Certificate of Accreditation: Supplement

Industrial Calibration Service (In-Cal)
71 Pine Road, Hudson, NH 03051
Contact Name: Irfan Saherwardi Phone: 603-883-5558

Accreditation is granted to the facility to perform the following calibrations:

Chemical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
pH Meters [FO]	4 pH to 10 pH	0.03 pH	Standard pH Solutions
Conductivity [FO]	10 µS to 1 413 µS	1 % of solution	Standard Conductivity Solution
Meters [FO]	3.9 mS to 50 mS	1 % of solution	

Dimensional

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Calipers [FO]	0.01 in to 80 in	$(681.75 + 2.25 \times 10^{-3}L)$ µin	Gage Blocks
Micrometers [FO]	0.05 in to 80 in	$(57.79 + 3.45 \times 10^{-1}L)$ µin	
Rulers [FO]	0.05 in to 80 in	$(67.33 + 13.58L)$ µin	
Tape Measure [FO]	0.05 in to 80 in	$(67.33 + 13.58L)$ µin	
Indicators [FO]	0.01 in to 6 in	$(68.16 + 1.51 \times 10^{-2}L)$ µin	
Height Gages [FO]	Up to 48 in	$(68 + 1.51 \times 10^{-1}L)$ µin	
Depth Gauges [FO]	Up to 12 in	$(68 + 4.77 \times 10^{-2}L)$ µin	
Gage Blocks [F]	0.02 in to 13 in	$(150 + 3.08 \times 10^{-1}L)$ µin	Universal Lab Master
Plain Ring Gages [F]	Up to 14 in	$(149 + 3.1 \times 10^{-1}L)$ µin	Universal Lab Master Thread View

Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure DC Voltage [FO]	0.01 mV to 330 mV	20 µV/V + 1 µV	Fluke 5520A
	330 mV to 3.3 V	11 µV/V + 2 µV	
	3.3 V to 33 V	11 µV/V + 2 µV	
	33 V to 330 V	18 µV/V + 150 µV	
	330 V to 1 000 V	18 µV/V + 1.5 mV	
Equipment to Output DC Voltage [FO]	0.01 mV to 100 mV	11 µV/V + 3 µV/V	Agilent 3458A/001
	100 mV to 1 V	10 µV/V + 0.3 µV/V	
	1 V to 10 V	10 µV/V + 0.1 µV/V	
	10 V to 100 V	12 µV/V + 2.3 µV/V	
	100 V to 1 000 V	24 µV/V + 0.1 µV/V	
Equipment to Measure DC Current Source [FO]	0.01 µA to 330 µA	150 µA/A + 0.02 µA	Fluke 5520A
	330 µA to 3.3 mA	100 µA/A + 0.03 µA	

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Equipment to Measure DC Current Source [FO]	3.3 mA to 33 mA	100 µA/A + 0.2 µA	Fluke-5520A
	33 mA to 330 mA	100 µA/A +2 µA	
	330 mA to 1.1 A	200 µA/A + 40 µA	
	1.1 A to 3.3 A	380 µA/A + 40 µA	
	3.3 A to 11 A	500 µA/A + 380 µA	
	11 A to 20 A	1 mA/A + 0.75 mA	
Equipment to Output DC Current [FO]	0.01 nA to 100 nA	35 µA/A + 400 µA/A	Agilent-3458A/001 w/Fluke – Y5020
	1 nA to 1 µA	25 µA/A + 40 µA/A	
	1 µA to 10 µA	25 µA/A + 10 µA/A	
	10 µA to 100 µA	25 µA/A + 8 µA/A	
	100 µA to 1 mA	25 µA/A + 5 µA/A	
	1 mA to 10 mA	25 µA/A + 5 µA/A	
	10 mA to 100 mA	40 µA/A + 5 µA/A	
	100 mA to 1 A	115 µA/A + 10 µA/A	
	1.1 A to 20 A	0.02 % of Reading	
Equipment to Measure DC High Voltage [FO]	0 kV to 30 kV	0.01 % of Reading + 0.01 % of full scale	Bertan 105-30R
Equipment to Measure DC Power At the list frequencies [FO]			Fluke – 5520A
0.33 mA to 330 mA	33 mV to 1 020 V	0.03 % of Reading	
0.33 A to 3 A	33 mV to 1 020 V	0.03 % of Reading	
3 A to 20.5 A	33 mV to 1 020 V	0.07 % of Reading	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	29 µA to 330 µA	0.2 % of Reading + 0.1 µA	
20 Hz to 45 Hz	29 µA to 330 µA	0.15 % of Reading + 0.1 µA	
45 Hz to 1 kHz	29 µA to 330 µA	0.13 % of Reading + 0.1 µA	
5 kHz to 10 kHz	29 µA to 330 µA	0.8 % of Reading + 0.2 µA	
10 kHz to 30 kHz	29 µA to 330 µA	1.6 % of Reading + 0.4 µA	

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Equipment to Measure AC Current At the listed frequencies [FO]			Fluke 5520A
10 Hz to 20 Hz	0.33 mA to 3.3 mA	0.2 % of Reading + 0.15 µA	
20 Hz to 45 Hz	0.33 mA to 3.3 mA	0.13 % of Reading + 0.15 µA	
45 Hz to 1 kHz	0.33 mA to 3.3 mA	0.1 % of Reading + 0.15 µA	
1 kHz to 5 kHz	0.33 mA to 3.3 mA	0.2 % of Reading + 0.2 µA	
5 kHz to 10 kHz	0.33 mA to 3.3 mA	0.5 % of Reading + 0.3 µA	
10 kHz to 30 kHz	0.33 mA to 3.3 mA	1 % of Reading + 0.6 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	3.3 mA to 33 mA	0.18 % of Reading + 2 µA	
20 Hz to 45 Hz	3.3 mA to 33 mA	0.09 % of Reading + 2 µA	
45 Hz to 1 kHz	3.3 mA to 33 mA	0.04 % of Reading + 2 µA	
1 kHz to 5 kHz	3.3 mA to 33 mA	0.08 % of Reading + 2 µA	
5 kHz to 10 kHz	3.3 mA to 33 mA	0.2 % of Reading + 3 µA	
10 kHz to 30 kHz	3.3 mA to 33 mA	0.4 % of Reading + 4 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	33 mA to 330 mA	0.18 % of Reading + 20 µA	
20 Hz to 45 Hz	33 mA to 330 mA	0.09 % of Reading + 20 µA	
45 Hz to 1 kHz	33 mA to 330 mA	0.04 % of Reading + 20 µA	
1 kHz to 5 kHz	33 mA to 330 mA	0.1 % of Reading + 50 µA	
5 kHz to 10 kHz	33 mA to 330 mA	0.2 % of Reading + 100 µA	
10 kHz to 30 kHz	33 mA to 330 mA	0.4 % of Reading + 200 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 45 Hz	0.33 A to 1.1 A	0.18 % of Reading + 100 µA	
45 Hz to 1 kHz	0.33 A to 1.1 A	0.05 % of Reading + 100 µA	
1 kHz to 5 kHz	0.33 A to 1.1 A	0.6 % of Reading + 1 000 µA	
5 kHz to 10 kHz	0.33 A to 1.1 A	2.5 % of Reading + 5 000 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 45 Hz	1.1 A to 3 A	0.18 % of Reading + 100 µA	
45 Hz to 1 kHz	1.1 A to 3 A	0.05 % of Reading + 100 µA	
1 kHz to 5 kHz	1.1 A to 3 A	0.6 % of Reading + 1 000 µA	
5 kHz to 10 kHz	1.1 A to 3 A	2.5 % of Reading + 5 000 µA	

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Equipment to Measure AC Current At the listed frequencies [FO]			Fluke 5520A
45 Hz to 100 Hz	3 A to 11 A	0.06 % of Reading + 2 000 µA	
100 Hz to 1 kHz	3 A to 11 A	0.1 % of Reading + 2 000 µA	
1 kHz to 5 kHz	3 A to 11 A	3 % of Reading + 2 000 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	29 µA to 330 µA	0.2 % of Reading + 0.1 µA	
20 Hz to 45 Hz	29 µA to 330 µA	0.15 % of Reading + 0.1 µA	
45 Hz to 1 kHz	29 µA to 330 µA	0.13 % of Reading + 0.1 µA	
1 kHz to 5 kHz	29 µA to 330 µA	0.2 % of Reading + 0.1 µA	
5 kHz to 10 kHz	29 µA to 330 µA	0.8 % of Reading + 0.2 µA	
10 kHz to 30 kHz	29 µA to 330 µA	1.6 % of Reading + 0.4 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	0.33 mA to 3.3 mA	0.2 % of Reading + 0.15 µA	
20 Hz to 45 Hz	0.33 mA to 3.3 mA	0.13 % of Reading + 0.15 µA	
45 Hz to 1 kHz	0.33 mA to 3.3 mA	0.1 % of Reading + 0.15 µA	
1 kHz to 5 kHz	0.33 mA to 3.3 mA	0.2 % of Reading + 0.2 µA	
5 kHz to 10 kHz	0.33 mA to 3.3 mA	0.5 % of Reading + 0.3 µA	
10 kHz to 30 kHz	0.33 mA to 3.3 mA	1 % of Reading + 0.6 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	3.3 mA to 33 mA	0.18 % of Reading + 2 µA	
20 Hz to 45 Hz	3.3 mA to 33 mA	0.09 % of Reading + 2 µA	
45 Hz to 1 kHz	3.3 mA to 33 mA	0.04 % of Reading + 2 µA	
1 kHz to 5 kHz	3.3 mA to 33 mA	0.08 % of Reading + 2 µA	
5 kHz to 10 kHz	3.3 mA to 33 mA	0.2 % of Reading + 3 µA	
10 kHz to 30 kHz	3.3 mA to 33 mA	0.4 % of Reading + 4 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	33 mA to 330 mA	0.18 % of Reading + 20 µA	
20 Hz to 45 Hz	33 mA to 330 mA	0.09 % of Reading + 20 µA	
45 Hz to 1 kHz	33 mA to 330 mA	0.04 % of Reading + 20 µA	
1 kHz to 5 kHz	33 mA to 330 mA	0.1 % of Reading + 50 µA	
5 kHz to 10 kHz	33 mA to 330 mA	0.2 % of Reading + 100 µA	
10 kHz to 30 kHz	33 mA to 330 mA	0.4 % of Reading + 200 µA	

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Equipment to Measure AC Current At the listed frequencies [FO]			Fluke 5520A
10 Hz to 45 Hz	1.1 A to 3 A	0.18 % of Reading + 100 µA	
45 Hz to 1 kHz	1.1 A to 3 A	0.05 % of Reading + 100 µA	
1 kHz to 5 kHz	1.1 A to 3 A	0.6 % of Reading + 1 000 µA	
5 kHz to 10 kHz	1.1 A to 3 A	2.5 % of Reading + 5 000 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
10 Hz to 45 Hz	1.1 A to 3 A	0.18 % of Reading + 100 µA	
45 Hz to 1 kHz	1.1 A to 3 A	0.05 % of Reading + 100 µA	
1 kHz to 5 kHz	1.1 A to 3 A	0.6 % of Reading + 1 000 µA	
5 kHz to 10 kHz	1.1 A to 3 A	2.5 % of Reading + 5 000 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
45 Hz to 100 Hz	3 A to 11 A	0.06 % of Reading + 2 000 µA	
100 Hz to 1 kHz	3 A to 11 A	0.1 % of Reading + 2 000 µA	
1 kHz to 5 kHz	3 A to 11 A	3 % of Reading + 2 000 µA	
Equipment to Measure AC Current At the listed frequencies [FO]			
45 Hz to 100 Hz	11 A to 20.5 A	0.12 % of Reading + 5 000 µA	
100 Hz to 1 kHz	11 A to 20.5 A	0.15 % of Reading + 5 000 µA	
1 kHz to 5 kHz	11 A to 20.5 A	3 % of Reading + 5 000 µA	
Equipment to Output AC Current At the listed frequencies [FO]			Agilent 3458A/001
10 Hz to 20 Hz	0.01 µA to 100 µA	0.4 % of Full Scale + 0.03 % of Reading	
20 Hz to 45 Hz	0.01 µA to 100 µA	0.15 % of Full Scale + 0.03 % of Reading	
45 Hz to 100 Hz	0.01 µA to 100 µA	0.06 % of Full Scale + 0.03 % of Reading	
100 Hz to 5 kHz	0.01 µA to 100 µA	0.06 % of Full Scale + 0.03 % of Reading	
Equipment to Output AC Current At the listed frequencies [FO]			
10 Hz to 20 Hz	1 mA to 100 mA	0.4 % of Full Scale + 0.02 % of Reading	
20 Hz to 45 Hz	1 mA to 100 mA	0.15 % of Full Scale + 0.02 % of Reading	
45 Hz to 100 Hz	1 mA to 100 mA	0.06 % of Full Scale + 0.02 % of Reading	
100 Hz to 5 kHz	1 mA to 100 mA	0.03 % of Full Scale + 0.02 % of Reading	
5 kHz to 20 kHz	1 mA to 100 mA	0.06 % of Full Scale + 0.02 % of Reading	
50 kHz to 100 kHz	1 mA to 100 mA	0.55 % of Full Scale + 0.15 % of Reading	

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Equipment to Output AC Current At the listed frequencies [FO]			Agilent 3458A/001
10 Hz to 20 Hz	100 mA to 1 A	0.4 % of Full Scale + 0.02 % of Reading	
20 Hz to 45 Hz	100 mA to 1 A	0.16 % of Full Scale + 0.02 % of Reading	
45 Hz to 100 Hz	100 mA to 1 A	0.08 % of Full Scale + 0.02 % of Reading	
100 Hz to 5 kHz	100 mA to 1 A	0.1 % of Full Scale + 0.02 % of Reading	
5 kHz to 20 kHz	100 mA to 1 A	0.03 % of Full Scale + 0.02 % of Reading	
20 kHz to 50 kHz	100 mA to 1 A	1 % of Full Scale + 0.04 % of Reading	
Equipment to Output AC Current At the listed frequencies[FO]			Agilent 3458A/001 w/ Fluke-Y5020
45 Hz to 5 kHz	1 A to 20 A	0.15 % of Reading + 16 mA	
Equipment to Measure AC Voltage At the listed frequencies [FO]			Fluke 5520A
10 Hz to 45 Hz	1 mV to 33 mV	800 µV/V + 6 µV	
45 Hz to 10 kHz	1 mV to 33 mV	150 µV/V + 6 µV	
10 kHz to 20 kHz	1 mV to 33 mV	200 µV/V + 6 µV	
20 kHz to 50 kHz	1 mV to 33 mV	1 000 µV/V 6 µV	
50 kHz to 100 kHz	1 mV to 33 mV	3 500 µV/V 12 µV	
100 kHz to 500 kHz	1 mV to 33 mV	8 000 µV/V + 50 µV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
10 Hz to 45 Hz	33 mV to 330 mV	300 µV/V + 8 µV	
50 kHz to 100 kHz	33 mV to 330 mV	800 µV/V + 32 µV	
100 kHz to 500 kHz	33 mV to 330 mV	2 000 µV/V + 70 µV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
10 Hz to 45 Hz	0.33 V to 3.3 V	300 µV/V + 50 µV	
20 kHz to 50 kHz	0.33 V to 3.3 V	300 µV/V + 50 µV	
50 kHz to 100 kHz	0.33 V to 3.3 V	700 µV/V + 125 µV	
100 kHz to 500 kHz	0.33 V to 3.3 V	2 400 µV/V + 600 µV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
10 Hz to 45 Hz	3.3 V to 33 V	300 µV/V + 650 µV	
10 kHz to 20 kHz	3.3 V to 33 V	240 µV/V + 600 µV	
20 kHz to 50 kHz	3.3 V to 33 V	350 µV/V + 600 µV	
50 kHz to 100 kHz	3.3 V to 33 V	900 µV/V + 1 600 µV	

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Equipment to Measure AC Voltage At the listed frequencies [FO]			Fluke 5520A
10 Hz to 45 Hz	33 V to 330 V	190 µV/V + 2 000 µV	
45 Hz to 10 kHz	33 V to 330 V	200 µV/V + 6 000 µV	
10 kHz to 20 kHz	33 V to 330 V	250 µV/V + 6 000 µV	
20 kHz to 50 kHz	33 V to 330 V	300 µV/V + 6 000 µV	
50 kHz to 100 kHz	33 V to 330 V	2 000 µV/V + 50 000 µV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
45 Hz to 1 kHz	330 V to 1 020 V	300 µV/V + 10 000 µV	
1 kHz to 5 kHz	330 V to 1 020 V	250 µV/V + 10 000 µV	
5 kHz to 10 kHz	330 V to 1 020 V	300 µV/V + 10 000 µV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
10 Hz to 45 Hz	1 mV to 33 mV	0.08 % of Reading + 6 µV	
45 Hz to 10 kHz	1 mV to 33 mV	0.015 % of Reading + 6 µV	
10 kHz to 20 kHz	1 mV to 33 mV	0.02 % of Reading + 6 µV	
20 kHz to 50 kHz	1 mV to 33 mV	0.1 % of Reading + 6 µV	
50 kHz to 100 kHz	1 mV to 33 mV	0.35 % of Reading + 12 µV	
100 kHz to 500 kHz	1 mV to 33 mV	0.8 % of Reading + 50 µV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
10 Hz to 45 Hz	33 mV to 330 mV	0.03 % of Reading + 8 µV	
45 Hz to 10 kHz	33 mV to 330 mV	0.013 % of Reading + 8 µV	
10 kHz to 20 kHz	33 mV to 330 mV	0.015 % of Reading + 8 µV	
20 kHz to 50 kHz	33 mV to 330 mV	0.035 % of Reading + 8 µV	
50 kHz to 100 kHz	33 mV to 330 mV	0.08 % of Reading + 32 µV	
100 kHz to 500 kHz	33 mV to 330 mV	0.2 % of Reading + 70 µV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
10 Hz to 45 Hz	0.33 V to 3.3 V	0.03 % of Reading + 50 µV	
45 Hz to 10 kHz	0.33 V to 3.3 V	0.012 % of Reading + 25 µV	
10 kHz to 20 kHz	0.33 V to 3.3 V	0.019 % of Reading + 50 µV	
20 kHz to 50 kHz	0.33 V to 3.3 V	0.03 % of Reading + 50 µV	
50 kHz to 100 kHz	0.33 V to 3.3 V	0.07 % of Reading + 125 µV	
100 kHz to 500 kHz	0.33 V to 3.3 V	0.24 % of Reading + 600 µV	

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Equipment to Measure AC Voltage At the listed frequencies [FO]			Fluke 5520A
10 Hz to 45 Hz	3.3 V to 33 V	0.03 % of Reading + 650 µV	
45 Hz to 10 kHz	3.3 V to 33 V	0.015 % of Reading + 200 µV	
10 kHz to 20 kHz	3.3 V to 33 V	0.024 % of Reading + 600 µV	
20 kHz to 50 kHz	3.3 V to 33 V	0.035 % of Reading + 600 µV	
50 kHz to 100 kHz	3.3 V to 33 V	0.09 % of Reading + 1.6 mV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
45 Hz to 1 kHz	33 V to 330 V	0.019 % of Reading + 2 mV	
1 kHz to 10 kHz	33 V to 330 V	0.02 % of Reading + 6 mV	
10 kHz to 20 kHz	33 V to 330 V	0.025 % of Reading + 6 mV	
20 kHz to 50 kHz	33 V to 330 V	0.03 % of Reading + 6 mV	
50 kHz to 100 kHz	33 V to 330 V	0.2 % of Reading + 50 mV	
Equipment to Measure AC Voltage At the listed frequencies [FO]			
45 Hz to 1 kHz	330 V to 1 020 V	0.03 % of Reading + 10 mV	
1 kHz to 5 kHz	330 V to 1 020 V	0.025 % of Reading + 10 mV	
5 kHz to 10 kHz	330 V to 1 020 V	0.03 % of Reading + 10 mV	
Equipment to Measure AC Voltage –Bandwidth < 2 MHz At the listed frequencies [FO]			Agilent 3458A/001
1 Hz to 40 Hz	1 mV to 10 mV	0.03 % of Reading + 3 µV	
40 Hz to 1 kHz	1 mV to 10 mV	0.02 % of Reading + 1.1 µV	
1 kHz to 20 kHz	1 mV to 10 mV	0.03 % of Reading + 1.1 µV	
20 kHz to 50 kHz	1 mV to 10 mV	0.1 % of Reading + 1.1 µV	
50 kHz to 100 kHz	1 mV to 10 mV	0.5 % of Reading + 1.1 µV	
100 kHz to 300 kHz	1 mV to 10 mV	4 % of Reading + 2 µV	
Equipment to Measure AC Voltage -Bandwidth < 2 MHz At the listed frequencies [FO]			
1 Hz to 40 Hz	100 mV to 10 V	0.007 % of Reading + 0.4 mV	
40 Hz to 1 kHz	100 mV to 10 V	0.007 % of Reading + 0.2 mV	
1 kHz to 20 kHz	100 mV to 10 V	0.014 % of Reading + 0.2 mV	
20 kHz to 50 kHz	100 mV to 10 V	0.03 % of Reading + 0.2 mV	
50 kHz to 100 kHz	100 mV to 10 V	0.08 % of Reading + 0.2 mV	
100 kHz to 300 kHz	100 mV to 10 V	0.3 % of Reading + 1 mV	
300 kHz to 1 MHz	100 mV to 10 V	1 % of Reading + 1 mV	
1 MHz to 2 MHz	100 mV to 10 V	1.5 % of Reading + 1 mV	

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Equipment to Measure AC Voltage -Bandwidth < 2 MHz At the listed frequencies FO			Agilent 3458A/001
1 Hz to 40 Hz	10 V to 100 V	0.02 % of Reading + 4 mV	
40 Hz to 1 kHz	10 V to 100 V	0.02 % of Reading + 2 mV	
1 kHz to 20 kHz	10 V to 100 V	0.02 % of Reading + 2 mV	
20 kHz to 50 kHz	10 V to 100 V	0.035 % of Reading + 2 mV	
50 kHz to 100 kHz	10 V to 100 V	0.12 % of Reading + 2 mV	
100 kHz to 300 kHz	10 V to 100 V	0.4 % of Reading + 10 mV	
300 kHz to 1 MHz	10 V to 100 V	1.5 % of Reading + 10 mV	
Equipment to Measure AC Voltage -Bandwidth < 2 MHz At the listed frequencies FO			
1 Hz to 40 Hz	100 V to 1 000 V	0.04 % of Reading + 40 mV	
40 Hz to 1 kHz	100 V to 1 000 V	0.04 % of Reading + 20 mV	
1 kHz to 20 kHz	100 V to 1 000 V	0.06 % of Reading +20 mV	
20 kHz to 50 kHz	100 V to 1 000 V	0.12 % of Reading + 20 mV	
50 kHz to 100 kHz	100 V to 1 000 V	0.3 % of Reading + 20 mV	
Equipment to Measure AC Voltage –Bandwidth > 2 MHz At the listed frequencies FO			
45 Hz to 100 kHz	0.01 mV to 10 mV	0.09 % of Reading + 6 µV	
100 kHz to 1 MHz	0.01 mV to 10 mV	1.2 % of Reading + 5 µV	
1 MHz to 4 MHz	0.01 mV to 10 mV	7 % of Reading + 7 µV	
4 MHz to 8 MHz	0.01 mV to 10 mV	20 % of Reading + 8 µV	
Equipment to Measure AC Voltage –Bandwidth > 2 MHz At the listed frequencies FO			
45 Hz to 100 kHz	100 mV to 10 V	0.09 % of Reading + 6 mV	
100 kHz to 1 MHz	100 mV to 10 V	2 % of Reading + 5 mV	
1 MHz to 4 MHz	100 mV to 10 V	4 % of Reading + 7 mV	
4 MHz to 8 MHz	100 mV to 10 V	4 % of Reading + 8 mV	
8 MHz to 10 MHz	100 mV to 10 V	15 % of Reading + 10 mV	
Equipment to Measure AC Voltage –Bandwidth > 2 MHz At the listed frequencies FO			
45 Hz to 100 kHz	10 V to 100 V	0.12 % of Reading + 2 mV	
Equipment to Measure AC Voltage –Bandwidth > 2 MHz At the listed frequencies FO			
45 Hz to 100 kHz	100 V to 1 000 V	0.3 % of Reading + 0.1 V	

Certificate of Accreditation: Supplement

Industrial Calibration Service (In-Cal)
71 Pine Road, Hudson, NH 03051
Contact Name: Irfan Saherwardi Phone: 603-883-5558

Accreditation is granted to the facility to perform the following calibrations:

Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure AC Power At the listed frequencies FO			Fluke 5520A
3.3 mA to 20.5 A	33 mV to 330 mV	0.14 % of Reading	
3.3 mA to 20.5 A	330 mV to 1 020 V	0.12 % of Reading	
AC/DC High Voltage Source	1 kV to 6 kV	35 V	Fluke 80k-6, Fluke 89 IV
	1 kV to 15 kV	90 V	Fluke 80k-15, Fluke 89 IV
	1 kV to 40 kV	240 V	Fluke 80k-40, Fluke 89 IV
AC/DC Current Source (High Voltage)	10 mA-DC	1 % of Reading	Clarostat 240 & Fluke 189/89
	100 mA-AC		
Equipment to Output Frequency Measure FO	0.01 Hz to 2 MHz	2.5 Hz/MHz + 5 µHz	Agilent 3458A/001
Frequency Source FO	1 Hz to 10 MHz	0.05 % of Reading	Fluke 5520A
	1 Hz to 40 Hz	0.05 % of Reading	
	40 Hz to 10 MHz	0.01 % of Reading	
Equipment to Measure Inductance Fixed Value FO	100 mH	0.1 % of Reading	Gen. Radio 1482-L
Temperature Calibration, Indication and control Equipment used with Thermocouple Type B FO	600 °C to 1 820 °C	0.44 °C	Electrical Simulation of Thermocouple Output Fluke 5520A
Temperature Calibration, Indication and control Equipment used with Thermocouple Type C FO	0 °C to 2 316 °C	0.84 °C	
Temperature Calibration, Indication and control Equipment used with Thermocouple Type E FO	-250 °C to 1 000 °C	0.5 °C	
Temperature Calibration, Indication and control Equipment used with Thermocouple Type J FO	-210 °C to 1 200 °C	0.27 °C	
Temperature Calibration, Indication and control Equipment used with Thermocouple Type K FO	-200 °C to 1 372 °C	0.4 °C	
Temperature Calibration, Indication and control Equipment used with Thermocouple Type N FO	-200 °C to 1 300 °C	0.4 °C	

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Temperature Calibration, Indication and control Equipment used with Thermocouple Type R [FO]	0 °C to 1 767 °C	0.57 °C	Electrical Simulation of Thermocouple Output Fluke 5520A
Temperature Calibration, Indication and control Equipment used with Thermocouple Type S [FO]	0 °C to 1 767 °C	0.47 °C	
Temperature Calibration, Indication and control Equipment used with Thermocouple Type T [FO]	-250 °C to 400 °C	0.63 °C	
Temperature Calibration, Indication and control Equipment used with RTD Type Pt 395, 100 Ω [FO]	-200 °C to 800 °C	0.23 °C	Electrical Simulation of RTD Output Fluke 5520A
Temperature Calibration, Indication and control Equipment used with RTD Type Pt 3926, 100 Ω [FO]	-200 °C to 630 °C	0.12 °C	
Temperature Calibration, Indication and control Equipment used with RTD Type Pt 3916, 100 Ω [FO]	-200 °C to 630 °C	0.25 °C	
Temperature Calibration, Indication and control Equipment used with RTD Type Pt 385, 200 Ω [FO]	-200 °C to 630 °C	0.16 °C	
Temperature Calibration, Indication and control Equipment used with RTD Type Pt 385, 500 Ω [FO]	-200 °C to 630 °C	0.11 °C	
Temperature Calibration, Indication and control Equipment used with RTD Type Pt 385, 1 000 Ω [FO]	-200 °C to 630 °C	0.23 °C	
Temperature Calibration, Indication and control Equipment used with RTD Type Pt Ni 385, 120 Ω [FO]	-80 °C to 260 °C	0.14 °C	
Temperature Calibration, Indication and control Equipment used with RTD Type Cu 427, 10 Ω [FO]	-100 °C to 260 °C	0.3 °C	

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Electrical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Equipment to Measure Resistance [FO]	Up to 11 Ω	40 μΩ/Ω + 0.001 Ω	Fluke 5520A
	11 Ω to 33 Ω	30 μΩ/Ω + 0.001 5 Ω	
	33 Ω to 110 Ω	28 μΩ/Ω + 0.001 4 Ω	
	110 Ω to 330 Ω	28 μΩ/Ω + 0.002 Ω	
	330 Ω to 1.1 kΩ	28 μΩ/Ω + 0.002 Ω	
	1.1 kΩ to 3.3 kΩ	28 μΩ/Ω + 0.02 Ω	
	3.3 kΩ to 11 kΩ	28 μΩ/Ω + 0.02 Ω	
	11 kΩ to 33 kΩ	28 μΩ/Ω + 0.2 Ω	
	33 kΩ to 110 kΩ	28 μΩ/Ω + 0.2 Ω	
	110 kΩ to 330 kΩ	32 μΩ/Ω + 2 Ω	
	330 kΩ to 1.1 MΩ	32 μΩ/Ω + 2 Ω	
	1.1 MΩ to 3.3 MΩ	60 μΩ/Ω + 30 Ω	
Equipment to Measure Resistance [FO]	3.3 MΩ to 11 MΩ	130 μΩ/Ω + 50 Ω	
	11 MΩ to 33 MΩ	250 μΩ/Ω + 2.5 kΩ	
	33 MΩ to 110 MΩ	500 μΩ/Ω + 3 kΩ	
	110 MΩ to 330 MΩ	3 000 μΩ/Ω + 0.1 MΩ	
	330 MΩ to 1 100 MΩ	1 500 μΩ/Ω + 0.5 MΩ	
Equipment to Measure Resistance [FO]	0.01 Ω	500 μΩ/Ω	SR-1 Series Fixed Values
	0.1 Ω	300 μΩ/Ω	
	1 Ω	50 μΩ/Ω	
	10 Ω	50 μΩ/Ω	
	100 Ω	50 μΩ/Ω	
	1 kΩ	50 μΩ/Ω	
	10 kΩ	50 μΩ/Ω	
	100 kΩ	50 μΩ/Ω	
	1 MΩ	100 μΩ/Ω	
	10 MΩ	100 μΩ/Ω	
Insulation Resistance Measure [FO]	1 kΩ to 10 TΩ	1.5 % of Reading	Fluke – 5320A

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Industrial Calibration Service (In-Cal)
71 Pine Road, Hudson, NH 03051
Contact Name: Irfan Saherwardi Phone: 603-883-5558

Accreditation is granted to the facility to perform the following calibrations:

Mass, Force, and Weighing Devices

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Balances [FO]	0.000 1 g to 220 g	$(2 \times 10^{-4} + 9.53 \times 10^{-8}\ \text{Wt})$ g	Standard Weights (Ultra Class)
	220 g to 2 000 g	$(1.13 \times 10^{-2} + 1.63 \times 10^{-7}\ \text{Wt})$ g	
	2 kg to 40 kg	0.01 kg	
Scales [FO]	Up to 600 lbf	0.1 % of Reading	Standard Weights (Class F)
Force [FO]	Up to 600 lbf	0.1 % of Reading	Standard Weights (Class F)
	500 lbf to 1.5 Mlbf	0.1 % of Reading	Load Cells

Mechanical

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Torque Wrench [F]	100 lbf·in to 1 000 lbf·in	0.25 % of Reading	Torque Transducer - CDI
	60 lbf·ft to 650 lbf·ft	0.5 % of Reading	Torque Transducer - CDI
	100 lbf·ft to 1 000 lbf·ft	0.09 % of Reading	Torque Transducer -Norbar
Torque Watch [FO]	5 ozf·in to 250 ozf·in	0.1 % of Reading	Torque Transducer (Honeywell)
Pressure [F]	Up to 10 000 psi	0.05 % of Full Scale	Pressure Modules
	Up to 500 psi	0.015 % of Reading	Dead Weight Tester
	-14.5 psi to 15 psi	0.01 % of Reading	Fluke-PPC-4
Hardness Tester [FO]	20 HRA to 97 HRA	1 HRA	Hardness Blocks
	30 HRB to 96 HRB	1 HRB	
	20 HRC to 97 HRC	1 HRC	

Thermodynamic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Measure Non-Contract Temperature [FO]	35 °C to 500 °C (95 °F to 932 °F)	2.2 ºC (3.96 ºF)	Fluke 4181
Temperature Controllers/Indicators Type J [FO]	800 °C to 1 820 °C	0.6 °C	Process Calibrator (740-series)
Temperature Controllers/Indicators Type K [FO]	-200 °C to 1 372 °C	0.7 °C	
Temperature Controllers/Indicators Type T [FO]	-250 °C to 400 °C	0.6 °C	

Certificate of Accreditation: Supplement

Industrial Calibration Service (In-Cal)
71 Pine Road, Hudson, NH 03051
Contact Name: Irfan Saherwardi Phone: 603-883-5558

Accreditation is granted to the facility to perform the following calibrations:

Thermodynamic

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Temperature Controllers/Indicators Type E [FO]	-250 °C to 1 000 °C	0.5 °C	Process Calibrator (740-series)
Temperature Controllers/Indicators Type N [FO]	-200 °C to 1 300 °C	0.6 °C	
Thermocouples RTD's Thermometers [FO]	-45 °C to 0 °C	0.02 °C	Temperature Baths, Blocks, Environmental Chamber or High Temperature Furnace monitored by PRT & Indicator or Thermocouple & Indicator.
	0 °C to 1 000 °C	1 °C	

Time & Frequency

MEASURED INSTRUMENT, QUANTITY OR GAUGE	RANGE OR NOMINAL DEVICE SIZE AS APPROPRIATE	CALIBRATION AND MEASUREMENT CAPABILITY EXPRESSED AS AN UNCERTAINTY (±)	CALIBRATION EQUIPMENT AND REFERENCE STANDARDS USED
Timers/Stopwatches [FO]	1 m to 24 h	0.61 s	Agilent-53132A Cole Parmer-1021

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Accreditation is granted to the facility to perform the following calibrations:

1. The CMC (Calibration and Measurement Capability) stated for calibrations included on this scope of accreditation represents the smallest measurement uncertainty attainable by the laboratory when performing a more or less routine calibration of a nearly ideal device under nearly ideal conditions. It is typically expressed at a confidence level of 95 % using a coverage factor *k* (usually equal to 2). The actual measurement uncertainty associated with a specific calibration performed by the laboratory will typically be larger than the CMC for the same calibration since capability and performance of the device being calibrated and the conditions related to the calibration may reasonably be expected to deviate from ideal to some degree.

2. The laboratories range of calibration capability for all disciplines for which they are accredited is the interval from the smallest calibrated standard to the largest calibrated standard used in performing the calibration. The low end of this range must be an attainable value for which the laboratory has or has access to the standard referenced. Verification of an indicated value of zero in the absence of a standard is common practice in the procedure for many calibrations but by its definition it does not constitute calibration of zero capacity.

3. The presence of a superscript F means that the laboratory performs calibration of the indicated parameter at its fixed location. Example: Outside Micrometer^{F} would mean that the laboratory performs this calibration at its fixed location.

4. The presence of a superscript FO means that the laboratory performs calibration of the indicated parameter both at its fixed location and onsite at customer locations. Example: Outside Micrometer^{FO} would mean that the laboratory performs this calibration at its fixed location and onsite at customer locations.

5. Measurement uncertainties obtained for calibrations performed at customer sites can be expected to be larger than the measurement uncertainties obtained at the laboratories fixed location for similar calibrations. This is due to the effects of transportation of the standards and equipment and upon environmental conditions at the customer site which are typically not controlled as closely as at the laboratories fixed location.

6. The term L represents length in inches or millimeters as appropriate to the uncertainty statement.

7. The term Wt represents weight in pounds or grams (including SI multiple and submultiple units) appropriate to the uncertainty statement.