



CERTIFICATE OF ACCREDITATION

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

This is to certify that

Transcat – San Juan
281 Calle Matadero
Urb Puerto Nuevo
San Juan, PR 00920

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

ISO/IEC 17025:2017

and national standards

ANSI/NCSL Z540-1-1994 (R2002)

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-2489.05

Certificate Number



ANAB Approval

Certificate Valid Through: 09/07/2021
Version No. 003 Issued: 06/19/2019



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).



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**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017 AND
ANSI/NCSL Z540-1-1994 (R2002)**

Transcat – San Juan

281 Calle Matadero
Urb Puerto Nuevo
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Brian Samuelson
787-706-8855

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	



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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		



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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	



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Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Current – Measure ¹	0 μA to 100 μA		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 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 % + 2.3μA	
20 Hz to 45 Hz	0.17 % + 2.3μA		
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		



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 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	
DC Resistance – Measure ¹	0 Ω to 10 Ω	18 μΩ/Ω + 58 μΩ	Agilent 3458A Option 002
	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	12 μΩ/Ω + 58 mΩ	
	100 kΩ to 1 MΩ	19 μΩ/Ω + 2.3 Ω	
	1 MΩ to 10 MΩ	62 μΩ/Ω + 120 Ω	
	10 MΩ to 100 MΩ	590 μΩ/Ω + 1.2 kΩ	
	100 MΩ to 1 GΩ	0.58 % + 12 kΩ	
DC Resistance – Generate ¹	0 Ω to 11Ω	34 μΩ/Ω + 1 mΩ	Fluke 5520A
	11 Ω to 33 Ω	27 μΩ/Ω + 1.2 mΩ	
	33 Ω to 110 Ω	25 μΩ/Ω + 1.1 mΩ	
	110 Ω to 330 Ω	26 μΩ/Ω + 1.6 mΩ	
	330 Ω to 1.1 kΩ	25 μΩ/Ω + 1.6 mΩ	
	1.1 kΩ to 3.3 kΩ	25 μΩ/Ω + 16 mΩ	
	3.3 kΩ to 11 kΩ	22 μΩ/Ω + 16 mΩ	
	11 kΩ to 33 kΩ	23 μΩ/Ω + 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 %	
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	



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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 μV/V + 0.58 μV	Agilent 3458A Option 002
	100 mV 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 + 120 μV	
	500 V to 800 V	16 μV/V + 120 μV	
	800 V to 1 kV	21 μV/V + 120 μV	
DC Voltage – Generate ¹	0 mV to 330 mV	16 μV/V + 0.78 μV	Fluke 5520A
	330 mV to 3 V	9.1 μV/V + 1.6 μV	
	3 V to 33 V	10 μV/V + 16 μV	
	33 V to 330 V	16 μV/V + 116 μV	
	330V to 1 kV	15 μV/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 μV	
	40 Hz to 1 kHz	0.028 % + 1.2 μV	
	1 kHz to 20 kHz	0.038 % + 1.2 μV	
	20 kHz to 50 kHz	0.15 % + 1.2 μV	
	50 kHz to 100 kHz	0.59 % + 1.2 μV	
	100 kHz to 300 kHz	4.6 % + 2.3 μV	



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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 μV	
	40 Hz to 1 kHz	0.009 4 % + 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	
	1 MHz to 2 MHz	1.9 % + 12 μV	
	2 MHz to 4 MHz	4.7 % + 81 μV	
	4 MHz to 8 MHz	4.7 % + 92 μV	
	8 MHz to 10 MHz	17 % + 120 μV	
	100 mV to 1 V		
	1 Hz to 40 Hz	0.009 8 % + 46 μV	
	40 Hz to 1 kHz	0.009 4 % + 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 % + 120 μV	
	300 kHz to 1 MHz	1.2 % + 120 μV	
1 MHz to 2 MHz	1.9 % + 120 μV		
2 MHz to 4 MHz	4.7 % + 810 μV		



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Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measure ¹	4 MHz to 8 MHz	4.7 % + 920 μV	Agilent 3458A Option 002
	8 MHz to 10 MHz	17 % + 1.2 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	
	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		



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Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Measure ¹	100 V to 700 V		Agilent 3458A Option 002
	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	
AC Voltage – Generate ¹	1 mV to 32.999 mV		Fluke 5520A
	10 Hz to 45 Hz	0.063 % + 4.7 μV	
	45 Hz to 10 kHz	0.015 % + 4.7 μV	
	10 kHz to 20 kHz	0.018 % + 4.7 μV	
	20 kHz to 50 kHz	0.079 % + 4.7 μV	
	50 kHz to 100 kHz	0.27 % + 9.3 μV	
	100 kHz to 500 kHz	0.62 % + 39 μV	
	33 mV to 329.99 mV		
	10 Hz to 45 Hz	0.023 % + 6.2 μV	
	45 Hz to 10 kHz	0.012 % + 6.2 μV	
	10 kHz to 20 kHz	0.013 % + 8 μV	
	20 kHz to 50 kHz	0.028 % + 8 μV	
	50 kHz to 100 kHz	0.062 % + 25 μV	
	100 kHz to 500 kHz	0.16 % + 54 μV	



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Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
AC Voltage – Generate ¹	0.33 V to 3.299 99 V		Fluke 5520A
	10 Hz to 45 Hz	0.023 % + 39 μV	
	45 Hz to 10 kHz	0.012 % + 47 μV	
	10 kHz to 20 kHz	0.015 % + 47 μV	
	20 kHz to 50 kHz	0.024 % + 39 μV	
	50 kHz to 100 kHz	0.054 % + 97 μV	
	100 kHz to 500 kHz	0.19 % + 470 μV	
	3.3 V to 32.999 9 V		
	10 Hz to 45 Hz	0.023 % + 505 μV	
	45 Hz to 10 kHz	0.012 % + 466 μV	
	10 kHz to 20 kHz	0.019 % + 466 μV	
	20 kHz to 50 kHz	0.027 % + 466 μV	
	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		



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Capacitance Measuring Equipment ¹	50 pF to 190 pF 1 kHz	0.6 % + 5 pF	Decade Capacitor
	0.19 nF to 1.099 9 nF 10 Hz to 10 kHz	0.39 % + 6.1 pF	Fluke 5520A
	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	
	11 nF to 109.999 nF 10 Hz to 1 kHz	0.21 % + 61 pF	
	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	



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Capacitance Measuring Equipment ¹	110 μF to 329.999 μF DC to 50 Hz	0.35 % + 0.18 μF	Fluke 5520A
	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 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	



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
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	
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	



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
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	
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	



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Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Power Measuring Equipment ¹			
DC Power ¹			Fluke 5520A
0.33 mA to 330 mA	11 μ W 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 %	
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)			Fluke 5520A
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%	
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 %	
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 %	



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
4.5 A to 20.5 A	150 mW to 6.7 W 6.7 W to 20 kW	0.17 % 0.17 %	
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
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



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
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 μV 2.8 % + 230 μV 3.2 % + 230 μV 4 % + 230 μV	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 μV 1.8 % + 78 μV 3.2 % + 78 μV	Fluke 5520A/SC600
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/SC600
Input Capacitance Measure ¹	5 pF to 50 pF	3.9 % + 0.39 pF	Fluke 5520A/SC600
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/SC600
Wave Generator – Source ¹ Frequency Sine, Square, Triangle	10 Hz to 10 kHz	0.0019% + 0.012 Hz	Fluke 5520A/SC600



Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
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) μin	Comparison to Gage Blocks
	1 in to 10 in	(9 + 14L) μin	
Anvil Flatness ¹	0 in to 1 in	6.1 μin	Optical Flats
Rulers	0 in to 36 in	(0.002 + 14L) μin	Glass Scale with Optics

Mass and Mass Related

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



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Mass – Metric	30 g	13 µg	Echelon II
	20 g	12 µg	
	10 g	8.6 µg	
	5 g	4.4 µg	
	3 g	4.3 µg	
	2 g	4.3 µg	
	1 g	4.3 µg	
	500 mg	1.7 µg	
	300 mg	1.7 µg	
	200 mg	1.7 µg	
	100 mg	1.7 µg	
	50 mg	1.7 µg	
	30 mg	1.7 µg	
	20 mg	1.7 µg	
	10 mg	1.7 µg	
	5 mg	1.7 µg	
	3 mg	1.7 µg	
	2 mg	1.7 µg	
	1 mg	1.7 µg	
	25 kg	0.23 g	Echelon III
	20 kg	0.23 g	
	10 kg	8.3 mg	



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Mass – Metric	5 kg	4.1 mg	Echelon III
	3 kg	2.7 mg	
	2 kg	1.9 mg	
	1 kg	0.83 mg	
	500 g	0.41 mg	
	300 g	0.27 mg	
	200 g	0.2 mg	
	100 g	84 µg	
	50 g	41 µg	
	30 g	26 µg	
	20 g	26 µg	
	10 g	18 µg	
	5 g	11 µg	
	3 g	11 µg	
	2 g	11 µg	
	1 g	11 µg	
	500 mg	3.6 µg	
	300 mg	3.6 µg	
	200 mg	3.6 µg	
	100 mg	3.6 µg	
	50 mg	3.6 µg	
30 mg	3.6 µg		



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Mass – Metric	20 mg	3.6 µg	Echelon III
	10 mg	3.6 µg	
	5 mg	3.6 µg	
	3 mg	3.6 µg	
	2 mg	3.6 µg	
	1 mg	3.6 µg	
Mass – Avoirdupois	50 lb	41 mg	ASTM Class 0 Weights
	30 lb	35 mg	
	20 lb	34 mg	
	10 lb	34 mg	
	5 lb	34 mg	
	3 lb	34 mg	
	2 lb	34 mg	
	1 lb	34 mg	
Balances – Metric ¹	10 kg	3.9 mg	ASTM Class 1 Weights
	5 kg	2.6 mg	
	3 kg	2.3 mg	
	2 kg	2.2 mg	
	1 kg	2 mg	
	500 g	2 mg	
	300 g	2 mg	
	200 g	2 mg	



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Balances – Metric ¹	100 g	39 µg	ASTM Class 1 Weights
	50 g	24 µg	
	30 g	22 µg	
	20 g	22 µg	
	10 g	8.4 µg	
	5 g	5.2 µg	
	3 g	5.2 µg	
	2 g	5.2 µg	
	1 g	5.2 µg	
	500 mg	1.7 µg	
	200 mg	1.7 µg	
	100 mg	1.7 µg	
	50 mg	1.7 µg	
	30 mg	1.7 µg	
	20 mg	1.7 µg	
	10 mg	1.7 µg	
	5 mg	1.7 µg	
	3 mg	1.7 µg	
	2 mg	1.7 µg	
	1 mg	1.7 µg	



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
Balances – Avoirdupois ¹	50 lb	2.3 g	ASTM Class 1 Weights
	30 lb	1.4 g	
	20 lb	0.91 g	
	10 lb	0.46 g	
	5 lb	0.23 g	
	3 lb	0.14 g	
	2 lb	91 mg	
	1 lb	46 mg	
	8 oz	23 mg	
	4 oz	12 mg	
	2 oz	5.7 mg	
	1 oz	2.9 mg	
	0.5 oz	1.4 mg	
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	
Gage Pressure – Pneumatic ¹	-15 psi to 25 psi	0.001 6 psi	Ruska 7250xi
	25 psi to 500 psi	0.006 5 %	DHI PPC 4 Controller
	-36 inH ₂ O to -22 inH ₂ O	0.009 % + 150 μinH ₂ O	
	-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	



Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-) ²	Reference Standard, Method and/or Equipment
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	0.5 % RH	Humidity Generator
	(75 to 95) %RH	0.65 % RH	
	(10 to 95) %RH	0.5 % RH	Humidity Generator
Temperature – Generate ¹	(10 to 50) %RH	0.5 % RH	Humidity Generator
	(50 to 75) %RH	0.7 % RH	
	(75 to 95) %RH	0.85 % RH	
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 x 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:

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. 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.
4. 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.
5. L = Length in inches
6. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2489.05.
7. 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.



Vice President

