National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200915-0**

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Transcat - Boston 230 Ballardvale Wilmington, MA 01887 Mr. Michael Sublett Phone: 978-988-3911 Fax: 978-988-3973 E-mail: msublett@transcat.com URL: www.transcat.com	**Parameter(s) of Accreditation** 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 3,9	Remarks
DIMENSIONAL			
ANGULAR (20/D01)			
Angle	0° to 75° 90°	140” 79”	Sine Bar Granite Square
LENGTH & DIAMETER; STEP GAGES (20/D05)			
Micrometers & Calipers – Outside, Inside, Depth Field calibrations Available Note 4	0.01 in to 24 in	22 µin + 6.6L µin	Comparison to Gage Blocks
Anvil Flatness Field calibrations Available Note 4	0 in to 1 in	5.0 µin	Optical Flats
Anvil Parallelism Field calibrations Available Note 4	0 in to 1 in	16 µin	Optical Flats
Digital & Dial Indicators Field calibrations Available Note 4	0 in to 2 in 2 in to 6 in	17 µin 7 µin + 7.5L µin	Gage Blocks/Surface Plate
Single Axis - Outside	0 in to 10 in	12 µin + 3.2L µin	Horizontal Comparator
Height Measuring Equipment	0 in to 4 in 4 in to 24 in	46 µin + 2.5L µin 25 µin + 7.7L µin	Gage Blocks/Surface Plate

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

Measured Parameter or Device Calibrated	Range	Uncertainty (*k*=2) [Note 3,9]	Remarks
Parallelism & Straightness	0 in to 36 in	61 µin	Gage Amp/Surface Plate
SPHERICAL DIAMETER; PLUG and RING GAGES (20/D11)			
Plain Plug & Ring Gages	0 in to 4 in	12 µin + 4*L* µin	Horizontal Comparator
THREADED PLUG and RING GAGES (20/D14)			
Plug Gage			
Major Diameter	0 in to 4 in	12 µin + 4*L*	Horizontal Comparator
Pitch Diameter		83 µin	
Ring Gage			
Inner Pitch Diameter	0 in to 4 in	140 µin	Horizontal Comparator

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	0.031 % + 16 nA	Fluke 5700A
		20 Hz to 40 Hz	0.019 % + 10 nA	
		40 Hz to 1 kHz	0.015 % + 8 nA	
		1 kHz to 5 kHz	0.03 % + 12 nA	
		5 kHz to 10 kHz	0.11 % + 65 nA	
	0.22 mA to 2.2 mA	10 Hz to 20 Hz	0.030 % + 40 nA	
		20 Hz to 40 Hz	0.018 % + 35 nA	
		40 Hz to 1 kHz	0.014 % + 35 nA	
		1 kHz to 5 kHz	0.021 % + 110 nA	
		5 kHz to 10 kHz	0.11 % + 650 nA	
	2.2 mA to 22 mA	10 Hz to 20 Hz	0.039 % + 0.40 µA	
		20 Hz to 40 Hz	0.019 % + 0.35 µA	
		40 Hz to 1 kHz	0.014 % + 0.35 µA	
		1 kHz to 5 kHz	0.021 % + 0.55 µA	
		5 kHz to 10 kHz	0.11 % + 5.0 µA	

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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
	22 mA to 220 mA	10 Hz to 20 Hz	0.033 % + 4.0 µA	
		20 Hz to 40 Hz	0.018 % + 3.5 µA	
		40 Hz to 1 kHz	0.014 % + 2.5 µA	
		1 kHz to 5 kHz	0.021 % + 3.5 µA	
		5 kHz to 10 kHz	0.11 % + 10 µA	
	0.22 A to 2.2 A	20 Hz to 1 kHz	0.027 % + 35 µA	
		1 kHz to 5 kHz	0.046 % + 80 µA	
		5 kHz to 10 kHz	0.70 % + 0.16 mA	
	2.2 A to 11 A	40 Hz to 1 kHz	0.048 % + 0.17 mA	Fluke 5700A w/5725A
		1 kHz to 5 kHz	0.096 % + 0.38 mA	
		5 kHz to 10 kHz	0.36 % + 0.75 mA	
	11 A to 20.5 A	45 Hz to 100 Hz	0.11 % + 3.9 mA	
		100 Hz to 1 kHz	0.14 % + 3.9 mA	
		1 kHz to 5 kHz	2.7 % + 3.9 mA	
Extended Frequency Ranges Field calibrations Available [Note 4]	29 µA to 330 µA	10 kHz to 30 kHz	1.5 % + 0.31 µA	Fluke 5520A
	0.33 mA to 3.3 mA	10 kHz to 30 kHz	0.92 % + 0.47 µA	
	3.3 mA to 33 mA	10 kHz to 30 kHz	0.37 % + 3.1 µA	
	33 mA to 330 mA	10 kHz to 30 kHz	0.37 % + 0.16 mA	
Clamp-on Ammeter Toroidal Type Field calibrations Available [Note 4]	20 A to 150 A	45 Hz to 65 Hz	0.35 % + 0.25 A	Fluke 5520A w/5500A/Coil
	20 A to 150 A	65 Hz to 440 Hz	0.94 % + 0.05 A	
	150 A to 1000 A	45 Hz to 65 Hz	0.34 % + 0.13 A	
	150 A to 1000 A	65 Hz to 440 Hz	1.2 % + 0.23 A	
Clamp-on Ammeter Non- Toroidal Type Field calibrations Available [Note 4]	20 A to 150 A	45 Hz to 65 Hz	0.60 % + 0.29 A	Fluke 5520A w/5500A/Coil
	20 A to 150 A	65 Hz to 440 Hz	1.0 % + 0.29 A	
	150 A to 1000 A	45 Hz to 65 Hz	0.57 % + 1.0 A	
	150 A to 1000 A	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	0.46 % + 35 nA	Agilent 3458A opt 002
		20 Hz to 45 Hz	0.18 % + 35 nA	
		45 Hz to 100 Hz	0.072 % + 35 nA	

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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
		0.1 kHz to 5 kHz	0.072 % + 35 nA	
	0.1 mA to 1 mA	10 Hz to 20 Hz	0.46 % + 0.23 µA	
		20 Hz to 45 Hz	0.17 % + 0.23 µA	
		45 Hz to 100 Hz	0.07 % + 0.23 µA	
		0.1 kHz to 5 kHz	0.038 % +0.23 µA	
	1 mA to 10 mA	10 Hz to 20 Hz	0.46 % + 2.3 µA	
		20 Hz to 45 Hz	0.17 % + 2.3 µA	
		45 Hz to 100 Hz	0.07 % + 2.3 µA	
		0.1 kHz to 5 kHz	0.038 % + 2.3 µA	
	10 mA to 100 mA	10 Hz to 20 Hz	0.46 % + 23 µA	
		20 Hz to 45 Hz	0.17 % + 23 µA	
		45 Hz to 100 Hz	0.07 % + 23 µA	
		0.1 kHz to 5 kHz	0.037 % + 23 µA	
	0.1 A to 1 A	10 Hz to 20 Hz	0.46 % + 0.23 mA	
		20 Hz to 45 Hz	0.19 % + 0.23 mA	
		45 Hz to 100 Hz	0.096 % + 0.23 mA	
		0.1 kHz to 5 kHz	0.12 % + 0.23 mA	
	1 to 3 A	40 Hz to 1 kHz	0.18 % + 2.1 mA	Agilent 34401A
		1 kHz to 5 kHz	0.20 % + 2.1 mA	
	3 to 30 A	40 Hz to 1 kHz	0.35 % + 2.3 mA	Agilent 34330A w/3458A
		1 kHz to 5 kHz	5.8 % + 2.3 mA	
AC Resistance– Measure Field calibrations Available [Note 4]	0 Ω to 6.25 Ω	1 kHz	0.7 % + 0.01 Ω	Gen Rad 1689-9700
	6.25 Ω to 100 kΩ		0.024 % + 0.01 Ω	
	100 kΩ to 410 kΩ		0.3 % + 0.01 Ω	

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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
DC RESISTANCE (20/E05)			
Measuring Equipment and Measure Field calibrations Available [Note 4]	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1 GΩ	19 μΩ/Ω + 58 μΩ 15 μΩ/Ω + 0.58 mΩ 12 μΩ/Ω + 0.58 mΩ 12 μΩ/Ω + 5.8 mΩ 13 μΩ/Ω + 58 mΩ 19 μΩ/Ω + 2.3 Ω 62 μΩ/Ω + 0.12 kΩ 0.059 % + 1.2 kΩ 0.58 % + 12 kΩ	HP3458A w/Decade Resistor
Measuring Equipment Field calibrations Available [Note 4]	333 μΩ 1 mΩ 10 mΩ 100 mΩ 1 Ω 10 Ω	0.12 % 590 μΩ/Ω 140 μΩ/Ω 120 μΩ/Ω 120 μΩ/Ω 120 μΩ/Ω	Guildline 9711A
DC Current – Measuring Equipment Field calibrations Available [Note 4]	1 A to 11 A 11 A to 20.5 A	0.04 % + 0.48 mA 0.10 % + 0.58 mA	Fluke 5700A w/5725A Fluke 5520A
DC Current – Measure & Measuring Equipment Field calibrations Available [Note 4]	0 to 100 μA 0.1 mA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 0.1 A to 1 A	26 μA/A + 0.9 nA 26 μA/A + 5.8 nA 26 μA/A + 58 nA 43 μA/A + 0.58 μA 0.013 % + 12 μA	HP 3458A with current source
DC Current – Measure Field calibrations Available [Note 4]	0 to 10 μA 10 μA to 100 μA 100 μA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 10 A	130 μA/A + 58 pA 120 μA/A + 580 pA 120 μA/A + 5.8 nA 120 μA/A + 58 nA 120 μA/A + 580 nA 120 μA/A + 5.8 μA 140 μA/A + 58 μA	Guildline 9711A w/HP 3458A

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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
Clamp-on Ammeter Non-Toroidal Type Field calibrations Available [Note 4]	10 A to 100 A 100 A to 300 A 300 A to 1000 A 20 A to 150 A 150 A to 1000 A	590 µA/A + 580 µA 0.12 % + 0.0017 A 0.12 % + 0.0058 A 0.51 % + 0.14 A 0.51 % + 0.50 A	Meterman 1000-100 w/3458A Fluke 5520A w/ 5500A/Coil
DC VOLTAGE (20/E06)			
DC Voltage – Measure Field calibrations Available [Note 4]	1 kV to 2 kV 2 kV to 20 kV	0.047 % + 0.40 V 0.047 % + 4.0 V	Vitrek 4600A
Measuring Equipment Field calibrations Available [Note 4]	220 V to 1.1 kV	7.6 µV/V + 0.40 mV	Fluke 5700A w/5725A
Measuring Equipment & Measure Field calibrations Available [Note 4]	0 mV to 100 mV 0.1 V 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 1 kV	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	3458A Opt 002 w/5700A

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				
LF AC VOLTAGE (20/E09)				
AC Voltage – Measure Field calibrations Available [Note 4]	0 mV to 10 mV	1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz	0.039 % + 3.5 µV 0.028 % + 1.2 µV 0.038 % + 1.2 µV 0.15 % + 1.2 µV 0.59 % + 1.2 µV 4.6 % + 2.3 µV	Agilent 3458A opt 002

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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
	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	
	100 mV to 1 V	1 Hz to 40 Hz	0.0098 % + 46 µV	
		40 Hz to 1 kHz	0.0095 % + 23 µV	
		1 kHz to 20 kHz	0.017 % + 23 µV	
		20 kHz to 50 kHz	0.036 % + 23 µV	
		50 kHz to 100 kHz	0.093 % + 23 µV	
		100 kHz to 300 kHz	0.35 % + 0.12 mV	
		300 kHz to 1 MHz	1.2 % + 0.12 mV	
	1 V to 10 V	1 Hz to 40 Hz	0.0095 % + 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	1.2 % + 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	

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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
		50 kHz to 100 kHz	0.35 % + 23 mV	
	1 kV to 2 kV	20 Hz to 100 Hz	0.11 % + 2.3 V	Vitrek 4600A
		100 Hz to 400 Hz	0.47 % + 4.6 V	
	2 kV to 20 kV	20 Hz to 100 Hz	0.52 % + 23 V	
	0 mV to 1 mV	100 kHz to 1 MHz	2.0 % + 2.4 µV	R&S URE3
		1 MHz to 3 MHz	3.8 % + 2.4 µV	
		3 MHz to 10 MHz	10 % + 2.4 µV	
		10 MHz to 20 MHz	25 % + 2.4 µV	
	1 mV to 3 mV	100 kHz to 1 MHz	1.0 % + 2 µV	
		1 MHz to 3 MHz	3.8 % + 2 µV	
		3 MHz to 10 MHz	11 % + 2 µV	
		10 MHz to 20 MHz	25 % + 2 µV	
	3 mV to 100 mV	100 kHz to 1 MHz	0.98 % + 3 µV	
		1 MHz to 10 MHz	1.9 % + 3 µV	
		3 MHz to 10 MHz	3.2 % + 3 µV	
		10 MHz to 20 MHz	7.6 % + 3 µV	
		20 MHz to 30 MHz	16 % + 3 µV	
AC Voltage – Measuring Equipment Field calibrations Available [Note 4]	0 mV to 2.2 mV	10 Hz to 20 Hz	0.16 % + 4.0 µV	Fluke 5700A
		20 Hz to 40 Hz	0.10 % + 4.0 µV	
		40 Hz to 20 kHz	0.078 % + 4.0 µV	
		20 kHz to 50 kHz	0.13 % + 4.0 µV	
		50 kHz to 100 kHz	0.17 % + 5 µV	
		100 kHz to 300 kHz	0.33 % + 10 µV	
		300 kHz to 500 kHz	0.47 % + 20 µV	
		500 kHz to 1 MHz	0.58 % + 20 µV	
	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	

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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
		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 % + 7.0 µV	
		40 Hz to 20 kHz	0.0085 % + 7.0 µV	
		20 kHz to 50 kHz	0.021 % + 7.0 µV	
		50 kHz to 100 kHz	0.047 % + 17 µV	
		100 kHz to 300 kHz	0.091 % + 20 µV	
		300 kHz to 500 kHz	0.14 % + 25 µV	
		500 kHz to 1 MHz	0.28 % + 45 µV	
	220 mV to 2.2 V	10 Hz to 20 Hz	0.027 % + 40 µV	
		20 Hz to 40 Hz	0.01 % + 15 µV	
		40 Hz to 20 kHz	0.0048 % + 8.0 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 % + 0.08 mV	
		300 kHz to 500 kHz	0.10 % + 0.2 mV	
		500 kHz to 1 MHz	0.18 % + 0.3 mV	
	2.2 V to 22 V	10 Hz to 20 Hz	0.028 % + 0.40 mV	
		20 Hz to 40 Hz	0.010 % + 0.15 mV	
		40 Hz to 20 kHz	0.0049 % + 50 µV	
		20 kHz to 50 kHz	0.0083 % + 0.1 mV	
		50 kHz to 100 kHz	0.012 % + 0.2 mV	
		100 kHz to 300 kHz	0.030 % + 0.6 mV	
		300 kHz to 500 kHz	0.10 % + 2.0 mV	
		500 kHz to 1 MHz	0.17 % + 3.2 mV	
	22 V to 220 V	10 Hz to 20 Hz	0.028 % + 4.0 mV	
		20 Hz to 40 Hz	0.010 % + 1.5 mV	
		40 Hz to 20 kHz	0.0056 % + 0.60 mV	
		20 kHz to 50 kHz	0.0093 % + 1.0 mV	
		50 kHz to 100 kHz	0.016 % + 2.5 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	0.09 % + 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	30 kHz to 50 kHz	0.061 % + 11 mV	Fluke 5700A w/ 5725A
		50 kHz to 100 kHz	0.23 % + 45 mV	
	220 V to 1100 V	40 Hz to 1 kHz	0.011 % + 4.0 mV	
		1 kHz to 20 kHz	0.017 % + 6.0 mV	
		20 kHz to 30 kHz	0.061 % + 11 mV	
LF CAPACITANCE (20/E10)				
Capacitance Measure Field calibrations Available [Note 4]	1 pF to 10 pF	1 kHz	0.47 % + 0.05 pF	GenRad 1689-9700
	10 pF to 100 pF	1 kHz	0.058 % + 0.05 pF	
	100 pF to 1 µF	1 kHz	0.024 % + 0.05 pF	
	1 µF to 100 µF	1 kHz	0.035 %	
	100 µF to 1 mF	1 kHz	0.24 %	
Measure Equipment Field calibrations Available [Note 4]	0.1 nF to 0.5 nF	0.1 kHz to 1 kHz	0.58 pF	Arco SS32
	0.5 nF to 1400 nF	0.1 kHz to 1 kHz	0.12 % + 0.018 pF	
	0.19 nF to 1.1 nF	10 Hz to 10 kHz	0.39 % + 6.1 pF	5520A
	1.1 nF to 3.3 nF	10 Hz to 3 kHz	0.39 % + 6.1 pF	
	3.3 nF to 11 nF	10 Hz to 1 kHz	0.21 % + 6.1 pF	
	11 nF to 110 nF	10 Hz to 1 kHz	0.21 % + 61 pF	
	110 nF to 330 nF	10 Hz to 1 kHz	0.21 % + 0.18 nF	
	0.33 µF to 1.1 µF	10 Hz to 600 Hz	0.20 % + 0.61 nF	
	1.1 µF to 3.3 µF	10 Hz to 300 Hz	0.20 % + 1.9 nF	
	3.3 µF to 11 µF	10 Hz to 150 Hz	0.20 % + 6.1 nF	
	11 µF to 33 µF	10 Hz to 120 Hz	0.32 % + 18 nF	
	33 µF to 110 µF	10 Hz to 80 Hz	0.35 % + 61 nF	
	110 µF to 330 µF	DC to 50 Hz	0.35 % + 0.18 µF	
	0.33 mF to 1.1 mF	DC to 20 Hz	0.35 % + 0.61 µF	
	1.1 mF to 3.3 mF	DC to 6 Hz	0.35 % + 1.8 µF	
	3.3 mF to 11 mF	DC to 2 Hz	0.35 % + 6.1 µF	
	11 mF to 33 mF	DC to 0.6 Hz	0.58 % + 18 µF	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) [Note 3,5]	Remarks
	33 mF to 110 mF	DC to 0.2 Hz	0.85 % + 61 µF	
LF INDUCTANCE (20/E11)				
Inductance – Measure Field calibrations Available [Note 4]	1 mH to 10 mH 10 mH to 10 H	1 kHz 1 kHz	0.024 % + 0.1 µH 0.024 % + 1.4 µH	GenRad 1689-9700
Measuring Equipment Field calibrations Available [Note 4]	100 mH	1 kHz	0.14 %	Standard Inductor
LF POWER/ENERGY (20/E12)				
Power – Measuring Equipment (for current range listed below) DC Power				
0.33 mA to 330 mA	11 µW to 1.1 mW	DC	0.024 %	Fluke 5520A
	1.1 mW to 0.11 W	DC	0.027 %	
	0.11W to 110 W	DC	0.024 %	
	110 W to 330 W	DC	0.018 %	
0.33 A to 3 A	11 W to 110 mW	DC	0.044 %	
	0.11 W to 990 W	DC	0.053 %	
	1 W to 3 kW	DC	0.0096 %	
3 A to 20.5 A	99 mW to 0.99 W	DC	0.088 %	
	0.99 W to 6.8 kW	DC	0.07 %	
	6.8 W to 20.5 kW	DC	0.04 %	
AC Power [Note 8] (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 0.10 W	10 Hz to 65 Hz	0.089 %	

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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
	0.1W to 300 W	10 Hz to 65 Hz	0.078 %	
0.33 A to 0.9 A	11 mW to 0.3 W	10 Hz to 65 Hz	0.071 %	
	0.3 W to 900 W	10 Hz to 65 Hz	0.081 %	
0.9 A to 2.2 A	30 mW to 0.72 W	10 Hz to 65 Hz	0.089 %	
	0.72 W 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 %	
PHASE METERS (20/E15)				
Measuring Equipment Field calibrations Available [Note 4]	0° to 90°	10 Hz to 65 Hz	0.10°	Fluke 5520A
	0° to 90°	65 Hz to 500 Hz	0.20°	
	0° to 90°	500 Hz to 1 kHz	0.37°	
	0° to 90°	1 kHz to 5 kHz	1.8°	
	0° to 90°	5 kHz to 10 kHz	3.6°	
	0° to 90°	10 kHz to 30 kHz	7.3°	

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

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3,5]	Remarks
TIME AND FREQUENCY			
FREQUENCY DISSEMINATION (20/F01)			
Source and Measure	10 MHz	5.8×10^{-10}	Rubidium
PULSE WAVEFORM (20/F04)			
Rise time (Generate) Field calibrations Available [Note 4]	≤ 300 ps	2.6 %	5520A SC1100

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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
MECHANICAL			
FORCE (20/M06)			
Force Measuring Equipment	1 lb to 100 lb	0.016 %	NIST Class F
TORQUE (20/M15)			
Torque Measure	5 lbf-in to 250 lbf-ft	0.85 %	Torque Calibrator
WEIGHING INSTRUMENTS (20/M16)			
Balances & Scales Field calibrations Available Note 4	5 kg	11 mg	ASTM Class 2
	2 kg	11 mg	
	1 kg	0.76 mg	
	500 g	0.78 mg	
	200 g	0.21 mg	ASTM Class 1
	100 g	0.29 mg	
	50 g	0.15 mg	
	20 g	50 µg	
	10 g	62 µg	
	5 g	23 µg	
	2 g	27 µg	
	1 g	23 µg	
	500 mg	20 µg	
	200 mg	20 µg	
	100 mg	20 µg	
	50 mg	20 µg	
	20 mg	20 µg	
	10 mg	20 µg	
	5 mg	20 µg	
	2 mg	20 µg	
	1 mg	20 µg	
Avoirdupois	1 lb to 100 lb	0.016 %	NIST Class F
	100 lb to 200 lb	0.027 %	
	200 lb to 300 lb	0.036 %	

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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
THERMODYNAMIC			
HUMIDITY (20/T02)			
Humidity – Measure Field calibrations Available Note 4	10 % to 90 %	1.3 % RH	Vaisala HMI41
LABORATORY THERMOMETERS (20/T03)			
Temperature – Measure Field calibrations Available Note 4	-195 °C to 0 °C 0 °C to 420 °C 420 °C to 660 °C	0.012 °C + 0.001 % 0.025 °C + 0.001 % 0.037 °C + 0.001 %	Hart 5626 w/Black Stack
Temperature – Measuring Equipment Field calibrations Available Note 4	-20 °C to 150 ºC 150 °C to 400 ºC	0.024 ºC 0.18 ºC	Hart 5626 w/Dry Well
PRESSURE (20/T05)			
Absolute Pressure Source - Pneumatic	0 psia to 30 psia 30 psia to 1000 psia	0.0024 psia 0.0066 % + 0.00048 psia	DHI PPC 4 Controller
Gage Pressure - Pneumatic	-10 inH_2O to 10 inH_2O -15 psig to -3 psig -3 psig to 3 psig 3 psig to 30 psig 30 psig to 1000 psig	0.013 inH_2O 0.0021 psi 0.0016 psi 0.0021 psi 0.0066 % + 0.0001 psi	DPI 620 w/PM620 DHI PPC 4 Controller DPI 620 w/PM620 DHI PPC 4 Controller DHI PPC 4 Controller
Pressure - Hydraulic	50 psig to 15 000 psig	0.03 %	Ametek T150
THERMOCOUPLE & PYROMETER INDICATORS (20/T08)			
Electrical Simulation of Thermocouples Field calibrations Available Note 4			
TYPE E	-250 ºC to -100 ºC -100 ºC to -25 ºC -25 ºC to 350 ºC 350 ºC to 650 ºC 650 ºC to 1000 ºC	0.39 ºC 0.12 ºC 0.11 ºC 0.12 ºC 0.16 ºC	Fluke 5520A

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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
TYPE J	-210 ºC to -100 ºC	0.21 ºC	
	-100 ºC to -30 ºC	0.12 ºC	
	-30 ºC to 150 ºC	0.11 ºC	
	150 ºC to 760 ºC	0.13 ºC	
	760 ºC to 1200 ºC	0.18 ºC	
TYPE K	-200 ºC to -100 ºC	0.26 ºC	
	-100 ºC to -25 ºC	0.14 ºC	
	-25 ºC to 120 ºC	0.12 ºC	
	120 ºC to 1000 ºC	0.20 ºC	
	1000 ºC to 1372 ºC	0.31 ºC	
TYPE T	-250 ºC to -150 ºC	0.49 ºC	
	-150 ºC to 0 ºC	0.19 ºC	
	0 ºC to 120 ºC	0.12 ºC	
	120 ºC to 400 ºC	0.11 ºC	
TYPE R	0 ºC to 250 ºC	0.44 ºC	
	250 ºC to 400 ºC	0.27 ºC	
	400 ºC to 1000 ºC	0.26 ºC	
	1000 ºC to 1767 ºC	0.31 ºC	
TYPE S	0 ºC to 250 ºC	0.44 ºC	
	250 ºC to 1000 ºC	0.28 ºC	
	1000 ºC to 1400 ºC	0.29 ºC	
	1400 ºC to 1767 ºC	0.36 ºC	
TYPE N	-200 ºC to -100 ºC	0.31 ºC	
	-100 ºC to -25 ºC	0.17 ºC	
	-25 ºC to 120 ºC	0.15 ºC	
	120 ºC to 410 ºC	0.14 ºC	
	410 ºC to 1300 ºC	0.21 ºC	
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 using a coverage factor, $k = 2$, with a level of confidence of approximately 95 %. 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. **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:** Where L is the numerical value of the measurand in the same unit given in the range.

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