National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES

NVLAP LAB CODE 200905-0
Scope Revised: 2015-06-09

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Transcat – Ottawa 4043 Carling Avenue Ottawa, ON K2K 2A4 CANADA Mr. Keith Powell Phone: 613-591-8140; Fax: 613-591-6318 E-mail: kpowell@transcat.com URL: http://www.transcat.com	**Fields of Calibration** Dimensional Electromagnetics – DC/Low Frequency Time and Frequency Mechanical Thermodynamic This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (NVLAP Code: 20/A01)

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) [Notes 1,2]

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3]	Remarks
DIMENSIONAL			
LENGTH and DIAMETER (20/D05)			
Micrometers and Calipers – Outside, Inside, Depth Field calibrations available [Note 4]	0 in to 0.05 in 0.05 to 0.45 in 0.45 in to 1.0 in 1.0 in to 4.0 in 4.0 in to 40 in	7.5 µin 7 µin/in + 7 µin 12 µin/in + 5 µin 15 µin/in + 2 µin 16 µin/in + 9 µin	Comparison to Gage Blocks and Ring Gage
Anvil Flatness Field calibrations available [Note 4]	0 in to 1 in	6.3 µin	Optical Flats
Dial Indicators	0 in to 0.45 in 0.45 in to 1.0 in 1.0 in to 4.0 in 4 in to 6 in	3 µin/in + 18 µin 8 µin/in + 15 µin 14 µin/in + 9 µin 16 µin/in + 9 µin	Gage Blocks with Surface Plate
Length Measure	0 in to 36 in	0.016 in	36 in Ruler
Height Equipment and Measure	0.0 in to 0.45 in 0.45 in to 1.0 in 1.0 in to 4.0 in 4 in to 24 in	1 µin/in + 48 µin 4 µin/in + 46 µin 10 µin/in + 40 µin 15 µin/in + 21 µin	Gage Blocks with Surface Plate

2015-07-01 through 2016-06-30
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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) Note 3,5	Remarks
ELECTROMAGNETICS – DC/LOW FREQUENCY				
AC RESISTORS and CURRENT (20/E02)				
AC Current – Measuring Equipment Field calibrations available Note 4	0 µA to 220 µA	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.031 % + 16 nA 0.019 % + 10 nA 0.015 % + 8 nA 0.030 % + 12 nA 0.11 % + 65 nA	Fluke 5700A-EP
	0.22 mA to 2.2 mA	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.03 % + 40 nA 0.018 % + 35 nA 0.014 % + 35 nA 0.021 % + 0.11 µA 0.11 % + 0.65 µA	
	2.2 mA to 22 mA	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.039 % + 0.40 µA 0.019 % + 0.35 µA 0.014 % + 0.35 µA 0.021 % + 0.55 µA 0.11 % + 5 µA	
	22 mA to 220 mA	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.033 % + 4 µA 0.018 % + 3.5 µA 0.014 % + 2.5 µA 0.021 % + 3.5 µA 0.11 % + 10 µA	
	0.22 A to 2.2 A	20 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.027 % + 35 µA 0.046 % + 80 µA 0.7 % + 0.16 mA	
	2.2 A to 11 A	40 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.048 % + 0.17 mA 0.096 % + 0.38 mA 0.36 % + 0.75 mA	Fluke 5700A-EP with 5725A

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) Note 3,5	Remarks
	11 A to 20.5 A	45 Hz to 100 Hz	0.095 % + 3.9 mA	Fluke 5520A
		100 Hz to 1 kHz	0.12 % + 3.9 mA	
		1 kHz to 5 kHz	2.3 % + 3.9 mA	
Extended Frequency Ranges Field calibrations available Note 4	29 µA to 330 µA	10 kHz to 30 kHz	1.2 % + 0.31 µA	Fluke 5520A
	330 µA to 3.3 mA	10 kHz to 30 kHz	0.78 % + 0.47 µA	
	3.3 mA to 29 mA	10 kHz to 30 kHz	0.31 % + 3.1 µA	
	29 mA to 330 mA	10 kHz to 30 kHz	0.31 % + 0.16 mA	
Clamp-on Ammeter Toroidal Type Field calibrations available Note 4	20.5 A to 150 A	45 Hz to 65 Hz	0.42 % + 29 mA	Fluke 5520A with 5500A/Coil
		65 Hz to 440 Hz	1.0 % + 31 mA	
	150 A to 500 A	45 Hz to 65 Hz	0.42 % + 130 mA	
		65 Hz to 440 Hz	1.0 % + 140 mA	
	500 A to 1025 A	45 Hz to 65 Hz	0.43 % + 220 mA	
		65 Hz to 440 Hz	1.0 % + 230 mA	
Clamp-on Ammeter Non-Toroidal Type Field calibrations available Note 4	20.5 A to 150 A	45 Hz to 65 Hz	0.70 % + 290 mA	Fluke 5520A with 5500A/Coil
		65 Hz to 440 Hz	1.3 % + 290 mA	
	150 A to 500 A	45 Hz to 65 Hz	0.70 % + 300 mA	
		65 Hz to 440 Hz	1.3 % + 1.0 A	
	500 A to 1025 A	45 Hz to 65 Hz	0.70 % + 350 mA	
		65 Hz to 440 Hz	1.3 % + 1.1 A	
AC Current – Measure Field calibrations available Note 4	0 µA to 100 µA	10 Hz to 20 Hz	0.47 % + 35 nA	Agilent 3458A opt 2
		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 % + 0.23 µA	
		20 Hz to 45 Hz	0.18 % + 0.23 µA	
		45 Hz to 100 Hz	0.071 % + 0.23 µA	
		100 Hz 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	0.18 % + 2.3 µA	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (*k*=2) Note 3,5	Remarks
		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	0.18 % + 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 % + 0.23 mA	
		20 Hz to 45 Hz	0.19 % + 0.23 mA	
		45 Hz to 100 Hz	0.097 % + 0.23 mA	
		100 Hz to 5 kHz	0.12 % + 0.23 mA	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty (*k*=2) Note 3,5	Remarks
DC RESISTANCE and CURRENT (20/E05)			
DC Resistance – Measuring Equipment and Measure			Agilent 3458A with Decade Resistor
Field calibrations available Note 4	0 Ω to 10 Ω	18 µΩ/Ω + 58 µΩ	
	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 + 0.12 kΩ	
	10 MΩ to 100 MΩ	0.059 % + 1.2 kΩ	
	100 MΩ to 1 GΩ	0.58 % + 12 kΩ	
DC Resistance – Measuring Equipment			
Field calibrations available Note 4	1 mΩ	2.3 nΩ	Fixed Resistor
	10 mΩ	12 nΩ	
	100 mΩ	0.48 µΩ	
	10 MΩ to 100 MΩ	0.08 %	IET HRRS-B-7-100k-5kV
	100 MΩ to 1 GΩ	0.24 %	
	1 GΩ to 10 GΩ	0.41 %	
	10 GΩ to 100 GΩ	0.84 %	
	100GΩ to 1 TΩ	2.50 %	

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Measured Parameter or Device Calibrated	Range	Uncertainty (*k*=2) Note 3,5	Remarks
DC Current – Measuring Equipment and Measure Field calibrations available Note 4	0 µA to 100 µA 100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A	26 µA/A + 0.92 nA 26 µA/A + 5.8 nA 26 µA/A + 58 nA 43 µA/A + 0.58 µA 130 µA/A + 12 µA	Agilent 3458A with Current Source
DC Current – Measuring Equipment Field calibrations available Note 4	220 mA to 2.2 A 2.2 A to 11 A 11 A to 20.5 A	0.20 mA/A + 12 µA 0.40 mA/A + 0.48 mA 0.93 mA/A + 0.58 mA	Fluke 5700A-EP Fluke 5700A-EP with 5725A Fluke 5520A
DC Current – Measure Field calibrations available Note 4	1 A to 50 A 50 A to 100 A	0.03 % 0.30 %	Yokogawa 2792 with Agilent 3458A Empro HA50-100 w/Agilent 3458A opt 002
Clamp-on Ammeter Non-Toroidal Type Field calibrations available Note 4	20 A to 150 A 150 A to 1000 A	0.58 % + 0.16 A 0.58 % + 0.58 A	Fluke 5520A with 5500A/Coil
DC VOLTAGE (20/E06)			
DC Voltage – Measure Equipment Field calibrations available Note 4	0 V to 220 mV 220 mV to 2.2 V 2.2 V to 11 V 11 V to 22 V 22 V to 220 V 220 V to 1100 V	8.5 µV/V + 0.44 µV 5.1 µV/V + 0.7 µV 4.0 µV/V + 2.5 µV 4.0 µV/V + 4 µV 6.2 µV/V + 40 µV 7.6 µV/V + 0.40 mV	Fluke 5700A-EP
DC Voltage – Measure Field calibrations available Note 4	0 mV to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 500 V 500 V to 800 V 800 V to 1000 V	7.1 µV/V + 0.58 µV 5.0 µV/V + 0.58 µV 5.1 µV/V + 0.58 µV 7.6 µV/V + 35 µV 11 µV/V + 0.12 mV 16 µV/V + 0.12 mV 21 µV/V + 0.12 mV	Agilent 3458A opt 2

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Measured Parameter or Device Calibrated	Range	Uncertainty (*k*=2) Note 3,5	Remarks
DC High Voltage – Measure	2 kV to 20 kV	0.07 % + 4.6 V	Vitrek 4600A
	20 kV to 40 kV	0.07 % + 9.2 V	Vitrek 4640A

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (*k*=2) Note 3,5	Remarks
LF AC VOLTAGE (20/E09)				
AC High Voltage – Measure	1 kV to 2 kV	20 Hz to 100 Hz	0.3 % + 2.3 V	Vitrek 4600
Field calibrations available Note 4		100 Hz to 400 Hz	0.73 % + 4.6 V	
	2 kV to 20 kV	20 Hz to 100 Hz	0.37 % + 23 V	
	20 kV to 40 kV	50 Hz to 60 Hz	0.65 % + 69 V	Vitrek 4640
AC Voltage – Measure	0 mV to 10 mV	1 Hz to 40 Hz	0.039 % + 3.5 µV	Agilent 3458A opt 2
Field calibrations available Note 4		40 Hz to 1 kHz	0.029 % + 1.2 µV	
		1 kHz to 20 kHz	0.039 % + 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	4.7 % + 2.3 µV	
		300 kHz to 1 MHz	1.5 % + 5.8 µV	
	10 mV to 100 mV	1 Hz to 40 Hz	0.013 % + 4.6 µV	
		40 Hz to 1 kHz	0.0095 % + 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	
	100 mV to 1 V	1 Hz to 40 Hz	0.0098 % + 46 µV	
		40 Hz to 1 kHz	0.0094 % + 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	

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Measured Parameter or Device Calibrated	**Range**	**Frequency Range**	**Uncertainty (*k*=2)** Note 3,5	**Remarks**
		100 kHz to 300 kHz	0.35 % + 0.12 mV	
		300 kHz to 1 MHz	1.7 % + 0.12 mV	
		1 MHz to 2 MHz	1.9 % + 0.12 mV	
		2 MHz to 4 MHz	4.7 % + 0.81 mV	
		4 MHz to 8 MHz	4.7 % + 0.92 mV	
	1 V to 10 V	1 Hz to 40 Hz	0.0095 % + 0.46 mV	
		40 Hz to 1 kHz	0.0095 % + 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	1.7 % + 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 % + 9.3 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	0.042 % + 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	
AC Voltage – Measuring Equipment Field calibrations available Note 4	0 mV to 2.2 mV	10 Hz to 20 Hz	0.16 % + 4 µV	Fluke 5700A-EP
		20 Hz to 40 Hz	0.1 % + 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	

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Measured Parameter or Device Calibrated	**Range**	**Frequency Range**	**Uncertainty (*k*=2) Note 3,5**	**Remarks**
		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	
	2.2 mV to 22 mV	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	0.03 % + 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	0.0085 % + 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	0.010 % + 15 µV	
		40 Hz to 20 kHz	0.0048 % + 8 µV	
		20 kHz to 50 kHz	0.008 % + 10 µV	
		50 kHz to 100 kHz	0.012 % + 30 µV	
		100 kHz to 300 kHz	0.043 % + 80 µV	
		300 kHz to 500 kHz	0.01 % + 200 µV	
		500 kHz to 1 MHz	0.18 % + 300 µV	
	2.2 V to 22 V	10 Hz to 20 Hz	0.028 % + 0.4 mV	
		20 Hz to 40 Hz	0.010 % + 0.15 mV	
		40 Hz to 20 kHz	0.005 % + 50 µV	
		20 kHz to 50 kHz	0.0083 % + 0.1 mV	
		50 kHz to 100 kHz	0.012 % + 0.2 mV	

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Measured Parameter or Device Calibrated	**Range**	**Frequency Range**	**Uncertainty (*k*=2) Note 3,5**	**Remarks**
		100 kHz to 300 kHz	0.030 % + 0.6 mV	
		300 kHz to 500 kHz	0.11 % + 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	0.0057 % + 0.6 mV	
		20 kHz to 50 kHz	0.0093 % + 1 mV	
		50 kHz to 100 kHz	0.017 % + 2.5 mV	
		100 kHz to 300 kHz	0.091 % + 16 mV	
		300 kHz to 500 kHz	0.44 % + 40 mV	
		500 kHz to 1 MHz	0.8 % + 80 mV	
	220 V to 1100 V	40 Hz to 1 kHz	0.011 % + 4 mV	Fluke 5700A-EP/5725A
		1 kHz to 20 kHz	0.017 % + 6 mV	
		20 kHz to 30 kHz	0.061 % + 11 mV	
	220 V to 750 V	30 kHz to 50 kHz	0.061 % + 11 mV	
		50 kHz to 100 kHz	0.23 % + 45 mV	
LF CAPACITANCE (20/E10)				
Capacitance – Measuring Equipment Field calibrations available Note 4	0.19 nF to < 1.1 nF	10 Hz to 10 kHz	0.39 % + 7.8 pF	Fluke 5520A
	1.1 nF to < 3.3 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	0.20 % + 0.78 nF	
	1.1 µF to < 3.3 µF	10 Hz to 300 Hz	0.20 % + 2.3 nF	
	3.3 µF to < 11 µF	10 Hz to 150 Hz	0.20 % + 7.8 nF	
	11 µF to < 33 µF	10 Hz to 120 Hz	0.32 % + 23 nF	
	33 µF to < 110 µF	10 Hz to 80 Hz	0.35 % + 78 nF	
	110 µF to < 330 µF	DC to 50 Hz	0.35 % + 0.23 µF	
	0.33 mF to < 1.1 mF	DC to 20 Hz	0.35 % + 0.78 µF	
	1.1 mF to < 3.3 mF	DC to 6 Hz	0.35 % + 2.3 µF	
	3.3 mF to < 11 mF	DC to 2 Hz	0.35 % + 7.8 µF	

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	11 mF to < 33 mF 33 mF to < 110 mF	DC to 0.6 Hz DC to 0.2 Hz	0.58 % + 23 µF 0.86 % + 78 µF	
LF POWER/ENERGY (20/E12)				
Power – Measuring Equipment 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	DC DC DC DC	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	DC DC DC	0.044 % 0.053 % 0.0096 %	
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	DC DC DC	0.088 % 0.07 % 0.04 %	
AC Power Note 8 (PF = 1)				
3.3 mA to 9 mA	0.11 mW to 3 mW 3 mW to 9 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.13 % 0.077 %	
9 mA to 33 mA	0.3 mW to 10 mW 10 mW to 33 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.089 % 0.077 %	
33 mA to 90 mA	1 mW to 30 mW 30 mW to 90 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.071 % 0.057 %	
90 mA to 330 mA	3.0 mW to 100 mW 100 mW to 300 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.089 % 0.078 %	
0.33 A to 0.9 A	11 mW to 300 mW 300 mW to 900 W	10 Hz to 65 Hz 10 Hz to 65 Hz	0.071 % 0.081 %	
0.9 A to 2.2 A	30 mW to 720 mW 720 mW to 2 kW	10 Hz to 65 Hz 10 Hz to 65 Hz	0.089 % 0.079 %	

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2.2 A to 4.5 A	80 mW to 1.4 W 1.4 W to 4.5 kW	10 Hz to 65 Hz 10 Hz to 65 Hz	0.088 % 0.18 %	
4.5 A to 20.5 A	150 mW to 6.7 W 6.7 W to 20 kW	10 Hz to 65 Hz 10 Hz to 65 Hz	0.17 % 0.17 %	
PHASE METERS (20/E15)				
Phase Meters – Measure Equipment Field calibrations available Note 4	0° to 179.99°	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 30 kHz	0.11° 0.20° 0.39° 1.9° 3.9° 7.8°	Fluke 5520A
TIME and FREQUENCY				
FREQUENCY DISSEMINATION (20/F01)				
Frequency – Source and Measure		Uncertainty values of derivatives of 10 MHz will differ due to resolution, noise, and gating errors		
In-Lab	10 MHz		5.9×10^{-10}	Rubidium Oscillator
Field Note 4	10 MHz		2.3×10^{-9}	Agilent 53132A opt 10

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2			
Measured Parameter or Device Calibrated	**Range**	**Uncertainty (k=2)** Note 3,5	**Remarks**
PULSE WAVEFORM (20/F04)			
Rise Time – Generate Field calibrations available Note 4	250 ps (nominal) Note 9	51 ps	Fluke 5520A/SC1100
MECHANICAL			
FORCE (20/M06) Force Measuring Equipment – Tension and Compression	1 lbf to 400 lbf	0.013 %	NIST Class F Weights

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty (*k*=2) Note 3,5	Remarks
TORQUE (20/M15)			
Torque – Measure Field calibrations available Note 4	4 lbf-in to 10 lbf-in 10 lbf-in to 30 lbf-in 30 lbf-in to 80 lbf-ft 80 lbf-ft to 250 lbf-ft	1.9 % 1.0 % 0.76 % 0.60 %	Torque Calibrator
WEIGHING INSTRUMENTS (20/M16)			
Balances - Metric Field calibrations available Note 4	25 kg 20 kg 10 kg 5 kg 2 kg 1 kg 500 g 200 g 100 g 50 g 20 g 10 g 5 g 3 g 2 g 1 g 500 mg 200 mg 100 mg 50 mg 20 mg 10 mg 5 mg 1 mg	33 mg 23 mg 14 mg 3.2 mg 1.8 mg 0.7 mg 1.5 mg 0.17mg 140 µg 65 µg 59 µg 45 µg 44 µg 44 µg 44 µg 43 µg 43 µg 43 µg 43 µg 43 µg 43 µg 43 µg 43 µg	ASTM Class 1 Weights
Balances - Avoirdupois	1 lb to 400 lb	0.012 %	NIST Class F Weights

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Measured Parameter or Device Calibrated	Range	Uncertainty (*k*=2) Note 3,5	Remarks
THERMODYNAMIC			
HUMIDITY (20/T02)			
Relative Humidity – Measure Equipment 10 °C to 70 °C	10 % RH to 95 % RH	0.5 % RH	Thunder Scientific 2500STLT
Relative Humidity – Measure Field calibrations available Note 4			
-40 °C to 10 °C	0 % RH to 90 % RH	2.4 % RH	Vaisala HMI41/HMP46
10 °C to 60 °C	0 % RH to 90 % RH	1.3 % RH	
60 °C to 100 °C	0 % RH to 90 % RH	2.4 % RH	
20 °C to 100 °C	90 % RH to 100 % RH	2.4 % RH	
LABORATORY THERMOMETERS (20/T03)			
Temperature – Measuring Equipment Field calibrations available Note 4	-78.4 °C	0.026 °C	Dry Ice & Hart 5628
	-30 °C to 0 °C	0.026 °C	Liquid Bath & Hart 5628
	0.01 °C	0.0033 °C	TPW Cell
	0 °C to 120 °C	0.037 °C	Liquid Bath & Hart 5628
	120 °C to 600 °C	0.048 °C	Dry Block & Hart 5628
Temperature – Measure Field calibrations available Note 4	-195°C to 0 °C	0.012 °C	Hart 5628, Black Stack
	0°C to 420 °C	0.026 °C	
	420°C to 600 °C	0.037 °C	
PRESSURE (20/T05)			
Absolute Pressure – Source (Pneumatic)	0 psia to 25 psia	0.0019 psia	Ruska 7250xi
	25 psia to 500 psia	0.0065 % + 0.001 psia	
Gage Pressure – Source (Pneumatic) Field calibrations available Note 4	0 inH2O to 2 inH2O	0.0015 inH2O	Dwyer Hook Gauge
	4 inH2O to 14 inH2O	0.042 %	Ametek RK-1600
	-15 psig to 0 psig	0.017 %	Cosa T3500/3
	0.5 psig to 3 psig	0.017 %	Cosa T3500/3
	3 psig to 5 psig	0.0074 %	Cosa T3500/3
	5 psig to 25 psig	0.0017 psig	Ruska 7250xi

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty (*k*=2) Note 3,5	Remarks
Gage Pressure – Source (Hydraulic) Field calibrations available Note 4	25 psig to 500 psig 500 psig to 10 000 psig	0.0065 % 0.0080 %	Ruska 7250xi Cosa W2200-P
TEMPERATURE INDICATORS (20/T08)			
Electrical Calibration of Thermocouple Devices Field calibrations available Note 4			
E	-250 °C to 1000 °C	0.1 °C	Thermocouple Half Junction
J	-210 °C to 1200 °C	0.1 °C	
K	-200 °C to 1372 °C	0.1 °C	
T	-250 °C to 400 °C	0.1 °C	
R	0 °C to 250 °C	0.44 °C	Fluke 5520A
	250 °C to 400 °C	0.27 °C	
	400 °C to 1000 °C	0.26 °C	
	1000 °C to 1767 °C	0.31 °C	
S	0 °C to 250 °C	0.45 °C	
	250 °C to 1000 °C	0.28 °C	
	1000 °C to 1400 °C	0.29 °C	
	1400 °C to 1767 °C	0.36 °C	
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 1300 °C	0.21 °C	
	-200 °C to -100 °C	0.31 °C	
END			

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Notes
Note 1: A Calibration and Measurement Capability (CMC) is a description of the best result of a calibration or measurement (result with the smallest uncertainty of measurement) that is available to the laboratory's customers under normal conditions, when performing more or less routine calibrations of nearly ideal measurement standards or instruments. The CMC is described in the laboratory's scope of accreditation by: the measurement parameter/device being calibrated, the measurement range, the uncertainty associated with that range (see note 3), and remarks on additional parameters, if applicable. **Note 2:** Calibration and Measurement Capabilities are traceable to the national measurement standards of the U.S. or to the national measurement standards of other countries and are thus traceable to the internationally accepted representation of the appropriate SI (Système International) unit. **Note 3:** The uncertainty associated with a measurement in a CMC is an expanded uncertainty with a level of confidence of approximately 95 %, typically using a coverage factor of $k = 2$. However, laboratories may report a coverage factor different than $k = 2$ to achieve the 95 % level of confidence. Units for the measurand and its uncertainty are to match. Exceptions to this occur when marketplace practice employs mixed units, such as when the artifact to be measured is labeled in non-SI units and the uncertainty is given in SI units (Example: 5 lb weight with uncertainty given in mg). **Note 3a:** The uncertainty of a specific calibration by the laboratory may be greater than the uncertainty in the CMC due to the condition and behavior of the customer's device and specific circumstances of the calibration. The uncertainties quoted do not include possible effects on the calibrated device of transportation, long term stability, or intended use. **Note 3b:** As the CMC represents the best measurement results achievable under normal conditions, the accredited calibration laboratory shall not report smaller uncertainty of measurement than that given in a CMC for calibrations or measurements covered by that CMC. **Note 3c:** As described in Note 1, CMCs cover calibrations and measurements that are available to the laboratory's customers under *normal conditions.* However, the laboratory may have the capability to offer special tests, employing special conditions, which yield calibration or measurement results with lower uncertainties. Such special tests are not covered by the CMCs and are outside the laboratory's scope of accreditation. In this case, NVLAP requirements for the labeling, on calibration reports, of results outside the laboratory's scope of accreditation apply. These requirements are set out in Annex A.1.h. of NIST Handbook 150, Procedures and General Requirements. **Note 4:** Uncertainties associated with field service calibration may be greater as they incorporate on-site environmental contributions, transportation effects, or other factors that affect the measurements. (This note applies only if marked in the body of the scope.) **Note 5:** Values listed with percent (%) are percent of reading or generated value unless otherwise noted. **Note 6:** NVLAP accreditation is the formal recognition of specific calibration capabilities. Neither NVLAP nor NIST guarantee the accuracy of individual calibrations made by accredited laboratories. **Note 7:** See NIST Handbook 150 for further explanation of these notes.

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Note 8: 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.
Note 9: 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.

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