



ANSI-ASQ National Accreditation Board/AClass

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005 & ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid to: November 21, 2012

Certificate Number: AC-1121

I. Electromagnetic - DC/Low Frequency⁸

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Voltage - Source ⁵	Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV	7.5 μ V/V + 400 nV 5 μ V/V + 700 nV 3.5 μ V/V + 2.5 μ V 3.5 μ V/V + 4 μ V 5 μ V/V + 40 μ V 6.5 μ V/V + 400 μ V	Fluke 5720A Opt 03 Fluke 5725A	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
Fixed Points	10 V	4 μ V	Fluke 732A	
DC Voltage - Measure ⁵	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V 200 V to 1.05 kV	5 μ V/V + 100 nV 3.5 μ V/V + 400 nV 3.5 μ V/V + 4 μ V 5.5 μ V/V + 40 μ V 5.5 μ V/V + 500 μ V	Fluke 8508A Opt 01	
Fixed Points	Up to 120 kV 100 mV 1 V 10 V 100 V 1 kV	1 mV/V 2 μ V 2.2 μ V 6 μ V 224 μ V 2.34 mV	Ross VD120-6.2Y Fluke 732A with 752A and 8508A Opt 01	
DC Current - Source ⁵	Up to 220 μ A 220 μ A to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 3) A (3 to 11) A (11 to 20.5) A	40 μ A/A + 6 nA 35 μ A/A + 7 nA 35 μ A/A + 400 nA 45 μ A/A + 700 nA 80 μ A/A + 12 μ A 380 μ A/A + 40 μ A 360 μ A/A + 480 μ A 1 mA/A + 750 μ A	Fluke 5720A Opt 03 Fluke 5520A Fluke 5725A Fluke 5520A	



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DC Current - Measure ⁵	(1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 10) A (10 to 20) A (20 to 100) A	3.31 μ A/A 3.17 μ A/A 3.11 μ A/A 3.86 μ A/A 5.98 μ A/A 160 μ A/A	Fluke 8508A Opt 01 with Shunts or Standard Resistors	
Resistance - Source ⁵	1 Ω	95 $\mu\Omega$	Fluke 5720A Opt 03	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
	1.9 Ω	181 $\mu\Omega$		
	10 Ω	230 $\mu\Omega$		
	19 Ω	437 $\mu\Omega$		
	100 Ω	1 m Ω		
	190 Ω	1.9 m Ω		
	1 k Ω	8.5 m Ω		
	1.9 k Ω	16.2 m Ω		
	10 k Ω	85 m Ω		
	19 k Ω	162 m Ω		
	100 k Ω	1.1 Ω		
	190 k Ω	2.09 Ω		
	1 M Ω	20 Ω		
	1.9 M Ω	40 Ω		
10 M Ω	400 Ω			
19 M Ω	893 Ω			
100 M Ω	10 k Ω			
(10 to 120) Ω (in 10 Ω steps)	2.5 $\mu\Omega/\Omega$	ESI SR1010-10		
100 Ω to 1.2 k Ω (in 100 Ω steps)	1.7 $\mu\Omega/\Omega$	ESI SR1010-100		
(1 to 12) k Ω (in 1 k Ω steps)	1.15 $\mu\Omega/\Omega$	ESI SR1010-1K		
(10 to 120) k Ω (in 10 k Ω steps)	480 n Ω/Ω	ESI SR1010-10K		
100 k Ω to 1.2 M Ω (in 100 k Ω steps)	390 n Ω/Ω	ESI SR1010-100K		
(1 to 11) M Ω (in 1 M Ω steps)	7.6 $\mu\Omega/\Omega$	ESI SR1050-1M		
(10 to 100) M Ω (in 10 M Ω steps)	20 $\mu\Omega/\Omega$			
100 M Ω to 1 G Ω (in 100 M Ω steps)	100 $\mu\Omega/\Omega$			
(1 to 10) G Ω (in 1 G Ω steps)	200 $\mu\Omega/\Omega$	IET HRRS-B-5-10M-5kV		
(10 to 100) G Ω (in 10 G Ω steps)	2 m Ω/Ω			
100 G Ω to 1 T Ω (in 100 G Ω steps)	2 m Ω/Ω			

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Resistance - Source ⁵ (cont.) Fixed Points	0.001 Ω 0.01 Ω 0.1 Ω 1 Ω 10 kΩ	431 pΩ 4.31 nΩ 43.5 nΩ 250 nΩ 2.4 mΩ	L&N 4223-B L&N 4222-B L&N 4221-B L&N 4210 ESI SR104	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
Resistance - Measure ⁵	Up to 2 Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 1 GΩ (1 to 10) GΩ (10 to 100) GΩ 100 GΩ to 1 TΩ (1 to 10) TΩ (10 to 100) TΩ	7.2 μΩ/ Ω 3.2 μΩ/ Ω 3.2 μΩ/ Ω 2.7 μΩ/ Ω 2.7 μΩ/ Ω 1.9 μΩ/ Ω 8.5 μΩ/ Ω 16.4 μΩ/ Ω 14.5 μΩ/ Ω 500 μΩ/ Ω 700 μΩ/ Ω 1 mΩ/ Ω 2 mΩ/ Ω 3 mΩ/ Ω 5 mΩ/ Ω	Fluke 8508A Opt 01 with Standard Resistors Guildline 6500	
Capacitance - Source ⁵ 1 kHz 1 kHz 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 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz Up to 50 Hz Up to 20 Hz Up to 6 Hz Up to 2 Hz Up to 0.6 Hz Up to 0.2 Hz	100 pF 1 nF 190 pF to 1.1 nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF 330 nF to 1.1 μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF 330 μF to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.00059 pF 0.0048 pF 5 mF/F + 10 pF 2.6 mF/F + 10 pF 2.6 mF/F + 100 pF 2.5 mF/F + 300 pF 2.6 mF/F + 1 nF 2.5 mF/F + 3 nF 2.6 mF/F + 10 nF 4 mF/F + 30 nF 4.5 mF/F + 100 nF 4.5 mF/F + 300 nF 4.5 mF/F + 1 μF 5 mF/F + 10 pF 5 mF/F + 10 pF 5 mF/F + 3 μF 5 mF/F + 10 μF 8 mF/F + 30 μF 11 mF/F + 100 μF	Genrad 1404B Genrad 1404A Fluke 5520A	



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Capacitance - Measure Up to 1 kHz	Up to 10 pF (10 to 100) pF 100 pF to 1 nF (1 to 10) nF (10 to 100) nF 100 nF to 1 µF (1 to 10) mF (10 to 25) mF (25 to 100) mF	400 µF/F 200 µF/F 200 µF/F 200 µF/F 200 µF/F 200 µF/F 200 µF/F 200 µF/F 300 µF/F	Genrad 1689M Digibridge	
AC Voltage - Source ⁵	Up to 2.2 mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (2.2 to 22) mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (22 to 220) mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz 220 mV to 2.2 V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	240 µV/V + 4 µV 90 µV/V + 4 µV 80 µV/V + 4 µV 200 µV/V + 4 µV 500 µV/V + 5 µV 1.1 mV/V + 10 µV 1.4 mV/V + 20 µV 2.7 mV/V + 20 µV 240 µV/V + 4 µV 90 µV/V + 4 µV 80 µV/V + 4 µV 200 µV/V + 4 µV 500 µV/V + 5 µV 1.1 mV/V + 10 µV 1.4 mV/V + 20 µV 2.7 mV/V + 20 µV 240 µV/V + 12 µV 90 µV/V + 7 µV 80 µV/V + 7 µV 200 µV/V + 7 µV 460 µV/V + 17 µV 900 µV/V + 20 µV 1.4 mV/V + 25 µV 2.7 mV/V + 45 µV 240 µV/V + 40 µV 90 µV/V + 15 µV 45 µV/V + 8 µV 75 µV/V + 10 µV 110 µV/V + 30 µV 420 µV/V + 80 µV 1 mV/V + 200 µV 1.7 mV/V + 300 µV	Fluke 5720A Opt 03	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Source ⁵ (cont.)	(2.2 to 22) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (22 to 220) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz 220 V to 1.1 kV (15 to 50) Hz 50 Hz to 1 kHz	240 µV/V + 400 µV 90 µV/V + 150 µV 45 µV/V + 50 µV 70 µV/V + 100 µV 100 µV/V + 200 µV 275 µV/V + 600 µV 1 mV/V + 2 mV 1.5 mV/V + 3.2 mV 240 µV/V + 4 mV 90 µV/V + 1.5 mV 52 µV/V + 600 µV 80 µV/V + 1 mV 150 µV/V + 2.5 mV 900 µV/V + 16 mV 4.4 mV/V + 40 mV 8 mV/V + 80 mV 300 µV/V + 16 mV 70 µV/V + 3.5 mV	Fluke 5720A Opt 03	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
AC Voltage - Measure ⁵	(1 to 10) mV (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1MHz (1 to 4) MHz (4 to 8) MHz (10 to 100) mV (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 4) MHz (4 to 8) MHz (8 to 10) MHz	300 µV/V + 3 µV 200 µV/V + 1.1 µV 300 µV/V + 1.1 µV 1 mV/V + 1.1 µV 5 mV/V + 1.1 µV 40 mV/V + 2 µV 12 mV/V + 5 µV 70 mV/V + 7 µV 200 mV/V + 8 µV 72 µV/V + 4 µV 72 µV/V + 2 µV 142 µV/V + 2 µV 302 µV/V + 2 µV 802 µV/V + 2 µV 3 mV/V + 10 µV 10 mV/V + 10 µV 15 mV/V + 10 µV 40 mV/V + 8 µV 150 mV/V + 100 µV	HP 3458A Opt 002	

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AC Voltage - Measure ⁵ (cont.)	100 mV to 1 V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 4) MHz (4 to 8) MHz (8 to 10) MHz	72 µV/V + 40 µV 72 µV/V + 20 µV 142 µV/V + 20 µV 302 µV/V + 20 µV 802 µV/V + 20 µV 3 mV/V + 100 µV 1 mV/V + 100 µV 15 mV/V + 100 µV 40 mV/V + 800 µV 150 mV/V + 1 mV	HP 3458A Opt 002	
	(1 to 10)V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 4) MHz (4 to 8) MHz (8 to 10) MHz	72 µV/V + 400 µV 72 µV/V + 200 µV 142 µV/V + 200 µV 302 µV/V + 200 µV 802 µV/V + 200 µV 3 mV/V + 1 mV 1 mV/V + 1 mV 15 mV/V + 1 mV 40 mV/V + 8 mV 150 mV/V + 10 mV		
	(10 to 100) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	200 µV/V + 4 mV 200 µV/V + 2 mV 200 µV/V + 2 mV 350 µV/V + 2 mV 1.2 mV/V + 2 mV 4 mV/V + 10 mV 15 mV/V + 10 mV		Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
	100 V to 1 kV (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	400 µV/V + 40 mV 400 µV/V + 20 mV 600 µV/V + 20 mV 1.2 mV/V + 20 mV 3 mV/V + 20 mV 135 µV/V + 4 µV 340 µV/V + 8 µV 765 µV/V + 20 µV		
	200 mV to 2 V (1 to 10) Hz (10 to 40)Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	150 µV/V + 120 µV 115 µV/V + 20 µV 90 µV/V + 20 µV 75 µV/V + 20 µV 110 µV/V + 20 µV 220 µV/V + 840 µV 570 µV/V + 200 µV 3 mV/V + 2 mV 10 mV/V + 2 mV	Fluke 8508A Opt 01	

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AC Current - Measure ⁵	<p>Up to 200 µA (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz</p> <p>200 µA to 2 mA (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz</p> <p>(2 to 20) mA (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz</p> <p>10 mA Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>25 mA Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>50 mA Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>100 mA Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>250 mA Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>500 mA Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p> <p>1 A Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz</p>	<p>250 µA/A + 20 nA 250 µA/A + 20 nA 600 µA/A + 20 nA 4 mA/A + 20 nA</p> <p>250 µA/A + 200 nA 250 µA/A + 200 nA 600 µA/A + 200 nA 4 mA/A + 200 nA</p> <p>250 µA/A + 2 µA 250 µA/A + 2 µA 600 µA/A + 2 µA 4 mA/A + 2 µA</p> <p>205 µA/A 48 µA/A 48 µA/A 78 µA/A</p> <p>205 µA/A 48 µA/A 48 µA/A 82 µA/A</p> <p>205 µA/A 48 µA/A 53 µA/A 87 µA/A</p> <p>205 µA/A 48 µA/A 53 µA/A 87 µA/A</p> <p>205 µA/A 48 µA/A 53 µA/A 87 µA/A</p> <p>205 µA/A 48 µA/A 53 µA/A 91 µA/A</p> <p>206 µA/A 53 µA/A 68 µA/A 128 µA/A</p>	<p>Fluke 8508A Opt 01</p> <p>Holt HCS-1</p>	<p>Surecal 5.0 Software, OEM and GIDEP Sourced Procedures</p>

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AC Current - Measure (cont.)	2.5 A Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	212 µA/A 73 µA/A 77 µA/A 137 µA/A	Holt HCS-1	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
	5 A Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	212 µA/A 73 µA/A 87 µA/A 185 µA/A		
	10 A Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	216 µA/A 82 µA/A 102 µA/A 147 µA/A		
	20 A Range (10 to 400) Hz 400 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	222 µA/A 97 µA/A 122 µA/A 171 µA/A		
AC Phase - Source	(1 to 100) kHz	0.01 deg	Clarke Hess 5500-2	
AC Phase - Measure	10 Hz to 50 kHz	0.01 deg	K-H 6610	
Electrical Simulation of Thermocouple Indicators ⁵ Type B	(600 to 800) °C	0.44 °C	Fluke 5520A/SC 1100	
	(800 to 1 000) °C	0.34 °C		
	(1 000 to 1 550) °C	0.3 °C		
	(1 550 to 1 820) °C	0.33 °C		
	Type C	(0 to 150) °C		0.3 °C
		(150 to 650) °C		0.26 °C
		(650 to 1 000) °C		0.31 °C
		(1 000 to 1 800) °C		0.5 °C
		(1 800 to 2 316) °C		0.84 °C
	Type E	(-250 to -100) °C		0.5 °C
		(-100 to -25) °C		0.16 °C
		(-25 to 350) °C		0.14 °C
(350 to 650) °C		0.16 °C		
(650 to 1 000) °C		0.21 °C		



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Electrical Simulation of Thermocouple Indicators ⁵ (cont.) Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	Fluke 5520A/SC 1100	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures		
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.4 °C				
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.37 °C 0.26 °C 0.17 °C				
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1 300) °C	0.4 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C				
Type R	(0 to 250) °C (250 to 400) °C (400 to 1 000) °C (1 000 to 1 767) °C	0.51 °C 0.35 °C 0.33 °C 0.4 °C				
Type S	(0 to 250) °C (250 to 1 000) °C (1 000 to 1400) °C (1 400 to 1 767) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C				
Type T	(-250 to -150) °C (-150 to 0) °C	0.63 °C 0.24 °C				
Type U	(0 to 120) °C (120 to 400) °C (-200 to 0) °C (0 to 600) °C	0.16 °C 0.14 °C 0.56 °C 0.27 °C				
Electrical Simulation of RTDs ⁵ Pt 385 (100 Ω)	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C				

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Electrical Simulation of RTDs ⁵ (cont.)				
Pt 3926 (100 Ω)	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C	Fluke 5520A/SC 1100	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
Pt 3916 (100 Ω)	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.25 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.23 °C		
Pt 385 (200 Ω)	(-200 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C		
Pt 385 (500 Ω)	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.06 °C 0.08 °C 0.09 °C 0.11 °C		
Pt 385 (1 000 Ω)	(-200 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C	0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.23 °C		
PtNi 120 (120 Ω)	(-80 to 100) °C (100 to 260) °C	0.08 °C 0.14 °C		
CU 427 (10 Ω)	(-100 to 260) °C	0.3 °C		

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Inductance - Source Fixed Points up to 1 kHz	100 μ H 1 mH 10 mH 100 mH 10 H	22.6 nH 226 nH 3 μ H 30 μ H 2.26 mH	Genrad 1482-B Genrad 1482-E Genrad 1481-D Genrad 1482-L Genrad 1482-T	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
Inductance - Measure Up to 1 kHz	Up to 1 mH (1 to 100) mH 100 mH to 1 H (1 to 10) H	210 μ H/H 210 μ H/H 510 μ H/H 2 mH/H	Genrad 1689M Digibridge	
Oscilloscopes ⁵ Amplitude - DC Signal into 50 Ω Load into 1 M Ω Load Amplitude - Square Wave 50 Ω Load 1 M Ω Load Rise Time Leveled Sine Wave Relative to 50 kHz [5 mV to 5.5 V] p-p Time Marker into 50 Ω Load – Source Wave Generator Amplitude (10 Hz to 10 kHz) Square, Sine, Triangle into 1 M Ω Square, Sine, Triangle into 50 Ω	(-6.6 to 6.6) V (-130 to 130) V \pm 1 mV to \pm 6.6 V p-p 10 Hz to 10 kHz \pm 1 mV to \pm 130 V p-p 10 Hz to 1 kHz (1 to 10) kHz 300 ps 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz 5 s to 50 ms 20 ms to 1 ns 1.8 mV to 55 V p-p 1.8 mV to 2.5 V p-p	2.5 mV/V + 40 μ V 500 μ V/V + 40 μ V 2.5 mV/V + 40 μ V 1 mV/V + 40 μ V 2.5 mV/V + 40 μ V +0 ps/ -100 ps 35 μ V/V + 300 μ V 40 μ V/V + 300 μ V 60 μ V/V + 300 μ V 70 μ V/V + 300 μ V (25 + 1000t) μ s/s 2.5 μ s/s 30 mV/V + 100 μ V 30 mV/V + 100 μ V	Fluke 5520A/SC 1100	

II. Electromagnetic - RF/Microwave⁹

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
RF Power - Source ⁵ 50 Ω load	1 dB 1 Hz to 100 kHz 100 kHz to 20 MHz (2 to 8) dB 1 Hz to 100 kHz 100 kHz to 10 MHz (2 to 4) dB 100 kHz to 10 MHz (10 to 20) MHz (5 to 8) dB 100 kHz to 10 MHz (10 to 20) MHz (+10 to -110) dBm (10 to 50) MHz 50 MHz to 2.6 GHz (2.6 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz (+10 to -10) dBm (20 to 40) GHz (+2.5 to -10) dBm (40 to 50) GHz (-10 to -60) dBm (20 to 40) GHz (40 to 50) GHz (-60 to -110) dBm (20 to 40) GHz (40 to 50) GHz	0.1 dB 0.4 dB 0.2 dB 0.5 dB 0.6 dB 0.9 dB 0.6 dB 0.9 dB 0.91 dB 0.61 dB 0.48 dB 0.74 dB 0.93 dB 0.9 dB 1.7 dB 1.2 dB 2 dB 1.7 dB 2.5 dB	HP 3325B HP 83630A w/ 8902A, 11722A, 11792A and 11793A HP 83650A	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
RF Power - Measure ⁵ 50 Ω load	(+10 to -20) dBm 10 MHz to 2.6 GHz (2.6 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz (+10 to +20) dBm 10MHz to 18GHz (18 to 26.5)GHz (-20 to -70) dBm 10MHz to 6GHz (6 to 15) GHz (17 to 18) GHz (-30 to +20) dBm 100 kHz to 4.2 Hz (+30 to -20) dBm (26.5 to 50) GHz (-20 to -70) dBm (26.5 to 50) GHz	0.07 dBm 0.06 dBm 0.06 dBm 0.1 dBm 0.08 dBm 0.12 dBm 0.17 dBm 0.13 dBm 0.15 dBm 0.23 dBm 2.9 % 3.3 %	HP 8902A w/11793A, 11722A, and 11792A HP 436A w/ 8481A HP 436A w/ 8485A HP 436A w/ 8481D HP 436A w/ 8482A HP 437B w/ 8487A	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
RF Power - Measure ⁵ 50 Ω load (cont.) Power Reference (1 mW) ⁵	50 MHz	3.7 μW	HP 478-H76, HP 8902A w/ 11793A, Thermistor Mount	Surecal 5.0 Software, OEM and GIDEP Sourced Procedures
Phase Modulation - Measure ⁵ Carrier Frequency: 150 kHz to 10 MHz 10 MHz to 26.5 GHz	200 Hz to 10 kHz 200 Hz to 20 kHz	5 % 4 %	HP 8902A w/ 11722A HP 8902A w/ 11793A	
Amplitude Modulation - Source ⁵ Rate: 50 Hz to 10 kHz Depths: 5 % to 99 % Rate: 1 kHz Depths: 30 % Rate: DC to 10 kHz Depths: 0 % to 90 %	100 MHz to 1.28 GHz 10 MHz to 50 GHz (26.5 to 50) GHz	2.3 % 5.8 % 2.3 %	HP 8902A w/ 8663A HP 83650A HP 83650A	
Amplitude Modulation - Measure ⁵ Rate: 20 Hz to 10 kHz, to 99 % 50 Hz to 10 kHz (5 to 99) % 20 Hz to 10 kHz, to 99 % 50 Hz to 10 kHz (5 to 99) %	150 kHz to 10 MHz 150 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz	3.5 % 2.3 % 3.5 % 1.2 %	HP 8902A w/ 11722A HP 8902A w/ 11793A	
Frequency Modulation - Source ⁵ Modulation Rate: 20 Hz to 10 kHz 50 Hz to 100 kHz 20 Hz to 200 kHz Rate: 100 kHz to 8 MHz Dev.: < 10 MHz	250 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz (26.5 to 50) GHz	2.4 % 1.3 % 5.8 % 10 %	HP 8902A w/ 8663A HP83650A	
Frequency Modulation - Measure ⁵ Modulation Rate: 20 Hz to 10 kHz 50 Hz to 100 kHz 20 Hz to 200 kHz	250 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz	2.4 % 1.3 % 5.8 %	HP 8902A	
Rise Time - Measure	Up to 12.4 GHz (12.4 to 20) GHz	28.2 ps 17.5 ps	HP 83483A	
Insertion Loss ⁵ (0 to 110) dB	2.5 MHz to 26.5 GHz	0.1 dB	HP 8902A w/ 11793A, 11722A, and 11792A	

III. Time & Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Frequency - Measure ⁵ * Note: Datum 9390-6000 GPS Frequency Standard is not used on-site.	10 MHz DC to 500 MHz 500 MHz to 46 GHz	6 parts in 10 ⁸ 6 parts in 10 ⁸ 6 parts in 10 ⁹	Datum 9390-6000 HP 5335A HP 5352B	OEM and GIDEP Sourced Calibration Procedures

IV. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature - Source	Ambient to 200 °C (-80 to 100) °C (-40 to 150) °C (20 to 300) °C (60 to 550) °C	0.016 °C 0.018 °C 0.017 °C 0.023 °C 0.031 °C	Hart 5680 SPRT, 1590 and the following baths; Ertco TCS-200-35 Hart 7380 Hart 7341 Hart 6022 Hart 6050	OEM, GIDEP, NIST, and ASTM Sourced Calibration Procedures
Fixed Points	-195 °C -38.83319 °C 231.9278 °C 419.5268 °C	0.004 °C 0.004 °C 0.004 °C 0.004 °C	NBPLN2 Hart T.P. Hg Cell Hart F.P. Sn Cell Hart F.P. Zn Cell	
*Triple Point of Water	0.01 °C	0.0001 °C	Triple Point Cell	
Temperature - Measure ⁵	-190 °C -39 °C 0.01 °C 231 °C 420 °C	0.004 °C 0.009 °C 0.003 °C 0.009 °C 0.018 °C	Hart 5680 SPRT with Hart 1590 Super Thermometer	
Relative Humidity - Measure ⁵	0 to 100 %RH	1.2 %	Vaisala HMI41/HMP46	
Relative Humidity - Source	(10 to 50) %RH (50 to 95) %RH	0.35 % 0.35 %	Thunder Scientific 2500 Humidity Generator	

V. Optical Radiation



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Fiber Optic Power - Source Attenuation (dB) Wavelength (nm) Laser Source (Power Stability)	(-80 to +3) dBm (1 000 to 1 650) nm	4 % + 50 pW	HP 81521B w/ HP 81533B	OEM and GIDEP Sourced Procedures
	(-60 to +20) dBm (850 to 1 500) nm	3%	Newport 2835-C w/ Newport 818-SI-1	
	(700 to 1 650) nm	1.3 parts in 10 ⁶	HP 86120B	
	(1 310 to 1 550) nm (1 450 to 1 590) nm	0.017 dB 0.035 dB	Agilent 81654A HP 8168F	

VI. Mechanical

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Torque Wrenches ⁵	(5 to 50 in oz) 4 in-lb to 2 000 ft-lb	0.61 % of reading 0.32 % of reading	CDI Suretest Torque Calibration System	OEM and GIDEP Sourced Procedures
Torque Transducers and Calibrators	(Up to 280) in-oz (5 to 100) in-lb (5 to 290) ft-lb (50 to 2 000) ft-lb	0.34 % of reading 0.16 % of reading 0.03 % of reading 0.06 % of reading	Class F Weights with 2.5 in. Radius Wheel 5 in. Radius Wheel 10 in. Radius Butterfly 40 in. Radius Arm	
Vacuum	(-15 to 0) psi	0.009 % of reading	Ruska 7250xi	
Force	Up to 700 lbf	0.13 % of reading	Class F Weights	
Durometers ⁵	Type A, B, and O Type C, D, and DO	0.8 Duro 0.5 Duro	Precision Scale or Gage Blocks with RDC-1 Durometer Calibrator	



PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Pressure	1 in H ₂ O	0.0004 in H ₂ O	Ruska V1600/3D Deadweight Tester	OEM and GIDEP Sourced Procedures
	1.1 in H ₂ O	0.0004 in H ₂ O		
	1.2 in H ₂ O	0.0004 in H ₂ O		
	1.3 in H ₂ O	0.0004 in H ₂ O		
	1.4 in H ₂ O	0.0004 in H ₂ O		
	1.5 in H ₂ O	0.0004 in H ₂ O		
	1.6 in H ₂ O	0.0004 in H ₂ O		
	1.625 in H ₂ O	0.0004 in H ₂ O		
	1.65 in H ₂ O	0.0004 in H ₂ O		
	1.7 in H ₂ O	0.0005 in H ₂ O		
	1.8 in H ₂ O	0.0005 in H ₂ O		
	1.9 in H ₂ O	0.0005 in H ₂ O		
	2.1 in H ₂ O	0.0006 in H ₂ O		
	2.6 in H ₂ O	0.0007 in H ₂ O		
	3.6 in H ₂ O	0.0009 in H ₂ O		
	3.8 in H ₂ O	0.0009 in H ₂ O		
	3.9 in H ₂ O	0.0009 in H ₂ O		
	3.95 in H ₂ O	0.001 in H ₂ O		
	3.975 in H ₂ O	0.001 in H ₂ O		
	4 in H ₂ O	0.001 in H ₂ O		
	4 in H ₂ O	0.0009 in H ₂ O		
	4.025 in H ₂ O	0.001 in H ₂ O		
	4.05 in H ₂ O	0.001 in H ₂ O		
	4.1 in H ₂ O	0.001 in H ₂ O		
	4.2 in H ₂ O	0.001 in H ₂ O		
	4.3 in H ₂ O	0.001 in H ₂ O		
	4.5 in H ₂ O	0.001 in H ₂ O		
	5 in H ₂ O	0.001 in H ₂ O		
	6 in H ₂ O	0.001 in H ₂ O		
	9 in H ₂ O	0.002 in H ₂ O		
	14 in H ₂ O	0.003 in H ₂ O		
	24 in H ₂ O	0.005 in H ₂ O		
	44 in H ₂ O	0.01 in H ₂ O		
	54 in H ₂ O	0.013 in H ₂ O		
	59 in H ₂ O	0.015 in H ₂ O		
	61 in H ₂ O	0.016 in H ₂ O		
	62 in H ₂ O	0.016 in H ₂ O		
	63 in H ₂ O	0.017 in H ₂ O		
	63.5 in H ₂ O	0.017 in H ₂ O		
	63.7 in H ₂ O	0.017 in H ₂ O		
63.8 in H ₂ O	0.017 in H ₂ O			
63.9 in H ₂ O	0.016 in H ₂ O			
63.95 in H ₂ O	0.017 in H ₂ O			
63.975 in H ₂ O	0.017 in H ₂ O			
64 in H ₂ O	0.015 in H ₂ O			

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Pressure (cont.)	(0.2 to 25) psia (0.2 to 25) psig (25 to 100) psia (25 to 100) psig (100 to 1 000) psia (100 to 1 000) psig (1 to 4) kpsig (4 to 20) kpsig (20 to 40) kpsig	0.003 % 0.002 % 0.003 % 0.002 % 0.003 % 0.002 % 0.004 % 0.01 % 0.018 %	Ruska Deadweight Testers	OEM and GIDEP Sourced Procedures
*Mass	30 kg 25 kg 20 kg 10 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 3 g 2 g 1 g 500 mg 300 mg 200 mg 100 mg 50 mg 30 mg 20 mg 10 mg 5 mg (0.003 to 0.001) g	14 mg 13 mg 14 mg 2.8 mg 1.7 mg 1 mg 1.2 mg 0.2 mg 0.12 mg 0.08 mg 0.09 mg 0.07 mg 0.05 mg 0.02 mg 0.03 mg 0.03 mg 0.005 mg 0.002 mg 0.002 mg 0.002 mg 0.001 mg 0.001 mg 0.001 mg 0.001 mg 0.001 mg 0.001 mg 0.001 mg 0.001 mg 0.001 mg 0.001 mg	Class 0 Weights w/ KA30-3/ID7-MC Comparator Class 0 Weights w/ PR10003 Comparator Class 0 Weights w/ AX1004 Comparator Class 0 Weights w/ AE240 Comparator Class 0 Weights w/ MX5 Comparator	NIST and ASTM Calibration Procedures
Scales and Balances	Up to 100 g (100 to 200) g (200 to 300) g (300 to 500) g 500 g to 1 kg (1 to 2) kg Up to 300 lb (300 to 500) lb (500 to 1 000) lb	330 µg 340 µg 2.58 mg 2.59 mg 47.26 mg 32.68 mg 0.03 lb 0.38 lb 0.52 lb	Class 1 Weights Class F Weights	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Pipettes	1 µl to 5 ml (5 to 25) ml	0.006 µl 20 µl	M-T MX5 M-T AX205DR with M-T Pipette Software	OEM and GIDEP Sourced Procedures
Mass Flow of Gases	Up to 100 sccm Up to 1 000 sccm Up to 20 slm Up to 40 slm Up to 80 slm	0.2 % of reading or 0.02 % full scale (whichever is greater)	DHI molbloc/ molbox Mass Flow System	
Air Velocity Air Flow	(0 to 5 000) fpm (0 to 25) mps	1.16 % of reading + 1 digit	Wind Tunnel Monitored with Ashcroft ATE100 and AQS-1 Differential Pressure Meter with Druck DPI 141 Barometer	

VII. Dimensional

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
*Single Axis Dimensional Gaging - Inside ⁵	(0.02 to 4) in (4 to 12) in	(2.4 + 1.65L) µin (1.2 + 3.3L) µin	P&W Labmaster with Grade 00 Gage Blocks	OEM and GIDEP Sourced Procedures
*Single Axis Dimensional Gaging - Outside ⁵	Up to 4 in (4 to 12) in	(2.4 + 1.65L) µin (1.2 + 3.3L) µin		
*Thread Pitch - Outside ⁵	Up to 4 in	(152 + L) µin	P&W Labmaster with Grade 00 Gage Blocks and Thread Wires	
Calipers ⁵ - Inside and Outside	Up to 4 in (4 to 20) in	(152 + L) µin (758 + 1.1L) µin	Gage Blocks	
Micrometers ⁵ - Inside, Outside, and Depth	Up to 4 in (4 to 20) in	(86 + 1.7L)µin (111 + 5L)µin		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION AND MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Height Gages ⁵	Up to 20 in	(69.4 + 5.3L) μ in	Comparison with Grade 00 Gage Blocks and Surface Plate	OEM and GIDEP Sourced Procedures

Notes:

1. Calibration and Measurement Capabilities (CMC) (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of k=2.
2. This laboratory offers calibration services in its main laboratory, at satellite laboratory locations, and on-site at customer designated locations. Since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
3. Temperature fixed point cells carry accuracies from 0.0002 °C for the Hg cell to 0.0009 °C for the Zn cell.
4. The accredited corporate site with the above address is also accredited for the following satellite sites: Philips On-Site, 3000 Minuteman Road, Andover, MA, 01810, POC Cheri Mooney, Phone: 978-659-3381 and Goodrich On-Site, 100 Wooster Heights Road, Danbury, CT, 06810, POC Laura Wolken, Phone 203-797-5801.
5. Parameters have been verified and authorized for accredited calibration at the Philips and Goodrich satellite sites.
6. Capabilities denoted with an asterisk (*) cannot be performed on-site.
7. The use of (L) signifies an expression of Length in inches.
8. Electromagnetic - DC/Low Frequency CMC do not include possible contributions to uncertainty from a "best available" unit under test.
9. RF/Microwave CMC do not include possible contributions to uncertainty caused by mismatch.
10. The use of (t) signifies Time in seconds.
11. This scope is part of and must be included with the Certificate of Accreditation No. AC-1121.



Vice President

