



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

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CALIBRATION and TESTING

Valid to: March 1, 2012

Certificate Number: ACT-1317

I. Dimensional Calibration

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Gage Blocks*	Up to 6 in (7 to 20) in	(2.7 + 1.1L) μin (9.7 + 1.1L) μin	Comparator Master Gage Blocks LVDT Master Gage Blocks	CP-1
Calipers	Up to 72 in	(0.6R + 10L) μin	Gage Blocks	CP-2
Micrometers OD	Up to 72 in	(0.6R + 10L) μin	Gage Blocks	CP-3
Micrometers ID	Up to 30 in	(0.6R + 10L) μin	Gage Blocks	CP-3
Micrometers Depth	Up to 24 in	(0.6R + 10L) μin	Gage Blocks	CP-3
Indicators	Up to 12 in	67 μin	ULM	CP-4
Height Gages	Up to 72 in	(0.6R + 10L) μin	Gage Blocks	CP-5
Bore Gages, Tri-Bore	Up to 8 in	68 μin	Master Ring	CP-6
Bore Gages, 2-pt	Up to 0.020 in	85 μin	Indicator Checker	CP-6



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Pin Gages	Up to 1 in	43 µin	Bench Micrometer	CP-7
Plain Plug Gages *	Up to 20 in	(15 + 2D) µin	ULM Gage Blocks	CP-8
Plain Ring Gages *	(0.08 – 18) in	(10 + 2D) µin	Supermicrometer® Master Rings	CP-9
Thread Plug Gages * Major Diameter Pitch Diameter	Up to 8 in Up to 8 in	(26 + 2D) µin (54 + 2D) µin	ULM Thread Wires	CP-10
Thread Rings (Solid) * Minor Diameter Pitch Diameter	Up to 8 in	(33 + 2D) µin (45 + 2D) µin	ULM	CP-11
Thread Rings (Adj.) * Minor Diameter Pitch Diameter	Up to 8 in	(33 + 2D) µin 310 µin	ULM Master Setting Plugs	CP-12
Thread Measuring Wires *	Up to 80 TPI	13 µin	ULM 0.750 Roll 0.125 Roll	CP-13
Linear Scales * Steel Rules	Up to 72 in	(100 + 5L) µin	Measuring Microscope	CP-14
Tape Measures	Up to 300 ft	(500 + 5L) µin	CMM	CP-15
Levels, Machinist *	Up to 96 in	0.00015 in / ft	Surface Plate	CP-16
Pi Tapes *	Up to 60 ft	0.0005 in / ft Diameter	CMM	CP-17
CMM s Linear Accuracy Volumetric Accuracy Repeatability	Up to 120 in	(55 + 4L) µin (120 + 4L) µin 120 µin	Laser Interferometer Ball Bar Sphere	CP-18
Optical Comparators Linearity X-Y Axis Squareness	Up to 20 in Up to 30 in	150 µin 180 µin	Glass Master	CP-19

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Optical Comparators Magnification	10x 20x 31.25x 50x 61.25x 100x	0.001 in 0.0005 in 0.00032 in 0.0002 in 0.00016 in 0.0001 in	Glass Master Glass Rule	CP-19
Glass Masters*	Up to 12 in	28 μin	Measuring Microscope	CP-20
Measuring Microscopes	Up to 12 in	16 μin	Laser Interferometer	CP-21
Surface Analyzers	Up to 500 μin	(5 + 0.6R) μin	Roughness Standard	CP-22
Roughness Standards*	Up to 250 μin	3.5 μin	Profilometer	CP-23
Surface Plates Flatness Repeatability	(6 × 6) to (18 × 18) in (18 × 24) to (72 × 144) in 0.002 in	48 μin (30 + 0.5D) μin 30 μin	Electronic Levels Autocollimator Repeat O Meter	CP-24
Electronic Levels*	± 1 000 arc sec	1.2 arc sec	Gage Blocks Sine Plate	CP-25
Autocollimators*	Up to 30 min	0.82 arc sec	Angle Generator	CP-26

II. Dimensional Inspection / Measurement

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Angle*	(0 to 360) °	30 arc sec 1.5 arc sec 16 arc sec 14 arc sec	CMM Sine Plate Optical Comparator Measuring Microscope	Dimensional Layout GD&T Metrology
Diameter*	Up to 40 in Up to 16 in Up to 8 in	(160 + 10D) μin (180 + 10D) μin (100 + 10D) μin	CMM Optical Comparator Measuring Microscope	Dimensional Layout GD&T Metrology

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Flatness	(0 to 0.020) μ in	73 μ in/ft 1.6 μ in 45 μ in 48 μ in 110 μ in 30 μ in	CMM Optical Flat Autocollimator Electronic Levels Height Stand – LVDT Laser Interferometer	Dimensional Layout GD&T Metrology
Length* X Axis Y Axis Z Axis	Up to 40 in Up to 80 in Up to 40 in	(165 + 4L) μ in (190 + 4L) μ in (140 + 4L) μ in	CMM	Dimensional Layout GD&T Metrology
Volumetric *	40 in \times 80 in \times 40 in	350 μ in	CMM	Dimensional Layout GD&T Metrology
Length* X Axis Y Axis	Up to 8 in Up to 4 in	40 μ in 25 μ in	Microscope	Dimensional Layout GD&T Metrology
Length* X Axis Y Axis	Up to 12 in Up to 8 in	150 μ in 90 μ in	Optical Comparator	Dimensional Layout GD&T Metrology
Length	Up to 20 in Up to 6 in Up to 20 in Up to 1 in	(230 + 4L) μ in (2.7 + 1.1L) μ in (9 + 2L) μ in 43 μ in	Height Gage Laser Interferometer ULM Bench Micrometer	Dimensional Layout GD&T Metrology
Parallelism	(0 to 0.02) in	72 μ in / ft 73 μ in 32 μ in	CMM Height Stand, LVDT Measuring Microscope	Dimensional Layout GD&T Metrology
Roundness*	(0 to 0.02) in	33 μ in / in Diameter 10 μ in	CMM Roundness Tester	Dimensional Layout GD&T Metrology
Sphericity*	(0 to 0.02) in	180 μ in	CMM	Dimensional Layout GD&T Metrology
Squareness	(0 to 0.02) in	77 μ in / ft 1.6 μ in 86 μ in 18 μ in 35 μ in	CMM Optical Flat Height Stand – LVDT Laser Interferometer Measuring Microscope	Dimensional Layout GD&T Metrology
Straightness	(0 to 0.02) in	47 μ in 14 μ in 26 μ in	CMM Laser Interferometer Measuring Microscope	Dimensional Layout GD&T Metrology

III. Chemical Quantities



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
pH Meters	4, 7, 10 pH units	0.027 pH 20 µV/V + 1 µV	Buffer Solution Fluke 5520A	CP-27 OEM, GIDEP, MET/CAL Sourced Procedures
Conductivity	10 µS 100 µS 1000 µS 10 000 µS 100 000 µS	1 µS 10 µS 100 µS 1 000 µS 10 000 µS	Conductivity Solution	CP-28
	10 µS 100 µS 1000 µS 10 000 µS 100 000 µS	0.005 µS 0.05 µS 0.5 µS 5 µS 50 µS	Decade Box Multifunction Calibrator	OEM, GIDEP, MET/CAL Sourced Procedures

IV. Fluid Properties

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Refractometers	(0 to 100) %	0.28 + 0.6R	Standard Solution	CP-29
Viscosity Cups	10-120 cSt	1 cSt + 0.44 %	Viscosity Standard	CP-30
Volumetric Dispenser Calibration*	Up to 1 000 mL	0.014 mL	Analytical Balance	CP-31

V. Thermodynamic Calibration

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature - Measure	(-200 to 660) °C (661 to 1 370) °C	0.05 °C 3.0 °C	PRT Calibrator w/ thermocouple	OEM, GIDEP, MET/CAL Sourced Procedures

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		[EXPRESSED AS UNCERTAINTY(±)]		
Temperature - Source	(- 40 to 660) °C	0.5 °C	Dry Block	OEM, GIDEP, MET/CAL Sourced Procedures
IR Non-Contact Temperature Equipment*	(35 to 500) °C (200 to 1 150) °C	1.4 °C	Black Body	CP-49
Relative Humidity - Measure*	(10 to 50) %RH	0.5 °C	Chilled Mirror	OEM, GIDEP, MET/CAL Sourced Procedures

VI. Time and Frequency Calibration

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Frequency	10 Hz to 1.3 GHz	1.7 X 10 ⁻⁹ Hz	GPS Reference	OEM, GIDEP, MET/CAL Sourced Procedures
Time Interval	Up to 24 hrs	13 ms	GPS Reference Frequency Counter	

VII. Calibration of Non-Destructive Testing Equipment

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Magnetic Particle Unit Ammeter Timer Black Light White Light	(0 to 20 000) A (0.01 to 9.99) s (0 to 19 990) μW/cm ² (0 to 199.9) fc	8.3 A 0.002 s 240 μW/cm ² 0.15 fc	Current Timer Digital Radiometer	CP-32
Magnetometer / Gaussmeter & Hall Effect Probes*	(0 to 100) G	0.34 G	Helmholtz Coil, Current Source	OEM & GIDEP Sourced Procedures

VIII. Mechanical Calibration

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Force Source and Measure (Compression / Tension)	(0 to 2 000) lbf	0.4 % + 0.6R	Class F Weights	CP-33
	(0 to 150 000) lbf	0.4 % + 0.6R	Load Cell	CP-34
Extensometers	(0 to 1) in	0.0001 in	Extensometer Calibrator	CP-35
Extrusion Plastometers Temperature Bore diameter Piston diameter	(100 to 400) °C Up to 0.25 in Up to 1 in	0.05 °C 0.0003 in 0.0001 in	PRT Pin Gage Micrometer	CP-36
Durometers	(0 to 822) gf (0 to 10) gf	0.34 units	Durocalibrator	CP-37
Durocalibrators* A-Scale D-Scale	(0 to 822) gf (0 to 10) gf	0.15 gf 0.5 gf	Gram Weight Measuring Microscope	CP-38
Pressure Gages and Transducers	(-15 to 100) psi (100 to 1 500) psi (1 000 to 15 000) psi	0.012 psi 0.38 psi 5.9 psi	Pressure Calibrator DWT	CP-39
Torque Analyzers	(0 to 2 000) lbf-ft	1 lbf-ft	Torque Arm Class F weight	CP-40
Torque Wrenches	(0 to 2 000) lbf-ft	2.8 lbf-ft	Torque Analyzer	CP-41
Mass	(1 to 200) g 200 g to 5 kg (5 to 52) kg	0.3 mg 6.2 mg 23 mg	Balance Class 1 Weights	CP-42
Scales and Balances	10 mg to 1g 1.1 g to 1 kg (1.1 to 20) kg	0.12 mg + 0.6R 1.8 mg + 0.6R 76 mg + 0.6R	Class 1 Weights	CP-43
	(50 to 1 000) lb (1 001 to 10 000) lb	0.15 lb + 0.6R 0.50 lb + 0.6R	Class F Weights	
Brinell Hardness Testers	(500 to 3 000) kgf	3 HBW	Hardness Test Blocks	CP-44

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Rockwell and Superficial Hardness Tester	HRA HRB HRC HRE HRF HRN HRT	1 HRA 1.2 HRB 0.8 HRC 1 HRE 1.2 HRF 1 HRN 1.2 HRT	Hardness Test Blocks	CP-45
Knoop Hardness Tester	(100 to 940) HK	25 HK	Hardness Test Blocks	CP-46
Vickers Hardness Tester	(100 to 940) HV	13 HV	Hardness Test Blocks	CP-47

IX. 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 $\mu\text{V}/\text{V} + 1 \mu\text{V}$ 11 $\mu\text{V}/\text{V} + 2 \mu\text{V}$ 12 $\mu\text{V}/\text{V} + 20 \mu\text{V}$ 18 $\mu\text{V}/\text{V} + 150 \mu\text{V}$ 18 $\mu\text{V}/\text{V} + 1.5 \text{ mV}$	Fluke 5520A	OEM, GIDEP, MET/CAL Sourced Procedures
DC Voltage - Measure	(10 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	7 $\mu\text{V}/\text{V} + 1 \mu\text{V}$ 6 $\mu\text{V}/\text{V} + 3 \mu\text{V}$ 6 $\mu\text{V}/\text{V} + 1 \mu\text{V}$ 8 $\mu\text{V}/\text{V} + 30 \mu\text{V}$ 8 $\mu\text{V}/\text{V} + 100 \mu\text{V}$	HP 3458A	
DC High Voltage - Measure	Up to 6 kV Up to 40 kV	10 mV/V 20 mV/V	HP 3458A w/ Probe	
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 (11 to 20) A (20 to 150) A (150 to 1 000) A	150 $\mu\text{A}/\text{A} + 20 \text{ nA}$ 100 $\mu\text{A}/\text{A} + 50 \text{ nA}$ 100 $\mu\text{A}/\text{A} + 250 \text{ nA}$ 100 $\mu\text{A}/\text{A} + 2.5 \mu\text{A}$ 200 $\mu\text{A}/\text{A} + 40 \mu\text{A}$ 380 $\mu\text{A}/\text{A} + 40 \mu\text{A}$ 500 $\mu\text{A}/\text{A} + 500 \mu\text{A}$ 1 mA/A + 750 μA 27 mA/A + 50 mA 27 mA/A + 50 mA	Fluke 5520A with 50 Turn Coil	

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DC Current - Measure	Up to 100 nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	35 µA/A + 40 pA 25 µA/A + 40 pA 25 µA/A + 100 pA 25 µA/A + 800 nA 25 µA/A + 5 µA 25 µA/A + 50 µA 40 µA/A + 500 µA 115 µA/A + 10 µA	HP 3458A	OEM, GIDEP, MET/CAL Sourced Procedures
DC High Current - Measure	(1 to 60) A (60 to 2 000) A	600 µA/A 15 mA/A + 2 A	HP 3458A w/ Shunt Clamp-on Meter	
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 330 MΩ to 1.1 GΩ	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 15 mΩ/Ω + 500 kΩ	Fluke 5520A	
Resistance – Measure	10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ	18 µΩ/Ω + 50 µΩ 15 µΩ/Ω + 0.5 mΩ 13 µΩ/Ω + 0.5 mΩ 13 µΩ/Ω + 5 mΩ 13 µΩ/Ω + 50 mΩ 18 µΩ/Ω + 2 Ω 53 µΩ/Ω + 100 Ω 503 µΩ/Ω + 1 kΩ 5 mΩ/Ω + 10 kΩ	HP 3458A	
DC Power - Source 33 mV to 1.02 kV	330 µA to 330 mA 330 mA to 3 A (3 to 20.5) A	0.023 % of Watts Output 0.022 % of Watts Output 0.07 % of Watts Output	Fluke 5520A	



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Electrical Simulation of Thermocouple Devices				
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	0.30 °C 0.26 °C 0.31 °C 0.5 °C 0.84 °C		
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1 000) °C	0.5 °C 0.16 °C 0.21 °C		
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1 200) °C	0.27 °C 0.17 °C 0.23 °C		
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C	0.33 °C 0.18 °C 0.26 °C 0.4 °C	Fluke 5520A	OEM, GIDEP, MET/CAL Sourced Procedures
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	(-250 to -100) °C (-100 to -25) °C (-25 to 410) °C (410 to 1 300) °C	0.4 °C 0.22 °C 0.19 °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 1400) °C (1400 to 1767) °C	0.47 °C 0.37 °C 0.46 °C		



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Electrical Simulation of Thermocouple Devices 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	Fluke 5520A	OEM, GIDEP, MET/CAL Sourced Procedures
Type U	(-200 to 0) °C (0 to 600) °C	0.56 °C 0.27 °C		
Electrical Simulation of RTD Devices Pt 395, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C (630 to 800) °C	0.05 °C 0.07 °C 0.1 °C 0.12 °C 0.23 °C		
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C	0.05 °C 0.07 °C 0.1 °C 0.12 °C		
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to 100) °C (100 to 400) °C (400 to 600) °C (600 to 630) °C	0.25 °C 0.06 °C 0.09 °C 0.1 °C 0.23 °C		
Pt 385, 200 Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.05 °C 0.14 °C 0.16 °C		
Pt 385, 500 Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.06 °C 0.09 °C 0.11 °C		
Pt 385, 1000 Ω	(-200 to 260) °C (0 to 300) °C (260 to 600) °C (600 to 630) °C	0.05 °C 0.06 °C 0.07 °C 0.23 °C		
PtNi 385, 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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AC Voltage - Source	<p>(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</p> <p>(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</p> <p>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</p> <p>(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</p> <p>(33 to 330) V (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz</p> <p>330 V to 1.02 kV 45 Hz to 10 kHz (1 to 5) kHz (5 to 10) kHz</p>	<p>800 $\mu\text{V}/\text{V} + 6 \mu\text{V}$ 150 $\mu\text{V}/\text{V} + 6 \mu\text{V}$ 200 $\mu\text{V}/\text{V} + 6 \mu\text{V}$ 1 mV/V + 6 μV 3.5 mV/V + 12 μV 8.0 mV/V + 50 μV</p> <p>300 $\mu\text{V}/\text{V} + 8 \mu\text{V}$ 145 $\mu\text{V}/\text{V} + 8 \mu\text{V}$ 160 $\mu\text{V}/\text{V} + 8 \mu\text{V}$ 350 $\mu\text{V}/\text{V} + 8 \mu\text{V}$ 800 $\mu\text{V}/\text{V} + 32 \mu\text{V}$ 2 mV/V + 70 μV</p> <p>300 $\mu\text{V}/\text{V} + 50 \mu\text{V}$ 150 $\mu\text{V}/\text{V} + 60 \mu\text{V}$ 190 $\mu\text{V}/\text{V} + 60 \mu\text{V}$ 300 $\mu\text{V}/\text{V} + 50 \mu\text{V}$ 700 $\mu\text{V}/\text{V} + 125 \mu\text{V}$ 2.4 mV/V + 600 μV</p> <p>300 $\mu\text{V}/\text{V} + 650 \mu\text{V}$ 150 $\mu\text{V}/\text{V} + 600 \mu\text{V}$ 240 $\mu\text{V}/\text{V} + 600 \mu\text{V}$ 350 $\mu\text{V}/\text{V} + 600 \mu\text{V}$ 900 $\mu\text{V}/\text{V} + 1.6 \text{ mV}$</p> <p>190 $\mu\text{V}/\text{V} + 2 \text{ mV}$ 200 $\mu\text{V}/\text{V} + 6 \text{ mV}$ 250 $\mu\text{V}/\text{V} + 6 \text{ mV}$ 300 $\mu\text{V}/\text{V} + 6 \text{ mV}$ 2 mV/V + 50 mV</p> <p>300 $\mu\text{V}/\text{V} + 10 \text{ mV}$ 250 $\mu\text{V}/\text{V} + 10 \text{ mV}$ 300 $\mu\text{V}/\text{V} + 10 \text{ mV}$</p>	Fluke 5520A	OEM, GIDEP, MET/CAL Sourced Procedures

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure	<p>(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</p> <p>(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 (0.3 to 1) MHz (1 to 2) MHz</p> <p>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 2) MHz</p> <p>(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 2) MHz</p> <p>(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</p>	<p>300 $\mu\text{V/V} + 3 \mu\text{V}$ 200 $\mu\text{V/V} + 1.1 \mu\text{V}$ 300 $\mu\text{V/V} + 1.1 \mu\text{V}$ 1 $\text{mV/V} + 1.1 \mu\text{V}$ 5 $\text{mV/V} + 1.1 \mu\text{V}$ 40 $\text{mV/V} + 2 \mu\text{V}$</p> <p>70 $\mu\text{V/V} + 4 \mu\text{V}$ 70 $\mu\text{V/V} + 2 \mu\text{V}$ 140 $\mu\text{V/V} + 2 \mu\text{V}$ 300 $\mu\text{V/V} + 2 \mu\text{V}$ 800 $\mu\text{V/V} + 2 \mu\text{V}$ 3 $\text{mV/V} + 10 \mu\text{V}$ 10 $\text{mV/V} + 10 \mu\text{V}$ 15 $\text{mV/V} + 10 \mu\text{V}$</p> <p>70 $\mu\text{V/V} + 40 \mu\text{V}$ 70 $\mu\text{V/V} + 20 \mu\text{V}$ 140 $\mu\text{V/V} + 20 \mu\text{V}$ 300 $\mu\text{V/V} + 20 \mu\text{V}$ 800 $\mu\text{V/V} + 20 \mu\text{V}$ 3 $\text{mV/V} + 100 \mu\text{V}$ 10 $\text{mV/V} + 100 \mu\text{V}$ 15 $\text{mV/V} + 100 \mu\text{V}$</p> <p>70 $\mu\text{V/V} + 400 \mu\text{V}$ 70 $\mu\text{V/V} + 200 \mu\text{V}$ 140 $\mu\text{V/V} + 200 \mu\text{V}$ 300 $\mu\text{V/V} + 200 \mu\text{V}$ 800 $\mu\text{V/V} + 200 \mu\text{V}$ 3 $\text{mV/V} + 1 \text{mV}$ 10 $\text{mV/V} + 1 \text{mV}$ 15 $\text{mV/V} + 1 \text{mV}$</p> <p>200 $\mu\text{V/V} + 4 \text{mV}$ 200 $\mu\text{V/V} + 2 \text{mV}$ 200 $\mu\text{V/V} + 2 \text{mV}$ 350 $\mu\text{V/V} + 2 \text{mV}$ 1.2 $\text{mV/V} + 2 \text{mV}$ 4 $\text{mV/V} + 10 \text{mV}$ 15 $\text{mV/V} + 10 \text{mV}$</p>	HP 3458A	OEM, GIDEP, MET/CAL Sourced Procedures



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure (cont.)	(100 to 700) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	400 μ V/V + 40 mV 400 μ V/V + 20 mV 600 μ V/V + 20 mV 1.3 mV/V + 20 mV 3 mV/V + 20 mV	HP 3458A	OEM, GIDEP, MET/CAL Sourced Procedures
AC High Voltage - Measure	Up to 6 kV Up to 500 Hz Up to 6 kV 500 Hz to 1 kHz Up to 40 kV 60 Hz	10 mV/V 20 mV/V 50 mV/V	HP 3458A w/ HV Probe	
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 45 Hz 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 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz 330 mA to 3 A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	2 mA/A + 100 nA 1.5 mA/A + 100 nA 1.3 mA/A + 100 nA 3 mA/A + 150 nA 8 mA/A + 200 nA 16 mA/A + 400 nA 2 mA/A + 150 nA 1.3 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 μ A 900 μ A /A + 2 μ A 400 μ A /A + 2 μ A 800 μ A /A + 2 μ A 2 mA/A + 3 μ A 4 mA/A + 4 μ A 1.8 mA/A + 20 μ A 900 μ A /A + 20 μ A 400 μ A /A + 20 μ A 1 mA/A + 50 μ A 2 mA/A + 100 μ A 4 mA/A + 200 μ A 1.8 mA/A + 100 μ A 500 μ A /A + 100 μ A 6 mA/A + 100 μ A 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.)	(3 to 11) A (10 to 45) Hz 45 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 Clamp-On Only (20 to 1000) A (45 to 100) Hz	600 μ A/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 2.8 mA/A + 110 mA	Fluke 5520A Fluke 5520A w/ 50 turn coil	OEM, GIDEP, MET/CAL 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 (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	4 mA/A + 30 nA 1.5 mA/A + 30 nA 600 mA/A + 30 nA 0.6 mA/A + 30 nA 4 mA/A + 200 nA 1.5 mA/A + 200 nA 600 μ A/A + 200 nA 300 μ A/A + 200 nA 600 μ A/A + 200 nA 4 mA/A + 400 nA 6 mA/A + 1.5 μ A 4 mA/A + 2 μ A 1.5 mA/A + 2 μ A 600 μ A/A + 2 μ A 300 μ A/A + 2 μ A 600 μ A/A + 2 μ A 4 mA/A + 4 μ A 6 mA/A + 15 μ A 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 6 mA/A + 150 μ A	HP 3458A	



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current - Measure	100 mA to 1 A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz (5 to 20) kHz (20 to 50) kHz (20 to 2 000) A (60 to 100) Hz	4 mA/A + 200 µA 1.6 mA/A + 200 µA 800 µA/A + 200 µA 1 mA/A + 200 µA 3 mA/A + 200 µA 10 mA/A + 400 µA 35 mA/A + 3 A	HP 3458A Clamp-On Meter	OEM, GIDEP, MET/CAL Sourced Procedures
Capacitance - Source 10 Hz to 10 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 Hz to 1 kHz (10 to 300) kHz (10 to 150) kHz (10 to 120) kHz (10 to 80) kHz (10 to 50) kHz (0 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	(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 (1.3 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 5 mF/F + 10 pF 2.5 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	
Phase - Angle (0 to 90) ° (10 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.1 ° 0.25 ° 0.5 ° 2.5 ° 5 ° 10 °			



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Leveled Sine Wave 5 mV to 5.5 V Absolute Flatness	50 kHz reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz	20 mV/V + 300 μ V 35 mV/V + 300 μ V 40 mV/V + 300 μ V 60 mV/V + 300 μ V 70 mV/V + 300 μ V 15 mV/V + 100 μ V 20 mV/V + 100 μ V 40 mV/V + 100 μ V 50 mV/V + 100 μ V	Fluke 5520A	OEM, GIDEP, MET/CAL Sourced Procedures
AC Power - Source (33 to 330) mV 330 mV to 1 020 V	(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 20.5) A (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 20.5) A	0.14 % of watts output 0.10 % of watts output 0.14 % of watts output 0.10 % of watts output 0.13 % of watts output 0.11 % of watts output 0.13 % of watts output 0.11 % of watts output 0.12 % of watts output 0.08 % of watts output 0.12 % of watts output 0.08 % of watts output 0.11 % of watts output 0.09 % of watts output 0.12 % of watts output 0.10% of watts output		



X. Electromagnetic - RF/Microwave

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
RF Power - Measure (-20 to 30) dBm	150 kHz to 1.3 GHz	0.05 dB	Measuring Receiver	OEM, GIDEP, MET/CAL Sourced Procedures
Attenuation (0 to -50) dBm (-50 to -80) dBm (-80 to -120) dBm	100 MHz to 1.3 GHz	0.3 dB	Measuring Receiver Signal Generator	

Notes:

1. Calibration and Measurement Capabilities (CMC)(Expanded Uncertainties) are based on approximately a 95% confidence level using a coverage factor of $k=2$.
2. The use of (L) for length, (D) for diameter, (d) for diagonal, and (R) for resolution signifies a measurement expression in inches.
3. The calibration parameters marked with an asterisk (*) are only available in-house (within Accu-Chek, Inc.'s laboratories). All other parameters are offered both in-house 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 organization maintains a satellite organization where no key activities other than calibration and testing are performed. This satellite site is included in this scope of accreditation. Only one accreditation certificate and scope of accreditation is issued with the corporate organization's address. Reports are issued from the corporate address only.
5. This organization's satellite site is located at 11145 Lusckek Drive Cincinnati, OH 45241.
6. Mismatch error is not included in CMC calculation.
7. This scope is part of and must be included with Certificate of Accreditation No. ACT-1317.



Vice President

