



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

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CALIBRATION

Valid to: November 18, 2013

Certificate Number: AC-1196

I. Electromagnetic - DC/Low Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Voltage - Source	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 µV/V + 400 nV 5 µV/V + 700 nV 3.5 µV/V + 2.5 µV 3.5 µV/V + 4 µV 5 µV/V + 40 µV 6.6 µV/V + 400 µV	Fluke 5720A	METCAL and OEM and GIDEP Sourced Procedures
DC Voltage - Measure	Up to 100 mV 100 mV to 1V (1 to 10) V (10 to 100) V (100 to 1 000) V (1 to 30) kV	50 µV/V + 3.5 µV 40 µV/V + 70 µV 35µ V/V + 50 µV 45 µV/V + 600 µV 45 µV/V + 10 mV 1 mV/V	HP 3458A Ross VD30	
AC Voltage - Source	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	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	Fluke 5720A	



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AC Voltage - Source (cont.)	(2.2 to 22) mV			
	(10 to 20) Hz	240 μV/V + 4 μV		
	(20 to 40) Hz	90 μV/V + 4 μV		
	40 Hz to 20 kHz	80 μV/V + 4 μV		
	(20 to 50) kHz	200 μV/V + 4 μV		
	(50 to 100) kHz	500 μV/V + 5 μV		
	(100 to 300) kHz	1.1 mV/V + 10 μV		
	(300 to 500) kHz	1.4 mV/V + 20 μV		
	500 kHz to 1 MHz	2.7 mV/V + 20 μV		
	(22 to 220) mV			
	(10 to 20) Hz	240 μV/V + 12 μV		
	(20 to 40) Hz	90 μV/V + 7 μV		
	40 Hz to 20 kHz	80 μV/V + 7 μV		
	(20 to 50) kHz	200 μV/V + 7 μV		
	(50 to 100) kHz	460 μV/V + 17 μV		
	(100 to 300) kHz	900 μV/V + 20 μV		
	(300 to 500) kHz	1.4 mV/V + 25 μV		
	500 kHz to 1 MHz	2.7 mV/V + 45 μV		
	220 mV to 2.2 V			
	(10 to 20) Hz	240 μV/V + 40 μV		
	(20 to 40) Hz	90 μV/V + 15 μV		
	40 Hz to 20 kHz	45 μV/V + 8 μV		
	(20 to 50) kHz	75 μV/V + 10 μV		
	(50 to 100) kHz	110 μV/V + 30 μV		
	(100 to 300) kHz	420 μV/V + 80 μV		
	(300 to 500) kHz	1 mV/V + 200 μV		
	500 kHz to 1 MHz	1.7 mV/V + 300 μV		
	(2.2 to 22) V			
(10 to 20) Hz	240 μV/V + 400 μV			
(20 to 40) Hz	90 μV/V + 150 μV			
40 Hz to 20 kHz	45 μV/V + 50 μV			
(20 to 50) kHz	70 μV/V + 100 μV			
(50 to 100) kHz	100 μV/V + 200 μV			
(100 to 300) kHz	275 μV/V + 600 μV			
(300 to 500) kHz	1 mV/V + 2 mV			
500 kHz to 1 MHz	1.5 mV/V + 3.2 mV			
(22 to 220) V				
(10 to 20) Hz	240 μV/V + 4 mV			
(20 to 40) Hz	90 μV/V + 1.5 mV			
40 Hz to 20 kHz	52 μV/V + 600 μV			
(20 to 50) kHz	80 μV/V + 1 mV			
(50 to 100) kHz	150 μV/V + 2.5 mV			
(100 to 300) kHz	900 μV/V + 16 mV			
(300 to 500) kHz	4.4 mV/V + 40 mV			
500 kHz to 1 MHz	8 mV/V + 80 mV			



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current - Source (cont.)	(2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 220 mA to 2.2 A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (2.2 to 11) A 40 Hz to 1kHz (1 to 5) kHz (5 to 10) kHz	250 µA/A + 400 nA 160 µA/A + 350 nA 120 µA/A + 350 nA 200 µA/A + 550 nA 1.1 mA/A + 5 µA 250 µA/A + 4 µA 160 µA/A + 3.5 µA 120 µA/A + 2.5 µA 200 µA/A + 3.5 µA 1.1 mA/A + 10 µA 260 µA/A + 35 µA 450 µA/A + 80 µA 7 mA/A + 160 µA 400 µA/A + 170 µA 950 µA/A + 380 µA 3.6 mA/A + 750 µA	Fluke 5720A	METCAL and OEM and GIDEP Sourced Procedures
AC Current - Measure	(5 to 100) µA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz 100 µA to 1 mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz (1 to 10) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	4 mA/A + 30 nA 1.5 mA/A + 30 nA 600 µA/A + 30 nA 600 µA/A + 30 nA 4 mA/A + 200 nA 1.5 mA/A + 200 nA 600 µA/A + 200 nA 300 µA/A + 200 nA 600 µA/A + 200 nA 4 mA/A + 400 nA 5.5 mA/A + 1.5 µA 4 mA/A + 2 µA 1.5 mA/A + 2 µA 600 µA/A + 2 µA 300 µA/A + 2 µA 600 µA/A + 2 µA 4 mA/A + 4 µA 5.5 mA/A + 15 µA	HP 3458A	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current - Measure (cont.)	(10 to 100) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz 100 mA to 1 A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	4 mA/A + 20 μ A 1.5 mA/A + 20 μ A 600 μ A/A + 20 μ A 300 μ A/A + 20 μ A 600 μ A/A + 20 μ A 4 mA/A + 40 μ A 5.5 mA/A + 150 μ A 4 mA/A + 200 μ A 1.6 mA/A + 200 μ A 800 μ A/A + 200 μ A 1 mA/A + 200 μ A 3 mA/A + 200 μ A 10 mA/A + 400 μ A	HP 3458A	
Electrical Simulation of Thermocouple Indicators				
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.44 °C 0.34 °C 0.3 °C 0.33 °C		
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.3 °C 0.26 °C 0.31 °C 0.5 °C 0.84 °C		
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C	0.5 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	Fluke 5520A/SC1100	METCAL and OEM and GIDEP Sourced Procedures
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		
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		



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Electrical Simulation of Thermocouple Indicators (cont.)				
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 1300) °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	0.57 °C 0.35 °C 0.33 °C 0.4 °C		
Type S	(0 to 250) °C (250 to 1 000) °C (1 000 to 1 400) °C (1 400 to 1 767) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C	Fluke 5520A/SC1100	METCAL and OEM and GIDEP Sourced Procedures
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C		
Type U	(-200 to 0) °C (0 to 600) °C	0.56 °C 0.27 °C		
Electrical Simulation of RTDs Pt 385, 100 Ω	(-200 to -80) °C (-80 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 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C		

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Electrical Simulation of RTDs (cont.)	Pt 385, 100 Ω	(-200 to -80) °C	0.05 °C	Fluke 5520A/SC1100	METCAL and OEM and GIDEP Sourced Procedures
		(-80 to 0) °C	0.05 °C		
		(0 to 100) °C	0.07 °C		
		(100 to 300) °C	0.09 °C		
		(300 to 400) °C	0.1 °C		
		(400 to 630) °C	0.12 °C		
	Pt 3926, 100 Ω	(-200 to -190) °C	0.25 °C		
		(-190 to -80) °C	0.04 °C		
		(-80 to 0) °C	0.05 °C		
		(0 to 100) °C	0.06 °C		
		(100 to 260) °C	0.07 °C		
		(260 to 300) °C	0.08 °C		
		(300 to 400) °C	0.09 °C		
		(400 to 600) °C	0.1 °C		
		(600 to 630) °C	0.23 °C		
	Pt 3916, 100 Ω	(-200 to -80) °C	0.04 °C		
		(-80 to 0) °C	0.04 °C		
		(0 to 100) °C	0.04 °C		
		(100 to 260) °C	0.05 °C		
		(260 to 300) °C	0.12 °C		
		(300 to 400) °C	0.13 °C		
		(400 to 600) °C	0.14 °C		
		(600 to 630) °C	0.16 °C		
	Pt 385, 200 Ω	(-200 to -80) °C	0.04 °C		
	(-80 to 0) °C	0.05 °C			
	(0 to 100) °C	0.05 °C			
	(100 to 260) °C	0.06 °C			
	(260 to 300) °C	0.08 °C			
	(300 to 400) °C	0.08 °C			
	(400 to 600) °C	0.09 °C			
	(600 to 630) °C	0.11 °C			
Pt 385, 500 Ω	(-200 to -80) °C	0.04 °C			
	(-80 to 0) °C	0.05 °C			
	(0 to 100) °C	0.05 °C			
	(100 to 260) °C	0.06 °C			
	(260 to 300) °C	0.08 °C			
	(300 to 400) °C	0.08 °C			
	(400 to 600) °C	0.09 °C			
	(600 to 630) °C	0.11 °C			



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of RTDs (cont.) Pt 385, 1 000 Ω	(-200 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	0.03 °C 0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.07 °C 0.23 °C	Fluke 5520A/SC1100	METCAL and OEM and GIDEP Sourced Procedures
PtNi 385, 120 Ω (Ni 120)	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.08 °C 0.08 °C 0.14 °C		
Cu 427, 10 Ω	(-100 to 260) °C	0.3 °C		
Resistance - Source	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ 1.1 MΩ to 3.3 MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1GΩ	40 μΩ/Ω + 1 mΩ 30 μΩ/Ω + 1.5 mΩ 28 μΩ/Ω + 1.4 mΩ 28 μΩ/Ω + 2 mΩ 28 μΩ/Ω + 2 mΩ 28 μΩ/Ω + 20 mΩ 28 μΩ/Ω + 20 mΩ 28 μΩ/Ω + 200 mΩ 28 μΩ/Ω + 200m Ω 32 μΩ/Ω + 2 Ω 32 μΩ/Ω + 2 Ω 60 μΩ/Ω + 30 Ω 130 μΩ/Ω + 50 Ω 250 μ Ω/Ω + 2.5k Ω 500μ Ω/Ω + 3 kΩ 3 mΩ/Ω + 100 kΩ 15 mΩ/Ω + 500 kΩ	Fluke 5520A/SC1100	
Fixed Points	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ	95 μΩ 181 μΩ 230 μΩ 437 μΩ 1 mΩ 1.9 mΩ 8.5 mΩ 16.2 mΩ	Fluke 5720A	

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Resistance - Source - Fixed Points (cont.)	10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	85 mΩ 162 mΩ 1.1 Ω 2.09 Ω 20 Ω 40 Ω 400 Ω 893 Ω 10 kΩ	Fluke 5720A	METCAL and OEM and GIDEP Sourced Procedures
Resistance - Measure	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 k Ω to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ	18 μΩ/Ω + 50 μΩ 13 μΩ/Ω + 500 μΩ 11 μΩ/Ω + 500 μΩ 11 μΩ/Ω + 5 mΩ 11 μΩ/Ω + 50 mΩ 100 μΩ/Ω + 1 mΩ 400 μΩ/Ω + 1 mΩ 8 m Ω/Ω + 10 mΩ	HP 3458A	
Capacitance - Source	(190 to 400) pF 400 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 33) mF (11 to 33) mF (33 to 110) mF	5 mF/F + 10 pF 5 mF/F + 10 pF 5 mF/F + 10 pF 5.5 mF/F + 10 pF 2.5 mF/F + 100 pF 2.5 mF/F + 100 pF 2.5 mF/F + 300 pF 2.5 mF/F + 1 nF 2.5 mF/F + 3 nF 2.5 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 4.5 mF/F + 3 μF 4.5 mF/F + 10 μF 7.5 mF/F + 30 μF 11 mF/F + 100 μF	Fluke 5520A/SC1100	



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Oscilloscopes				
Amplitude DC Signal 50 Ω @ 1 kHz 1 MΩ @1 kHz	(0 to 6.6) V p-p (0 to 130) V p-p	2.5 mV/V + 40 μV 500 μV/V + 40 μV		
Leveled Sine Wave	50 kHz to 100 MHz	35 μV/V + 300 μV		
Amplitude Squarewave 50 Ω Load 1M Ω Load	1 mV to 6.6 V p-p 10Hz to 10 KHz 1 mV to 130 V p-p 10Hz to 1 KHz 1KHz to 10 KHz	2.5 mV/V + 40 μV 1 mV/V + 400 μV 2.5 mV/V + 40 μV		
Flatness (50 kHz ref)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	15 μV/V + 100 μV 20 μV/V + 100 μV 40 μV/V + 100 μV		
Time Marker - Source Period @ 50 Ω Rise Time	5 s to 50 ms 20 ms to 2 ns ≤ 300 ps	(25 + 1000t) μs/s 2.5 μs/s +0 / -100 ps	Fluke 5520A/SC1100	METCAL and OEM and GIDEP Sourced Procedures
Edge Specs into 50Ω Load Rise Time Amplitude (p-p)	≤350 ps 5mV to 2.5 V	+0 ps/-100 ps 20 mV/V +200 μV		
Wave Generator - Source Amplitude (10Hz to 10KHz)				
Square, Sine, Triangle Into 1M Ω	1.8 mV to 55 Vp-p	30 mV/V +100 μV		
Square, Sine, Triangle Into 50 Ω	1.8 mV to 2.5 Vp-p	30 mV/V +100 μV		
Frequency	10 Hz to 100 kHz	25 μs/s + 15 mHz		

II. Dimensional

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Calipers	Up to 40 in	(333 + 4L) μ in	Gage Blocks	DTS CP521
Micrometers	Up to 36 in	(49 + 8L) μ in	Gage Blocks	DTS CP501
Indicators - Test - Drop	Up to 0.06 in Up to 4 in	37 μ in (31 + 4.8L) μ in	Gage Blocks	DTS CP511
Plug Gages - Cylindrical	Up to 12 in	(6.9 + 3.4L) μ in	ULM and Gage Blocks	DTS CP514
Rings - Cylindrical	Up to 12 in	(13.9 + 3.6) μ in	ULM and Gage Blocks	DTS CP515
Height Gages	Up to 40 in	(6.4 + 9.3L) μ in	Gage Blocks	DTS CP504 and OEM Sourced Procedure
Surface Plates - Flatness	Up to 100 in	(18 + 0.6D) μ in	Electronic Levels	DTS CP524
Gage Blocks	Up to 12 in	(2.9 + 1.3L) μ in	Gage Block Comparator	DTS CP500
ULM/ Bench Micrometer	Up to 20 in	(0.9 + 5.4L) μ in	Gage Blocks	DTS CP508
Optical Comparator	Up to 6 in	270 μ in	Glass Scale	DTS CP513

Notes:

1. Calibration and Measurement Capabilities (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of $k=2$.
2. This laboratory's capabilities include in-laboratory and on-site calibrations performed 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. CMC for Electromagnetic-DC/Low Frequency do not include possible contributions to uncertainty caused by a "best available" unit under test.
4. The use of (t) signifies Time in seconds.
5. The term (D) is the Diameter of the surface plate in inches.
6. The term (L) refers to Length in inches.
7. This scope is part of and must be included with the Certificate of Accreditation No. AC-1196.

Karl Greenaway

Vice President