



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

TECHMASTER ASIA (THAILAND) Co., Ltd.
5/41 Home In Town, Paholyothin 73, Sanambin, Donmuang
Bangkok 10210, Thailand

has been assessed by ANAB
and meets the requirements of international standard

ISO/IEC 17025:2005

while demonstrating technical competence in the field(s) of

CALIBRATION

Refer to the accompanying Scope(s) of Accreditation for information regarding the types of calibrations to which this accreditation applies.

AC-1705

Certificate Number

ANAB Approval

Certificate Valid To: 09/14/2017
Version No. 001 Issued: 09/21/2015



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated January 2009).



ANSI-ASQ National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

TECHMASTER ASIA (THAILAND) Co., Ltd.

5/41 Home In Town, Paholyothin 73, Sanambin, Donmuang
Bangkok 10210, Thailand

Robert Tyler 760-536-0227
btyler@techmaster.us www.techmastertest.com

CALIBRATION

Valid to: September 14, 2017

Certificate Number: AC-1705

I. Electromagnetic - DC/Low Frequency

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Voltage - Source ³	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	7.7 µV/V + 0.86 µV 5.9 µV/V + 0.87 µV 4.2 µV/V + 3.1 µV 3.9 µV/V + 14 µV 5.9 µV/V + 48 µV 7.5 µV/V + 0.76 mV	Fluke 5700A	DOD Midas, OEM and GIDEP Sourced Procedures
DC Voltage - Measure ³	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV (1 to 20) kV (20 to 35) kV (35 to 40) kV	7.2 µV/V + 0.55 µV 7 µV/V + 0.42 µV 6.9 µV/V + 0.86 µV 9.2 µV/V + 38 µV 9.3 µV/V + 0.13 µV 20 mV/V 10 mV/V 20 mV/V	HP 3458A Opt 002 with Fluke 80K-40 High Voltage Probe	
DC Current - Source ³	Up to 220 µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 3) A (3 to 11) A (11 to 20.5) A	48 µA/A + 7.1 nA 41 µA/A + 9.6 nA 42 µA/A + 49 nA 54 µA/A + 0.84 µA 95 µA/A + 15 µA 0.45 mA/A + 66 µA 0.59 mA/A + 0.60 mA 1.2 mA/A + 0.91 mA	Fluke 5700A Fluke 5520A	
Clamp-On Ammeters ³	(20 to 1 000) A	2.9 mA/A + 0.08 A	Fluke 5520A with Fluke Coil	



PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
DC Current - Measure ³	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 Up to 300 A	22 µA/A + 93 pA 18 µA/A + 0.10 nA 28 µA/A + 0.14 nA 30 µA/A + 0.98 nA 30 µA/A + 6.5 nA 30 µA/A + 63 nA 44 µA/A + 1 µA 0.14 mA/A + 12 µA 2.5 mA/A + 1 mA	HP 3458A Opt 002 with Empro HA-300-100	
AC Voltage - Source ³	(1 to 2.2) mV (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 (2.2 to 22) mV (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 (22 to 220 mV (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 220 mV to 2.2 V (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	0.34 mV/V + 5.8 µV 0.12 mV/V + 5.1 µV 98 µV/V + 4.9 µV 0.25 mV/V + 4.9 µV 0.67 mV/V + 6.7 µV 1.5 mV/V + 13 µV 0.30 mV/V + 4.9 µV 0.11 mV/V + 4.9 µV 96 µV/V + 4.8 µV 24 µV/V + 4.8 µV 0.60 mV/V + 6 µV 1.3 mV/V + 12 µV 1.7 mV/V + 24 µV 3.2 mV/V + 24 µV 0.29 mV/V + 14 µV 0.10 mV/V + 9.4 µV 92 µV/V + 9.2 µV 0.24 mV/V + 88 µV 0.55 mV/V + 20 µV 1.1 mV/V + 24 µV 1.7 mV/V + 30 µV 3.2 mV/V + 53 µV 0.23 mV/V + 54 µV 0.11 mV/V + 19 µV 54 µV/V + 10 µV 88 µV/V + 14 µV 0.13 mV/V + 38 µV 0.50 mV/V + 96 µV 1.2 mV/V + 0.24 mV 2 mV/V + 0.35 mV	Fluke 5700A	DOD Midas, OEM and GIDEP Sourced Procedures

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Source ³ (cont.)	(2.2 to 22) V (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 (22 to 220) V (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 220 V to 1.1 kV (15 to 50) Hz 50 Hz to 1 kHz	0.30 mV/V + 0.54 mV 0.12 mV/V + 0.20 mV 53 µV/V + 67 µV 91 µV/V + 0.13 mV 0.12 mV/V + 0.26 mV 0.33 mV/V + 0.72 mV 1.2 mV/V + 2.4 mV 1.2 mV/V + 3.8 mV 0.30 mV/V + 5.4 mV 0.12 mV/V + 1.8 mV 59 µV/V + 0.85 mV 99 µV/V + 1.4 mV 0.18 mV/V + 3.1 mV 1.2 mV/V + 19 mV 0.36 mV/V + 20 mV 82 µV/V + 5.5 mV	Fluke 5700A	
AC Voltage - Source ³ Wide Band	300 µV to 3.5 V (10 to 30) Hz 30 Hz to 120 kHz 300 µV to 1.1 mV 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz 300 µV to 3 mV 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz 3 mV to 3.5 V 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	4.9 µV/V + 3.7 µV 4.9 µV/V + 3.7 µV 2.4 µV/V + 3.5 µV 4.7 µV/V + 3.5 µV 7.1 µV/V + 3.5 µV 18 µV/V + 18 µV 1.2 µV/V + 3.5 µV 3.5 µV/V + 3.5 µV 5.9 µV/V + 3.5 µV 18 µV/V + 3.5 µV 1.2 µV/V + 3.5 µV 2.4 µV/V + 3.5 µV 4.7 µV/V + 3.5 µV 12 µV/V + 3.5 µV	Fluke 5700A/03 Wide Band Function	DOD Midas, OEM and GIDEP Sourced Procedures
AC Voltage - Measure ³	(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	0.36 mV/V + 3.6 µV 0.23 mV/V + 1.4 µV 0.32 V/V + 1.7 µV 1.2 mV/V + 1.6 µV 5.7 mV/V + 2 µV 46 mV/V + 2.6 µV	HP 3458A Opt 002	

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Voltage - Measure ³ (cont.)	100 mV to 10 V (1 Hz 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 (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 100 V to 1 kV (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (1 to 40) kV 60 Hz	72 µV/V + 0.85 mV 84 µV/V + 0.26 mV 0.17 mV/V + 0.26 mV 0.35 mV/V + 0.25 mV 0.93 mV/V + 0.27 mV 3.5 mV/V + 1.2 mV 12 mV/V + 1.2 mV 18 mV/V + 1.2 mV 0.24 mV + 4.7 mV 0.15 mV + 16 mV 0.15 mV + 17 mV 0.36 mV + 8.6 mV 1.4 mV/V + 3.9 mV 4.8 mV/V + 12 mV 18 mV/V + 12 mV 0.46 mV/V + 50 mV 0.46 mV/V + 28 mV 0.69 mV/V + 29 mV 1.5 mV/V + 24 mV 3.6 mV/V + 24 mV 50 mV/V + 0.11 V	HP 3458A Opt 002 with Fluke 80K-40 High Voltage Probe	DOD Midas, OEM and GIDEP Sourced Procedures
AC Current - Source ³	(9 to 220) µA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 220 µA to 2.2 mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz	0.36 mA/A + 25 nA 0.24 mA/A + 16 nA 0.17 mA/A + 12 nA 0.42 mA/A + 18 nA 1.6 mA/A + 95 nA 0.37 mA/A + 73 nA 0.25 mA/A + 68 nA 0.19 mA/A + 54 nA 0.32 mA/A + 0.17 µA 1.6 mA/A + 0.95 µA 0.32 mA/A + 0.67 µA 0.20 mA/A + 0.57 µA 0.16 mA/A + 0.46 µA 0.27 mA/A + 0.73 µA 1.3 mA/A + 5.9 µA 0.32 mA/A + 6.1 µA 0.20 mA/A + 5 µA 0.16 mA/A + 3.4 µA 1.4 µA/A + 12 µA	Fluke 5700A	

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
AC Current - Source ³ (cont.) Clamp-On Ammeters	220 mA to 2.2 A 20 Hz to 1kHz (1 to 5) kHz (5 to 10) kHz (20 to 1 000) A 45 Hz to 5 kHz	0.31 mA/A + 44 µA 0.53 mA/A + 0.11 mV 8.3 mA/A + 0.29 mV 2.8 mA/A + 0.14 A	Fluke 5700A Fluke 5520A with Fluke Coil	DOD Midas, OEM and GIDEP Sourced Procedures
AC Current - Measure ³	Up to 100 µA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz 100 µA 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 100 mA to 1 A (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	4.7 mA/A + 36 nA 1.8 mA/A + 35 nA 0.71 mA/A + 35 nA 0.70 mA/A + 35 nA 4.7 mA/A + 24 µA 1.8 mA/A + 24 µA 0.71 mA/A + 24 µA 0.36 mA/A + 23 µA 0.71 mA/A + 24 µA 4.7 mA/A + 47 µA 6.5 mA/A + 0.18 mA 4.7 mA/A + 0.24 mA 1.9 mA/A + 0.24 mA 0.95 mA/A + 0.24 mA 1.1 mA/A + 0.26 mA 3.5 mA/A + 0.24 mA 12 mA/A + 0.47 mA	Agilent 3458A Opt 002	
Resistance - Source ³	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	5.7 µΩ/Ω + 1.1 mΩ 35 µΩ/Ω + 1.8 mΩ 29 µΩ/Ω + 0.57 mΩ 33 µΩ/Ω + 2.4 mΩ 30 µΩ/Ω + 4.3 mΩ 33 µΩ/Ω + 27 mΩ 4.5 µΩ/Ω + 1.7 Ω 34 µΩ/Ω + 0.23 Ω 33 µΩ/Ω + 0.33 Ω 35 µΩ/Ω + 4 Ω 37 µΩ/Ω + 2.4 Ω 71 µΩ/Ω + 36 Ω 0.15 mΩ/Ω + 67 Ω 0.39 mΩ/Ω + 3 kΩ 0.58 mΩ/Ω + 4.8 kΩ 3.5 mΩ/Ω + 0.12 MΩ 18 mΩ/Ω + 0.59 MΩ	Fluke 5520A	

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Resistance - Source ³ Fixed Points	1 Ω	0.12 mΩ	Fluke 5700A	
	1.9 Ω	0.22 mΩ		
	10 Ω	0.28 mΩ		
	19 Ω	0.58 mΩ		
	100 Ω	1.3 mΩ		
	190 Ω	2.4 mΩ		
	1 kΩ	10 mΩ		
	1.9 kΩ	20 mΩ		
	10 kΩ	90 mΩ		
	19 kΩ	0.19 Ω		
	100 kΩ	1.3 Ω		
	190 kΩ	2.5 Ω		
	1 MΩ	2.4 Ω		
	1.9 MΩ	47 Ω		
	10 MΩ	0.47 kΩ		
	19 MΩ	1.3 kΩ		
100 MΩ	12 kΩ			
10 mΩ to 1 kΩ (1 to 100) kΩ	0.1 mΩ/Ω + 2 mΩ 0.1 mΩ/Ω + 0.18 Ω	ESI DB62-11K ESI DB62-111K IET HRRS-Q-3-100M- 5KV	DOD Midas, OEM and GIDEP Sourced Procedures	
100 kΩ to 1 GΩ (1 to 10) GΩ	1 mΩ/Ω + 11 kΩ 2 mΩ/Ω + 0.58 kΩ			
(10 to 100) GΩ	5 mΩ/Ω + 23 Ω			
Resistance - Measure ³ Fixed Points	10 Ω	22 μΩ/Ω + 62 μΩ	HP 3458A Opt 002	
	100 Ω	18 μΩ/Ω + 0.61 mΩ		
	1 kΩ	16 μΩ/Ω + 0.73 mΩ		
	10 kΩ	15 μΩ/Ω + 13 mΩ		
	100 kΩ	15 μΩ/Ω + 67 mΩ		
	1 MΩ	21 μΩ/Ω + 2.7 Ω		
	10 MΩ	46 μΩ/Ω + 0.39 kΩ		
	100 MΩ	0.56 mΩ/Ω + 1.2 kΩ		
1 GΩ	6 mΩ/Ω + 12 kΩ			
Capacitance - Source ³ 190 pF to 1.1 nF (1.1 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	10 Hz to 10 kHz	5 mF/F + 12 pF	Fluke 5520A	
	10 Hz to 3 kHz	5.8 mF/F + 12 pF		
	10 Hz to 10 kHz	2.9 mF/F + 0.12 nF		
	10 Hz to 10 kHz	2.9 mF/F + 0.35 nF		
	(10 to 600) Hz	3 mF/F + 1.2 nF		
	(10 to 300) Hz	4.1 mF/F + 3.5 nF		
	(10 to 150) Hz	4.1 mF/F + 11 nF		
	(10 to 120) Hz	4.7 mF/F + 35 nF		
	(10 to 80) Hz	5.9 mF/F + 0.11 μF		
	(10 to 80) Hz	8.1 mF/F + 0.35 μF		
	(10 to 80) Hz	12 mF/F + 0.27 μF		

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Capacitance - Source ³ 1 pF 10 pF 100 pF 1 nF Algorithmic Deviation 1 pF 10 pF 100 pF 1 nF	1 kHz 1 kHz 1 kHz 1 kHz (1 to 3) MHz 4 MHz 5 MHz 10 MHz 13 MHz (1 to 13) MHz (1 to 10) MHz 13 MHz (1 to 4) MHz 5 MHz 10 MHz 13 MHz	1.2 fF 12 fF 0.12 pF 1.2 pF 1.2 fF 1.3 fF 1.5 fF 2.8 fF 3.9 fF 12 fF 0.12 pF 0.13 pF 1.2 pF 1.3 pF 2.2 pF 3 pF	Hewlett Packard 16380A Set consisting of 16381A, 16382A, 16383A, and 16384A	DOD Midas, OEM and GIDEP Sourced Procedures
Inductance - Source	100 μH to 1 mH (1 to 10) mH (10 to 100) mH 100 mH to 1 H (1 to 10) H	24 mH/H + 5 μH 24 mH/H + 0.7 mH 19 mH/H + 8.2 μH 9.5 mH/H + 0.13 mH 9.5 mH/H + 1.5 mH	IET 1491-G	
Electrical Simulation of Thermocouple Indicating Devices - Source and Measure ³ Type K Type T Type J Type E Type R	(-200 to -50) °C (-50 to 1 372) °C (-200 to -50) °C (-50 to 400) °C (-210 to -50) °C (-50 to 760) °C (-230 to -50) °C (-50 to 1 000) °C (0 to 1 768) °C	0.56 °C (1 °F) 0.28 °C (0.5 °F) 0.56 °C (1 °F) 0.28 °C (0.5 °F) 0.56 °C (1 °F) 0.28 °C (0.5 °F) 0.56 °C (1 °F) 0.28 °C (0.5 °F) 0.95 °C (1.8 °F)	Fluke 5520A	

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Oscilloscopes³				
Square Wave Signal				
10 Hz to 10 kHz	1 mV to 6.6 V p-p	0.25 mV/V p-p + 0.11 V		
50 Ω	1 mV to 130 V p-p	2.5 mV/V p-p + 58 mV		
1 M Ω				
Level Sine Wave	5 mV to 5.5 V	11 mV/V + 0.11 V		
Amplitude	50 kHz to 100 MHz	25 mV/V + 0.11 V	Fluke 5520A	DOD Midas, OEM and GIDEP Sourced Procedures
	(100 to 300) MHz	30 mV/V + 0.11 V		
	(300 to 600) MHz	52 mV/V + 0.11 V		
Flatness referenced to 50 kHz reference	50 kHz to 100 MHz	6.3 mV/V + 0.11 V		
	(100 to 300) MHz	5.9 mV/V + 0.17 V		
	(300 to 600) MHz	23 mV/V + 0.17 V		
Time Markers (5-2-1 sequence) into a 50 Ω load	5 s to 50 ms	0.30 mHz/Hz + 0.12 Hz		
	20 ms to 100 ns	2.5 x 10 ⁻⁶ Hz		
	(50 to 20) ns	2.5 x 10 ⁻⁶ Hz		
	10 ns	2.5 x 10 ⁻⁶ Hz		
	(5 to 2) ns	2.5 x 10 ⁻⁶ Hz		
Rise Time	≤ 300 ps	0.06 ps/s + 0.03 ps		

II. Electromagnetic - RF/ Microwave

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
RF Tuned Power- Measure ³ (0 to 139) dB	100 kHz to 4.2 GHz (4.2 to 18) GHz	0.02 dB + 0.02044 dB/10 dB Step 0.02 dB + 0.02044 dB/10 dB Step	HP 8902A HP 11793A HP 11722A HP 11792A	DOD Midas, OEM and GIDEP Sourced Procedures
Amplitude Modulation - Source ³ Rate: 6 MHz to 20 GHz, 0 % to 100 %	DC to 100 kHz	1.2 % + 0.07 AM	HP 83620B	

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Amplitude Modulation - Measure ³ Rate: 50 Hz to 10 kHz, 5 % to 99 % 50 Hz to 100 kHz, 20 % to 99 %	150 kHz to 10 MHz 10 MHz to 1.3 GHz	0.044 % + 2.332 % 0.012 % + 1.181 %	HP 8902A	DOD Midas, OEM and GIDEP Sourced Procedures
Frequency Modulation - Measure ³ Rate: 20 Hz to 10 kHz Dev:20 Hz to 40 kHz peak Rate: 50 Hz to 200 kHz Dev:250 Hz to 400 kHz peak	250 kHz to 10 MHz 10 MHz to 1.3 GHz	0.022 kHz + 2.266 % 0.16 kHz + 5.833 %	HP8902A	
Frequency Modulation - Source ³ Rate: 1 kHz rate Max. Dev. 2 MHz Max. Dev. 4 MHz Max. Dev. 8 MHz Max. Dev. 16 MHz Max. Dev. 32 MHz	250 kHz to 1 GHz (1 to 2) GHz (2 to 3.2) GHz (3.2 to 10) GHz (10 to 20) GHz	4 % + 24 Hz	HP 83620B	
Phase Modulation - Measure ³ >0.7 rad Dev. >0.6 rad Dev.	150 kHz to 10.0 MHz 10 MHz to 1.3 GHz	0.003 rad + 4.932 % 0.067 rad + 3.378 %	HP 8902A	
Phase Modulation - Measure ³ Rate:200 Hz to 10 kHz Rate:200 Hz to 20 kHz	150 kHz to 10 MHz 10 MHz to 1.3 GHz	4.6 % + 1 digit 3.5 % + 1 digit	HP 8902A	
Distortion - Measure ³ Rate: 20 Hz to 250 kHz (0.01 to 100) %	20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.3 dB	HP 8902B	
Power - Measure ³ 1 mW reference	50 MHz 100 kHz to 4.2 GHz 10 MHz to 18 GHz 50 MHz to 26.5 GHz	0.01 mW 3 % + 0.10 dbm 3.2 % + 0.10 dbm 3 % + 0.10 dbm	HP 478A with HP 432A HP 8482A, E4419B, HP 8481A, E4419B, HP 8485A, E4419B	
Noise Figure - Source ³ 15 dB ENR	10 MHz to 26.5 GHz	0.17 dB	HP 346C	

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Noise Figure - Measure ³	100 kHz to 30 MHz 30 MHz to 3 GHz (3 to 26.5) GHz	0.43 dB 0.42 dB 0.47 dB	HP 346C, Agilent E4448A, HP 8449B	DOD Midas, OEM and GIDEP Sourced Procedures

III. Time & Frequency

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Frequency - Source ³	1 μHz to 80 MHz 10 MHz to 26.5 GHz	5 x 10 ⁻¹² Hz 5 x 10 ⁻¹² Hz	HP 33250A Agilent 8340B	DOD Midas, OEM and GIDEP Sourced Procedures
Frequency - Measure ³	1 μHz to 12.4 GHz 1 Hz to 26.5 GHz	5 x 10 ⁻¹² Hz 5 x 10 ⁻¹² Hz	HP 53132A Opt 124 Agilent E4440A	
Stopwatches/Timers	Up to 3 600 s	0.25 s	HP 53132A	
RPM – Measure Non-Contact	(60 to 3 000) rpm (3 000 to 6 000) rpm (6 000 to 12 000) rpm (12 000 to 60 000) rpm (60 000 to 100 000) rpm (100 000 to 120 000) rpm	0.13 rpm + 0.0002 rpm 0.13 rpm + 0.0002 rpm 0.16 rpm + 0.0002 rpm 1.3 rpm + 0.0002 rpm 1.6 rpm + 0.0002 rpm 2.4 rpm + 0.0002 rpm	Agilent 33250A	
Stroboscopes	(0 to 100 000) rpm	0.00007 % of Applied + 0.58 rpm	Fluke 5520A	

IV. Optical Radiation

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Optical Wavelength – Measure ³	(700 to 1 650) nm	3 parts in 10 ⁶	Agilent 86120A	DOD Midas, OEM and GIDEP Sourced Procedures

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Laser Power - Measure	Up to 50 W	9.9 mW/W + 18 mW	Gentect Maestro, UP50N-50H-W9-D0	DOD Midas, OEM and GIDEP Sourced Procedures

V. Thermodynamic

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Temperature - Measure Ovens and Chambers	(-100 to 1 300) °C	1.2 °C	Agilent 34970A	DOD Midas, OEM and GIDEP Sourced Procedures
Temperature - Measure Dry Well and Liquid Bath	(-40 to 180) °C (-200 to 0) °C (0 to 660) °C	0.24 °C 0.01 °C 0.02 °C	Vaisala HM141/HMP46 Fluke 5626, Agilent 3458A	
IR Temperature	(-18 to 149) °C (100 to 932) °C	1 °C 1.2 °C	Omega BB701 Omega BB-4A	
Relative Humidity - Measure Ovens and Chambers	Up to 90 %RH (90 to 100) %RH	0.2 % of Applied + 1.3 %RH 2.5 %RH	Vaisala HM141/HMP46	
Platinum Resistance Thermometers	(-8 to 100) °C (100 to 350) °C	0.0018 % + 0.006 °C 0.0022 % + 0.006 °C	Fluke 9009, HP 3458A, Fluke 5626	
Thermocouple Sensors	(-8 to 100) °C (100 to 350) °C	0.26 °C 0.66 °C	Fluke 9009, HP 3458A, Fluke 5626	

VI. Mechanical

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Sound Level Meters	94 dB 114 dB	0.48 dB 0.48 dB	Center 326	DOD Midas, OEM, and GIDEP Sourced Procedures

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Force Gages	Up to 20 kgf	23 gf	Class M1 Weights	DOD Midas, OEM and GIDEP Sourced Procedures
Pressure - Source	(-12 to 300) psi (300 to 10 000) psi	0.2 psi 0.0001 % of Applied + 9.5 psi 0.21 psi	Fluke 718 300G (Air) Fluke 700P31 (Air) Fluke 700P-24 (Differential) Fluke P324 (Oil)	
	(0 to 15) psi (0 to 10 000) psi	0.02 % of Applied + 0.21 psi		
Torque Tools	(1 to 10) in lb (10 to 100) in lb (5 to 50) ft lb (25 to 250) ft lb	0.6 % of Applied + 0.008 in lb 0.6 % of Applied + 0.07 in lb 0.6 % of Applied + 0.04 ft lb 0.7 % of Applied + 0.15 ft lb	Mountz LLT10i Mountz BMX100i Mountz BMX50F Mountz BMX250F	
Torque Transducers	Up to 22 cm kg	0.03 % of Applied + 0.0003 cm kg	Mountz 4 in Torque Wheel and Weights	
Balances	1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg	0.15 mg 0.15 mg 0.15 mg 0.23 mg 0.42 mg 1.0 mg 2.0 mg 4.0 mg 7.0 mg 0.01 g 0.02 g 0.05 g	Class F Weights (Up to 18.11 kg)	
	10 g 20 g 50 g 100 g 200 g 500 g 1 kg 20 kg	0.7 mg 0.9 mg 1.0 mg 1.7 mg 3.3 mg 8.3 mg 17 mg 0.3 g	Class M1 Weights (Up to 104 kg)	
Mass	Up to 100 g Up to 10 kg	0.1 mg 0.01 g	Class F Weights, Balance	
Air Velocity	Up to 7 040 fpm	1.2 % of Applied + 1.6 fpm	Interactive Instruments JS500, Omega HHH141A	

VII. Dimensional

PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(\pm)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Ring Gages	Up to 6 in	(3.6 + 10L) μ in	Mahr Federal UMM	DOD Midas, OEM and GIDEP Sourced Procedures
Thread Measuring Wires	Up to 0.09623 in	(3.4 + 10L) μ in		
Thread Plug Gages - External Diameter	Up to 2 in (2 to 6) in	85 μ in (58 + 10L) μ in		
Thread Ring Gages - Internal Diameter	Up to 1.5 in (1 to 8) in	36 μ in (15 + 10L) μ in		
Gage Blocks	Up to 6 in (6 to 19) in	(3.8 to 10L) μ in (-24 + 8.8L) μ in		
Pin Gages	Up to 1 in (1 to 6) in	20 μ in (5.8 + 10L) μ in		
Bore Gages	Up to 1 in	110 μ in		
Calipers External Diameter	Up to 40 inch (Up to 1 000 mm)	13 μ in/in + 590 μ in	Grade 2 Gage Blocks, End Rods	
Inside Diameter (Fixed Points)	(1 and 2) in (25.4 and 50.8) mm	28 μ in/in + 660 μ in	Ring Gages	
Micrometers and Thickness Gages	Up to 12 in (Up to 300 mm)	30 μ in/in + 19 μ in	Grade 2 Gage Blocks, End Rods	
Height Gages	Up to 40 in (Up to 1 000 mm)	4.7 μ in/in + 750 μ in		
Depth Gages	Up to 40 in (Up to 1 000 mm)	21 μ in/in + 140 μ in	Grade 2 Gage Blocks, End Rods	
Dial Indicators	Up to 4 in (Up to 100 mm)	21 μ in/in + 1 800 μ in	Grade 2 Gage Blocks	

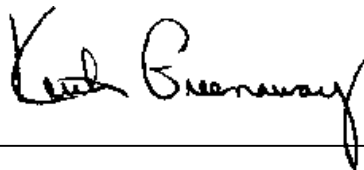
PARAMETER/ EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
Steel Rules	Up to 12 in (Up to 300 mm)	0.04 in	Grade 2 Gage Blocks	DOD Midas, OEM and GIDEP Sourced Procedures
Tape Measure	Up to 12 in (Up to 300 mm)	0.04 in		
Feeler (Thickness) Gages	Up to 1 mm	0.00014 mm	Mahr ULM 600	
Holtest	Extension to 25 mm	0.00012 % + 0.0006 mm		
Optical Comparators and Visual System	Up to 300 mm	0.01 mm	Grade 2 Gage Blocks, Glass Scale	

VIII. Chemical Quantities

PARAMETER / EQUIPMENT	RANGE	CALIBRATION & MEASUREMENT CAPABILITY [EXPRESSED AS UNCERTAINTY(±)]	REFERENCE STANDARD OR EQUIPMENT	METHOD(S)
pH - Source	4.01 pH 7.00 pH 10.00 pH	0.01 pH 0.02 pH 0.02 pH	pH Solutions	DOD Midas, OEM and GIDEP Sourced Procedures
Conductivity - Source	84 µS/cm 1 413 µS/cm 5 000 µS/cm 12 880 µS/cm 111 800 µS/cm	1.9 µS/cm 7.2 µS/cm 28 µS/cm 71 µS/cm 0.56 mS/cm	Conductivity Solutions	

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.
3. These parameters are available for on-site calibrations.
4. The use of (L) signifies Length in inches.
5. This scope is formatted as part of a single document including the Certificate of Accreditation No. AC-1705.



Vice-President