



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

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CALIBRATION

Valid to: May 22, 2012

Certificate Number: AC-1328

I. Electromagnetic - DC/Low Frequency

Table with 5 columns: PARAMETER / EQUIPMENT, RANGE, CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)], REFERENCE STANDARD OR EQUIPMENT, METHOD(S). Rows include DC Voltage - Source, DC Voltage - Measure, High Voltage, DC Current - Source, and DC Current - Measure.



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
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 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ	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 + 200 mΩ 32 μΩ/Ω + 2 Ω 32 μΩ/Ω + 2 Ω 60 μΩ/Ω + 30 Ω 130 μΩ/Ω + 50 Ω 250 μΩ/Ω + 2.5 kΩ 500 μΩ/Ω + 3 kΩ 3 mΩ/Ω + 100 kΩ	Fluke 5520A	
Resistance - Measure	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	15 μΩ /Ω + 1 mΩ 9 μΩ /Ω + 300 μΩ 9 μΩ /Ω + 300 μΩ 9 μΩ /Ω + 300 μΩ 9 μΩ /Ω + 300 μΩ 14 μΩ /Ω + 700 μΩ 30 μΩ /Ω + 4 mΩ 300 μΩ /Ω + 45 mΩ 3 mΩ /Ω + 450 mΩ	Datron 1281	OEM and METCAL Sourced Calibration Procedures
AC Voltage - Source	(1 to 33) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (33 to 330) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	800 μV/V + 6 μV 150 μV/V + 6 μV 200 μV/V + 6 μV 1 mV/V + 6 μV 3.5 mV/V + 12 μV 8 mV/V + 50 μV 300 μV/V + 8 μV 145 μV/V + 8 μV 160 μV/V + 8 μV 350 μV/V + 8 μV 800 μV/V + 32 μV 2 mV/V + 70 μV	Fluke 5520A	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Source (cont.)	330 mV to 3.3 V (10 to 45) Hz 45Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (3.3 to 33) V (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (33 to 330) V 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz 330 V to 1.02 kV 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	300 µV/V + 50 µV 150 µV/V + 60 µV 190 µV/V + 60 µV 300 µV/V + 50 µV 700 µV/V + 125 µV 2.4 mV/V + 600 µV 300 µV/V + 650 µV 150 µV/V + 600 µV 240 µV/V + 600 µV 350 µV/V + 600 µV 900 µV/V + 1.6 mV 190µV/V + 2 mV 200 µV/V + 6 mV 250 µV/V + 6 mV 300 µV/V + 6 mV 2 mV/V + 50 mV 300 µV/V + 10 mV 250 µV/V + 10 mV 300 µV/V + 10 mV	Fluke 5520A	OEM and METCAL Sourced Calibration Procedures
AC Voltage - Measure	Up to 100 mV (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 (1 to 100) 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	220 µV/V + 70 µV 220 µV/V + 20 µV 200 µV/V + 20 µV 200µV/V + 10 µV 200 µV/V + 20 µV 400 µV/V + 40 µV 700 µV/V + 100 µV 170 µV/V + 60 µV 170 µV/V + 10 µV 150 µV/V + 10 µV 130 µV/V + 10 µV 150 µV/V + 10 µV 250 µV/V + 20 µV 500 µV/V + 100 µV 3 mV/V + 1 mV 10 mV/V + 10 mV	Datron 1281	



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure (cont.)	100 V to 1 kV (1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz 30 to 100) kHz	170 µV/V + 70 µV 170 µV/V + 20 µV 150 µV/V + 20 µV 250 µV/V + 40 µV 500 µV/V + 200 µV	Datron 1281	OEM and METCAL Sourced Calibration Procedures
High Voltage	(1 to 84.84) kV at 60 Hz	10 mV/V	Ross VD120-6.2Y-A with HP3458A	
AC Current - Source	(29 to 330) µA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz 330 µA to 3.3 mA (10 to 20) Hz (20 to 45) Hz 45Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (3.3 to 33) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (33 to 330) mA (10 to 20) Hz (20 to 45) Hz 45Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz 330 mA to 1.1 A (10 to 45) Hz 45Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	2 mA/A + 100 nA 1.5 mA/A + 100 nA 1.25 mA/A + 100 nA 3 mA/A + 150 nA 8 mA/A + 200 nA 16 mA/A + 400 nA 2 mA/A + 150 nA 1.25 mA/A + 150 nA 1 mA/A + 150 nA 2 mA/A + 200 nA 5 mA/A + 300 nA 10 mA/A + 600 nA 1.8 mA/A + 2 µA 900 µA/A + 2 µA 400 µA/A + 2 µA 800 µA/A + 2 µA 2 mA/A + 3 µA 4 mA/A + 4 µA 1.8 mA/A + 20 µA 900 µA/A + 20 µA 400 µA/A + 20 µA 1 mA/A + 50 µA 2 mA/A + 100 µA 4 mA/A + 200 µA 1.8 mA/A + 100 µA 500 µA/A + 100 µA 6 mA/A + 1 mA 25 mA/A + 5 mA	Fluke 5520A	



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current - Source (cont.)	(1.1 to 3) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (3 to 11) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.8 mA/A + 100 µA 600 µA/A + 100 µA 6 mA/A + 1 mA 25 mA/A + 5 mA 600 µA/A + 2 mA 1 mA/A + 2 mA 30 mA/A + 2 mA 1.2 mA/A + 5 mA 1.5 mA/A + 5 mA 30 mA/A + 5 mA	Fluke 5520A	OEM and METCAL Sourced Calibration Procedures
AC Current - Measure	100 µA to 100 mA 10 Hz to 5 kHz 100 mA to 1 A 10 Hz to 1 kHz	300 µA/A + 100 µA 600 µA/A + 200 µA	Datron 1281	
Frequency - Source	10 mHz to 2 MHz	2.5 µHz/Hz ± 5 µHz		
Capacitance - Source	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 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (0 to 50) Hz (0 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	190 pF to 1.1 nF (1.1 to 3.3) nF (3.3 to 11) nF (11 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	5 mF/F + 10 pF 5 mF/F + 10 pF 2.5 mF/F + 10 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	



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of Thermocouples				
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 .016 °C 0.14 °C 0.16 °C 0.21 °C		
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		
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	Fluke 5520A	OEM and METCAL Sourced Calibration Procedures
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		
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		
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		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of RTDs (cont.) Pt 3926, 100 Ω Pt 3916, 100 Ω Pt 385, 200 Ω Pt 385, 500 Ω Pt 385, 1 000 Ω	(-200 to -80) °C	0.05 °C	Fluke 5520A	OEM and METCAL Sourced Calibration 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		
	(-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		
	(-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		
	(-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			
(-200 to -80) °C	0.03 °C			
(-80 to 0) °C	0.03 °C			
(0 to 100) °C	0.04 °C			
(100 to 260) °C	0.05 °C			
(260 to 300) °C	0.06 °C			
(300 to 400) °C	0.07 °C			
(400 to 600) °C	0.07 °C			
(600 to 630) °C	0.23 °C			



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Electrical Simulation of RTDs (cont.) PtNi 385, 120 Ω (Ni 120)	(-80 to 0)°C (0 to 100)°C	0.08 °C 0.08 °C		
Cu 427, 10 Ω	(100 to 260) °C (-100 to 260) °C	0.14 °C 0.3 °C		
Oscilloscopes Square Wave 50 Ω @ 1 kHz 1 MΩ @ 1 kHz Leveled Sine Wave	1 mV to 6.6 V p-p 1 mV to 130 V p-p 50 kHz reference	2.5 mV/V + 40 μV 1 mV/V + 40 μV 20 mV/V + 300 μV	Fluke 5520A	OEM and METCAL Sourced Calibration Procedures
Amplitude (50 kHz ref)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	35 mV/V + 300 μV 40 mV/V + 300 μV 60 mV/V + 300 μV		
Flatness (50 kHz ref)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	15 mV/V + 100 μV 20 mV/V + 100 μV 40 mV/V + 100 μV		
Time Marker - Source & Period @ 50 V	5 s to 50 ms 20 ms to 100 ns 50 ns to 20 ns 10 ns 5 ns to 2 ns	(25 + 1000t) μs/s 2.5 μs/s 2.5 μs/s 2.5 μs/s 2.5 μs/s		
Rise Time	≤ 300 ps	+0 ps/-100 ps		
Input Resistance	(40 to 60) Ω 500 kΩ to 1.5 MΩ	1 m Ω/Ω 1 m Ω/Ω		

II. Mechanical

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Torque	20 to 100 lbf-in 40 to 200 lbf-ft	3.1 lbf-in 2.9 lbf-ft	M-100 TAF-20	OEM and GIDEP Sourced Procedures

III. Dimensional

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Micrometers	Up to 1 in 1 to 6 in 6 to 12 in	51.7 µin 88.5 µin 155 µin	Gage Blocks	OEM and GIDEP Sourced Procedures
Depth Micrometers	Up to 12 in	155 µin		
Calipers	Up to 6 in 6 to 12 12 to 24	69.9 µin 711 µin 754 µin		
Test Indicators	Up to 16	60 µin		
Dial Indicators	Up to 2 in	79.2 µin		
Height Gages	Up to 24 in	718 µin	Gage Blocks, Surface Plate	

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 laboratory 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. CMC for Electromagnetic – DC/Low Frequency does not include possible contributions to uncertainty from a “best available” unit under test.
4. The use of (t) represents Time in seconds.
5. This scope is part of and must be included with the Certificate of Accreditation No. AC-1328.



Vice President

