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ACCREDITATION
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CERTIFICATE OF ACCREDITATION

This is to attest

FIELD CALIBRATIONS, INC

9830 SOUTH 51ST STREET, SUITE B-111
PHOENIX, ARIZONA 85044-5668, U.S.A.

Calibration Laboratory CL-112

has met the requirements of AC204, *IAS Accreditation Criteria for Calibration Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories*. This organization is accredited to provide the services specified in the scope of accreditation.

Expiration Date March 1, 2026

Effective Date April 19, 2025



International Accreditation Service

Issued under the authority of IAS management

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FIELD CALIBRATIONS, INC

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Accredited to ISO/IEC 17025:2017

Effective Date April 19, 2025

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY ^{1,2} (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
Dimensional			
Micrometers ⁵	0.0625 in to 60 in	(70 + 7.5L) µin (where L = length in inches)	Direct measurement method Gage blocks, and micrometer standards
Calipers ⁵	Up to 1 in 1 in to 60 in	280 µin 320 µin	Direct measurement method with gage blocks
Mechanical			
Speed – Generate ³ (Contact)	55 rpm to 5000 rpm 5000 rpm to 7000 rpm 7000 rpm to 46000 rpm	0.001 rpm 0.0012 rpm 0.000018 %	Direct measurement method Quantum N-11-ECS/3A w/HP 53132A
Speed – Generate ³ (Non- contact)	1 rpm to 100 rpm 100 rpm to 1000 rpm 1000 rpm to 99999 rpm	0.0088 rpm 0.065 rpm 0.58 rpm	Direct measurement method HP 3325B
Speed – Measure ⁴ (Non-contact)	1 rpm to 99999 rpm 0.3 ft/min to 6500 ft/min 4 in/min to 78000 in/min 0.1 m/min to 1999 m/min	0.03 % 0.03 % 0.03 % 0.03 %	Direct measurement method Electromatic CDT2000
Speed – Measure ⁴ (Contact)	1 rpm to 99999 rpm 0.3 ft/min to 6500 ft/min 4 in/min to 78000 in/min 0.1 m/min to 1999 m/min	1.0 % 1.0 % 1.0 % 1.0 %	Direct measurement method Electromatic CDT2000
	0.1 ft/min to 999.99 ft/min 1000 ft/min to 9999.9 ft/min 10 000 ft/min to 25 000 ft/min	0.13 % + 0.06 ft/min 0.13 % + 0.6 ft/min 0.13 % + 1 ft/min	Direct measurement method Shimpo DT-107A
Scales and Balances ⁵ - (Linearity Test Only)	200 mg 1 g to 10 g 10 g	0.070 mg 0.50 mg 0.059 mg	Direct measurement method Class 1 and Class 3 Weights

* If information in this CMC is presented in non-SI units, the conversion factors stated in NIST Special Publication 811 "Guide for the Use of the International System of Units (SI)" apply.



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	20 g 30 g 40 g 50 g 50 g to 100 g 100 g 100 g to 200 g 200 g 200 g to 300 g 300 g 300 g to 400 g 400 g 400 g to 500 g 500 g 500 g to 800 g 1 kg 1 kg to 2.8 kg 3 kg 3 kg to 4.8 kg 5 kg 5 kg to 9.8 kg 10 kg 10 kg to 14.8 kg 15 kg	0.12 mg 0.087 mg 0.015 mg 0.14 mg 0.22 mg 0.28 mg 0.50 mg 0.58 mg 0.80 mg 0.86 mg 1.1 mg 0.91 mg 1.1 mg 1.2 mg 2.1 mg 2.9 mg 7.7 mg 8.8 mg 14 mg 14 mg 28 mg 120 mg 130 mg 130 mg	
	33 lb to 50 lb 50 lb 50 lb to 100 lb 100 lb 100 lb to 150 lb 150 lb 150 lb to 200 lb 200 lb 200 lb to 250 lb 250 lb 250 lb to 300 lb 300 lb 300 lb to 350 lb 350 lb 350 lb to 400 lb 400 lb	0.014 lb 0.0058 lb 0.019 lb 0.011 lb 0.025 lb 0.017 lb 0.031 lb 0.023 lb 0.037 lb 0.029 lb 0.044 lb 0.037 lb 0.050 lb 0.042 lb 0.055 lb 0.048 lb	Direct measurement method Class 7 Weights
Pressure/Vacuum ⁵ – Generate ³ and Measure ⁴	0 inH ₂ O to 10 inH ₂ O	0.03 inH ₂ O	Direct measurement method Fluke 700P01 w/719
	-12 psi to 30 psi	0.015 psi	Direct measurement method Fluke 717-30G
	0 psia to 30 psia	0.021 psi	Direct measurement method Fluke 700PA5 w/719



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Pressure/Vacuum ⁵ – Generate ³ and Measure ⁴ (continued)	30 psi to 100 psi	0.035 psi	Direct measurement method Fluke 719-100G
	100 psi to 300 psi	0.11 psi	Direct measurement method Fluke 719 Pro 300G
	300 psi to 1000 psi	0.5 psi	Direct measurement method Fluke 700P08 w/719
	1000 psi to 3000 psi	1.5 psi	Direct measurement method Ametek XP2i 3000
	3000 psi to 5000 psi	4.0 psi	Direct measurement method Fluke 700P30 w/719
	5000 psi to 7000 psi	4 psi	Direct measurement method Ashcroft 7000
	7000 psi to 10 000 psi	8 psi	Direct measurement method Fluke 700P31 w/ 719
Force Gages ⁵	1 gf to 200 gf	0.028 gf	Direct measurement method Class 1 and Class 3 Weights
	0.5 lbf to 2 lbf	0.0012 lbf	Direct measurement method Class 7 Weights
	2 lbf to 5 lbf	0.0027 lbf	
	5 lbf to 10 lbf	0.0046 lbf	
	10 lbf to 20 lbf	0.0082 lbf	
	20 lbf to 30 lbf	0.012 lbf	
	30 lbf to 40 lbf	0.015 lbf	
	40 lbf to 50 lbf	0.019 lbf	
	50 lbf to 60 lbf	0.024 lbf	
	60 lbf to 70 lbf	0.027 lbf	
	70 lbf to 80 lbf	0.030 lbf	
	80 lbf to 90 lbf	0.033 lbf	
	90 lbf to 100 lbf	0.038 lbf	
	100 lbf to 110 lbf	0.043 lbf	
Force ⁵ – Measure ⁴	0 lbf to 10 000 lbf	0.005 % + 10 lbf	Direct measurement method Interface 1211 NE with Newport Infinity INFS
Force ⁵ – Measure ⁴ (continued)	0 lbf to 100 000 lbf	200 lbf	Direct measurement method Transcell TI-500E w/VMC VLC-120
	0 lbf to 225 000 lbf	0.55 % + 100 lbf	Direct measurement method Tetrahedron 300K Load Cell w/Precision Digital PD6000-6R0



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Hand Torque Tools	Clockwise Direction 10 lbf·in to 30 lbf·in 30 lbf·in to 100 lbf·in 100 lbf·in to 500 lbf·in 500 lbf·in to 1200 lbf·in 1200 lbf·in to 3120 lbf·in Counter Clockwise Direction 10 lbf·in to 30 lbf·in 30 lbf·in to 100 lbf·in 100 lbf·in to 500 lbf·in 500 lbf·in to 1200 lbf·in 1200 lbf·in to 3120 lbf·in	(X is the applied torque value) 1.78 % 0.013X+1.7 % 0.0021X+1.2 % 0.0005X+0.86 % 0.2 % 2 % 0.014X+1.9 % 0.0017X+1.1 % 0.0007X+1.1 % 0.22 %	Direct measurement method using Larson UTWCS, ISO 6789-1
Thermal			
Simulated Temperature ⁵ - Thermocouples Generate & Measure			Direct measurement method Fluke 7526A
Type B	600 °C to 800 °C 800 °C to 1550 °C 1550 °C to 1820 °C	0.35 °C 0.28 °C 0.22 °C	
Type E	-250 °C to -200 °C -200 °C to -100 °C -100 °C to 0 °C 0 °C to 600 °C 600 °C to 1000 °C	0.25 °C 0.12 °C 0.09 °C 0.08 °C 0.10 °C	
Type J	-210 °C to -100 °C -100 °C to 800 °C 800 °C to 1200 °C	0.14 °C 0.09 °C 0.10 °C	
Type K	-250 °C to -200 °C -200 °C to -100 °C -100 °C to 500 °C 500 °C to 800 °C 800 °C to 1372 °C	0.46 °C 0.16 °C 0.10 °C 0.10 °C 0.13 °C	
Type N	-250 °C to -200 °C -200 °C to -100 °C -100 °C to 0 °C 0 °C to 100 °C 100 °C to 800 °C 800 °C to 1300 °C	0.73 °C 0.23 °C 0.12 °C 0.11 °C 0.10 °C 0.12 °C	

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Simulated Temperature ⁵ - Thermocouples Generate & Measure (continued)			Direct measurement method Fluke 7526A
Type R	-50 °C to -25 °C -25 °C to 0 °C 0 °C to 100 °C 100 °C to 400 °C 400 °C to 600 °C 600 °C to 1000 °C 1000 °C to 1600 °C 1600 °C to 1767 °C	0.55 °C 0.45 °C 0.39 °C 0.28 °C 0.22 °C 0.21 °C 0.19 °C 0.23 °C	
Type S	-50 °C to -25 °C -25 °C to 0 °C 0 °C to 100 °C 100 °C to 400 °C 400 °C to 600 °C 600 °C to 1000 °C 1000 °C to 1600 °C 1600 °C to 1767 °C	0.51 °C 0.43 °C 0.38 °C 0.29 °C 0.23 °C 0.22 °C 0.22 °C 0.26 °C	
Type T	-250 °C to -200 °C -200 °C to -100 °C -100 °C to 0 °C 0 °C to 200 °C 200 °C to 400 °C	0.35 °C 0.16 °C 0.11 °C 0.09 °C 0.09 °C	
Type U	-200 °C to 0 °C 0 °C to 200 °C 200 °C to 600 °C	0.16 °C 0.10 °C 0.10 °C	
Simulated Temperature ⁵ RTD Generate & Measure			Direct measurement method Fluke 7526A
Pt 385, 100 Ω	-200 °C to 800 °C	0.05 °C	
Pt 385, 1000 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C	0.014 °C 0.016 °C 0.020 °C 0.022 °C 0.027 °C	
Pt 3926, 100 Ω	-200 °C to 630 °C	0.05 °C	
Pt 3916, 100 Ω	-200 °C to 630 °C	0.05 °C	



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Ni 120, 120 Ω	-80 °C to 260 °C	0.02 °C	
Temperature ⁵ – Measure ⁴	-200 °C to -39 °C -39 °C to 0.01 °C 0.01 °C to 232 °C 232 °C to 420 °C 420 °C to 660 °C	0.016 °C 0.017 °C 0.033 °C 0.042 °C 0.058 °C	Comparison measurement method Hart 1502A w/5628
Temperature ⁵ – Generate ³	-200 °C to -39 °C -39 °C to 0.01 °C 0.01 °C to 200 °C 200 °C to 300 °C 300 °C to 400 °C 400 °C to 500 °C 500 °C to 600 °C 600 °C to 660 °C	0.016 °C 0.017 °C 0.033 °C 0.32 °C 0.42 °C 0.49 °C 0.56 °C 0.60 °C	Comparison measurement method Hart 1502A w/5628 Fluke 1703 Fluke 9144
Infrared Temperature ⁵ – Measure ⁴	20 °C to 100 °C 100 °C to 250 °C	2 °C 2 %	Direct measurement method Fluke 62 MAX+
Relative Humidity – Generate ³	10 %RH to 30 %RH 30 %RH to 80 %RH 80 %RH to 95 %RH	0.52 %RH 0.58 %RH 0.69 %RH	Direct measurement method Thunder Scientific 1200
Relative Humidity ⁵ – Measure ⁴	0 %RH to 90 %RH 90 %RH to 97 %RH	1 %RH 1.7 %RH	Comparison measurement method Vaisala HM70
Electrical – DC/LF			
DC Voltage ⁵ – Generate ³ and Measure ⁴	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1050 V	5.0 μV/V + 100 nV 3.5 μV/V + 400 nV 3.5 μV/V + 4 μV 5.5 μV/V + 40 μV 5.5 μV/V + 500 μV	Direct measurement method Fluke 5720A w/Fluke 8508A
DC Voltage – Generate ³	1050 V to 1100 V	6.5 μV/V + 400 μV	Direct measurement method Fluke 5720A
DC Voltage ⁵ – Generate ³ and Measure ⁴	1100 V to 2 kV 2 kV to 20 kV	0.04 % + 0.4 V 0.04 % + 4 V	Direct measurement method Glassman LG40, Vitrek 4620B
DC Voltage – Measure ⁴	1050 V to 1100 V 20 kV to 100 kV	22 μV/V + 700 μV 0.0035 % + 0.10 kV	Direct measurement method Keithley 2002 Indirect measurement method Spellman HVD-100-1 w/HP 34401A
DC Current ⁵ Generate ³	50 aA to 2 pA 2 pA to 20 pA 20 pA to 200 pA 200 pA to 2 nA 0.1 A to 1 A 10 μA to 100 μA 0.1 mA to 1 mA	0.43 % + 10 fA 0.38 % + 10 fA 0.25 % + 30 fA 0.065 % + 100 fA 120 μA/A + 10 μA 25 μA/A + 0.8 nA 25 μA/A + 5 nA	Direct measurement method Keithley 263 Direct measurement method Fluke 5720A w/HP 3458A

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DC Current ⁵ Generate ³ (continued)	1 mA to 10 mA	25 μ A/A + 50 nA	
	10 mA to 100 mA	40 μ A/A + 0.5 μ A	
	0.022 A to 0.220 A	45 μ A/A + 0.7 μ A	Direct measurement method Fluke 5720A
	0.22 A to 2.2 A	80 μ A/A + 12 μ A	
	2.2 A to 11 A	360 μ A/A + 480 μ A	Direct measurement method Fluke 5720A w/5725A
	11 A to 20.5 A	0.1 % + 750 μ A	Direct measurement method Fluke 5520A
	20 A to 150 A 150 A to 550 A 550 A to 1000 A	0.26 % + 0.05 A 0.25 % + 0.06 A 0.27 % + 0.06 A	Indirect measurement method Fluke 5520A w/50 Turn Coil
DC Current ⁵ – Measure ⁴	0 A to 100 A	0.11 % + 0.3 mA	Indirect measurement method EMS 5.5-150-1-D w/HP 3458A & LAB100-100
	100 A to 120 A	0.12 % + 3 mA	Indirect measurement method EMS 5.5-150-1-D w/HP 3458A & LAB1000-100
	10 fA to 2 nA 2 nA to 20 nA 20 nA to 200 nA 200 nA to 2 μ A 2 μ A to 20 μ A 20 μ A to 200 μ A 200 μ A to 2 mA	0.3 % + 500 fA 0.2 % + 3 pA 0.15 % + 20 pA 0.15 % + 200 pA 0.1 % + 2 nA 0.1 % + 20 nA 0.1 % + 200 nA	Direct measurement method Keithley 487
	0 nA to 100 nA 0.1 μ A to 1 μ A 1 μ A to 10 μ A	35 μ A/A + 40 pA 25 μ A/A + 40 pA 25 μ A/A + 100 pA	Direct measurement method HP 3458A
	10 μ A to 200 μ A 200 μ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA	12 μ A/A + 400 pA 12 μ A/A + 4 nA 14 μ A/A + 40 nA 48 μ A/A + 800 nA	Direct measurement method Fluke 8508A
	10 mA to 100 mA 0.1 A to 1 A	40 μ A/A + 500 nA 120 μ A/A + 10 μ A	Direct measurement method HP 3458A
	0.2 A to 2 A 2 A to 20 A	190 μ A/A + 16 μ A 400 μ A/A + 400 μ A	Direct measurement method Fluke 8508A
	1 A to 30 A	0.13 % + 0.3 mA	Indirect measurement method HP 3458A w/HP 34330A
	10 A to 100 A	0.11 % + 0.3 mA	Indirect measurement method HP 3458A w/LAB100-100
	100 A to 1000 A	0.12 % + 3 mA	
DC Resistance ⁵ – Generate ³	1 m Ω	0.22 %	Direct measurement method HP 4203x series
	10 m Ω	0.22 %	
	100 m Ω	0.22 %	
	1 Ω	0.22 %	



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DC Resistance ⁵ – Generate ³ (continued)	10 Ω	0.12 %	Direct measurement method HP 4203x series
	100 Ω	0.12 %	
	1 kΩ	0.12 %	
	10 kΩ	0.12 %	
	100 kΩ	0.12 %	
	0 Ω to 2 Ω	17 μΩ/Ω + 4 μΩ	Direct measurement method Fluke 5500A w/Fluke 8508A
	2 Ω to 20 Ω	9.5 μΩ/Ω + 14 μΩ	
	20 Ω to 200 Ω	8.0 μΩ/Ω + 50 μΩ	
	190 Ω	10 μΩ/Ω	Direct measurement method Fluke 5720A
	1 kΩ	8.5 μΩ/Ω	
	1.9 kΩ	8.5 μΩ/Ω	
	10 kΩ	8.5 μΩ/Ω	
	19 kΩ	8.5 μΩ/Ω	
	100 kΩ	11 μΩ/Ω	
	190 kΩ	11 μΩ/Ω	
	1 MΩ	20 μΩ/Ω	
	1.9 MΩ	21 μΩ/Ω	
	10 MΩ	40 μΩ/Ω	
	19 MΩ	47 μΩ/Ω	
	100 MΩ	100 μΩ/Ω	
	11 MΩ to 32.99999 MΩ	250 μΩ/Ω + 2.5 kΩ	Direct measurement method Fluke 5520A
	33 MΩ to 109.9999 MΩ	500 μΩ/Ω + 3 kΩ	
	110 MΩ to 329.9999 MΩ	0.3 % + 100 kΩ	
	330 MΩ to 1100 MΩ	1.5 % + 500 kΩ	
	0.1 GΩ to 1 GΩ	0.1 %	Direct measurement method PPM R3-1, 110
	1 GΩ to 10 GΩ	0.5 %	Direct measurement method Biddle Megadek 72-6345-1
	10 GΩ to 100 GΩ	1.0 %	
	1 GΩ	0.1 %	Direct measurement method Keithley 263
	10 GΩ	0.23 %	
	100 GΩ	0.4 %	
	1 TΩ	0.57 %	Direct measurement method Rohde & Schwarz CR504
DC Resistance – Measure ⁴	0 Ω to 2 Ω	17 μΩ/Ω + 4 μΩ	Direct measurement method Fluke 8508A (Normal Mode)
	2 Ω to 20 Ω	9.5 μΩ/Ω + 14 μΩ	
	20 Ω to 200 Ω	8.0 μΩ/Ω + 50 μΩ	
	200 Ω to 2 kΩ	8.0 μΩ/Ω + 500 μΩ	
	2 kΩ to 20 kΩ	8.0 μΩ/Ω + 5 mΩ	
	20 kΩ to 200 kΩ	8.0 μΩ/Ω + 50 mΩ	
	200 kΩ to 2 MΩ	9.0 μΩ/Ω + 1 Ω	
	2 MΩ to 20 MΩ	20 μΩ/Ω + 100 Ω	
	20 MΩ to 200 MΩ	120 μΩ/Ω + 10 kΩ	
	200 MΩ to 2 GΩ	1500 μΩ/Ω + 1 MΩ	
	2 MΩ to 20 MΩ	17 μΩ/Ω + 10 Ω	Direct measurement method Fluke 8508A
	20 MΩ to 200 MΩ	65 μΩ/Ω + 1 kΩ	



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DC Resistance – Measure ⁴ (continued)	200 MΩ to 2 GΩ	180 μΩ/Ω + 100 kΩ	(High Voltage Mode)
	2 GΩ to 20 GΩ	1500 μΩ/Ω + 10 MΩ	
	10 MΩ 100 MΩ 1 GΩ 10 GΩ	0.0050 % 0.0064 % 0.015 % 0.12 %	Indirect measurement method HP 3458A; Fluke 5720A
	100 GΩ 1 TΩ	0.29 % 0.57 %	Indirect measurement method Keithley 487; Fluke 5720A
DC Power – Generate ³	(33 mV to 1020 V) 330 μA to 329.99 mA 330 mA to 2.999 A 3 A to 20.5 A	(% of output in Watts) 0.023 % 0.022 % 0.07 %	Direct measurement method Fluke 5520A
AC Voltage ⁵ – Generate ³	1 nV to 2.2 mV (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 500 kHz) (500 kHz to 1 MHz) 2.2 mV to 22 mV (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 500 kHz) (500 kHz to 1 MHz) 22 mV to 220 mV (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 500 kHz) (500 kHz to 1 MHz) 220 mV to 2.2 V (10 Hz to 20 Hz)	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 1100 μV/V + 10 μV 1400 μV/V + 20 μV 2700 μV/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 1100 μV/V + 10 μV 1400 μV/V + 20 μV 2700 μV/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 1400 μV/V + 25 μV 2700 μV/V + 45 μV 240 μV/V + 40 μV	Direct measurement method Fluke 5520A

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AC Voltage ⁵ – Generate ³ (continued)	(20 Hz to 40 Hz)	90 $\mu\text{V/V}$ + 15 μV	Direct measurement method Fluke 5520A
	(40 Hz to 20 kHz)	45 $\mu\text{V/V}$ + 8 μV	
	(20 kHz to 50 kHz)	75 $\mu\text{V/V}$ + 10 μV	
	(50 kHz to 100 kHz)	110 $\mu\text{V/V}$ + 30 μV	
	(100 kHz to 300 kHz)	420 $\mu\text{V/V}$ + 8 μV	
	(300 kHz to 500 kHz)	1000 $\mu\text{V/V}$ + 200 μV	
	(500 kHz to 1 MHz)	1700 $\mu\text{V/V}$ + 300 μV	
	2.2 V to 22 V		
	(10 Hz to 20 Hz)	240 $\mu\text{V/V}$ + 400 μV	
	(20 Hz to 40 Hz)	90 $\mu\text{V/V}$ + 150 μV	
	(40 Hz to 20 kHz)	45 $\mu\text{V/V}$ + 50 μV	
	(20 kHz to 50 kHz)	75 $\mu\text{V/V}$ + 100 μV	
	(50 kHz to 100 kHz)	100 $\mu\text{V/V}$ + 200 μV	
	(100 kHz to 300 kHz)	280 $\mu\text{V/V}$ + 600 μV	
	(300 kHz to 500 kHz)	1000 $\mu\text{V/V}$ + 2 mV	
	(500 kHz to 1 MHz)	1500 $\mu\text{V/V}$ + 3.2 mV	
	22 V to 220 V		
	(10 Hz to 20 Hz)	240 $\mu\text{V/V}$ + 4 mV	
	(20 Hz to 40 Hz)	90 $\mu\text{V/V}$ + 1.5 mV	
	(40 Hz to 20 kHz)	52 $\mu\text{V/V}$ + 0.6 mV	
	(20 kHz to 50 kHz)	80 $\mu\text{V/V}$ + 1 mV	
	(50 kHz to 100 kHz)	150 $\mu\text{V/V}$ + 2.5 mV	
	(100 kHz to 300 kHz)	900 $\mu\text{V/V}$ + 16 mV	
	(300 kHz to 500 kHz)	4400 $\mu\text{V/V}$ + 40 mV	
	(500 kHz to 1 MHz)	8000 $\mu\text{V/V}$ + 80 mV	
	220 V to 1100 V		
	(15 Hz to 50 Hz)	300 $\mu\text{V/V}$ + 16 mV	
	(50 Hz to 1 kHz)	70 $\mu\text{V/V}$ + 3.5 mV	
	220 V to 750 V		
	(30 kHz to 50 kHz)	600 $\mu\text{V/V}$ + 11 mV	
	(50 kHz to 500 kHz)	2300 $\mu\text{V/V}$ + 45 mV	
	220 V to 1100 V		
	(40 Hz to 1 kHz)	90 $\mu\text{V/V}$ + 4 mV	
	(1 kHz to 20 kHz)	170 $\mu\text{V/V}$ + 6 mV	
	(20 kHz to 30 kHz)	600 $\mu\text{V/V}$ + 11 mV	
AC Voltage ⁵ – Measure ⁴	0 mV to 10 mV		Direct measurement method HP 3458A
	(1 Hz to 40 Hz)	0.03 % + 3 μV	
	(40 Hz to 1 kHz)	0.02 % + 1.1 μV	
	(1 kHz to 20 kHz)	0.03 % + 1.1 μV	
	(20 kHz to 50 kHz)	0.1 % + 1.1 μV	
	(50 kHz to 100 kHz)	0.5 % + 1.1 μV	
	(100 kHz to 300 kHz)	4 % + 2 μV	



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MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY ^{1,2} (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
AC Voltage ⁵ – Measure ⁴ (continued)	10 mV to 100 mV (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz) (1 MHz to 2 MHz) 100 mV to 1 V (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz) (1 MHz to 2 MHz) 1 V to 10 V (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz) (1 MHz to 2 MHz) 10 V to 100 V (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz) 100 V to 700 V (1 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz)	0.007 % + 4 µV 0.007 % + 2 µV 0.014 % + 2 µV 0.03 % + 2 µV 0.08 % + 2 µV 0.3 % + 10 µV 1 % + 10 µV 1.5 % + 10 µV 0.007 % + 40 µV 0.007 % + 20 µV 0.014 % + 20 µV 0.03 % + 20 µV 0.08 % + 20 µV 0.3 % + 100 µV 1 % + 100 µV 1.5 % + 100 µV 0.007 % + 400 µV 0.007 % + 200 µV 0.014 % + 200 µV 0.03 % + 200 µV 0.08 % + 200 µV 0.3 % + 1 mV 1 % + 1 mV 1.5 % + 1 mV 0.02 % + 4 mV 0.02 % + 2 mV 0.02 % + 2 mV 0.035 % + 2 mV 0.12 % + 2 mV 0.4 % + 10 mV 1.5 % + 10 mV 0.04 % + 28 mV 0.04 % + 14 mV 0.06 % + 14 mV 0.12 % + 14 mV 0.3 % + 14 mV	Direct measurement method HP 3458A

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	0 mV to 200 mV (1 Hz to 10 Hz) (10 Hz to 40 Hz) (40 Hz to 100 Hz) (100 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz)	165 $\mu\text{V/V}$ + 14 μV 140 $\mu\text{V/V}$ + 4 μV 120 $\mu\text{V/V}$ + 4 μV 110 $\mu\text{V/V}$ + 2 μV 140 $\mu\text{V/V}$ + 4 μV 340 $\mu\text{V/V}$ + 8 μV 770 $\mu\text{V/V}$ + 20 μV	Direct measurement method Fluke 8508A Direct measurement method Fluke 8508A
	200 mV to 2 V (1 Hz to 10 Hz) (10 Hz to 40 Hz) (40 Hz to 100 Hz) (100 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz)	150 $\mu\text{V/V}$ + 120 μV 120 $\mu\text{V/V}$ + 20 μV 90 $\mu\text{V/V}$ + 20 μV 75 $\mu\text{V/V}$ + 20 μV 110 $\mu\text{V/V}$ + 20 μV 220 $\mu\text{V/V}$ + 40 μV 570 $\mu\text{V/V}$ + 200 μV 0.3 % + 2 mV 1 % + 20 mV	
	2 V to 20 V (1 Hz to 10 Hz) (10 Hz to 40 Hz) (40 Hz to 100 Hz) (100 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz)	150 $\mu\text{V/V}$ + 1.2 mV 120 $\mu\text{V/V}$ + 200 μV 90 $\mu\text{V/V}$ + 200 μV 75 $\mu\text{V/V}$ + 200 μV 110 $\mu\text{V/V}$ + 200 μV 220 $\mu\text{V/V}$ + 400 μV 570 $\mu\text{V/V}$ + 2 mV 0.3 % + 20 mV 1 % + 200 mV	
	20 V to 200 V (1 Hz to 10 Hz) (10 Hz to 40 Hz) (40 Hz to 100 Hz) (100 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz) (100 kHz to 300 kHz) (300 kHz to 1 MHz)	150 $\mu\text{V/V}$ + 12 mV 120 $\mu\text{V/V}$ + 2 mV 90 $\mu\text{V/V}$ + 2 mV 75 $\mu\text{V/V}$ + 2 mV 110 $\mu\text{V/V}$ + 2 mV 220 $\mu\text{V/V}$ + 4 mV 570 $\mu\text{V/V}$ + 20 mV 0.3 % + 200 mV 1 % + 2 V	
	200 V to 1050 V (1 Hz to 10 Hz) (10 Hz to 40 Hz) (40 Hz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz)	150 $\mu\text{V/V}$ + 70 mV 120 $\mu\text{V/V}$ + 20 mV 120 $\mu\text{V/V}$ + 20 mV 230 $\mu\text{V/V}$ + 40 mV 580 $\mu\text{V/V}$ + 200 mV	

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	0 kV to 2 kV (20 Hz to 100 Hz) (100 Hz to 400 Hz) (2 kV to 20 kV) 20 Hz to 100 Hz	0.07 % + 2 V 0.4 % + 4 V 0.2 % + 20 V	Direct measurement method Vitretek 4620B
AC Voltage – Measure ⁴ (AC Band >2 MHz)	0 mV to 10 mV (45 Hz to 100 kHz) (100 kHz to 1 MHz) (1 MHz to 4 MHz) (4 MHz to 8 MHz) 10 mV to 100 mV (45 Hz to 100 kHz) (100 kHz to 1 MHz) (1 MHz to 4 MHz) (4 MHz to 8 MHz) (8 MHz to 10 MHz) 100 mV to 1 V (45 Hz to 100 kHz) (100 kHz to 1 MHz) (1 MHz to 4 MHz) (4 MHz to 8 MHz) (8 MHz to 10 MHz) 1 V to 10 V (45 Hz to 100 kHz) (100 kHz to 1 MHz) (1 MHz to 4 MHz) (4 MHz to 8 MHz) (8 MHz to 10 MHz) 10 V to 100 V (45 Hz to 100 kHz) 100 V to 700 V (45 Hz to 100 kHz)	0.09 % + 6 µV 1.2 % + 5 µV 7 % + 7 µV 20 % + 8 µV 0.09 % + 60 µV 2 % + 50 µV 4 % + 70 µV 4 % + 80 µV 15 % + 100 µV 0.09 % + 600 µV 2 % + 500 µV 4 % + 700 µV 4 % + 800 µV 15 % + 1 mV 0.09 % + 6 mV 2 % + 5 mV 4 % + 7 mV 4 % + 8 mV 15 % + 10 m 0.12 % + 2 mV 0.3 % + 70 mV	Direct measurement method HP 3458A
AC Voltage – Amplitude Flatness, Measure ⁴	1 V to 2 V (10 Hz to 10 MHz) (10 MHz to 30 MHz) (30 MHz to 50 MHz) (50 MHz to 100 MHz)	0.08 % 0.16 % 0.4 % 0.8 %	Indirect measurement method HP 3458A w/Fluke A55
AC Current ⁵ – Generate ³	1 nA to 220 µA (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 1 kHz)	250 µA/A + 16 nA 160 µA/A + 10 nA 120 µA/A + 8 nA	Direct measurement method Fluke 5720A

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AC Current ⁵ – Generate ³ (continued)	(1 kHz to 5 kHz) (5 kHz to 10 kHz)	280 μ A/A + 12 nA 1100 μ A/A + 65 nA	Direct measurement method Fluke 5720A
	220 μ A to 2.2 mA (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz)	250 μ A/A + 40 nA 160 μ A/A + 35 nA 120 μ A/A + 35 nA 200 μ A/A + 110 nA 1100 μ A/A + 650 nA	
	2.2 mA to 22 mA (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz)	250 μ A/A + 400 nA 160 μ A/A + 350 nA 120 μ A/A + 350 nA 200 μ A/A + 550 nA 1100 μ A/A + 5 μ A	
	22 mA to 220 mA (10 Hz to 20 Hz) (20 Hz to 40 Hz) (40 Hz to 1 kHz)	250 μ A/A + 4 μ A 160 μ A/A + 3.5 μ A 120 μ A/A + 2.5 μ A	
	22 mA to 220 mA (1 kHz to 5 kHz) (5 kHz to 10 kHz)	200 μ A/A + 3.5 μ A 1100 μ A/A + 10 μ A	
	220 mA to 2.2 A (20 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz)	260 μ A/A + 35 μ A 450 μ A/A + 80 μ A 7000 μ A/A + 160 μ A	
	2.2 A to 11 A (40 Hz to 1 kHz) (1 kHz to 5 kHz) (5 kHz to 10 kHz)	460 μ A/A + 170 μ A 950 μ A/A + 380 μ A 600 μ A/A + 750 μ A	
	1 A to 20 A (1 Hz to 5 kHz)	0.025 + (0.012 F) % (where F is frequency in kHz)	
	20 A to 100 A (1 Hz to 1 kHz)	0.1 A	
	11 A to 20.5 A (45 Hz to 100 Hz) (100 Hz to 1 kHz) (1 kHz to 5 kHz)	0.12 % + 5 mA 0.15 % + 5 mA 3 % + 5 mA	
			Indirect measurement method Shepherd Scientific 100 w/Fluke Y5020
			Indirect measurement method Shepherd Scientific 100 w/Valhalla 2575A
			Direct measurement method Fluke 5520A



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	0 A to 1000 A (45 Hz to 440 Hz)	0.28 % + 0.11 A	Indirect measurement method Fluke 5520A w/50 turn coil
AC Current – Measure ⁴	0 µA to 100 µA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 5 kHz)	0.4 % + 30 nA 0.15 % + 30 nA 0.06 % + 30 nA	Direct measurement method HP 3458A
	100 µA to 1 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 100 Hz) (100 Hz to 5 kHz) (5 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz)	0.4 % + 200 nA 0.15 % + 200 nA 0.06 % + 200 nA 0.03 % + 200 nA 0.06 % + 200 nA 0.4 % + 400 nA 0.55 % + 1.5 µA	
	1 mA to 10 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 100 Hz) (100 Hz to 5 kHz) (5 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz)	0.4 % + 2 µA 0.15 % + 2 µA 0.06 % + 2 µA 0.03 % + 2 µA 0.06 % + 2 µA 0.4 % + 4 µA 0.55 % + 15 µA	
	10 mA to 100 mA (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 100 Hz) (100 Hz to 5 kHz) (5 kHz to 20 kHz) (20 kHz to 50 kHz) (50 kHz to 100 kHz)	0.4 % + 20 µA 0.15 % + 20 µA 0.06 % + 20 µA 0.03 % + 20 µA 0.06 % + 20 µA 0.4 % + 40 µA 0.55 % + 150 µA	
	100 mA to 1 A (10 Hz to 20 Hz) (20 Hz to 45 Hz) (45 Hz to 100 Hz) (100 Hz to 5 kHz) (5 kHz to 20 kHz) (20 kHz to 50 kHz)	0.4 % + 200 µA 0.16 % + 200 µA 0.08 % + 200 µA 0.1 % + 200 µA 0.3 % + 200 µA 1 % + 400 µA	
	0 µA to 200 µA (1 Hz to 10 Hz) (10 Hz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz)	310 µA/A + 20 nA 300 µA/A + 20 nA 710 µA/A + 20 nA 0.4 % + 20 nA	

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AC Current – Measure ⁴ (continued)	200 µA to 2 mA (1 Hz to 10 Hz) (10 Hz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz)	310 µA/A + 200 nA 300 µA/A + 200 nA 710 µA/A + 200 nA 0.4 % + 200 nA	Direct measurement method Fluke 8508A
	2 mA to 20 mA (1 Hz to 10 Hz) (10 Hz to 10 kHz) (10 kHz to 30 kHz) (30 kHz to 100 kHz)	310 µA/A + 2 µA 300 µA/A + 2 µA 710 µA/A + 2 µA 0.4 % + 2 µA	
	20 mA to 200 mA (1 Hz to 10 Hz) (10 Hz to 10 kHz) (10 kHz to 30 kHz)	310 µA/A + 20 µA 290 µA/A + 20 µA 630 µA/A + 20 µA	
	200 mA to 2 A (10 Hz to 2 kHz) (2 kHz to 10 kHz) (10 kHz to 30 kHz)	620 µA/A + 200 µA 730 µA/A + 200 µA 0.3 % + 200 µA	
	2 A to 20 A (10 Hz to 2 kHz) (2 kHz to 10 kHz)	820 µA/A + 2 mA 0.25 % + 2 mA	
	1 A to 20 A (1 Hz to 5 kHz)	0.025 % + (0.012 %*F) of RDG where F is frequency in kHz	Indirect measurement method Fluke Y5020 w/ Fluke 8508A
	20 A to 100 A (1 Hz to 1 kHz)	0.1 A	Indirect measurement method Valhalla 2575A w/ Fluke 8508A



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AC Resistance – Generate ³	10 Ω		Direct measurement method HP 42030 resistor set
	(DC to 1 MHz)	0.13 %	
	(1 MHz to 2 MHz)	0.14 %	
	(2 MHz to 3 MHz)	0.16 %	
	(3 MHz to 4 MHz)	0.17 %	
	(4 MHz to 5 MHz)	0.2 %	
	(5 MHz to 10 MHz)	0.5 %	
	(10 MHz to 13 MHz)	0.7 %	
	100 Ω		
	(DC to 1 MHz)	0.13 %	
	(1 MHz to 2 MHz)	0.14 %	
	(2 MHz to 3 MHz)	0.15 %	
	(3 MHz to 4 MHz)	0.15 %	
	(4 MHz to 5 MHz)	0.15 %	
	(5 MHz to 10 MHz)	0.3 %	
	(10 MHz to 13 MHz)	0.4 %	
	1 kΩ		
	(DC to 100 kHz)	0.13 % + 0.2 Ω	
	(100 kHz to 1 MHz)	0.13 % + 0.2 Ω	
	(1 MHz to 2 MHz)	0.13 % + 0.2 Ω	
	(2 MHz to 3 MHz)	0.13 % + 0.2 Ω	
	(3 MHz to 4 MHz)	0.14 % + 0.2 Ω	
	(4 MHz to 5 MHz)	0.15 % + 0.2 Ω	
	(5 MHz to 10 MHz)	0.3 % + 0.2 Ω	
	(10 MHz to 13 MHz)	0.4 % + 0.2 Ω	
	10 kΩ		
	(DC to 100 kHz)	0.12 % + 2 Ω	
	(100 kHz to 1 MHz)	0.13 % + 2 Ω	
	100 kΩ		
	(DC to 100 kHz)	0.13 % + 20 Ω	
	(100 kHz to 1 MHz)	0.13 % + 20 Ω	
AC Resistance – Measure ⁴	1 Ω:		Direct measurement method HP 4284A
	100 Hz	1.7 %	
	1 kHz	1.5 %	
	10 kHz	1.5 %	
	100 kHz	1.5 %	
	10 Ω:		
	100 Hz	0.31 %	
	1 kHz	0.20 %	
	10 kHz	0.22 %	
	100 kHz	0.22 %	
	100 Ω:		
	100 Hz	0.092 %	



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AC Resistance – Measure ⁴ (continued)	1 kHz 10 kHz 100 kHz 1 kΩ: 100 Hz 1 kHz 10 kHz 100 kHz 10 kΩ: 100 Hz 1 kHz 10 kHz 100 kHz 100 kΩ: 100 Hz 1 kHz 10 kHz 100 kHz	0.092 % 0.12 % 0.12 % 0.92 % 0.92 % 0.92 % 0.12 % 0.092 % 0.092 % 0.092 % 0.10 % 0.10 % 0.10 % 0.10 % 0.10 % 0.12 % 0.28 %	Direct measurement method HP 4284A
AC Power – Generate ³ (45 Hz to 65 Hz)	33 mV to 330 mV (3.3 mA to 8.999 mA) (9 mA to 32.999 mA) (33 mA to 89.99 mA) (90 mA to 329.99 mA) (330 mA to 0.8999 A) (0.9 A to 2.1999 A) (2.2 A to 4.4999 A) (4.5 A to 20.5 A) 330 mV to 1020 V (3.3 mA to 8.999 mA) (9 mA to 32.999 mA) (33 mA to 89.99 mA) (90 mA to 329.99 mA) (330 mA to 0.8999 A) (0.9 A to 2.1999 A) (2.2 A to 4.4999 A) (4.5 A to 20.5 A)	(% of output in Watts) 0.14 % 0.1 % 0.14 % 0.1 % 0.13 % 0.11 % 0.13 % 0.11 % 0.12 % 0.08 % 0.12 % 0.08 % 0.11 % 0.09 % 0.12 % 0.1 %	Direct measurement method Fluke 5520A
Capacitance – Generate ³	0.19 nF to 1.0999 nF (10 Hz to 10 kHz) 1.1 nF to 3.2999 nF (10 Hz to 3 kHz) 3.3 nF to 10.9999 nF (10 Hz to 1 kHz)	0.5 % + 0.01 nF 0.5 % + 0.01 nF 0.25 % + 0.01 nF	Direct measurement method Fluke 5520A



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Capacitance – Generate ³ (continued)	11 nF to 109.999 nF (10 Hz to 1 kHz) 110 nF to 329.999 nF (10 Hz to 1 kHz) 330 nF to 1.09999 µF (10 Hz to 600 Hz) 1.1 µF to 3.29999 µF (10 Hz to 300 Hz) 3.3 µF to 10.9999 µF (10 Hz to 150 Hz) 11 µF to 32.9999 µF (10 Hz to 120 Hz) 33 µF to 109.999 µF (10 Hz to 80 Hz) 110 µF to 329.999 µF (0 Hz to 50 Hz) 330 µF to 1.09999 mF (0 Hz to 20 Hz) 1.1 mF to 3.2999 mF (0 Hz to 6 Hz) 3.3 mF to 10.9999 mF (0 Hz to 2 Hz) 11 mF to 32.9999 mF (0 Hz to 0.6 Hz) 33 mF to 110 mF (0 Hz to 0.2 Hz)	0.25 % + 0.1 nF 0.25 % + 0.3 nF 0.25 % + 1 nF 0.25 % + 3 nF 0.25 % + 10 nF 0.4 % + 30 nF 0.45 % + 100 nF 0.45 % + 300 nF 0.45 % + 1 µF 0.45 % + 3 µF 0.45 % + 10 µF 0.75 % + 30 µF 1.1 % + 100 µF	Direct measurement method Fluke 5520A
Capacitance – Generate ³ / Measure ⁴	1 pF: 100 kHz 10 pF: 10 kHz 100 kHz 100 pF: 1 kHz 10 kHz 100 kHz	0.50 % 0.39 % 0.29 % 0.38 % 0.13 % 0.10 %	Direct measurement method HP 4284A



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Capacitance – Generate ³ / Measure ⁴ (continued)	1 nF: 100 Hz 1 kHz 10 kHz 100 kHz 10 nF: 100 Hz 1 kHz 10 kHz 100 kHz 100 nF: 100 Hz 1 kHz 10 kHz 100 kHz 1 uF: 100 Hz 1 kHz 10 kHz 100 kHz 10 uF: 100 Hz 1 kHz 10 kHz 100 uF: 100 Hz 1 kHz 1 mF: 100 Hz	0.38 % 0.12 % 0.092 % 0.12 % 0.12 % 0.092 % 0.092 % 0.092 % 0.12 % 0.092 % 0.092 % 0.093 % 0.20 % 0.092 % 0.092 % 0.20 % 1.0 % 0.092 % 0.17 % 1.0 % 0.29 % 1.0 % 1.2%	Direct measurement method HP 4284A
Inductance – Generate ³ / Measure ⁴	10 uH: 100 kHz 100 uH: 10 kHz 100 kHz 1 mH: 1 kHz 10 kHz 100 kHz 10 mH: 100 Hz 1 kHz 10 kHz 100 kHz 100 mH: 100 Hz 1 kHz 10 kHz	0.24 % 0.24 % 0.17 % 0.22 % 0.17 % 0.12 % 0.33 % 0.15 % 0.092 % 0.10 % 0.27 % 0.092 % 0.093 %	Direct measurement method HP 4284A

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Inductance – Generate ³ / Measure ⁴ (Continued)	100 kHz 1 H: 100 Hz 1 kHz 10 H: 100 Hz	0.28 % 0.092 % 0.092 % 0.092 %	Direct Measurement Method HP 4284A Continued
Oscilloscopes - Voltage Function – DC Signal (50 Ω)	±1 mV to ±5 V	0.025 % + 25 µV	Direct measurement method Fluke 9500B w/9530
Oscilloscopes Voltage Function - DC Signal (1 MΩ)	±1 mV to ±200 V	0.025 % + 25 µV	
Oscilloscopes Square Wave Signal (<10 kHz) (50 Ω)	40 µV _{p-p} to 5 V _{p-p} ≥1 mV ≤1 mV	0.1 % + 10 µV 1.0 % + 10 µV	
Oscilloscopes - Square Wave Signal (<10 kHz) (1 MΩ)	40 µV _{p-p} to 200 V _{p-p} ≥1 mV ≤1 mV	0.1 % + 10 µV 1.0 % + 10 µV	
Oscilloscopes - Square Wave Frequency	10 Hz to 100 kHz	0.25 µHz/Hz	
Oscilloscopes - Edge Function - Rise/Fall Time	150 ps (Fast Edge) 500 ps (Edge)	15 ps 40 ps	
Oscilloscopes – Leveled Sine Function - Leveled Sine Amplitude (Single Ref Frequency 50 kHz to 10 MHz)	5 mV _{p-p} to 5 V _{p-p} (0.1 Hz to 550 MHz) 5 mV _{p-p} to 3 V _{p-p} (550 MHz to 2.5 GHz) 5 mV _{p-p} to 2 V _{p-p} (2.5 GHz to 3.2 GHz)	(@ single reference frequency) 1.5 % 1.5 % 1.5 %	
Oscilloscopes – Leveled Sine Flatness with reference to frequency	(into VSWR of 1.6:1) 0.1 Hz to 300 MHz 300 MHz to 550 MHz 550 MHz to 1.1 GHz 1.1 GHz to 3.2 GHz (into VSWR of 1.2:1) 0.1 Hz to 300 MHz 300 MHz to 550 MHz 550 MHz to 1.1 GHz 1.1 GHz to 3.2 GHz	4 % 4 % 5 % 5 % 2 % 2.5 % 3.5 % 4 %	

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Oscilloscopes – Timing Marker Function - Square	9.0091 ns to 55 s	0.25 µs/s	Direct measurement method Fluke 9500B w/9530
Pulse and Narrow Triangle	900.91 ns to 55 s	0.25 µs/s	
Sine	450.5 ps to 9.009 ns	0.25 µs/s	
Oscilloscopes – Input Impedance Function - Resistance Measurement	10 Ω to 40 Ω 40 Ω to 90 Ω 90 Ω to 150 Ω 50 kΩ to 800 kΩ 800 kΩ to 1.2 MΩ 1.2 MΩ to 12 MΩ	0.5 % 0.1 % 0.5 % 0.5 % 0.1 % 0.5 %	
Oscilloscopes – Pulse Width Function	1 ns to 100 ns	5 % + 200 ps	
Time and Frequency			
Timers/Stop Watches ⁵	0.001 s to 99999.999 s	0.001 %	Comparison measurement method VWR 62344-880
Frequency – Generate ³ / Measure ⁴	0.1 MHz, 1 MHz, 5 MHz, 10 MHz	(5 x 10 ⁻¹² F) Hz Where F is frequency in Hz	Direct measurement method Fluke 910R
	1 Hz to 26.5 GHz	(1.2 x 10 ⁻¹⁰ F) Hz Where F is frequency in Hz	Direct measurement method HP 3325, Fluke 910R as external time base
RF/Microwave and Electromagnetics			
Amplitude Modulation – Measure ⁴ (150 kHz to 10 MHz)	Rate: 50 Hz to 10 kHz Depth: 5 % to 99 %	2 % + 1 digit	Direct measurement method HP 8902A w/HP 11793A (using peak detector)
	Rate: 20 Hz to 10 kHz Depth: 5 % to 99 %	3 % + 1 digit	
(10 MHz to 1300 MHz)	Rate: 50 Hz to 50 kHz Depth: 5 % to 99 %	1 % + 1 digit	
	Rate: 20 Hz to 20 kHz Depth: 5 % to 99 %	3 % + 1 digit	
(1.3 GHz to 26.5 GHz)	Rate: 50 Hz to 50 kHz Depth: 5 % to 99 %	1.5 % + 1 digit	

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MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY ^{1,2} (±)	CALIBRATION METHOD OR PROCEDURE, STANDARD EQUIPMENT (OPTIONAL)
	Rate: 20 Hz to 100 kHz Depth: 5 % to 99 %	3 % + 1 digit	Direct measurement method HP 8902A w/HP 11793A (using peak detector)
Frequency Modulation – Measure ⁴ (250 kHz to 10 MHz) (10 MHz to 1.3 GHz) (1.3 GHz to 26.5 GHz)	Rate: 20 Hz to 10 kHz Deviation: 40 kHz peak	2 % + 1 digit	
	Rate: 50 Hz to 100 kHz Deviation: 400 kHz peak	1 % + 1 digit	
	Rate: 20 Hz to 200 kHz Deviation: 400 kHz peak	5 % + 1 digit	
	Rate: 50 Hz to 100 kHz Deviation: 400 kHz peak	1 % + 1 digit	
	Rate: 20 Hz to 200 kHz Deviation: 40 kHz peak	5 % + 1 digit	
Amplitude Modulation – Flatness Measure ⁴ (10 MHz to 1.3 GHz Carrier Frequency)	Rate: 90 Hz to 10 kHz Depth: 20 % to 80 %	0.3 % + 1 digit	Direct measurement method HP 8902A
Modulation Residual AM – Measure ⁴ 50 Hz to 3 kHz BW	0 % rms to 100 % rms	0.01 % rms	
Modulation Residual FM – Measure ⁴ 50 Hz to 3 kHz BW	≤100 MHz 1300 MHz	1 Hz _{rms} 8.1 Hz _{rms}	
Phase Modulation – Measure ⁴	(150 kHz to 10 MHz) 200 Hz to 10 kHz	4 % + 1 digit	Direct measurement method HP 8902A w/HP 11793A (using peak detector)
	(10 MHz to 1.3 GHz) 200 Hz to 20 kHz	3 % + 1 digit	
	(1.3 GHz to 26.5 GHz) 200 Hz to 20 kHz	3 % + 1 digit	
Noise Measurement ⁴ (Distortion Harmonics <330 kHz)	20 Hz to 20 kHz 20 kHz to 100 kHz	1 dB 2 dB	Direct measurement method HP 8903B
Single Side Band Phase Noise (SSB)	10 MHz to 1300 MHz	1 dB	Direct measurement method HP 8902A-030, 037
Attenuation – Generate ³	(200 Hz to 80 MHz) 0 dB to 18 dB 20 dB to 58 dB 60 dB to 98 dB	0.04 dB 0.09 dB 0.20 dB	Direct measurement method HP 3335A



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Attenuation – Generate ³ (continued)	(DC to 18 GHz) 1 dB 2 dB 3 dB to 6 dB 7 dB to 8 dB 9 dB 10 dB 11 dB (18 GHz to 26.5 GHz) 1 dB 2 dB 3 dB to 6 dB 7 dB to 8 dB 9 dB 10 dB 11 dB	0.35 dB 0.45 dB 0.55 dB 0.60 dB 0.65 dB 0.70 dB 0.80 dB 0.40 dB 0.50 dB 0.70 dB 0.80 dB 0.85 dB 0.90 dB 1.10 dB	Direct measurement method Agilent 84904K, APC 3.5 mm connector
	(DC to 6 GHz) 10 dB 20 dB 30 dB 40 dB 50 dB 60 dB 70 dB to 80 dB 90 dB (6 GHz to 12.4 GHz) 10 dB 20 dB 30 dB 40 dB 50 dB 60 dB 70 dB 80 dB 90 dB 20 dB 30 dB 40 dB 50 dB 60 dB 70 dB 80 dB 90 dB	0.3 dB 0.5 dB 0.6 dB 0.7 dB 0.8 dB 1.0 dB 1.1 dB 1.2 dB 0.4 dB 0.5 dB 0.7 dB 0.9 dB 1.0 dB 1.3 dB 1.5 dB 1.6 dB 1.7 dB 0.6 dB 0.8 dB 1.1 dB 1.2 dB 1.4 dB 1.7 dB 1.8 dB 2.1 dB	Direct measurement method HP 8497K, APC 3.5 mm Connector



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Attenuation – Generate ³ (continued)	(18 GHz to 26.5 GHz) 10 dB 20 dB 30 dB 40 dB 50 dB 60 dB 70 dB 80 dB 90 dB	0.7 dB 0.8 dB 1.0 dB 1.5 dB 1.6 dB 1.9 dB 2.3 dB 2.5 dB 2.8 dB	Direct measurement method HP 8497K, APC 3.5 mm Connector
Attenuation – Measure ⁴	(100 kHz to 26.5 GHz) 0 dB to -20 dB -20 dB to -40 dB -40 dB to -60 dB -60 dB to -80 dB -80 dB to -100 dB -100 dB to -127 dB	0.05 dB + M 0.18 dB + M 0.20 dB + M 0.24 dB + M 0.28 dB + M 0.35 dB + M Where M is the mis- match uncertainty, which has the fol- lowing best-case values: 100 kHz to 6 GHz–0.02 dB, 6 GHz to 26.5 GHz– 0.07 dB	Direct measurement method HP 8902A w/11722A and 11793A
Power – Generate ³ (into 50 Ω)	(0.001 Hz to 100 kHz) -56.02 dBm to 13.52 dBm 13.52 dBm to 23.98 dBm (100 kHz to 10 MHz) -56.02 dBm to +13.52 dBm (10 MHz to 20 MHz) -56.02 dBm to -16.02 dBm -16.02 dBm to +13.52 dBm (100 kHz to 20 MHz) 13.52 dBm to 23.98 dBm	0.2 dB 0.1 dB 0.6 dB 0.9 dB 0.6 dB 0.4 dB	Direct measurement method HP 3325B (sinewave 0 dB attenuation, BNC connector)
	(0.01 GHz to 3 GHz) +10 dBm to -9.95 dBm -10 dBm to -19.95 dBm -20 dBm to -49.95 dBm -50 dBm to -79.95 dBm -80 dBm to -100 dBm	0.9 dBm 1.2 dBm 1.5 dBm 1.8 dBm 2.1 dBm	Direct measurement method HP 8340B, internally leveled Type N connector

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Power – Generate ³ (into 50 Ω) (continued)	(2.3 GHz to 20 GHz) +18 dBm to +10 dBm +10 dBm to -9.95 dBm -10 dBm to -19.95 dBm -20 dBm to -49.95 dBm -50 dBm to -79.95 dBm -80 dBm to -100 dBm (20 GHz to 26.5 GHz) +18 dBm to +10 dBm +10 dBm to -9.95 dBm -10 dBm to -19.95 dBm -20 dBm to -49.95 dBm -50 dBm to -79.95 dBm -80 dBm to -100 dBm	1.8 dBm 1.5 dBm 2.0 dBm 2.3 dBm 2.6 dBm 2.9 dBm 2.3 dBm 2.0 dBm 2.5 dBm 2.8 dBm 3.1 dBm 3.4 dBm	Direct measurement method HP 8340B, internally leveled Type N connector
Power – Measure ³	(0.0001 GHz to 18 GHz) -20 dBm to -15 dBm -15 dBm to -10 dBm -10 dBm to 10 dBm 10 dBm to 20 dBm (18 GHz to 26.5 GHz) -20 dBm to -15 dBm -15 dBm to -10 dBm -10 dBm to 10 dBm 10 dBm to 20 dBm	0.34 dBm 0.15 dBm 0.12 dBm 0.19 dBm 0.35 dBm 0.17 dBm 0.14 dBm 0.21 dBm	Direct measurement method HP 437B with 8482A Direct measurement method HP 437B with 8485A
Harmonic and Non-Harmonic Amplitude Measure ⁴ (0.02 Hz to 25.5 kHz)	+30 dBV to -120 dBV	0.6 dB	Direct measurement method HP 3582A
Harmonic and Non-Harmonic Amplitude Measure ⁴ (9 kHz to 25 GHz)	0 dB to 60 dB Reference Level (Log Scale) (Linear Scale)	0.75 dB 3 %	Direct method HP 8592B
Harmonic and Non-Harmonic Amplitude Measure ⁴	-60 dB to -70 dB Reference Level (Log Scale) (Linear Scale)	1 dB 3 %	
Chemical/Gas			
pH ⁶ - Generate ³	4 pH 7 pH 10 pH	0.054 pH 0.037 pH 0.066 pH	Direct method using Buffer Solutions

¹The uncertainty covered by the Calibration and Measurement Capability (CMC) is expressed as the expanded uncertainty having a coverage probability of approximately 95 %. It is the smallest measurement uncertainty that a laboratory can achieve within its scope of accreditation when performing calibrations of a best existing device. The

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measurement uncertainty reported on a calibration certificate may be greater than that provided in the CMC due to the behavior of the calibration item and other factors that may contribute to the uncertainty of a specific calibration.

²When uncertainty is stated in relative terms (such as percent, a multiplier expressed as a decimal fraction or in scientific notation), it is in relation to instrument reading or instrument output, as appropriate, unless otherwise indicated.

³Capability is suitable for the calibration of measuring devices in the stated ranges.

⁴Capability is suitable for the calibration of devices intended to generate the indicated quantity in the stated ranges.

⁵Also available as site calibration. Note that actual measurement uncertainties achievable at a customer's site can normally be expected to be larger than the uncertainties listed on this Scope of Accreditation.

RDG = reading

BW = bandwidth

p-p = peak to peak

HV = high voltage

VSWR = voltage standing wave ratio

