



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

Garber Scale and Calibration

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CALIBRATION

Valid to: January 26, 2009

Certificate Number: AC-1255

I. Dimensional

| PARAMETER/ EQUIPMENT | RANGE | BEST MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)] | REFERENCE STANDARD OR EQUIPMENT | METHOD(S) |
|---------------------------------|--|--|---|-----------------------------------|
| Gage Blocks | Up to 1 in (1 to 4) in (4 to 12) in | 4.1 µin 4.9 µin 6.9 µin | Pratt & Whitney LMU-2130, Master blocks | OEM & GIDEP Sourced Procedures |
| Thread Plugs | Up to 12 in | 126 µin | Pratt & Whitney LMU-2130, Master gage Blocks, Grade 1, Thread Measuring Wires | OEM & GIDEP Sourced Procedures |
| Thread measuring wires | (4 to 120) tpi | 13 µin | Pratt & Whitney LMU-2130, Master gage Blocks, Grade 1 | OEM & GIDEP Sourced Procedures |
| Thread Rings | (0.112 to 8) in | 136 µin | Pratt & Whitney LMU-2130, Master Plain Rings, Class XXX | OEM & GIDEP Sourced Procedures |
| Plain Plugs and Pins | (0.004 to 1) in (1 to 4) in (4 to 12) in | 11.4 µin 11.6 µin 12.6 µin | Pratt & Whitney LMU-2130, Master gage Blocks, Grade 1 | OEM & GIDEP Sourced Procedures |
| Plain Rings | (0.04 to 1) in (1 to 4) in (4 to 12) in | 11.0 µin 19.5 µin 32.5 µin | Pratt & Whitney LMU-2130, Master Plain Rings, Class XXX | OEM & GIDEP Sourced Procedures |
| Micrometers OD | Up to 1 in (1 to 10) in (10 to 48) in | 94 µin 138 µin 1 159 µin | Gage Blocks Grade 2, Optical Flat | OEM & GIDEP Sourced Procedures |
| Micrometers ID | Up to 1 in (1 to 10) in (10 to 48) in | 94 µin 138 µin 1 159 µin | Gage Blocks Grade 2, Optical Flat | OEM & GIDEP Sourced Procedures |

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| Micrometers Bore | Up to 1 in (1 to 10) in (10 to 48) in | 94 µin 138 µin 1 159 µin | Gage Blocks Grade 2, Optical Flat | OEM & GIDEP Sourced Procedures |
| Micrometers Depth | Up to 1 in (1 to 10) in (10 to 48) in | 94 µin 138 µin 1 159 µin | Gage Blocks Grade 2 | OEM & GIDEP Sourced Procedures |
| Calipers Dial, Vernier & Digital | Up to 6 in (6 to 12) in (12 to 48) in | 602 µin 1 181 µin 1 225 µin | Gage Blocks Grade 2 | OEM & GIDEP Sourced Procedures |
| Indicators: Dial and Digital | Up to 6 in (0.001 in) Up to 0.5 in (0.0001 in) Up to 0.05 in (0.00005 in) Up to 0.02 in (0.00002 in) Up to 0.01 in (0.00001 in) | 288 µin 133.7 µin 61.9 µin 36.4 µin 20.1 µin | Gage Blocks Grade 2 Indicator calibrator | OEM & GIDEP Sourced Procedures |
| Indicator Calibrators | Up to 1 in | 61 µin | Gage Blocks, Grade 2 | OEM & GIDEP Sourced Procedures |
| Surface Plates -- Flatness | To (36 x 48) in To (72 x 144) in | (25 + 10D) µin (50 + 30D) µin | Planeators - Straight Indicators | OEM & GIDEP Sourced Procedures |
| Height gages | Up to 12 in (12 to 48) in | 630 µin 642 µin | Gage Blocks Grade 2 | OEM & GIDEP Sourced Procedures |
| Length Standards | Up to 1 in (1 to 4) in (4 to 10) in (10 to 24) in | 39 µin 64 µin 120 µin 271 µin | Pratt & Whitney LMU- 2130, Master gage Blocks, Long Blocks, Electronic Height Gage | OEM & GIDEP Sourced Procedures |
| Parallels | Up to 4 in | 52.2 µin | Pratt & Whitney LMU- 2130, Master gage Blocks | OEM & GIDEP Sourced Procedures |
| Optical Comparators ³ | X 6.0 in Y 6.0 in | 1.73 R 1.73 R | Glass Scale Standard, Check balls | OEM & GIDEP Sourced Procedures |

II. Mechanical

| PARAMETER/ EQUIPMENT | RANGE | BEST MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)] | REFERENCE STANDARD OR EQUIPMENT | METHOD(S) |
|-------------------------|---|--|--|-----------------------------------|
| Pressure/Vacuum | Up to 30 in Hg Up to 100 psi Up to 150 psi Up to 1 000 psi Up to 10 000 psi | 1.09 in Hg 1.23 psi 2.04 psi 2.64 psi 3.26 psi | Precision Pressure Calibrator Dead Weight Tester Ametek Model: R-110-1 | OEM & GIDEP Sourced Procedures |
| Torque | Up to 100 in·oz Up to 250 ft·lb | 0.87 in·oz 1.91 ft·lb | Torque calibrator CDI-Suretest Model: 5000-ST | OEM & GIDEP Sourced Procedures |
| Durometers | Up to 100 duro | 1.34 % Full scale | Load Cell | OEM & GIDEP Sourced Procedures |
| Balance | Up to 200 g | 0.22 mg | Class 0 Weights | NIST Handbook 44 |
| Balance | Up to 600 g | 19.2 mg | Class 1 or S Weights | NIST Handbook 44 |
| Balance or Scale | Up to 1 200 g (0.1 g) Up to 2 000 g (0.2 g) Up to 5 kg (0.5 g) Up to 30 kg (1 g) | 0.18 g 0.26 g 0.58 g 1.21 g | Class 1 or S Weights | NIST Handbook 44 |
| Scale | Up to 2 lb (0.0002 lb) Up to 5 lb (0.0005 lb) Up to 10 lb (0.001 lb) Up to 20 lb (0.005 lb) Up to 25 lb (0.002 lb) | 0.0004 lb 0.0008 lb 0.0016 lb 0.008 lb 0.003 lb | Class F Weights | NIST Handbook 44 |
| Scale | Up to 50 lb (0.005 lb) Up to 100 lb (0.01 lb) Up to 150 lb (0.05 lb) Up to 500 lb (0.05 lb) Up to 1 000 lb (0.2 lb) Up to 2 000 lb (0.5 lb) Up to 5 000 lb (1 lb) Up to 20 000 lb (2 lb) Up to 200 000 lb (20 lb) | 0.01 lb 0.011 lb 0.084 lb 0.095 lb 0.35 lb 0.86 lb 1.7 lb 3.5 lb 36 lb | Class F Weights | NIST Handbook 44 |
| Mass standards | Up to 50 lb | 0.001 lb | Comparison to calibrated weights | NIST Handbook 105-1 |

III. Electromagnetic DC/Low Frequency

| PARAMETER/ EQUIPMENT | RANGE | BEST MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)] | REFERENCE STANDARD OR EQUIPMENT | METHOD(S) |
|-------------------------|--|--|---------------------------------------|-----------------------------------|
| DC Voltage | Up to 330 mV 330 mV to 33 V (33 to 100) V (100 to 1 000) V | 0.02 mV 2.12 mV 11.2 mV 106 mV | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| DC Current | Up to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1A (1 to 10) A | 0.001 mA 0.002 mA 0.015 mA 0.4 mA 6.4 mA | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| Resistance | Up to 10 Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω 10 K Ω to 1 M Ω (1 to 10) M Ω | 0.01 Ω 0.025 Ω 0.166 Ω 0.018 k Ω 0.0002 M Ω 0.007 M Ω | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| Capacitance | Up to 1 nF (1 to 100) nF 100 nF to 1 μ F | 0.015 nF 0.365 nF 0.003 μ F | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| AC Current – 45 Hz | Up to 190 μ A (190 to 329) μ A Up to 3.29 mA (3.29 to 329) mA Up to 2 A (2 to 10) A | 0.49 μ A 0.67 μ A 0.12 μ A 1.23 mA 0.12 A 0.12 A | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| AC Current – 1 kHz | Up to 190 μ A (190 to 329) μ A Up to 3.29 mA (3.29 to 329) mA Up to 2 A (2 to 10) A | 1.01 μ A 1.57 μ A 0.12 mA 1.39 mA 0.12 A 0.12 A | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| AC Current – 10 kHz | Up to 1.9 mA | 0.016 mA | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| AC Voltage – 45 Hz | Up to 330 mV 330 mV to 10 V (10 to 100) V (100 to 1 000) V | 0.2 mV 2.6 mV 58 mV 0.6 V | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| AC Voltage – 1 kHz | Up to 330 mV 330 mV to 10 V (10 to 100) V (100 to 1 000) V | 0.19 mV 1.4 mV 96 mV 0.3 V | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| AC Voltage – 10 kHz | Up to 330 mV 330 mV to 10 V (10 to 100) V (100 to 1 000) V | 0.35 mV 10.7 mV 124 mV 2.5 V | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| AC Voltage – 50 kHz | Up to 330 mV 330 mV to 10 V | 0.96 mV 41 mV | Fluke 5500A | OEM & GIDEP Sourced Procedures |

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| AC Voltage – 100 kHz | Up to 330 mV | 3 mV | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| Oscilloscope Amplitude | 0 VDC – 50 Ω load 6 VDC – 50 Ω load 0 VDC – 1 MΩ load 66 VDC – 1 MΩ load 130 VDC – 1 MΩ load | 11.6 mV 20.9 mV 11.6 mV 39.9 mV 76.1 mV | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| Flatness | 50 kHz ref to 10 mVp-p 50 kHz ref to 5 Vp-p 100 kHz to 30 mV 100 kHz to 5.5 V 300 MHz to 30 mV 300 MHz to 5.5 V 600 MHz to 30 mV 600 MHz to 5.5 V | 0.58 mV 117 mV 1.05 mV 131 mV 1.05 mV 128 mV 0.99 mV 124 mV | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| Rise time Vp-p | 400 ps 1 MHz, 1 V 400 ps 10 MHz, 0.5 V 400 ps 10 MHz, 1 V | 1.15 ps 1.15 ps 115.61 ps | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| Square wave 1 MΩ load | 100 mV to 100 MHz 1 V to 100 MHz | 0.70 mV 6.01 mV | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| Square wave 50 Ω load | 100 mV to 1 kHz 1 V to 1 kHz 5 V to 1 kHz | 0.70 mV 6.01 mV 31.23 mV | | |
| Time Marker | 2 nS 20 mS 50 mS 5 S | 28.90 ppm 28.90 ppm 28.90 ppm 2.98 ppm | Fluke 5500A | OEM & GIDEP Sourced Procedures |
| Electrical Simulation of Thermocouple Indicators | | | | |
| Temperature TC Type E | (-150 to -50) °C (-50 to 0) °C (0 to 750) °C | 0.52 °C 0.22 °C 0.26 °C | Omega CL | OEM & GIDEP Sourced Procedures |
| Temperature TC Type J | (-150 to 750) °C | 0.52 °C | Omega CL | OEM & GIDEP Sourced Procedures |
| Temperature TC Type K | (-150 to 1 100) °C | 0.52 °C | Omega CL | OEM & GIDEP Sourced Procedures |
| Temperature TC Type T | (-100 to 350) °C | 0.52 °C | Omega CL | OEM & GIDEP Sourced Procedures |
| Temperature Microbath | Up to 70 °C | 0.02 °C | RTD Probe & Fluke 5500A | OEM & GIDEP Sourced Procedures |
| Temperature RTD Probe | Up to 200 °C | 0.03 °C | Agilent 34401A | OEM & GIDEP Sourced Procedures |

IV. Thermodynamic

| PARAMETER/ EQUIPMENT | RANGE | BEST MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(+)] | REFERENCE STANDARD OR EQUIPMENT | METHOD(S) |
|---------------------------------|----------------|--|--|--------------------------------|
| Temperature Measurement | (0 to 260) °C | 0.26 °C | Hart Microbath 9131 | OEM & GIDEP Sourced Procedures |
| Temperature Measurement | (-5 to 140) °C | 0.14 °C | Hart Scientific 9105 Drywell | OEM & GIDEP Sourced Procedures |

Notes:

1. *Best Measurement Uncertainties (Expanded Uncertainty) are based on approximately a 95% confidence interval, using a coverage of k 2*
2. *The uncertainty associated when calibrating a balance/scale is dependent on local conditions, such as the resolution of the unit being calibrated and the environment in which the balance/scale is operating. The uncertainty listed in the scope here represents the best uncertainty for a balance/scale which the organization typically calibrates in its lab. Since field (on-site) conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected in the field (on-site) than what is reported on the accredited scope.*
3. *The term R = resolution of readout, unless otherwise stated, in inches; D = surface plate diagonal in inches.*
4. *For scale/balance and Indicators: Dial and Digital, numbers in parentheses represent resolution*
5. *This scope is part of and must be included with the Certificate of Accreditation No. AC - 1255*



President/CEO