



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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CALIBRATION

Valid to: March 29, 2013

Certificate Number: AC-1128

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 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V 330 V to 1 kV	20 µV/V + 1µV 11 µV/V + 2 µV 12 µV/V + 20 µV 18 µV/V + 150 µV 18 µV/V + 1.5 mV	Fluke 5520A	OEM Method
DC Current - Source	Up to 330 µA 330 µA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (3 to 20.5) A	150 µA/A + 20 nA 100 µA/A + 50 nA 100 µA/A + 250 nA 100 µA/A + 2.5 µA 200 µA/A + 40 µA 380 µA/A + 40 µA 500 µA/A + 500 µA 1 mA/A + 750 µA		
Resistance - Source	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω .110 Ω to 1.1 kΩ (1.1 to 11) kΩ (11 to 110) kΩ 110 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 + 20 mΩ 28 µΩ/Ω + 200 mΩ 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		



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Resistance - Measure	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 2 GΩ	10 μΩ/Ω + 4 μΩ 7 μΩ/Ω + 14 μΩ 7 μΩ/Ω + 500 μΩ 7 μΩ/Ω + 5 mΩ 7 μΩ/Ω + 50 mΩ 7 μΩ/Ω + 500 mΩ 7 μΩ/Ω + 10 Ω 29 μΩ/Ω + 1 kΩ 30 μΩ/Ω + 100 kΩ 500 μΩ/Ω + 10 MΩ	Fluke 8508A	
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 330 mV to 3.3 V (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 (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	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 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 190 μV/V + 2 mV 200 μV/V + 6 mV 250 μV/V + 6 mV 300 μV/V + 6 mV 2 mV/V + 50 mV	Fluke 5520A	OEM Method

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Source (cont.)	330 V to 1 kV 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	300 µV/V + 10 mV 250 µV/V + 10 mV 300 µV/V + 10 mV	Fluke 5520A	
AC Voltage - Measure	Up to 200 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 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 (2 to 20) 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 (20 to 200) 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 200 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	120 µV/V + 14 µV 120 µV/V + 40 µV 100 µV/V + 40 µV 100 µV/V + 20 µV 1300 µV/V + 40 µV 300 µV/V + 80 µV 700 µV/V + 200 µV 100 µV/V + 120 µV 100 µV/V + 20 µV 80 µV/V + 20 µV 60 µV/V + 20 µV 80 µV/V + 20 µV 200 µV/V + 40 µV 500 µV/V + 200 µV 100 µV/V + 1.2 mV 100 µV/V + 200 µV 80 µV/V + 200 µV 60 µV/V + 200 µV 80 µV/V + 200 µV 200 µV/V + 400 µV 500 µV/V + 2 mV 100 µV/V + 12 mV 100 µV/V + 2 mV 80 µV/V + 2 mV 60 µV/V + 2 mV 80 µV/V + 2 mV 200 µV/V + 4 mV 500 µV/V + 20 mV 100 µV/V + 140 mV 100 µV/V + 40 mV 80 µV/V + 40 mV 200 µV/V + 80 mV 500 µV/V + 400 mV	Fluke 8508A	OEM Method

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current - Source	<p>Up 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</p> <p>330 µA to 3.3 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</p> <p>(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</p> <p>(33 to 330) 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</p> <p>330 mA to 3 A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz</p> <p>(3 to 11) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz</p> <p>(11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz</p>	<p>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 1.6 mA/A + 400 nA</p> <p>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</p> <p>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</p> <p>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</p> <p>1.8 mA/A + 100 µA 600 µA/A + 100 µA 6 mA/A + 1 mA 25 mA/A + 5 mA</p> <p>600 µA/A + 2 mA 1 mA/A + 2 mA 30 mA/A + 2 mA</p> <p>1.2 mA/A + 5 mA 1.5 mA/A + 5 mA 30 mA/A + 5 mA</p>	Fluke 5520A	OEM Method



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Current - Measure	Up to 200 µA 200µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A	6.5 µA/A + 400 pA 6.5 µA/A + 4 nA 8 µA/A + 40 nA 33 µA/A + 800 nA 170 µA/A + 16 µA 380 µA/A + 400 mA	Fluke 8508A	
Electrical Simulation of Thermocouples				
Type B	(600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °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 1 000) °C (1 000 to 1 800) °C (1 800 to 2 316) °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	OEM Method
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 L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.37 °C 0.26 °C 0.17 °C		

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Electrical Simulation of Thermocouples (cont.) 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	Fluke 5520A	OEM Method		
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				
Type T	(-200 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 0.27				
Electrical Simulation of RTDs - Source Type Pt 385 100 Ω	(Up to 32) °F (32 to 1 200) °F	0.44 °F 0.4 °F				
Electrical Simulation of RTDs – Measure Type Pt 385 100 Ω	(-200 to 0) °C (0 to 660) °C	0.05 °C 0.06 °C			Fluke 8508A	

II. Time & Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Frequency – Measure	0.01 Hz to 225 MHz	0.00079 Hz	Philips PM6680B	OEM Method

III. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Thermocouples Type C	0 °C (25 to 150) °C (150 to 350) °C	0.59 °C 0.57 °C 0.66 °C		
Type E	0 °C (25 to 350) °C	0.28 °C 0.37 °C		
Type J	0 °C (25 to 150) °C (150 to 350) °C	0.28 °C 0.37 °C 0.41 °C		
Type K	0 °C (25 to 120) °C (120 to 350) °C	0.32 °C 0.40 °C 0.57 °C		
Type L	0 °C (25 to 350) °C	0.51 °C 0.57 °C		
Type N	0 °C (25 to 120) °C (120 to 350) °C	0.37 °C 0.45 °C 0.43 °C	Fluke 9100S Fluke 5520A	OEM Method
Type R	0 °C (25 to 250) °C (250 to 350) °C	1.12 °C 1.14 °C 0.73 °C		
Type S	0 °C (25 to 250) °C (250 to 350) °C	0.92 °C 0.95 °C 0.75 °C		
Type T	0 °C (25 to 120) °C (120 to 350) °C	0.32 °C 0.4 °C 0.37 °C		
Type U	0 °C (25 to 350) °C	0.53 °C 0.58 °C		

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Humidity	11 %RH 33 %RH 53 %RH 75 %RH	1.19 %RH 1.06 %RH 1.1 %RH 1.03 %RH	Saturated Salt Chamber	ASTM E104
RTDs Type Pt 385 100 Ω	0 °C (25 to 350) °C	0.13 °C 0.27 °C	Fluke 9100S Fluke 8508A	OEM Method

IV. Mechanical

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Pressure (Inert Gas)	(15 to 115) psia (115 to 1 015) psia	0.07 psi 0.5 psi	Mensor PCS400	OEM Method
Pressure (Hydraulic)	(25 to 5 000) psig (5 to 1 000) psig	0.06 % reading 0.036 % reading	Ashcroft 1305B	
Vacuum	(0 to 15) psia	0.026 psi	Mensor PCS400	

Notes:

1. Calibration and Measurement Capabilities (CMC) (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of $k=2$.
2. CMC for Electromagnetic - DC/Low Frequency do not include possible contributions to uncertainty caused by a "best available" unit under test.
3. 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.
4. This scope is part of and must be included with the Certificate of Accreditation No. AC-1128.



Vice-President

