with 5500A/Coil
	45 Hz to 65 Hz	0.3 % + 26 mA	
	65 Hz to 440 Hz	0.83 % + 47 mA	
	150 A to 1 000 A		
	45 Hz to 65 Hz	0.35 % + 0.12 A	
	65 Hz to 440 Hz	1.1 % + 0.22 A	
Clamp-on Ammeter (Non-Toroidal Type) Hall Effect Sensor ¹	20 A to 150 A		Fluke 5520A with 5500A/Coil
	45 Hz to 65 Hz	0.57 % + 0.25 A	
	65 Hz to 440 Hz	1 % + 0.25 A	
	150 A to 1000 A		
	45 Hz to 65 Hz	0.6 % + 0.9 A	
	65 Hz to 440 Hz	1.3 % + 0.92 A	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Measure ¹	0 μ A to 100 μ A		Agilent 3458A Option 002
	10 Hz to 20 Hz	0.46 % + 35 nA	
	20 Hz to 45 Hz	0.18 % + 35 nA	
	45 Hz to 100 Hz	0.072 % + 35 nA	
	100 Hz to 5 kHz	0.072 % + 35 nA	
	100 μ A 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 μ A	
	20 Hz to 45 Hz	0.17 % + 2.3 μ A	
	45 Hz to 100 Hz	0.071 % + 2.3 μ A	
	100 Hz to 5 kHz	0.038 % + 2.3 μ A	
	10 mA to 100 mA		
	10 Hz to 20 Hz	0.46 % + 23 μ A	
	20 Hz to 45 Hz	0.17 % + 23 μ A	
	45 Hz to 100 Hz	0.071 % + 23 μ A	
	100 Hz to 5 kHz	0.037 % + 23 μ A	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Measure ¹	100 mA to 1 A		Agilent 3458A Option 002
	10 Hz to 20 Hz	0.46 % + 230 μ A	
	20 Hz to 45 Hz	0.19 % + 230 μ A	
	45 Hz to 100 Hz	0.097 % + 230 μ A	
	100 Hz to 5 kHz	0.12 % + 230 μ A	
DC Resistance – Measure ¹	0 Ω to 10 Ω	18 $\mu\Omega/\Omega$ + 58 $\mu\Omega$	Agilent 3458A Option 002
	10 Ω to 100 Ω	15 $\mu\Omega/\Omega$ + 0.58 m Ω	
	100 Ω to 1 k Ω	12 $\mu\Omega/\Omega$ + 0.58 m Ω	
	1 k Ω to 10 k Ω	12 $\mu\Omega/\Omega$ + 5.8 m Ω	
	10 k Ω to 100 k Ω	12 $\mu\Omega/\Omega$ + 58 m Ω	
	100 k Ω to 1 M Ω	19 $\mu\Omega/\Omega$ + 2.3 Ω	
	1 M Ω to 10 M Ω	62 $\mu\Omega/\Omega$ + 120 Ω	
	10 M Ω to 100 M Ω	590 $\mu\Omega/\Omega$ + 1.2 k Ω	
	100 M Ω to 1 G Ω	0.58 % + 12 k Ω	
DC Resistance – Generate ¹	0 Ω to 11 Ω	34 $\mu\Omega/\Omega$ + 1 m Ω	Fluke 5520A
	11 Ω to 33 Ω	27 $\mu\Omega/\Omega$ + 1.2 m Ω	
	33 Ω to 110 Ω	25 $\mu\Omega/\Omega$ + 1.1 m Ω	
	110 Ω to 330 Ω	26 $\mu\Omega/\Omega$ + 1.6 m Ω	
	330 Ω to 1.1 k Ω	25 $\mu\Omega/\Omega$ + 1.6 m Ω	
	1.1 k Ω to 3.3 k Ω	25 $\mu\Omega/\Omega$ + 16 m Ω	
	3.3 k Ω to 11 k Ω	22 $\mu\Omega/\Omega$ + 16 m Ω	
	11 k Ω to 33 k Ω	23 $\mu\Omega/\Omega$ + 0.16 Ω	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
DC Resistance – Generate ¹	33 kΩ to 110 kΩ	23 μΩ/Ω + 0.16 Ω	Fluke 5520A
	110 kΩ to 330 kΩ	28 μΩ/Ω + 1.6 Ω	
	330 kΩ to 1.1 MΩ	27 μΩ/Ω + 1.6 Ω	
	1.1 MΩ to 3.3 MΩ	66 μΩ/Ω + 23 Ω	
	3.3 MΩ to 11 MΩ	110 μΩ/Ω + 39 Ω	
	11 MΩ to 33 MΩ	200 μΩ/Ω + 1.9 kΩ	
	33 MΩ to 110 MΩ	410 μΩ/Ω + 2.8 kΩ	
	110 MΩ to 330 MΩ	0.23 % + 100 kΩ	
	330 MΩ to 1 GΩ	1.2 % + 400 kΩ	
	10 GΩ	0.63 %	Decade Resistor
	100 GΩ	1.3 %	
DC Current – Measure ¹	0 μA to 100 μA	26 μA/A + 0.92 nA	Agilent 3458A Option 002
	100 μA to 1 mA	26 μA/A + 5.8 nA	
	1 mA to 10 mA	26 μA/A + 58 nA	
	10 mA to 100 mA	43 μA/A + 580 nA	
	100 mA to 1 A	130 μA/A + 12 μA	
DC Current – Generate ¹	0 μA to 330 μA	0.012 % + 0.02 μA	Fluke 5520A
	330 μA to 3.3 mA	0.008 2 % + 0.05 μA	
	3.3 mA to 33 mA	0.009 3 % + 0.19 μA	
	33 mA to 330 mA	0.007 8 % + 1.9 μA	
	330 mA to 1.1 A	0.016 % + 31 μA	
	1.1 A to 3 A	0.030 % + 31 μA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
DC Current – Generate ¹	3 A to 11 A	0.051 % + 0.39 mA	Fluke 5520A
	11 A to 20 A	0.083 % + 0.58 mA	
Clamp-on Ammeter (Non-Toroidal Type) Hall Effect Sensor ¹	20 A to 150 A	0.5 % + 0.14 A	Fluke 5520A with 5500A/Coil
	150 A to 1 000 A	0.51 % + 0.5 A	
DC Voltage – Measure ¹	0 V to 100 mV	7.1 μ V/V + 0.58 μ V	Agilent 3458A Option 002
	100 mV 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 + 120 μ V	
	500 V to 800 V	16 μ V/V + 120 μ V	
	800 V to 1 kV	21 μ V/V + 120 μ V	
DC Voltage – Generate ¹	0 mV to 330 mV	16 μ V/V + 0.78 μ V	Fluke 5520A
	330 mV to 3 V	9.1 μ V/V + 1.6 μ V	
	3 V to 33 V	10 μ V/V + 16 μ V	
	33 V to 330 V	16 μ V/V + 116 μ V	
	330V to 1 kV	15 μ V/V + 1.2 mV	
AC Voltage – Measure ¹	0 mV to 10 mV		Agilent 3458A Option 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 Option 002
	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	
	2 MHz to 4 MHz	4.7 % + 81 μ V	
	4 MHz to 8 MHz	4.7 % + 92 μ V	
	8 MHz to 10 MHz	17 % + 120 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 % + 120 μ V	
	300 kHz to 1 MHz	1.2 % + 120 μ V	
	1 MHz to 2 MHz	1.9 % + 120 μ V	
	2 MHz to 4 MHz	4.7 % + 810 μ V	
	4 MHz to 8 MHz	4.7 % + 920 μ V	
	8 MHz to 10 MHz	17 % + 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	1 V to 10 V		Agilent 3458A Option 002
	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	
	1 MHz to 2 MHz	1.8 % + 1.2 mV	
	2 MHz to 4 MHz	4.7 % + 8.1 mV	
	4 MHz to 8 MHz	4.7 % + 9.2 mV	
	8 MHz to 10 MHz	17 % + 12 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	0.07 % + 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 – Generate ¹	1 mV to 32.999 mV		Fluke 5520A
	10 Hz to 45 Hz	0.063 % + 4.7 μ V	
	45 Hz to 10 kHz	0.015 % + 4.7 μ V	
	10 kHz to 20 kHz	0.018 % + 4.7 μ V	
	20 kHz to 50 kHz	0.079 % + 4.7 μ V	
	50 kHz to 100 kHz	0.27 % + 9.3 μ V	
	100 kHz to 500 kHz	0.62 % + 39 μ V	
	33 mV to 329.99 mV		
	10 Hz to 45 Hz	0.023 % + 6.2 μ V	
	45 Hz to 10 kHz	0.012 % + 6.2 μ V	
	10 kHz to 20 kHz	0.013 % + 8 μ V	
	20 kHz to 50 kHz	0.028 % + 8 μ V	
	50 kHz to 100 kHz	0.062 % + 25 μ V	
	100 kHz to 500 kHz	0.16 % + 54 μ V	
AC Voltage – Generate ¹	0.33 V to 3.299 99 V		Fluke 5520A
	10 Hz to 45 Hz	0.023 % + 39 μ V	
	45 Hz to 10 kHz	0.012 % + 47 μ V	
	10 kHz to 20 kHz	0.015 % + 47 μ V	
	20 kHz to 50 kHz	0.024 % + 39 μ V	
	50 kHz to 100 kHz	0.054 % + 97 μ V	
	100 kHz to 500 kHz	0.19 % + 470 μ V	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Generate ¹	3.3 V to 32.999 9 V		Fluke 5520A
	10 Hz to 45 Hz	0.023 % + 505 μ V	
	45 Hz to 10 kHz	0.012 % + 466 μ V	
	10 kHz to 20 kHz	0.019 % + 466 μ V	
	20 kHz to 50 kHz	0.027 % + 466 μ V	
	50 kHz to 100 kHz	0.07 % + 1.2 mV	
	33 V to 329.999 V		
	45 Hz to 1 kHz	0.015 % + 1.6 mV	
	1 kHz to 10 kHz	0.016 % + 4.7 mV	
	10 kHz to 20 kHz	0.02 % + 4.7 mV	
	20 kHz to 50 kHz	0.025 % + 4.7 mV	
	50 kHz to 100 kHz	0.16 % + 39 mV	
	330 V to 1 020 V		
	45 Hz to 1 kHz	0.023 % + 7.7 mV	
	1 kHz to 5 kHz	0.02 % + 7.7 mV	
	5 kHz to 10 kHz	0.023 % + 7.7 mV	
Capacitance Measuring Equipment ¹	50 pF to 190 pF		Decade Capacitor
	1 kHz	0.6 % + 5 pF	
	0.19 nF to 1.099 9 nF		Fluke 5520A
	10 Hz to 10 kHz	0.39 % + 6.1 pF	
	1.1 nF to 3.299 9 nF		
	10 Hz to 3 kHz	0.39 % + 6.1 pF	
	3.3 nF to 10.999 9 nF		
	10 Hz to 1 kHz	0.21 % + 6.1 pF	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Capacitance Measuring Equipment ¹	11 nF to 109.999 nF 10 Hz to 1 kHz	0.21 % + 61 pF	Fluke 5520A
	110 nF to 329.999 nF 10 Hz to 1 kHz	0.21 % + 0.18 nF	
	0.33 µF to 1.099 99 µF 10 Hz to 600 Hz	0.2 % + 0.61 nF	
	1.1 µF to 3.299 9 µF 10 Hz to 300 Hz	0.2 % + 1.9 nF	
	3.3 µF to 10.999 9 µF 10 Hz to 150 Hz	0.2 % + 6.1 nF	
	11 µF to 32.999 9 µF 10 Hz to 120 Hz	0.32 % + 18 nF	
	33 µF to 109.999 9 µF 10 Hz to 80 Hz	0.35 % + 61 nF	
	110 µF to 329.999 µF DC to 50 Hz	0.35 %+ 0.18 µF	
	0.33 mF to 1.099 99 mF DC to 20 Hz	0.35 % + 0.61 µF	
	1.1 mF to 3.299 999 mF DC to 6 Hz	0.35 % + 1.8 µF	
	3.3 mF to 10.999 9 mF DC to 2 Hz	0.35 % + 6.1 µF	
	11 mF to 32.999 9 mF DC to 0.6 Hz	0.58 % + 18 µF	
	33 mF to 110 mF DC to 0.2 Hz	0.85 % + 61 µF	

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	-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	
	-90 °C to 0 °C	0.08 °C	
	0 °C to 15 °C	0.08 °C	
	15 °C to 890 °C	0.07 °C	
	890 °C to 1 000 °C	0.08 °C	
Type J	-210 °C to -180 °C	0.13 °C	Ectron 1140A
	-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 1 200 °C	0.08 °C	
Type K	-270 °C to -255 °C	2.3 °C	Ectron 1140A
	-255 °C to -195 °C	0.73 °C	
	-195 °C to -115 °C	0.14 °C	
	-115 °C to -55 °C	0.1 °C	
	-55 °C to 1 000 °C	0.08 °C	
	1 000 °C to 1 372 °C	0.09 °C	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Type N	-270 °C to -260 °C	5.1 °C	Ectron 1140A
	-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 1 300 °C	0.1 °C	
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 1 768 °C	0.23 °C	
Type S	-50 °C to -30 °C	0.65 °C	Ectron 1140A
	-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 1 768 °C	0.27 °C	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Type T	-270 °C to -255 °C	1.8 °C	Ectron 1140A
	-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 ¹ 0.33 mA to 330 mA	11 µW to 1.1 mW 1.1 mW to 110 mW 0.11 W to 110 W 110 W to 330 W	0.024 % 0.027 % 0.024 % 0.018 %	Fluke 5520A
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 %	
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 ^{1,4} (PF=1) 10 Hz to 65 Hz 3.3 mA to 9.0 mA	0.11 mW to 3 mW 3 mW to 9 W	0.13% 0.077%	Fluke 5520A
9.0 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 %	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Power ^{1,4} (PF=1) 10 Hz to 65 Hz 90 mA to 330 mA 0.33 A to 0.9 A 0.9 A to 2.2 A 2.2 A to 4.5 A 4.5 A to 20.5 A	3 mW to 100 mW 100 mW to 300 W 11 mW to 300 mW 300 mW to 900 W 30 mW to 720 mW 720 mW to 2 kW 80 mW to 1.4 W 1.4 W to 4.5 kW 150 mW to 6.7 W 6.7 W to 20 kW	0.089 % 0.078 % 0.071 % 0.081 % 0.089 % 0.079 % 0.088 % 0.18 % 0.17 % 0.17 %	Fluke 5520A
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/SC600

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
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 % 0.007 6 % 0.004 6 % 0.000 22 %	Fluke 5520A/SC600
Rise Time – Generate ^{1,7} 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)	51 ps 51 ps	Fluke 5520A/SC600
Leveled Sine Wave Generate ¹ 50 Ω Load 5.0 mV _(pk-pk) to 5.5 V _(pk-pk)	50 kHz 50 kHz to 100 MHz 100 MHz to 300 MHz 300 MHz to 600 MHz	1.8 % + 230 μ V 2.8 % + 230 μ V 3.2 % + 230 μ V 4 % + 230 μ V	Fluke 5520A/SC600
Bandwidth/Flatness Measure ¹ 50 Ω (50 kHz Reference) 5.0 mV _(pk-pk) to 5.5 V _(pk-pk)	50 kHz to 100 MHz 100 MHz to 300 MHz 300 MHz to 600 MHz	1.4 % + 78 μ V 1.8 % + 78 μ V 3.2 % + 78 μ V	Fluke 5520A/SC600
Input Impedance Measure ¹ 50 Ω 1 M Ω	40 Ω to 60 Ω 500 k Ω to 1.5 M Ω	0.082 % 0.081 %	Fluke 5520A/SC600
Input Capacitance Measure ¹	5 pF to 50 pF	3.9 % + 0.39 pF	Fluke 5520A/SC600

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Wave Generator – Source ¹ Amplitude (10 Hz to 10 kHz) Sine, Square, Triangle 50 Ω Load 1 M Ω 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 μ V _(pk-pk) 2.3 % + 78 μ V _(pk-pk)	Fluke 5520A/SC600
Wave Generator – Source ¹ Frequency Sine, Square, Triangle	10 Hz to 10 kHz	0.0019% + 0.012 Hz	Fluke 5520A/SC600
Rise Time – Generate	250 ps	63 ps ⁷	Fluke 5520A/SC600

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ⁵	Reference Standard, Method and/or Equipment
Micrometers and Calipers – Outside, Inside, Depth ¹	0.05 in to 1 in	(15 + 7L) μ in	Comparison to Gage Blocks
	1 in to 10 in	(9 + 14L) μ in	
Anvil Flatness ¹	0 in to 1 in	6.1 μ in	Optical Flats
Rulers	0 in to 36 in	(0.002 + 14L) μ in	Glass Scale with Optics

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Mass – Metric	1 mg	1.7 μ g	Echelon II
	2 mg	1.7 μ g	
	3 mg	1.7 μ g	
	5 mg	1.7 μ g	
	10 mg	1.7 μ g	
	20 mg	1.7 μ g	

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Mass – Metric	30 mg	1.7 µg	Echelon II
	50 mg	1.7 µg	
	100 mg	1.7 µg	
	200 mg	1.7 µg	
	300 mg	1.7 µg	
	500 mg	1.7 µg	
	1 g	4.3 µg	
	2 g	4.3 µg	
	3 g	4.3 µg	
	5 g	4.4 µg	
	10 g	8.6 µg	
	20 g	12 µg	
	30 g	13 µg	
	50 g	17 µg	
	100 g	35 µg	
	200 g	100 µg	
	300 g	0.13 mg	
	500 g	0.17 mg	
	1 kg	0.33 mg	
	2 kg	0.98 mg	
	3 kg	1.3 mg	
	5 kg	1.7 mg	
	10 kg	3.4 mg	

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Mass – Metric	1 mg	3.6 µg	Echelon III
	2 mg	3.6 µg	
	3 mg	3.6 µg	
	5 mg	3.6 µg	
	10 mg	3.6 µg	
	20 mg	3.6 µg	
	30 mg	3.6 µg	
	50 mg	3.6 µg	
	100 mg	3.6 µg	
	200 mg	3.6 µg	
	300 mg	3.6 µg	
	500 mg	3.6 µg	
	1 g	11 µg	
	2 g	11 µg	
	3 g	11 µg	
	5 g	11 µg	
	10 g	18 µg	
	20 g	26 µg	
	30 g	26 µg	
	50 g	41 µg	
	100 g	84 µg	
	200 g	0.2 mg	
	300 g	0.27 mg	

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Mass – Metric	500 g	0.41 mg	Echelon III
	1 kg	0.83 mg	
	2 kg	1.9 mg	
	3 kg	2.7 mg	
	5 kg	4.1 mg	
	10 kg	8.3 mg	
	20 kg	0.23 g	
	25 kg	0.23 g	
Mass – Avoirdupois	1 lb	34 mg	ASTM Class 0 Weights
	2 lb	34 mg	
	3 lb	34 mg	
	5 lb	34 mg	
	10 lb	34 mg	
	20 lb	34 mg	
	30 lb	35 mg	
	50 lb	41 mg	
Scales & Balances – Metric ^{1,8}	Up to 500 mg	1.7 µg	ASTM Class 1 Weights
	500 mg to 5 g	5.2 µg	
	5 g to 10 g	8.4 µg	
	10 g to 30 g	22 µg	
	30 g to 50 g	24 µg	
	50 g to 100 g	39 µg	
	100 g to 1 kg	2.0 mg	

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Scales & Balances – Metric ^{1,8}	1 kg to 2 kg	2.2 mg	ASTM Class 1 Weights
	2 kg to 3 kg	2.3 mg	
	3 kg to 5 kg	2.6 mg	
	5 kg to 10 kg	3.9 mg	
Scales & Balances Avoirdupois ^{1,8}	Up to 0.5 oz	1.4 mg	ASTM Class 1 Weights
	0.5 oz to 1 oz	2.9 mg	
	1 oz to 2 oz	5.7 mg	
	2 oz to 4 oz	12 mg	
	4 oz to 8 oz	23 mg	
	8 oz to 1 lb	46 mg	
	1 lb to 2 lb	91 mg	
	2 lb to 3 lb	0.14 g	
	3 lb to 5 lb	0.23 g	
	5 lb to 10 lb	0.46 g	
	10 lb to 20 lb	0.91 g	
	20 lb to 22 lb	1.4 g	
	50 lb to 1 200 lb	0.012 % applied load	NIST Class F Weights
Torque ¹	(1 to 10) N·m	0.90 %	Reference Torque Transducers
	(6 to 60) N·m	0.71 %	
	(40 to 400) N·m	0.71 %	
Absolute Pressure – Pneumatic ¹	0 psia to 25 psia	0.001 9 psia	Ruska 7250xi
	25 psia to 500 psia	0.006 5 % + 0.001 psia	

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Gage Pressure – Pneumatic ¹	-15 psi to 25 psi	0.001 6 psi	Ruska 7250xi
	25 psi to 500 psi	0.006 5 %	
	-36 inH ₂ O to -22 inH ₂ O	0.009 % + 150 µinH ₂ O	DHI PPC 4 Controller
	-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	
Gage Pressure – Hydraulic ¹	100 psi to 15 000 psi	0.009 %	Ametek T-150 Deadweight Tester

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Relative Humidity Generate (0 °C to 15 °C) (15 °C to 35 °C) (35 °C to 70 °C)	(10 to 75) %RH (75 to 95) %RH	0.5 % RH 0.65 % RH	Humidity Generator
	(10 to 95) %RH	0.5 % RH	Humidity Generator
	(10 to 50) %RH (50 to 75) %RH (75 to 95) %RH	0.5 % RH 0.7 % RH 0.85 % RH	Humidity Generator
Temperature – Generate ¹	-30 °C to 125 °C	0.036 °C	Liquid Bath with Indicator and SPRT
Temperature – Measure ¹	-195 °C to 0 °C	0.012 °C	SPRT with Indicator
	0 °C to 420 °C	0.024 °C	
	420 °C to 660 °C	0.035 °C	

Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Frequency – Measuring Equipment and Measure ¹	10 MHz	5.8×10^{-10} Hz/Hz	Rubidium Oscillator

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:

- 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.
- Values listed with percent (%) are percent of reading or generated value unless otherwise noted.
- As frequency & amplitude deviate from the listed values, uncertainty may be higher than stated. If needed, contact laboratory for more information regarding uncertainties at frequency and range combinations other than the ones shown.
- 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.
- L = Length in inches
- This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2489.05.
- 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 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.



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