National Voluntary Laboratory Accreditation Program

CALIBRATION LABORATORIES **NVLAP LAB CODE 200867-0**

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Transcat – Dayton	**Parameter(s) of Accreditation**
2056 South Alex Road West Carrollton, OH 45449 Mr. Derek Atkinson Phone: 937-866-1033 Fax: 937-866-1049 E-mail: datkinson@transcat.com URL: www.transcat.com	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 3,8]	**Remarks**
DIMENSIONAL			
ANGULAR (20/D01)			
Angles	0º to 75º 90º	6.6” 2.7”	Angle Blocks w/Sine Plate Master Square Comparison
GAGE BLOCKS (20/D03)			
Steel Blocks	0.01 in to 1 in 1 in to 4 in 4 in to 20 in	2.6 µin + 0.3*L* µin 1.5 µin + 1.4*L* µin 7.4 µin + 1.1*L* µin	Comparison to Gage Blocks
Chrome Blocks	0.01 in to 0.1 in 0.1 in to 0.2 in 0.2 in to 1.0 in 1.0 in to 4.0 in	2.9 µin 2.7 µin 2.7 µin + 0.6*L* µin 1.7 µin + 1.4*L* µin	
LENGTH and DIAMETER; STEP GAGES (20/D05)			
Micrometers and Calipers Field calibrations available [Note 4]	0.0 in to 0.4 in 0.4 in to 1 in 1 in to 40 in	8 µin + 1*L* µin 7 µin + 2*L* µin 4 µin + 5*L* µin	Comparison to Gage Blocks
Anvil Flatness Field calibrations available [Note 4]	0 in to 1 in	6.6 µin	Optical Flats

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Measured Parameter or Device Calibrated	**Range**	**Uncertainty (*k*=2)** [Note 3,8]	**Remarks**
Length Measurement – Single Axis	0.001 in to 20 in	9 µin + 4.1*L* µin	Helios Supra 500 Comparator
Inner Diameter – Ring Gages	0.125 in to 10 in	12 µin + 3.8*L* µin	
Length Measuring Equipment – Linear Displacement	0 ft to 12 ft	1.0 µin + 2.1*L* µin	Laser Interferometer
Height Measuring Equipment – Height Gages, Dial and Digital Indicators Field calibrations available [Note 4]	0 in to 1 in 1 in to 4 in 4 in to 24 in	31 µin + 1*L* µin 29 µin + 3*L* µin 25 µin + 4*L* µin	Comparison to Gage Blocks
Height Measure – Height Masters 1-2-3 Blocks, Caliper Masters, Parallels	0 in to 4 in 4 in to 24 in	51 µin + 0.4*L* µin 40 µin + 3.6*L* µin	Gage Blocks with Amplifier
Magnification – Optical Comparators Field calibrations available [Note 4]	10x to 50x	240 µin + 21*L* µin	Glass Scale and Magnification
SPHERICAL DIAMETER; PLUG / RING GAGES (20/D11)			
Outer Spherical Diameter	0.1 in to 1 in	46 µin	Helios Supra 500 Comparator
SURFACE TEXTURE (20/D12)			
Surface Plate Flatness Field calibrations available [Note 4]	12 in to 100 in	24 µin + $\sqrt{D}$ µin (D is the diagonal in inches)	Differential Levels
Flatness, Straightness and Parallelism Field calibrations available [Note 4]	0 in to 18 in	36 µin	Gage Amplifier and Surface Plate
THREADED PLUG and RING GAGES (20/D14)			
Threaded Plugs – Major Diameter	0 in to 6 in	9 µin + 4.1*L* µin	Comparator

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Measured Parameter or Device Calibrated	Range	Uncertainty (*k*=2) Note 3,8	Remarks
Outer Pitch Diameter	0 in to 6 in	80 µin	Comparator with Thread Wires
Threaded Rings	0 in to 2 in	160 µin	Comparison to Master Setting Plugs

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	0.030 % + 16 nA	Fluke 5720A
		20 Hz to 40 Hz	0.019 % + 10 nA	
		40 Hz to 1 kHz	0.015 % + 8 nA	
		1 kHz to 5 kHz	0.027 % + 10 nA	
		5 kHz to 10 kHz	0.11 % + 65 nA	
	220 µA 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	0.013 % + 35 nA	
		1 kHz to 5 kHz	0.021 % + 0.11 µA	
		5 kHz to 10 kHz	0.11 % + 0.65 µA	
	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 µA	
	22 mA to 220 mA	10 Hz to 20 Hz	0.033 % + 4 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	
	220 mA to 2.2 A	20 Hz to 1 kHz	0.027 % + 35 µA	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) Note 3,5	Remarks
		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	
		1 kHz to 5 kHz	0.096 % + 0.38 mA	
		5 kHz to 10 kHz	0.36 % + 0.75 mA	
	11 A to 20 A	45 Hz to 100Hz	0.092 % + 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 < 330µA	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 < 33 mA	10 kHz to 30 kHz	0.31 % + 3 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 A to 150 A	45 Hz to 65 Hz	0.34 % + 35 mA	Fluke 5520A with 5500A/Coil
		65 Hz to 440 Hz	0.95 % + 66 mA	
	150 A to 1000 A	45 Hz to 65 Hz	0.38 % + 0.17 A	
		65 Hz to 440 Hz	1.2 % + 0.29 A	
Clamp-on Ammeter Non-Toroidal Type Field calibrations available Note 4	20 A to 150 A	45 Hz to 65 Hz	0.66 % + 0.26 A	Fluke 5520A with 5500A/Coil
		65 Hz to 440 Hz	1.2 % + 0.29 A	
	150 A to 1000 A	45 Hz to 65 Hz	0.68 % + 1.0 A	
		65 Hz to 440 Hz	1.4 % + 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	HP 3458A
		20 Hz to 45 Hz	0.17 % + 35 nA	
		45 Hz to 100 Hz	0.072 % + 35 nA	
		100 Hz to 1 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	0.17 % + 0.23 µA	
		45 Hz to 100 Hz	0.071 % + 0.23 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
		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	0.17 % + 2.3 µA	
		45 Hz to 100 Hz	0.071 % + 2.3 µA	
		100 Hz to 5 kHz	0.038 % + 2.3 µA	
	10 mA to 100 mA	10 Hz to 20 Hz	0.46 % + 23 µA	
		20 Hz to 45 Hz	0.17 % + 23 µA	
		45 Hz to 100 Hz	0.071 % + 23 µA	
		100 Hz to 5 kHz	0.038 % + 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 Current – Measuring Equipment Field calibrations available Note 4	0 µA to 220 µA	41 µA/A + 6.9 nA	Fluke 5720A
	220 µA to 2.2 mA	36 µA/A + 8.1 nA	
	2.2 mA to 22 mA	36 µA/A + 46 nA	
	22 mA to 220 mA	57 µA/A + 0.7 nA	
	220 mA to 2.2 A	0.2 mA/A + 12 nA	
	2.2 A to 11 A	0.4 mA/A + 0.48 mA	Fluke 5720A with 5725A Amplifier
	11 A to 20 A	0.078 % + 0.58 mA	Fluke 5520A
Clamp-on Ammeter Non-Toroidal Type Field calibrations available Note 4	20 A to 150 A	0.58 % + 0.14 A	Fluke 5520A with 5500A/Coil
	150 A to 1000 A	0.59 % + 0.52 A	

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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 Current – Measure	0 µA to 100 µA	26 µA/A + 0.9 nA	HP 3458A opt. 2
	100 µA to 1 mA	26 µA/A + 6 nA	
	1 mA to 10 mA	26 µA/A + 58 nA	
	10 mA to 100 mA	43 µA/A + 0.58 µA	
	100 mA to 1 A	0.13 mA/A + 12 µA	
	1 A to 3 A	0.14 % + 0.7 mA	HP 34401A
DC Resistance – Measuring Equipment Field calibrations available Note 4	1 mΩ	0.16 mΩ/Ω	Standard Resistor
	10 mΩ	0.16 mΩ/Ω	
	100 mΩ	0.16 mΩ/Ω	
		(where V is DUT voltage)	
	1 GΩ	0.61 % + 1.4 kΩ/V	IET VRS-100
	10 GΩ	0.63 % + 20 kΩ/V	
	100 GΩ	1.2 % + 0.6 MΩ/V	
DC Resistance – Measure Field calibrations available Note 4	0 Ω to 25 Ω	0.036 mΩ	Hart 1590 with Reference Resistor
	25 Ω to 400 Ω	2.3 µΩ/Ω	
	400 Ω to 1 kΩ	4.6 µΩ/Ω	
	1 kΩ to 40 kΩ	10 µΩ/Ω	
	40 kΩ to 100 kΩ	12 µΩ/Ω + 58 mΩ	HP 3458A opt. 2
	100 kΩ to 1 MΩ	19 µΩ/Ω + 2 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 VOLTAGE (20/E06)			
DC Voltage – Measure Field calibrations available Note 4	0 mV to 100 mV	7.1 µV/V + 0.5 µV	Agilent 3458A opt. 2
	100 mV to 1 V	5 µV/V + 0.5 µV	
	1 V to 10 V	5.1 µV/V + 0.5 µV	
	10 V to 100 V	7.6 µV/V + 35 µV	
	100 V to 500 V	11 µV/V + 0.12 mV	
	500 V to 800 V	16 µV/V + 0.12 mV	
	800 V to 1 kV	21 µV/V + 0.12 mV	
	1 kV to 2 kV	0.047 % + 0.5 V	Vitrek 4600A

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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 Voltage – Measuring Equipment Field calibrations available [Note 4]	2 kV to 20 kV	0.049 % + 5 V	
	0 mV to 220 mV	8 µV/V + 0.4 µV	Fluke 5720A
	220 mV to 2.2 V	5.4 µV/V + 0.7 µV	
	2.2 V to 11 V	4.0 µV/V + 2.5 µV	
	11 V to 22 V	4.0 µV/V + 4.0 µV	
	22 V to 220 V	6.2 µV/V + 40 µV	Fluke 5720A with 5725A
	220 V to 1.1 kV	7.6 µV/V + 0.4 mV	

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 Voltage – Measuring Equipment Field calibrations available [Note 4]	0 mV to 2.2 mV	10 Hz to 20 Hz	0.16 % + 4 µV	Fluke 5720A
		20 Hz to 40 Hz	0.16 % + 4 µV	
		40 Hz to 20 kHz	0.10 % + 4 µV	
		20 kHz to 50 kHz	0.21 % + 4 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	0.044 % + 4 µV	
		20 Hz to 40 Hz	0.035 % + 4 µV	
		40 Hz to 20 kHz	0.015 % + 4 µV	
		20 kHz to 50 kHz	0.031 % + 4 µV	
		50 kHz to 100 kHz	0.059 % + 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	0.30 % + 20 µV	
	22 mV to 220 mV	10 Hz to 20 Hz	0.028 % + 12 µV	
		20 Hz to 40 Hz	0.017 % + 7 µV	
		40 Hz to 20 kHz	0.010 % + 7 µV	
		20 kHz to 50 kHz	0.021 % + 7 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
		50 kHz to 100 kHz	0.047 % + 17 µV	
		100 kHz to 300 kHz	0.092 % + 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	0.028 % + 40 µV	
		20 Hz to 40 Hz	0.016 % + 15 µV	
		40 Hz to 20 kHz	0.006 % + 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	0.10 % + 0.20 mV	
		500 kHz to 1 MHz	0.18 % + 0.30 mV	
	2.2 V to 22 V	10 Hz to 20 Hz	0.028 % + 0.4 mV	
		20 Hz to 40 Hz	0.016 % + 0.15 mV	
		40 Hz to 20 kHz	0.005 % + 0.05 mV	
		20 kHz to 50 kHz	0.008 % + 0.1 mV	
		50 kHz to 100 kHz	0.011 % + 0.2 mV	
		100 kHz to 300 kHz	0.030 % + 0.6 mV	
		300 kHz to 500 kHz	0.10 % + 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	Fluke 5720A with 5725A
		20 Hz to 40 Hz	0.010 % + 1.5 mV	
		40 Hz to 20 kHz	0.006 % + 0.6 mV	
		20 kHz to 50 kHz	0.009 % + 1 mV	
		50 kHz to 100 kHz	0.016 % + 2.5 mV	
		100 kHz to 300 kHz	0.09 % + 16 mV	
		300 kHz to 500 kHz	0.44 % + 40 mV	
		500 kHz to 1 MHz	0.80 % + 80 mV	
	220 V to 750 V	30 kHz to 50 kHz	0.061 % + 11 mV	
		50 kHz to 100 kHz	0.23 % + 45 mV	
	220 V to 1100 V	40 Hz to 1 kHz	0.011 % + 4 mV	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) [Note 3,5]	Remarks
		1 kHz to 20 kHz	0.017 % + 6 mV	
		20 kHz to 30 kHz	0.061 % + 11 mV	
AC Voltage – Measure Field calibrations available [Note 4]	0 mV to 10 mV	1 Hz to 40 Hz	0.039 % + 3.5 µV	HP 3458A opt. 2
		40 Hz to 1 kHz	0.028 % + 1.3 µV	
		1 kHz to 20 kHz	0.038 % + 1.3 µV	
		20 kHz to 50 kHz	0.15 % + 1.3 µV	
		50 kHz to 100 kHz	0.59 % + 1.3 µV	
		100 kHz to 300 kHz	4.6 % + 2.3 µV	
	10 mV to 100 mV	1 Hz to 40 Hz	0.013 % + 5 µV	
		40 Hz to 1 kHz	0.0094 % + 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	0.0094 % + 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	
		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	0.0094 % + 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	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) [Note 3,5]	Remarks
		1 kHz to 20 kHz	0.024 % + 2.3 mV	
		20 kHz to 50 kHz	0.041 % + 2.3 mV	
		50 kHz to 100 kHz	0.14 % + 2.3 mV	
		100 kHz to 300 kHz	0.46 % + 12 mV	
		300 kHz to 1 MHz	1.7 % + 12 mV	
	100 V to 700 V	1 Hz to 40 Hz	0.047 % + 46 mV	
		40 Hz to 1 kHz	0.047 % + 23 mV	
		1 kHz to 20 kHz	0.071 % + 23 mV	
		20 kHz to 50 kHz	0.14 % + 23 mV	
		50 kHz to 100 kHz	0.35 % + 23 mV	
	700 V to 2 kV	20 Hz to 100 Hz	0.083 % + 2.3 V	Vitrek 4600A
		100 Hz to 400 Hz	0.46 % + 4.6 V	
	2 kV to 15 kV	20 Hz to 100 Hz	0.38 % + 23 V	
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	
	11 mF to 33 mF	DC to 0.6 Hz	0.59 % + 23 µF	
	33 mF to 110 mF	DC to 0.2 Hz	0.86 % + 78 µF	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) [Note 3,5]	Remarks
LF POWER/ENERGY (20/E12)				
Power – Measuring Equipment				
DC Power				
0.33 mA to 330 mA	11 µW to 1.1 mW	DC	0.024 %	Fluke 5520A
	1.1 mW to 110 mW	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	0.099 W 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 9] (PF = 1)				
3.3 mA to 9 mA	0.11 mW to 3 mW	10 Hz to 65 Hz	0.13 %	
	3 mW to 9 W	10 Hz to 65 Hz	0.077%	
9 mA to 33 mA	0.3 mW to 10 mW	10 Hz to 65 Hz	0.089 %	
	10 mW to 33 W	10 Hz to 65 Hz	0.077 %	
33 mA to 90 mA	1 mW to 30 mW	10 Hz to 65 Hz	0.071 %	
	30 mW to 90 W	10 Hz to 65 Hz	0.057 %	
90 mA to 330 mA	3.0 mW to 100 mW	10 Hz to 65 Hz	0.089 %	
	100 mW to 300 W	10 Hz to 65 Hz	0.078 %	
0.33 A to 0.9 A	11 mW to 300 mW	10 Hz to 65 Hz	0.071 %	
	300 mW to 900 W	10 Hz to 65 Hz	0.081 %	
0.9 A to 2.2 A	30 mW to 720 mW	10 Hz to 65 Hz	0.089 %	
	720 mW to 2 kW	10 Hz to 65 Hz	0.079 %	
2.2 A to 4.5 A	80 mW to 1.4 W	10 Hz to 65 Hz	0.088 %	
	1.4 W to 4.5 kW	10 Hz to 65 Hz	0.18 %	

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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
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)				
Measuring 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	0.09° 0.20° 0.39° 1.9° 3.9° 7.8°	Fluke 5520A

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

Measured Parameter or Device Calibrated	Range	Uncertainty (k=2) [Note 3,5]	Remarks
OSCILLOSCOPES (20/E20)			
Sine Wave Flatness Field calibrations available [Note 4]	50 kHz to 100 MHz 100 MHz to 300 MHz 300 MHz to 600 MHz	1.9 % + 0.1 mV 2.3 % + 0.1 mV 4.2 % + 0.1 mV	Fluke 5522A/SC600
Rise Time – Measuring Equipment Field calibrations available [Note 4]	≥ 300 ps	240 ps	Fluke 5522A/SC600
Rise Time - Measure Field calibrations available [Note 4]	≥ 5 ns	4.0 ns	Agilent DSO5012
TIME and FREQUENCY			
FREQUENCY DISSEMINATION (20/F01)			
Frequency Measuring Equipment	10 MHz	5.8×10^{-10}	Rubidium Frequency Standard
MECHANICAL			
MASS DETERMINATION (20/M08)			
Mass - Metric	30 kg 20 kg 10 kg	0.3 g 0.2 g 0.1 g	Echelon III

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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
Mass - Avoirdupois	5 kg 2 kg 1 kg 0.5 kg 65 lb 50 lb 30 lb 20 lb 10 lb 5 lb 3 lb 2 lb 1 lb	50 mg 20 mg 10 mg 5 mg 0.3 g 0.23 g 0.14 g 91 mg 46 mg 23 mg 14 mg 9.1 mg 4.6 mg	Echelon III
HARDNESS (20/M13)			
Rockwell Hardness – Measuring Equipment Field calibrations available Note 4	20 HRC to 40 HRC 40 HRC to 60 HRC 60 HRC to 70 HRC	0.42 HRC 0.45 HRC 0.36 HRC	Hardness Blocks
Tungsten Carbide Balls Field calibrations available Note 4	20 HRBW to 50 HRBW 50 HRBW to 75 HRBW 75 HRBW to 105 HRBW	1.1 HRBW 0.71 HRBW 0.49 HRBW	Hardness Blocks
TORQUE (20/M15)			
Torque – Measuring Equipment Field calibrations available Note 4	2.5 lbf-in to 50 lbf-in 50 lbf-in to 250 lbf-ft 250 lbf-in to 800 lbf-ft	0.2 % 0.2 % 0.2 %	5 inch Torque Wheel with F Class Weights 10 inch Torque Butterfly with F Class Weights 40 inch Torque Arm with F Class Weights
Torque – Measure Field calibrations available Note 4	5 lbf-in to 300 lbf-ft	1.3 %	Stahlwille Torque Cells with Loader

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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
WEIGHING INSTRUMENTS (20/M16)			
Scales and Balances Field calibrations available [Note 4]	20 kg 5 kg 3 kg 2 kg 1 kg 500 g 300 g 200 g 100 g 50 g 30 g 20 g 10 g 5 g 2 g 1 g 500 mg 200 mg 100 mg 50 mg 20 mg 10 mg 5 mg 2 mg 1 mg	61 mg 10 mg 2.2 mg 1.5 mg 3 mg 0.71 mg 0.71 mg 0.25 mg 0.25 mg 0.11 mg 0.033 mg 0.033 mg 0.011 mg 0.011 mg 0.011 mg 0.011 mg 0.0034 mg 0.0034 mg 0.0034 mg 0.0034 mg 0.0034 mg 0.0034 mg 0.0034 mg 0.0034 mg 0.0034 mg	Characterized ASTM Class 1 and 2 Mass Standards
THERMODYNAMIC			
HUMIDITY (20/T02)			
Relative Humidity – Measuring Equipment Field calibrations available [Note 4]	10 % RH to 90 % RH	1.3 % RH	Vaisala HMI41/HMP46 with Salt Solutions

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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
LABORATORY THERMOMETERS, DIGITAL and ANALOG (20/T03)			
Temperature – Measuring Equipment Field calibrations available [Note 4]	-100 ºC to -40 ºC -40 ºC to 100 ºC 100 ºC to 270 ºC 270 ºC to 400 ºC	1.8 mK 1.2 mK 2.4 mK 4.8 mK	Hart 5699 SPRT with Precision Bath
	400 ºC to 600 ºC	21 mK	Hart 5699 SPRT with Furnace
Temperature – Measure Field calibrations available [Note 4]	-40 °C to 600 °C	26 mK	Hart Black Stack with SPRT
PRESSURE (20/T05)			
Pressure – Pneumatic Field calibrations available [Note 4]	-15 psi to 30 psi 30 psi to 300 psi 300 psi to 1000 psi	0.0022 psi 0.0075 % 0.01 %	DHI RPM4 with Pressure Controller
	-2 inH_2O to 2 inH_2O	0.0011 inH_2O	Dwyer 1430 Microtector
	-36 inH_2O to -22 inH_2O -22 inH_2O to 22 inH_2O 22 inH_2O to 60 inH_2O 60 inH_2O to 72 inH_2O 72 inH_2O to 804 inH_2O	0.009 % + 150 µinH_2O 0.0022 inH_2O 0.009 % + 150 µinH_2O 0.0067 inH_2O 0.009 % + 150 µinH_2O	DHI PPC4 Controller
Pressure – Hydraulic Field calibrations available [Note 4]	100 psi to 15 000 psi	0.013 %	Ametek T-150 Deadweight Tester
Pressure – Absolute Field calibrations available [Note 4]	0 psia to 30 psia 30 psia to 300 psia 300 psia to 1000 psia	0.0026 psia 0.0088 % 0.01 %	DHI RPM4 with Pressure Controller

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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
RESISTANCE THERMOMETRY (20/T07)			
Calibration of PRTs	0.010 ºC	0.6 mK	Comparison to TPW Cell
	156.598 ºC	1.9 mK	Comparison to In Cell
	231.928 ºC	2.1 mK	Comparison to Sn Cell
	419.527 ºC	3.5 mK	Comparison to Zn Cell
	660.323 ºC	8.6 mK	Comparison to Al Cell
SPRT Comparison	-195 ºC	2.4 mK	Hart 5699 SPRT with NBPLN2
	-80 ºC	1.8 mK	Hart 5699 SPRT with Precision Bath
	-38.8 ºC	1.1 mK	
TEMPERATURE INDICATORS (20/T08)			
Electrical Simulation of Thermocouples			Thermocouple Half-Junction with HP 3458A
Type R	-50 ºC to 1768 ºC	0.24 ºC	
Type S	-50 ºC to 1768 ºC	0.22 ºC	
Type E	-270 ºC to 1000 ºC	0.081 ºC	
Type T	-270 ºC to 400 ºC	0.10 ºC	
Type K	-270 ºC to 1372 ºC	0.085 ºC	
Type J	-210 ºC to 1200 ºC	0.084 ºC	
Type N	-200 °C to -100 °C	0.31 °C	Fluke 5520A
	-100 °C to -25 °C	0.18 °C	
	-25 °C to 120 °C	0.15 °C	
	120 °C to 410 °C	0.15 °C	
	410 °C to 1300 °C	0.21 °C	
Type B	600 °C to 800 °C	0.34 °C	
	800 °C to 1000 °C	0.27 °C	
	1000 °C to 1550 °C	0.24 °C	
	1550 °C to 1820 °C	0.26 °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 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: Where L is used, it is the numerical value of the measurand in the units shown in the range.
Note 9: 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.

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