



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

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**CALIBRATION**

Valid to: May 30, 2013

Certificate Number: AC-1393

**I. Electromagnetic - DC/Low Frequency**

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**DC Voltage - Source	10V  Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV  Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV  (1.1 to 25) kV	2.1 µV/V  8.1 µV/V + 600 nV 7.1 µV/V + 1 µV 7.1 µV/V + 3.5 µV 7.1 µV/V + 6.5 µV 8.1 µV/V + 80 µV 9.1 µV/V + 500 µV  6.6 µV/V + 400 nV 4.7 µV/V + 700 nV 4 µV/V + 2.5 µV 4 µV/V + 4 µV 4.7 µV/V + 40 µV 5.1 µV/V + 400 µV  1.2 mV/V	*Fluke 732B  **Fluke 5700A      *Fluke 5720A   **H20Y Supply w/Ross VD60-6.2Y-A- LB Divider	OEM and GIDEP Sourced Calibration Procedures
**DC Current - Source	Up to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A  Up to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A	50 µA/A + 8 nA 50 µA/A + 80 nA 60 µA/A + 800 nA 80 µA/A + 25 µA 360 µA/A + 480 µA  35.3 µA/A + 5 nA 31.1 µA/A + 7 nA 30.3 µA/A + 40 nA 60.6 µA/A + 12 µA	Fluke 5700A/5725A      *Fluke 5720A	
**Clamp-On Only	(11 to 20.5) A (20.5 to 100) A Up to 1 000 A	1 mA/A + 750 µA 400 µA/A + 30 mA 3 mA/A + 500 mA	Fluke 5520A Valhalla 2555A Fluke 5520A with Coil	



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**DC Voltage - Measure	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV  (1 to 60) kV  (60 to 100) kV	6.2 $\mu\text{V}/\text{V} + 3 \mu\text{V}$ 5.2 $\mu\text{V}/\text{V} + 300 \text{nV}$ 5.2 $\mu\text{V}/\text{V} + 50 \text{nV}$ 7.3 $\mu\text{V}/\text{V} + 300 \text{nV}$ 7.3 $\mu\text{V}/\text{V} + 100 \text{nV}$  1.2 mV/V  1.2 mV/V	HP 3458A Opt 002  with Ross VD60-6.2Y-A-LB Divider  with Spellman HVD-100	OEM and GIDEP Sourced Calibration Procedures
**DC Current - Measure	100 pA to 100 $\mu\text{A}$ 100 $\mu\text{A}$ to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 10) A (10 to 300) A	24 $\mu\text{A}/\text{A} + 800 \text{pA}$ 24 $\mu\text{A}/\text{A} + 5 \text{nA}$ 24 $\mu\text{A}/\text{A} + 50 \text{nA}$ 41 $\mu\text{A}/\text{A} + 500 \text{nA}$ 130 $\mu\text{A}/\text{A} + 10 \mu\text{A}$ 2.4 mV/V 2.7 mV/V	HP 3458A Opt 002  w/ Guildline 9222 w/ Guildline 9211A	
DC Voltage Ratio - Measure Ratio 10 mV to 100 V	Up to 100 mV 100 mV to 1.1 V	0.005 % + 500 nV 0.005 % (10 $\times$ setting) <sup>1/3</sup> + 500 nV	Fluke 720A with 5720A and 845A	
**DC Resistance - Measure	100 m $\Omega$ to 10 $\Omega$ (10 to 100) $\Omega$ 100 $\Omega$ to 1 k $\Omega$ (1 to 10) k $\Omega$ (10 to 100) k $\Omega$ 100 k $\Omega$ to 1 M $\Omega$ (1 to 10) M $\Omega$ (10 to 100) M $\Omega$ 100 M $\Omega$ to 1.2 G $\Omega$	18 $\mu\Omega/\Omega + 50 \mu\Omega$ 14 $\mu\Omega/\Omega + 500 \mu\Omega$ 12 $\mu\Omega/\Omega + 500 \mu\Omega$ 12 $\mu\Omega/\Omega + 5 \text{m}\Omega$ 12 $\mu\Omega/\Omega + 50 \text{m}\Omega$ 18 $\mu\Omega/\Omega + 2 \Omega$ 58 $\mu\Omega/\Omega + 100 \Omega$ 580 $\mu\Omega/\Omega + 1 \text{k}\Omega$ 5.8 m $\Omega/\Omega + 10 \text{k}\Omega$	HP 3458A Opt 002	



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**DC Power - Source	10 mW to 330 W 330 W to 11 kW (11 to 20.5) kW	2 mW/W 2.1 mW/W 2.3 mW/W	Fluke 5520A	
**AC Power - Source (45 to 65) Hz; PF = 1	10 μW to 100 mW 100 mW to 890 W 890 W to 3 kW (3 to 11) kW (11 to 20.5) kW	0.23 % 0.14 % 0.13 % 0.15 % 0.13 %		
**AC Voltage - Source	<b>200 μV to 2.2 mV</b> (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz <b>(2.2 to 22) mV</b> (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz <b>(22 to 220) mV</b> (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz <b>220 mV to 2.2 V</b> (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	550 μV/V + 4.5 μV 210 μV/V + 4.5 μV 110 μV/V + 4.5 μV 370 μV/V + 4.5 μV 850 μV/V + 7 μV 1.1 mV/V + 13 μV 1.7 mV/V + 25 μV 3.4 mV/V + 25 μV  550 μV/V + 5 μV 210 μV/V + 5 μV 110 μV/V + 5 μV 370 μV/V + 5 μV 850 μV/V + 7 μV 1.1 mV/V + 12 μV 1.7 mV/V + 25 μV 3.4 mV/V + 25 μV  550 μV/V + 13 μV 210 μV/V + 8 μV 110 μV/V + 8 μV 320 μV/V + 8 μV 850 μV/V + 25 μV 1.1 mV/V + 25 μV 1.7 mV/V + 35 μV 3.4 mV/V + 80 μV  500 μV/V + 80 μV 160 μV/V + 25 μV 75 μV/V + 6 μV 120 μV/V + 16 μV 250 μV/V + 70 μV 430 μV/V + 130 μV 1.1 mV/V + 350 μV 2.2 mV/V + 850 μV	Fluke 5700A w/ 5725A	

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**AC Voltage - Source (cont.)	<p><b>(2.2 to 22) V</b>            (10 to 20) Hz            (20 to 40) Hz            40 Hz to 20 kHz            (20 to 50) kHz            (50 to 100) kHz            (100 to 300) kHz            (300 to 500) kHz            500 kHz to 1 MHz</p> <p><b>(22 to 220) V</b>            (10 to 20) Hz            (20 to 40) Hz            40 Hz to 20 kHz            (20 to 50) kHz            (50 to 100) kHz            (100 to 300) kHz            (300 to 500) kHz            500 kHz to 1 MHz</p> <p><b>220 V to 1.1 kV</b>            (15 to 40) Hz            40 Hz to 1 kHz            (1 to 20) kHz            (20 to 30) kHz</p> <p><b>(220 to 750) V</b>            (30 to 50) kHz            (50 to 100) kHz</p>	<p>500 µV/V + 800 µV            160 µV/V + 250 µV            75 µV/V + 60 µV            120 µV/V + 160 µV            250 µV/V + 350 µV            500 µV/V + 1.5 mV            1.3 mV/V + 4.3 mV            2.7 mV/V + 8.5 mV</p> <p>500 µV/V + 8 mV            160 µV/V + 2.5 mV            80 µV/V + 800 µV            220 µV/V + 3.5 mV            500 µV/V + 8 mV            1.5 mV/V + 90 mV            4.7 mV/V + 90 mV            12 mV/V + 190 mV</p> <p>400 µV/V + 16 mV            90 µV/V + 4 mV            170 µV/V + 6 mV            600 µV/V + 11 mV</p> <p>600 µV/V + 11 mV            2.3 mV/V + 45 mV</p>	<p>Fluke 5700A            with Fluke 5725A</p>	<p>OEM and GIDEP            Sourced            Calibration            Procedures</p>
**AC Voltage - Measure	<p><b>3 µV to 10 mV</b>            (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><b>(10 to 100) mV</b>            (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>300 µV/V + 3 µV            200 µV/V + 1.1 µV            300 µV/V + 1.1 µV            1.2 mV/V + 1.1 µV            5.8 mV/V + 1.1 µV            46 mV/V + 2 µV</p> <p>80 µV/V + 4 µV            80 µV/V + 2 µV            200 µV/V + 2 µV            300 µV/V + 2 µV            900 µV/V + 2 µV            3.5 mV/V + 10 µV            12 mV/V + 10 µV            17 mV/V + 10 µV</p>	<p>HP 3458A Opt 002</p>	



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<p>**AC Current - Source (cont.)</p> <p>**Clamp-On Only</p>	<p><b>(2.2 to 22) mA</b>  (10 to 20) Hz  (20 to 40) Hz  40 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz  <b>(22 to 220) mA</b>  (10 to 20) Hz  (20 to 40) Hz  40 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz  <b>220 mA to 2.2 A</b>  20 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz  <b>(2.2 to 11) A</b>  20 Hz to 1 kHz  (1 to 5) kHz  (5 to 10) kHz  <b>(11 to 20.5) A</b>  (10 to 100) Hz  100 Hz to 1 kHz  (1 to 5) kHz  <b>(20 to 100) A</b>  (10 to 100) Hz  (100 to 400) Hz  400 Hz to 1 kHz  <b>Up to 550 A</b>  (45 to 65) Hz  <b>Up to 110 A</b>  (65 to 440) Hz</p>	<p>700 µA/A + 400 nA  350 µA/A + 350 nA  140 µA/A + 350 nA  600 µA/A + 4 µA  1.6 mA/A + 8 µA</p> <p>700 µA/A + 4 µA  350 µA/A + 3.5 µA  140 µA/A + 3.5 µA  600 µA/A + 40 µA  1.6 mA/A + 80 µA</p> <p>650 µA/A + 35 µA  750 µA/A + 80 µA  8.5 mA/A + 160 µA</p> <p>460 µA/A + 170 µA  950 µA/A + 380 µA  3.6 mA/A + 750 µA</p> <p>1.5 mA/A + 5 mA  1.8 mA/A + 5 mA  35 mA/A + 5 mA</p> <p>1.8 mA/A + 150 mA  2.4 mA/A + 200 mA  3.4 mA/A + 300 mA</p> <p>3.8 mA/A + 500 mA</p> <p>3.2 mA/A + 500 mA</p>	<p>Fluke 5700A</p> <p>Fluke 5520A</p> <p>Fluke 5700A w/ Valhalla 2555</p> <p>Fluke 5520A w/Coil</p>	<p>OEM and GIDEP Sourced Calibration Procedures</p>
<p>**AC Current - Measure</p>	<p><b>(10 to 100) µA</b>  (10 to 20) Hz  (20 to 45) Hz  (45 to 100) Hz  100 Hz to 5) kHz  <b>100 µA to 1 mA</b>  (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</p>	<p>4.6 mA/A + 30 nA  1.7 mA/A + 30 nA  700 µA/A + 30 nA  700 µA/A + 30 nA</p> <p>5 mA/A + 200 nA  1.7 mA/A + 200 nA  700 µA/A + 200 nA  400 µA/A + 200 nA  700 µA/A + 200 nA  4.6 mA/A + 200 nA  6.4 mA/A + 200 nA</p>	<p>HP 3458A Opt 002</p>	

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**AC Current - Measure (cont.)	<b>(1 to 10) mA</b> (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 <b>(10 to 100) mA</b> (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 <b>100 mA to 1 A</b> (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 <b>(1 to 20) A</b> 1 Hz to 10 kHz	4.6 mA/A + 2 µA 1.7 mA/A + 2 µA 700 µA/A + 2 µA 400 µA/A + 2 µA 700 µA/A + 2 µA 4.6 mA/A + 2 µA 6.4 mA/A + 2 µA  4.6 mA/A + 20 µA 1.7 mA/A + 20 µA 700 µA/A + 20 µA 400 µA/A + 20 µA 700 µA/A + 20 µA 4.6 mA/A + 20 µA 6.6 mA/A + 20 µA  4.6 mA/A + 200 µA 1.8 mA/A + 200 µA 900 µA/A + 200 µA 1.2 mA/A + 200 µA 3.5 mA/A + 200 µA 12 mA/A + 400 µA  (0.025 + 0.012F) %	HP 3458A Opt 002           w/ Fluke Y5020	OEM and GIDEP Sourced Calibration Procedures
AC Voltage Ratio - Source  0.1 to 1.11 0 to 0.1	50 Hz to 1 kHz 50 Hz to 1 kHz	1.5 parts in 10 <sup>6</sup> [1.49 (10 × Setting) <sup>1/2</sup> + 0.01 ppm of setting]	ESI DT 72	
**AC Resistance - Source	<b>10 Ω</b> DC to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz <b>100 Ω</b> DC to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz	1.3 mΩ/Ω 1.4 mΩ/Ω 1.7 mΩ/Ω 1.9 mΩ/Ω 2.6 mΩ/Ω 6.6 mΩ/Ω 10 mΩ/Ω  1.3 mΩ/Ω 1.4 mΩ/Ω 1.7 mΩ/Ω 1.4 mΩ/Ω 1.7 mΩ/Ω 3.4 mΩ/Ω 4.6 mΩ/Ω	HP 42030 Resistor Set	

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**AC Resistance - Source (cont.)	<b>1 kΩ</b> DC to 3 MHz (3 to 5) MHz (5 to 10) MHz (10 to 13) MHz <b>10 kΩ</b> DC to 1 MHz <b>100 kΩ</b> DC to 1 MHz	900 μΩ/Ω 1.1 mΩ/Ω 2.8 mΩ/Ω 4.1 mΩ/Ω 700 μΩ/Ω 900 μΩ/Ω	HP 42030 Resistor Set	OEM and GIDEP Sourced Calibration Procedures
**AC Resistance - Measure 1 Ω to 100 kΩ	12 Hz to 100 kHz	250 μΩ/Ω	GenRad 1689M	
**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 (10 to 50) Hz (10 to 20) 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	5.4 mF/F + 10 pF 5.4 mF/F + 10 pF 3.2 mF/F + 10 pF 2.7 mF/F + 100 pF 2.7 mF/F + 300 pF 2.7 mF/F + 1 nF 2.7 mF/F + 3 nF 2.9 mF/F + 10 nF 4.6 mF/F + 30 nF 5.1 mF/F + 100 nF 5.4 mF/F + 300 nF 6.2 mF/F + 1 mF	Fluke 5520A	
**Capacitance - Source Fixed Values	<b>1 pF</b> 100 Hz to 1 kHz 1 kHz to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz <b>10 pF</b> 100 Hz to 1 kHz 1 kHz to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz	0.0001 pF 0.0004 pF 0.0004 pF 0.0007 pF 0.0013 pF 0.002 pF 0.007 pF 0.01 pF 0.001 pF 0.002 pF 0.002 pF 0.003 pF 0.004 pF 0.005 pF 0.011 pF 0.014 pF	HP 1638XX Standard Capacitor	

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**Capacitance - Source Fixed Values (cont.)	<b>100 pF</b> 100 Hz to 1 kHz 1 kHz to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz <b>1 nF</b> 100 Hz to 1 kHz 1 kHz to 1 MHz (1 to 2) MHz (2 to 3) MHz (3 to 4) MHz (4 to 5) MHz (5 to 10) MHz (10 to 13) MHz <b>(10, 100) nF</b> (100 to 120) Hz 120 Hz to 1 kHz (1 to 10) kHz (10 to 100) kHz <b>1 μF</b> (100 to 120) Hz 120 Hz to 1 kHz (1 to 10) kHz (10 to 100) kHz	0.01 pF 0.02 pF 0.02 pF 0.03 pF 0.04 pF 0.05 pF 0.11 pF 0.14 pF 0.1 pF 0.4 pF 0.4 pF 0.7 pF 1 pF 1.4 pF 3.4 pF 4.8 pF 2 pF, 30 pF 1 pF, 10 pF 2 pF, 30 pF 4 pF, 40 pF 300 nF 100 nF 300 nF 700 nF	HP 1638XX Standard Capacitor	OEM and GIDEP Sourced Calibration Procedures
**Capacitance - Measure	<b>0.1 pF to 1 mF</b> 12 Hz to 100 kHz <b>100 nF to 1 mF</b> 1 kHz	250 μF/F 120 μF/F	GenRad 1620A GenRad 1689M	
**Inductance - Source 100 Hz to 1 kHz 100 Hz to 1 kHz 100 Hz to 1 kHz 100Hz 1 kHz	100 μH (1, 10, 100) mH (1, 2, 5) H 10H 10H	1 mH/H 300 μH/H 600 μH/H 1.03 mH/H 2.35 mH/H	GenRad 1482X	
**Inductance - Measure 12 Hz to 100 kHz	1 mH to 10 H	250 μH/H	GenRad 1689M	

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<b>**Oscilloscopes</b> Flatness relative to 50kHz Leveled Sine Wave 5mV to 5.5 V  Leveled Sine Wave - 50 Ω (50 kHz) (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 to 1 050) MHz  5 mV to 5.5 V p-p 5 mV to 5.5 V p-p 5 mV to 5.5 V p-p 5 mV to 5.5 V p-p 5 mV to 5.5 V p-p	15.5 mV/V + 100 μV 20.4 mV/V + 100 μV 40.4 mV/V + 100 μV 50.6 mV/V + 100 μV  20.4 mV/V + 300 μV 35.3 mV/V + 300 μV 40.2 mV/V + 300 μV 60.3 mV/V + 300 μV 70.5 mV/V + 300 μV	Fluke 5520A SC 1100	OEM and GIDEP Sourced Calibration Procedures
<b>**Distortion - Measure</b> (0 to 99.9) dB 20 Hz to 20 kHz (20 to 100) kHz (100 to 500) kHz	(50 to 500) kHz (50 to 500) kHz 500 kHz to 1 MHz	1.2 dB 0.07 dB 0.14 dB	HP 8903B  HP 339A	
Phase AC Voltage - Source 0° to 360° 50 mV to 120 V	1 Hz to 1 kHz (1 to 6.25) kHz (6.25 to 50) kHz (50 to 100) kHz	(7.03 + 0.05R) m° (12.2 + 0.1R) m° (19.1 + 0.15R) m° (52.1 + 0.4R) m°	Clark-Hess 5000	
<b>**Electrical Simulation of Thermocouples</b> Type B	(600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °C	0.5 °C 0.4 °C 0.36 °C 0.39 °C	Fluke 5520A	
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	0.36 °C 0.32 °C 0.37 °C 0.56 °C 0.9 °C		
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C	0.56 °C 0.22 °C 0.2 °C 0.22 °C 0.27 °C		

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**Electrical Simulation of Thermocouples (cont.)				
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 0.22 °C 0.2 °C 0.23 °C 0.29 °C		
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.43 °C 0.32 °C 0.23 °C		
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1 300) °C	0.46 °C 0.28 °C 0.25 °C 0.24 °C 0.33 °C	Fluke 5520A	OEM and GIDEP Sourced Calibration Procedures
Type R	(0 to 250) °C (250 to 400) °C (400 to 1 000) °C (1 000 to 1 767) °C	0.63 °C 0.41 °C 0.39 °C 0.46 °C		
Type S	(0 to 250) °C (250 to 1 000) °C (1 000 to 1 400) °C (1 400 to 1 767) °C	0.53 °C 0.42 °C 0.43 °C 0.52 °C		
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.69 °C 0.3 °C 0.22 °C 0.2 °C		
Type U	(-200 to 0) °C (0 to 600) °C	0.62 °C 0.33 °C		

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**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	0.06 °C 0.06 °C 0.08 °C 0.1 °C 0.11 °C 0.13 °C 0.24 °C		
Pt 3926, 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	0.06 °C 0.06 °C 0.08 °C 0.1 °C 0.11 °C 0.13 °C		
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.26 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.11 °C 0.24 °C	Fluke 5520A	OEM and GIDEP Sourced Calibration Procedures
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.05 °C 0.05 °C 0.05 °C 0.06 °C 0.13 °C 0.14 °C 0.15 °C 0.17 °C		
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.05 °C 0.06 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Electrical Simulation of RTDs (cont.)				OEM and GIDEP Sourced Calibration Procedures
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.24 °C	Fluke 5520A	
PtNi 385, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.09 °C 0.15 °C		
Cu 427, 10 Ω	(-100 to 260) °C	0.31 °C		
**Rise Time - Source	25 ps	3.5 %	Tektronix S-52 with 7S11 and 7T11	
**Rise Time - Measure	9 ps	3 %	HP 86100A with HP 86106A	
AC Level Flatness - Measure 0.5, 1 VAC	10 Hz 100 Hz 10 kHz 30 kHz 100 kHz 300 kHz 1 MHz 3 MHz 8 MHz 10 MHz 20 MHz 30 MHz 50 MHz 70 MHz 80 MHz 100 MHz	0.01 % 0.01 % 0.01 % 0.01 % 0.01 % 0.01 % 0.01 % 0.08 % 0.08 % 0.08 % 0.17 % 0.17 % 0.46 % 0.65 % 0.87 % 1.02 %	Precision Measurements EL130X, 0.5 V, 1V, and 3V Thermal Converters, HP 3458A Opt 002, Fluke 5700A	

## II. Electromagnetic - RF/Microwave\*\*

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**RF Power - Source (+23.98 to -56.02) dBm	DC to 20 MHz	0.5 dB	HP 3325A	OEM and GIDEP Sourced Calibration Procedures
(+10 to -127) dBm	20 MHz to 2 GHz	1.3 dB	HP 8648C	
(+10 to -30) dBm	(2 to 6.6) GHz	0.2 dB	HP 8340B	
(-30 to -60) dBm		0.5 dB		
(-60 to -70) dBm		0.96 dB		
(-70 to -80) dBm		3.1 dB		
(-80 to -90) dBm		3.2 dB		
(-90 to -100) dBm	3.3 dB			
(+10 to -30) dBm	(6.6 to 12.3) GHz	0.2 dB		
(-30 to -60) dBm		0.5 dB		
(-60 to -70) dBm		0.96 dB		
(-70 to -80) dBm		3.4 dB		
(-80 to -90) dBm		3.5 dB		
(-90 to -100) dBm	3.6 dB			
(+10 to -30) dBm	(12.3 to 18.6) GHz	0.2 dB		
(-30 to -60) dBm		0.5 dB		
(-60 to -70) dBm		0.96 dB		
(-70 to -80) dBm		4.2 dB		
(-80 to -90) dBm		4.4 dB		
(-90 to -100) dBm	4.7 dB			
(+10 to -10) dBm	(18.6 to 26) GHz	0.3 dB		
(-10 to -20) dBm		0.36 dB		
(-20 to -30) dBm		0.38 dB		
(-30 to -40) dBm		0.5 dB		
(-40 to -50) dBm		0.52 dB		
(-50 to -60) dBm		0.58 dB		
(-60 to -70) dBm		0.96 dB		
(-70 to -80) dBm		5.1 dB		
(-80 to -90) dBm		5.4 dB		
(-90 to -100) dBm		5.6 dB		
**RF Power - Measure				
(+30 to -20) dBm	100 kHz to 26.5 GHz	2.9 %	HP 8902A with 11722A and 11792A	
(+20 to -70) dBm	(2.6 to 26.5) GHz	2.9 %	HP 8485A with 438A	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**RF Attenuation Tuned RF Power - Measure 100 kHz to 26.5 GHz	(-0.0 to -10) dB (-10 to -20) dB (-20 to -30) dB (-30 to -40) dB (-40 to -50) dB (-50 to -60) dB (-60 to -70) dB (-70 to -80) dB (-80 to -90) dB (-90 to -100) dB (-100 to -110) dB (-110 to -120) dB	0.03 dB 0.06 dB 0.08 dB 0.11 dB 0.14 dB 0.16 dB 0.2 dB 0.22 dB 0.24 dB 0.32 dB 0.37 dB 0.37 dB	HP 8902A HP 11722A HP 11792A HP 11793A	
**Power Sensor Gold - Calibration Factor HP 8481A	10 MHz 30 MHz 50 MHz 100, 300, 500 MHz 1 GHz 1.5 GHz 2, 3, 4 GHz 5, 6 GHz 7, 8, 9 GHz 10 GHz 11, 12, 12.4 GHz 13 GHz 14 GHz 15 GHz 16 GHz 17 GHz 18 GHz	0.95 % 0.74 % 0.59 % 0.58 % 0.58 % 0.64 % 0.6 % 0.63 % 0.64 % 0.72 % 0.68 % 0.72 % 0.66 % 0.74 % 0.84 % 0.86 % 0.97 %	HP 438A, 8481A Gold Sensor, and 11667A DMM	
**HP 8481D / 8484A	10 MHz 30 MHz 50, 100, 300, 500 MHz 1 GHz 1.5 GHz 2, 3, 4, 5,6 GHz 7, 8, 9 GHz 10 GHz 11, 12, 12.4 GHz 13 GHz 14 GHz 15 GHz 16 GHz 17 GHz 18 GHz	1.52 % 1.4 % 1.33 % 1.33 % 1.35 % 1.34 % 1.35 % 1.39 % 1.36 % 1.39 % 1.36 % 1.4 % 1.46 % 1.46 % 1.54 %	HP 438A, 8481D, 8484A and 11667A DMM	OEM and GIDEP Sourced Calibration Procedures



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**HP 8482A	100 kHz 300 kHz, 500 kHz 1 MHz 3, 5, 10 MHz 30 MHz 50, 100, 300, 500 MHz 1 GHz 1.5 GHz 2 GHz 2.5 GHz 3 GHz 3.5 GHz 4 GHz 4.2 GHz	0.6 % 0.58 % 0.58 % 0.68 % 0.74 % 0.59 % 0.58 % 0.64 % 0.58 % 0.66 % 0.6 % 0.65 % 0.59 % 0.68 %	HP 438A, 8482A and 11667A DMM	OEM and GIDEP Sourced Calibration Procedures
**HP 8478B	10 MHz 30 MHz 50 MHz 100, 300, 500 MHz 1 GHz 1.5 GHz 2, 3, 4 GHz 5,6 GHz 7, 8, 9 GHz 10 GHz 11, 12, 12.4 GHz 13 GHz 14 GHz 15 GHz 16 GHz 17 GHz 18 GHz	0.91 % 0.68 % 0.52 % 0.51 % 0.51 % 0.57 % 0.52 % 0.56 % 0.58 % 0.66 % 0.62 % 0.66 % 0.59 % 0.68 % 0.79 % 0.81 % 0.93 %	HP 438A, 8481A and 11667A DMM	
**HP 478A	10 MHz 50 MHz 100, 300, 500 MHz 1 GHz	0.91 % 0.52 % 0.51 % 0.51 %	HP 432A, 478A and 11667A DMM	
**Phase Modulation - Measure Rate: 200 Hz to 10 kHz	150 kHz to 10 MHz 10 MHz to 1.3 GHz	4 % + 1 digit 3 % + 1 digit	HP 8902A w/ 11793A	
Rate: 200 Hz to 20 kHz	(1.3 to 26.5) GHz	4 % + 1 digit		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Amplitude Modulation - Measure			HP 8902A	OEM and GIDEP Sourced Calibration Procedures
Rate: 50 Hz to 10 kHz Depths: (5 to 99) %	150 kHz to 10 MHz	2 % + 1 digit		
Rate: 20 Hz to 10 kHz Depths: to 99 %	150 kHz to 10 MHz	3 % + 1 digit		
Rate: 50 Hz to 50 kHz Depths: (5 to 99) %	10 MHz to 1.3 GHz	1 % + 1 digit		
Rate: 20 Hz to 100 kHz Depths: to 99 %	10 MHz to 1.3 GHz	3 % + 1 digit		
Rate: 20 Hz to 100 kHz Depths: (5 to 99) %	(1.3 to 26.5) GHz	1.5 % + 1 digit	w/ 11793A	
Rate: 20 Hz to 100 kHz Depths: to 99 %	(1.3 to 26.5) GHz	3 % + 1 digit		
**Amplitude Modulation – Source			HP 11715A	
Rate: 50 Hz to 100 kHz Depths: (5 to 99) %	10 kHz to 2 GHz	0.1 %		
**Frequency Modulation			HP 8902A	
Rate: 20 Hz to 10 kHz Dev.: ≤ 40 kHz peak	250 kHz to 10 MHz	2 % + 1 digit		
Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz peak	10 MHz to 1.3 GHz	1 % + 1 digit		
Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz peak	10 MHz to 1.3 GHz	5 % + 1 digit		
Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz peak	(1.3 to 26.5) GHz	1 % + 1 digit	w/ HP 11793A	
Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz peak	(1.3 to 26.5) GHz	5 % + 1 digit		
**Frequency Modulation - Source			HP 11715A	
Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz peak	10 kHz to 2 GHz	0.1 %		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**VSWR – Measure - into 50 Ω				
1 < VSWR < 1.22	10 MHz to 2 GHz	0.01	Wiltron 60N50 with HP 8902A and HP 11722A	OEM and GIDEP Sourced Calibration Procedures
1.22 < VSWR < 1.67		0.02		
1.67 < VSWR < 3		0.04		
3 < VSWR < 7		0.07		
1 < VSWR < 1.1	10 MHz to 8.4 GHz	0.03	8757D w/ 85021B 8340B	
	(8.4 to 12.4) GHz	0.04		
	(12.4 to 18) GHz	0.04		
	(18 to 20) GHz	0.03		
	(20 to 26.5) GHz	0.06		
1.1 < VSWR < 1.25	10 MHz to 8.4 GHz	0.03	8757D w/ 85021B	
	(8.4 to 12.4) GHz	0.05		
	(12.4 to 18) GHz	0.05		
	(18 to 20) GHz	0.04		
	(20 to 26.5) GHz	0.07		
1.25 < VSWR < 1.5	10 MHz to 8.4 GHz	0.05	8757D w/ 85021B	
	(8.4 to 12.4) GHz	0.08		
	(12.4 to 18) GHz	0.07		
	(18 to 20) GHz	0.07		
	(20 to 26.5) GHz	0.11		
1.5 < VSWR < 2	10 MHz to 8.4 GHz	0.09		
	(8.4 to 12.4) GHz	0.17		
	(12.4 to 18) GHz	0.16		
	(18 to 20) GHz	0.15		
	(20 to 26.5) GHz	0.25		
2 < VSWR < 3	10 MHz to 8.4 GHz	0.24		
	(8.4 to 12.4) GHz	0.49		
	(12.4 to 18) GHz	0.47		
	(18 to 20) GHz	0.46		
	(20 to 26.5) GHz	0.7		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Transmission Magnitude	<b>300 kHz to 3 GHz</b> (10 to 0) dB (0 to -10) dB (-10 to -40) dB (-40 to -50) dB (-50 to -60) dB (-60 to -70) dB <b>(3 to 6) GHz</b> (10 to 0) dB (0 to -10) dB (-10 to -40) dB (-40 to -50) dB (-50 to -60) dB (-60 to -70) dB	0.3 dB 0.09 dB 0.1 dB 0.11 dB 0.18 dB 0.35 dB  0.52 dB 0.13 dB 0.13 dB 0.17 dB 0.25 dB 0.68 dB	8753E Network Analyzer  8753D Network Analyzer	OEM and GIDEP Sourced Calibration Procedures
**Transmission Phase (Into 50 Ω, 0° to 360°)	<b>300 kHz to 3 GHz</b> (10 to 0) dB (0 to -10) dB (-10 to -40) dB (-40 to -50) dB (-50 to -60) dB <b>(3 to 6) GHz</b> (10 to 0) dB (0 to -30) dB (-30 to -40) dB (-40 to -50) dB (-50 to -60) dB	4.05 ° 0.83 ° 0.89 ° 1.01 ° 1.37 °  4.62 ° 1.06 ° 1.08 ° 1.22 ° 2.14 °	8753E Network Analyzer  8753D Network Analyzer	
**Reflection Magnitude - Measure - into 50 Ω $0 < \Gamma \leq 1$  $0 < \Gamma \leq 0.05$  $0.05 < \Gamma \leq 0.1$	300 kHz to 3 GHz (3 to 6) GHz  10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz  10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	0.017 Γ 0.026 Γ  0.01 Γ 0.016 Γ 0.014 Γ 0.012 Γ 0.022 Γ  0.011 Γ 0.018 Γ 0.015 Γ 0.014 Γ 0.024 Γ	8753E Network Analyzer, 8753D Network Analyzer  HP 8757D with HP 85021B	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Reflection Magnitude - Measure into 50 Ω (cont.) 0.1 < $\Gamma$ ≤ 0.3	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	0.016 $\Gamma$ 0.031 $\Gamma$ 0.029 $\Gamma$ 0.027 $\Gamma$ 0.045 $\Gamma$	HP 8757D w/85021B	OEM and GIDEP Sourced Calibration Procedures
0.3 < $\Gamma$ ≤ 0.5	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	0.027 $\Gamma$ 0.059 $\Gamma$ 0.057 $\Gamma$ 0.055 $\Gamma$ 0.089 $\Gamma$		
0.5 < $\Gamma$ ≤ 0.75	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	0.049 $\Gamma$ 0.12 $\Gamma$ 0.11 $\Gamma$ 0.11 $\Gamma$ 0.18 $\Gamma$		
0.75 < $\Gamma$ ≤ 1	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	0.08 $\Gamma$ 0.19 $\Gamma$ 0.19 $\Gamma$ 0.19 $\Gamma$ 0.3 $\Gamma$		
**Reflection Phase (Into 50 Ω, 0° to 360°) 0.2 < $\Gamma$ ≤ 0.4	300 kHz to 3 GHz (3 to 6) GHz	2° 3.1°	HP 8753E Opt 6	
0.4 < $\Gamma$ ≤ 0.6	300 kHz to 3 GHz (3 to 6) GHz	1.4° 2.2°		
0.6 < $\Gamma$ ≤ 1	300 kHz to 3 GHz (3 to 6) GHz	1.2° 1.9°		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Return Loss - Measure into 50 Ω (cont.)				
(0 to 1) dB	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	0.1 dB 0.16 dB 0.14 dB 0.12 dB 0.22 dB		
(1 to 5) dB	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	0.11 dB 0.18 dB 0.16 dB 0.14 dB 0.25 dB		
(5 to 10) dB	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	0.18 dB 0.29 dB 0.25 dB 0.22 dB 0.4 dB	HP 8757D w/85021B	OEM and GIDEP Sourced Calibration Procedures
(10 to 20) dB	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	0.32 dB 0.52 dB 0.45 dB 0.39 dB 0.72 dB		
(20 to 30) dB	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	1.06 dB 1.75 dB 1.51 dB 1.28 dB 2.48 dB		
(30 to 40) dB	10 MHz to 8.4 GHz (8.4 to 12.4) GHz (12.4 to 18) GHz (18 to 20) GHz (20 to 26.5) GHz	3.81 dB 7.09 dB 5.84 dB 4.8 dB 11.81 dB		



PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Digital Modulation - Measure Carrier: 2 MHz to 2.65 GHz Error Vector Magnitude VM) (all digital modulations except FSK and CDMA)	Frequency Span: 1 Hz to 100 kHz 100 kHz to 1 MHz 1 MHz to 2.65 GHz	0.35 % 0.59 % 1.2 %	HP 89441A Vector Signal Analyzer	OEM and GIDEP Sourced Calibration Procedures
Phase (EVM) (all digital modulations except FSK and CDMA)	1 Hz to 100 kHz 100 kHz to 1 MHz 1 MHz to 2.65 GHz	0.22 ° 0.44 ° 0.72 °		
FSK Error Vector Magnitude	Symbol Rate: 3.2 kHz 1.152 MHz	0.68 % 2.1 %		
FSK Phase	3.2 kHz 1.152 MHz	16 Hz 3.3 kHz		
CDMA Error Vector Magnitude	Frequency Span: 2.6 MHz	1.2 %		
CDMA Phase	2.6 MHz	0.69 °		

### III. Time & Frequency

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Frequency - Source	10 MHz	5 parts in $10^{-12}$	True Time XL-DC GPS	OEM and GIDEP Sourced Calibration Procedures
	0.01 Hz to 20 MHz	5 parts in $10^{-12}$	HP 3325A	
	20 MHz to 2 GHz	5 parts in $10^{-12}$	HP 8648C	
	(2 to 26.5) GHz	5 parts in $10^{-12}$	HP 8673D	
**Frequency - Measure	10 MHz	5 parts in $10^{-12}$	True Time XL-DC GPS	
	DC to 2.6 GHz	5 parts in $10^{-12}$	PM 6654C	
**Time Interval	1 s to 3 hr	0.5 s	HP 53132A	

#### IV. Thermodynamic

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Relative Humidity - Source	(5 to 95) %	0.62 %	Omega RHCL-1 Chamber with General Eastern M4 Thermo-hygrometer	OEM and GIDEP Sourced Calibration Procedures
**Relative Humidity - Measure	(5 to 95) %	0.61 %	General Eastern M4 Thermo-hygrometer	
**Temperature - Source	(-5 to 125) °C	0.07 °C	Hart 7102 bath with 1502 Meter and 5626 SPRT	
**Temperature - Measure	(-200 to 420) °C	0.04 °C	Hart 1502 with 5612 PRT	
**IR Temperature - Source	(50 to 100) °C (100 to 500) °C	0.88 °C 1.2 °C	Hart 9132	

#### V. Mechanical

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Scales & Balances	(1 to 5) mg	0.04 mg	Class S Weights	OEM and GIDEP Sourced Calibration Procedures
	(10 to 30) mg	0.06 mg		
	(30 to 200) mg	0.11 mg		
	(200 to 500) mg	0.18 mg		
	500 mg to 1 g	0.25 mg		
	(1 to 10) g	0.34 mg		
	(10 to 50) g	0.64 mg		
	(50 to 100) g	1.1 mg		
	(100 to 200) g	2.1 mg		
	(1 to 5) lb	0.0006 lb		
	(5 to 10) lb	0.001 lb		
	(10 to 25) lb	0.004 lb		
	(25 to 50) lb	0.006 lb		
	(50 to 100) lb	0.02 lb		
(100 to 500) lb	0.05 lb			
**Tensiometers and Force Gages	(0 to 500) lb	0.95 lb	Class F Weights	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
RPM - Source	(0 to 12 000) RPM	0.01 %	Monarch Pocket-Tach	OEM and GIDEP Sourced Calibration Procedures
RPM - Measure	(0 to 12 000) RPM	0.1 %	Phillips 6654C	
**Viscosity - Source	(23 to 7 130) cSt	1.2 %	Standard Solutions	
**Pressure	(15 to 115) psia	0.016 psia	Mensor PCS400	
	(115 to 415) psia	0.05 psia	Mensor PDT-415	
	(415 to 1 015) psia	0.13 psia	Mansfield DWT	
	(100 to 10 000) psig	0.12 % of reading	Transmation 90-10WD	
*Pressure, Absolute by Addition of Air	(0 to 10) in H <sub>2</sub> O	0.037 in H <sub>2</sub> O		
	(5 to 350) kPa	$15 \times 10^{-6} + 10$ Pa	DHI 7601 (10 kPa/kg (Ceramic Piston))	
*Pressure, Absolute by Vacuum	350 to 7 000 kPa	$20 \times 10^{-6} + 10.1$ Pa	200 kPa/kg Piston Cylinder	
	(5 to 350) kPa	$(14 \times 10^{-6} + 0.2)$ Pa	DHI 7601 (10 kPa/kg (Ceramic Piston))	
*Pressure, Differential	(350 to 7 000) kPa	$(20 \times 10^{-6} + 1.2)$ Pa	200 kPa/kg Piston Cylinder	
	(5 to 350) kPa	$(14 \times 10^{-6} + 0.3)$ Pa	DHI 7601 (10 kPa/kg (ceramic piston))	
*Pressure, Gage	(5 to 350) kPa	$(15 \times 10^{-6} + 0.1)$ Pa	DHI 7601 (10 kPa/kg (Ceramic Piston))	
	350 to 7 000 kPa	$(20 \times 10^{-6} + 1.2)$ Pa	200 kPa/kg Piston Cylinder	
Vacuum	(0 to 15) psia	0.002 psia	Mensor PCS400	
**Torque Transducers	20 in·lb to 300 ft·lb (300 to 2 000) ft·lb	0.12 % 0.12 %	Class 6 & F Weights with: 10-in Butterfly 40 in Torque Arm	



<b>PARAMETER / EQUIPMENT</b>	<b>RANGE</b>	<b>CALIBRATION &amp; MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]</b>	<b>REFERENCE STANDARD OR EQUIPMENT</b>	<b>METHOD(S)</b>
Direct Verification of Durometer Spring Force - Types A, C and D	(10 to 90) duros	0.61 duros	Pan Balance with Class 6 Weights	OEM and GIDEP Sourced Calibration Procedures
Microphone Simulation (89 to 100) dB/20 µPa	(2 to 50) kHz	0.06 dB/20 µPa	Fluke 5520A with HP 3458A	
**Vibration ; Source and Measure	(1 to 10) G pk (9.806 to 98.066) pC/m/s <sup>2</sup> 30 Hz to 10 kHz	0.39 %	Hardy Instruments DI-803 with Dytran 3120 BK	
**pH - Source	(4.01, 7, 10) pH  (0 to 14) pH	0.02 pH  0.13 pH	Standard Solutions  Cole-Parmer 5657-10 pH Calibrator	
**Conductivity	(70, 445, 700) µmhos (2 060, 16 630) µmhos	1.2 %	Standard Solutions	
Sound Level Meters and Noise Dosimeters (Ref 2 × 10 <sup>-5</sup> dB)				
94 dB/20 µPa	31.5 Hz 63 Hz 125 Hz 250 Hz 500 Hz 1 kHz 2 kHz 4 kHz 8 kHz 12.5 kHz 16 kHz	0.36 dB/20 µPa 0.36 dB/20 µPa 0.36 dB/20 µPa 0.32 dB/20 µPa 0.32 dB/20 µPa 0.22 dB/20 µPa 0.36 dB/20 µPa 0.36 dB/20 µPa 0.46 dB/20 µPa 0.71 dB/20 µPa 0.71 dB/20 µPa	B & K 4226	
104 dB/20 µPa	250 Hz	0.41 dB/20 µPa	B & K 4226	
114 dB/20 µPa	250 Hz	0.41 dB/20 µPa	B & K 4226	
124 dB/20 µPa	250 Hz	0.21 dB/20 µPa	B & K 4220	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Microphone Calibrators (Ref $2 \times 10^{-5}$ Pa)				
94 dB/20 $\mu$ Pa	31.5 Hz 63 Hz 125 Hz 250 Hz 500 Hz 1 kHz 2 kHz 4 kHz 8 kHz 12.5 kHz 16 kHz	0.37 dB/20 $\mu$ Pa 0.37 dB/20 $\mu$ Pa 0.37 dB/20 $\mu$ Pa 0.32 dB/20 $\mu$ Pa 0.32 dB/20 $\mu$ Pa 0.23 dB/20 $\mu$ Pa 0.37 dB/20 $\mu$ Pa 0.37 dB/20 $\mu$ Pa 0.46 dB/20 $\mu$ Pa 0.71 dB/20 $\mu$ Pa 0.71 dB/20 $\mu$ Pa	B & K 4226, and GRAS 26AG	OEM and GIDEP Sourced Calibration Procedures
104 dB/20 $\mu$ Pa	250 Hz	0.42 dB/20 $\mu$ Pa	B & K 4226, and GRAS 26AG	
114 dB/20 $\mu$ Pa	250 Hz	0.26 dB/20 $\mu$ Pa	B & K 42AA, B&K 4226, and GRAS 26AG	
124 dB/20 $\mu$ Pa	250 Hz	0.36 dB/20 $\mu$ Pa	B & K 4220, B&K 2690 and GRAS 26AG	

## VI. Dimensional

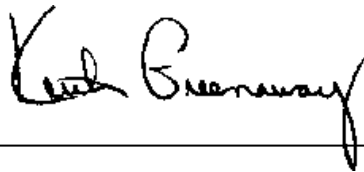
PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Micrometers, Height Gages, Depth Gages	Up to 60 in	(79 + 1.6L) $\mu$ in	Grade 2 Gage Blocks	OEM and GIDEP Sourced Calibration Procedures
**Calipers	Up to 60 in	(700 + 1.6L) $\mu$ in		
**Indicators	Up to 2 in	(79 + 1.6L) $\mu$ in	Grade 1 Gage Blocks	
**Rulers and Tape Measures	Up to 25 ft	0.009 in	Grade 1 Gage Blocks with Calipers	

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
**Cylindrical Rings	(0.08 to 8.05) in	37 µin	Grade 1 Gage Blocks and SIP	OEM and GIDEP Sourced Calibration Procedures
Threaded Rings Inside Diameter Pitch Diameter	(0.08 to 8.05) in (4 to 36) TPI	41.2 µin		
**Cylindrical Plain & Threaded Plugs and Pins Outside Diameter Pitch Diameter	(0 to 12) in (4 to 96) TPI	37 µin		
**Micrometer Set Standards	Up to 12 in	41.2 µin		
Thread Wires	Up to 10 in	37 µin		
**Hole Micrometers	(0.5, 0.75, 1, 1.25) in (1.5, 1.75, 2) in	67 µin	Class XX Ring Gages	
**Thickness Gages	Up to 5 in	0.0009 in	Grade 1 Gage Blocks	
**Surface Plates - Flatness	Up to (24 x 24) in (24 x 24) to (48 x 96) in (48 x 108) to (96 x 96) in	4.9 µin 7.8 µin 7.3 µin	Repeat-o-Meter Mahr-Federal Level	
- Repeat Reading	Up to (96 x 96) in	4.9 µin	Repeat-o-Meter	
**Length Measurement	(0.05 to 8) in	(30 + 5L) µin	Master Gage Blocks P & W Laser Ruler Gage Blocks and Comparator Nikon Microscope	
	(8 to 24) in	(35 + 15L) µin		
X and Y Axis	Up to 6 in	0.00006 in		

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
*Length X Axis Y Axis Z Axis	20 in 24 in 12 in	(140 + 12L) μin (140 + 12L) μin (140 + 12L) μin	Mitutoyo BHN-506	OEM and GIDEP Sourced Calibration Procedures
X Axis Y Axis Z Axis	28 in 40 in 18 in	(190 + 12L) μin (190 + 12L) μin (190 + 12L) μin	Mitutoyo BHN-710	
*External Diameter	(0.003 to 1) in	36 μin	Beta LaserMike	
*Radius	Up to 12 in Up to 600 mm	0.0012 in 12 μm/m + 6 μm	Optical Comparator Mitutoyo QVB 606	

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.
1. This laboratory also offers calibration services at a satellite laboratory located at: One Corporate Center, M/S 8194 P.O. Box 9005, Kokomo, Indiana 46904. Point of contact: Douglas Wiley, Phone: 765-451-1555.
2. A single asterisk (\*) identifies capabilities available only at the Kokomo satellite laboratory.
3. A double asterisk (\*\*) identifies capabilities available at both the Fairborn and Kokomo locations.
4. CMC displayed as percentage (%) are percent of reading unless indicated otherwise.
5. The use of (L) signifies an expression of Length in inches.
6. The use of (F) refers to the Frequency of the applied current.
7. This scope is part of and must be included with the Certificate of Accreditation No.AC-1393.



Vice President