



National Voluntary Laboratory Accreditation Program



CALIBRATION LABORATORIES

NVLAP LAB CODE 200905-0

Scope Revised: 2013-02-06

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	Parameter(s) of Accreditation Dimensional Electromagnetics – DC/Low Frequency Time and Frequency Mechanical Electromagnetics – RF/Microwave Thermodynamic This laboratory is compliant to ANSI/NCSL Z540-1-1994; Part 1. (NVLAP Code: 20/A01)
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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
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	8 μ in 8L μ in + 6 μ in 12L μ in + 5 μ in 15L μ in + 2 μ in 16L μ in + 9 μ in	Comparison to Gage Blocks
Anvil Flatness Field calibrations available ^{Note 4}	0 in to 1 in	6.3 μ in	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	3L μ in + 18 μ in 8L μ in + 15 μ in 14L μ in + 9 μ in 16L μ in + 9 μ in	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	1L μ in + 48 μ in 4L μ in + 46 μ in 10L μ in + 40 μ in 15L μ in + 19 μ in	Gage Blocks with Surface Plate

2012-07-01 through 2013-06-30

Effective dates

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
ELECTROMAGNETICS – DC/LOW FREQUENCY				
AC RESISTORS and CURRENT (20/E02)				
AC Current – Measuring Equipment Field calibrations available <small>Note 4</small>	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 ($k=2$) <small>Note 3,5</small>	Remarks
Extended Frequency Ranges Field calibrations available <small>Note 4</small>	11 A to 20.5 A	45 Hz to 100 Hz 100 Hz to 5 kHz 1 kHz to 5 kHz	2.3 % + 3.9 mA 0.12 % + 3.9 mA 0.095 % + 3.9 mA	Fluke 5520A
Clamp-on Ammeter Toroidal Type Field calibrations available <small>Note 4</small>	29 μ A to 330 μ A 330 μ A to 3.3 mA 3.3 mA to 29 mA 29 mA to 330 mA	10 kHz to 30 kHz 10 kHz to 30 kHz 10 kHz to 30 kHz 10 kHz to 30 kHz	1.2 % + 0.31 μ A 0.78 % + 0.47 μ A 0.31 % + 3.1 μ A 0.31 % + 0.16 mA	Fluke 5520A
Clamp-on Ammeter Non-Toroidal Type Field calibrations available <small>Note 4</small>	20.5 A to 150 A 150 A to 500 A 500 A to 1025 A	45 Hz to 65 Hz 65 Hz to 440 Hz 45 Hz to 65 Hz 65 Hz to 440 Hz 45 Hz to 65 Hz 65 Hz to 440 Hz	0.42 % + 29 mA 1.0 % + 31 mA 0.42 % + 130 mA 1.0 % + 140 mA 0.43 % + 220 mA 1.0 % + 230 mA	Fluke 5520A with 5500A/Coil
AC Current – Measure Field calibrations available <small>Note 4</small>	0 μ A to 100 μ A 100 μ A to 1 mA 1 mA to 10 mA	10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz 10 Hz to 20 Hz 20 Hz to 45 Hz	0.47 % + 35 nA 0.18 % + 35 nA 0.072 % + 35 nA 0.072 % + 35 nA 0.46 % + 0.23 μ A 0.18 % + 0.23 μ A 0.071 % + 0.23 μ A 0.038 % + 0.23 μ A 0.46 % + 2.3 μ A 0.18 % + 2.3 μ A	Agilent 3458A opt 2

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
		45 Hz to 100 Hz 100 Hz to 5 kHz	0.071 % + 2.3 μ A 0.038 % + 2.3 μ A	
	10 mA to 100 mA	10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz	0.46 % + 23 μ A 0.18 % + 23 μ A 0.071 % + 23 μ A 0.037 % + 23 μ A	
	100 mA to 1 A	10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz	0.46 % + 0.23 mA 0.19 % + 0.23 mA 0.097 % + 0.23 mA 0.12 % + 0.23 mA	

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
DC RESISTANCE and CURRENT (20/E05)			
DC Resistance – Measuring Equipment and Measure Field calibrations available <small>Note 4</small>	0 Ω to 10 Ω 10 Ω to 100 Ω 100 Ω to 1 k Ω 1 k Ω to 10 k Ω 10 k Ω to 100 k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω	18 μ Ω / Ω + 58 μ Ω 15 μ Ω / Ω + 0.58 m Ω 12 μ Ω / Ω + 0.58 m Ω 12 μ Ω / Ω + 5.8 m Ω 12 μ Ω / Ω + 58 m Ω 19 μ Ω / Ω + 2.3 Ω 62 μ Ω / Ω + 0.12 k Ω 0.59 % + 1.2 k Ω 0.58 % + 12 k Ω	Agilent 3458A with Decade Resistor
DC Resistance – Measuring Equipment Field calibrations available <small>Note 4</small>	1 m Ω 10 m Ω 100 m Ω 10 M Ω to 100 M Ω 100 M Ω to 1 G Ω 1 G Ω to 10 G Ω 10 G Ω to 100 G Ω 100G Ω to 1 T Ω	2.3 n Ω 12 n Ω 0.48 μ Ω 0.08 % 0.24 % 0.41 % 0.84 % 2.50 %	Fixed Resistor IET HRRS-B-7-100k-5kV

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
DC Current – Measuring Equipment and Measure Field calibrations available <small>Note 4</small>	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 <small>Note 4</small>	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 <small>Note 4</small>	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 <small>Note 4</small>	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 <small>Note 4</small>	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 <small>Note 4</small>	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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DC High Voltage – Measure and Measuring Equipment	2 kV to 20 kV 20 kV to 40 kV	0.24 % + 4.6 V 0.47 % + 9.2 V	Vitrek 4600A w/HV Source Vitrek 4640A w/HV Source

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
LF AC VOLTAGE (20/E09)				
AC High Voltage – Measure Field calibrations available <small>Note 4</small>	1 kV to 2 kV 2 kV to 20 kV 20 kV to 40 kV	20 Hz to 100 Hz 100 Hz to 400 Hz 20 Hz to 100 Hz 50 Hz to 60 Hz	0.11 % + 2.3 V 0.47 % + 4.6 V 0.52 % + 23 V 0.84 % + 69 V	Vitrek 4600 Vitrek 4640
AC Voltage – Measure Field calibrations available <small>Note 4</small>	0 mV to 10 mV 10 mV to 100 mV 100 mV to 1 V	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 300 kHz to 1 MHz 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 300 kHz to 1 MHz 1 MHz to 2 MHz 2 MHz to 4 MHz 4 MHz to 8 MHz 1 Hz to 40 Hz 40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 50 kHz	0.039 % + 3.5 μ V 0.029 % + 1.2 μ V 0.039 % + 1.2 μ V 0.15 % + 1.2 μ V 0.59 % + 1.2 μ V 4.7 % + 2.3 μ V 1.5 % + 5.8 μ V 0.013 % + 4.6 μ V 0.0095 % + 2.3 μ V 0.017 % + 2.3 μ V 0.037 % + 2.3 μ V 0.093 % + 2.3 μ V 0.36 % + 12 μ V 1.2 % + 12 μ V 1.9 % + 12 μ V 4.7 % + 81 μ V 4.7 % + 92 μ V 0.0098 % + 46 μ V 0.0094 % + 23 μ V 0.017 % + 23 μ V 0.036 % + 23 μ V	Agilent 3458A opt 2

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) <small>Note 3,5</small>	Remarks
AC Voltage – Measuring Equipment Field calibrations available <small>Note 4</small>	1 V to 10 V	50 kHz to 100 kHz	0.093 % + 23 μ V	
		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	
	10 V to 100 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	
AC Voltage – Measuring Equipment Field calibrations available <small>Note 4</small>	100 V to 700 V	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	
		1 Hz to 40 Hz	0.024 % + 4.6 mV	
		40 Hz to 1 kHz	0.024 % + 2.3 mV	
	0 mV to 2.2 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	
	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz	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	
		10 Hz to 20 Hz	0.16 % + 4 μ V	Fluke 5700A-EP
		20 Hz to 40 Hz	0.1 % + 4 μ V	
		40 Hz to 20 kHz	0.078 % + 4 μ V	
		20 kHz to 50 kHz	0.13 % + 4 μ V	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty (k=2) <small>Note 3,5</small>	Remarks
		50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.17 % + 5 µV 0.33 % + 10 µV 0.47 % + 20 µV 0.58 % + 20 µV	
	2.2 mV to 22 mV	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.042 % + 4 µV 0.03 % + 4 µV 0.014 % + 4 µV 0.03 % + 4 µV 0.058 % + 5 µV 0.12 % + 10 µV 0.16 % + 20 µV 0.27 % + 20 µV	
	22 mV to 220 mV	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.028 % + 12 µV 0.011 % + 7 µV 0.0085 % + 7 µV 0.021 % + 7 µV 0.047 % + 17 µV 0.091 % + 20 µV 0.14 % + 25 µV 0.28 % + 45 µV	
	220 mV to 2.2 V	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.027 % + 40 µV 0.010 % + 15 µV 0.0048 % + 8 µV 0.008 % + 10 µV 0.012 % + 30 µV 0.043 % + 80 µV 0.01 % + 200 µV 0.18 % + 300 µV	
	2.2 V to 22 V	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz	0.028 % + 0.4 mV 0.010 % + 0.15 mV 0.005 % + 50 µV 0.0083 % + 0.1 mV	

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Measured Parameter or Device Calibrated	Range	Frequency Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
		50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.012 % + 0.2 mV 0.030 % + 0.6 mV 0.11 % + 2 mV 0.17 % + 3.2 mV	
	22 V to 220 V	10 Hz to 20 Hz 20 Hz to 40 Hz 40 Hz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 300 kHz 300 kHz to 500 kHz 500 kHz to 1 MHz	0.028 % + 4 mV 0.01 % + 1.5 mV 0.0057 % + 0.6 mV 0.0093 % + 1 mV 0.017 % + 2.5 mV 0.091 % + 16 mV 0.44 % + 40 mV 0.8 % + 80 mV	
	220 V to 1100 V	40 Hz to 1 kHz 1 kHz to 20 kHz 20 kHz to 30 kHz	0.011 % + 4 mV 0.017 % + 6 mV 0.061 % + 11 mV	Fluke 5700A-EP/5725A
	220 V to 750 V	30 kHz to 50 kHz 50 kHz to 100 kHz	0.061 % + 11 mV 0.23 % + 45 mV	
LF CAPACITANCE (20/E10)				
Capacitance – Measuring Equipment Field calibrations available <small>Note 4</small>	0.19 nF to < 1.1 nF 1.1 nF to < 3.3 nF 3.3 nF to < 11 nF 11 nF to < 33 nF 33 nF to < 110 nF 110 nF to < 330 nF 0.33 µF to < 1.1 µF 1.1 µF to < 3.3 µF 3.3 µF to < 11 µF 11 µF to < 33 µF 33 µF to < 110 µF 110 µF to < 330 µF 0.33 mF to < 1.1 mF	10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 600 Hz 10 Hz to 300 Hz 10 Hz to 150 Hz 10 Hz to 120 Hz 10 Hz to 80 Hz DC to 50 Hz DC to 20 Hz	0.39 % + 7.8 pF 0.39 % + 7.8 pF 0.21 % + 7.8 pF 0.21 % + 78 pF 0.21 % + 78 pF 0.21 % + 0.23 nF 0.20 % + 0.78 nF 0.20 % + 2.3 nF 0.20 % + 7.8 nF 0.32 % + 23 nF 0.35 % + 78 nF 0.35 % + 0.23 µF 0.35 % + 0.78 µF	Fluke 5520A

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	1.1 mF to < 3.3 mF	DC to 6 Hz	0.35 % + 2.3 μ F	
	3.3 mF to < 11 mF	DC to 2 Hz	0.35 % + 7.8 μ F	
	11 mF to < 33 mF	DC to 0.6 Hz	0.58 % + 23 μ F	
	33 mF to < 110 mF	DC to 0.2 Hz	0.86 % + 78 μ F	
LF POWER/ENERGY (20/E12)				
Power – Measuring Equipment				
DC Power				
0.33 mA to 330 mA	11 μ W to 1.1 mW	DC	0.024 %	
	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 <small>Note 8</small> (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 %	

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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 %	
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)				
Phase Meters – Measure Equipment Field calibrations available <small>Note 4</small>	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 In-Lab	10 MHz	Uncertainty values of derivatives of 10 MHz will differ due to resolution, noise, and gating errors	5.2 x 10 ⁻¹⁰	Rubidium Oscillator
Field <small>Note 4</small>	10 MHz		2.2 x 10 ⁻⁹	Agilent 53132A opt 10
OSCILLATOR CHARACTERIZATION (20/F03)				
Harmonic Distortion Field calibrations available <small>Note 4</small>	0 dBc to -80 dBc	30 Hz to 6.5 GHz	1.7 dB	Agilent 8563E
Total Harmonic Distortion	0 dB to -80 dB	20 Hz to 20 kHz 20 kHz to 100 kHz	0.53 dB 1.0 dB	Agilent 8903B

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PULSE WAVEFORM (20/F04)			
Rise Time – Generate Field calibrations available <small>Note 4</small>	≥ 13 ps	1.5 ps	Tektronix 067-1338-00
Rise Time – Measure	≥ 16 ps	2.7 ps	Tektronix 11801C w/SD-24
MECHANICAL			
FORCE (20/M06) Force Measuring Equipment – Tension and Compression	1 lbf to 400 lbf	0.01 %	Dead Weight
MASS (20/M08)			
Balances - Metric Field calibrations available <small>Note 4</small>	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 μ g 65 μ g 59 μ g 45 μ g 44 μ g 44 μ g 44 μ g 43 μ g	ASTM Class 1 Weights

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NVLAP LAB CODE 200905-0

Scope Revised: 2013-02-06

CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
Balances - Avoirdupois	1 lb to 400 lb	0.012 %	NIST Class F Weights
TORQUE (20/M15)			
Torque – Measure Field calibrations available <small>Note 4</small>	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
ELECTROMAGNETICS – RF/MICROWAVE			
RF-DC VOLTAGE/ CURRENT CONVERTER (20/R11)			
Sine Wave Flatness Field calibrations available <small>Note 4</small> (1 V to 3 V, 50 Ω)	10 Hz to 1 MHz 1 MHz to 10 MHz 10 MHz to 30 MHz 30 MHz to 50 MHz 50 MHz to 80 MHz 80 MHz to 100 MHz	0.059 % 0.099 % 0.18 % 0.41 % 0.71 % 0.84 %	Ballantine 1395B-3
RF/MICROWAVE POWER METERS (20/R17)			
Absolute RF Power Field calibrations available <small>Note 4</small> 250 kHz to 2.6 GHz	+30 dBm to -20 dBm	2.3 %	Agilent 8902A with 11722A
THERMODYNAMIC			
HUMIDITY (20/T02)			
Relative Humidity – Measure Equipment 10 °C to 70 °C	10 % RH to 95 % RH	0.60 % RH	Thunder Scientific 2500STLT
Relative Humidity – Measure Field calibrations available <small>Note 4</small> -40 °C to 10 °C 10 °C to 60 °C 60 °C to 100 °C 20 °C to 100 °C	0 %RH to 90 % RH 0 %RH to 90 % RH 0 %RH to 90 % RH 90 %RH to 100 % RH	2.4 % RH 1.3 % RH 2.4 % RH 2.4 % RH	Vaisala HMI41/HMP46

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Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
LABORATORY THERMOMETERS (20/T03)			
Temperature – Measuring Equipment	-78.4 °C	0.026 °C	Dry Ice & Hart 5628
Field calibrations available <small>Note 4</small>	-30 °C to 0 °C	0.026 °C	Liquid Bath & Hart 5628
	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	-195°C to 0 °C	0.012 °C	Hart 5628, Black Stack
Field calibrations available <small>Note 4</small>	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)	0 inH ₂ O to 2 inH ₂ O	0.0015 inH ₂ O	Dwyer Hook Gauge
Field calibrations available <small>Note 4</small>	4 inH ₂ O to 14 inH ₂ O	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
	25 psig to 500 psig	0.0065 %	Ruska 7250xi
Gage Pressure – Source (Hydraulic)	500 psig to 10 000 psig	0.0080 %	Cosa W2200-P
Field calibrations available <small>Note 4</small>			
THERMOCOUPLES (20/T08)			
Electrical Calibration of Thermocouple Devices			
Field calibrations available <small>Note 4</small>			
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	

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CALIBRATION AND MEASUREMENT CAPABILITIES (CMC) Notes 1,2

Measured Parameter or Device Calibrated	Range	Uncertainty ($k=2$) <small>Note 3,5</small>	Remarks
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 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 used, it is the numeric value of the length of the device under tested in the same unit shown in the range.

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