



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

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

This is to certify that

Lockheed Martin Denver Metrology Services
12257 South Wadsworth Blvd. 220 Stargazer Loop, Dock 859
Littleton, CO 80125

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

ISO/IEC 17025:2005

and national standard

ANSI/NCSL Z540-1-1994

while demonstrating technical competence in the field of

CALIBRATION

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

AC-1349

Certificate Number


ANAB Approval

Certificate Valid: 12/06/2016-11/11/2018
Version No. 002 Issued: 12/06/2016



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 AND ANSI/NCSL Z540-1-1994

Lockheed Martin Denver Metrology Services

12257 South Wadsworth Blvd
220 Stargazer Loop, Dock 859
Littleton, CO 80125

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CALIBRATION

Valid to: November 11, 2018

Certificate Number: AC-1349

Electromagnetic - DC/Low Frequency

Parameter/ Equipment ²	Range	Calibration and Measurement Capability [Expressed as Uncertainty (\pm)]	Reference Standard or Equipment
DC Voltage - Measure	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (0.1 to 1) kV	6.1 μ V/V + 3.5 μ V 5.7 μ V/V + 0.4 μ V 5.4 μ V/V + 1 μ V 9 μ V/V + 40 μ V 11 μ V/V + 0.1 mV	Agilent 3458A Opt 002 (90-day spec)
DC Voltage - Source	Up to 220 mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (0.22 to 1.1) kV	6 μ V/V + 0.4 μ V 3.5 μ V/V + 0.7 μ V 2.5 μ V/V + 2.5 μ V 2.5 μ V/V + 4 μ V 3.5 μ V/V + 40 μ V 4.5 μ V/V + 0.4 mV	Fluke 5720A
DC Current - Measure	Up to 100 μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	25 μ A/A + 0.90 nA 21 μ A/A + 6 nA 29 μ A/A + 60 nA 40 μ A/A + 0.6 nA 0.12 mA/A + 12 μ A	Agilent 3458A Opt 002
DC Current - Source	Up to 220 μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A (2.2 to 11) A	35 μ A/A + 6 nA 30 μ A/A + 7 nA 30 μ A/A + 4 nA 40 μ A/A + 0.7 μ A 60 μ A/A + 12 μ A 0.34 mA/A + 0.48 mA	Fluke 5720A with Fluke 5725A



Electromagnetic - DC/Low Frequency

Parameter/ Equipment²	Range	Calibration and Measurement Capability [Expressed as Uncertainty (\pm)]	Reference Standard or Equipment
DC Resistance - Measure	Up to 10 Ω (10 to 100) Ω (0.1 to 1) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω	17 $\mu\Omega/\Omega$ + 58 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 0.58 m Ω 9 $\mu\Omega/\Omega$ + 0.6 m Ω 9 $\mu\Omega/\Omega$ + 6 m Ω 9 $\mu\Omega/\Omega$ + 60 $\mu\Omega$ 14 $\mu\Omega/\Omega$ + 2 Ω 59 $\mu\Omega/\Omega$ + 0.12 k Ω 0.58 m Ω/Ω + 1.2 k Ω	Agilent 3458A Opt 002
Resistance - Source Fixed Points	0 Ω (1, 1.9) Ω (10, 19) Ω (100, 190) Ω (1, 1.9, 10, 1.9) k Ω (100, 190) k Ω 1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	40 $\mu\Omega$ 80 $\mu\Omega/\Omega$ 21 $\mu\Omega/\Omega$ 9 $\mu\Omega/\Omega$ 7.5 $\mu\Omega/\Omega$ 9 $\mu\Omega/\Omega$ 15 $\mu\Omega/\Omega$ 16 $\mu\Omega/\Omega$ 31 $\mu\Omega/\Omega$ 39 $\mu\Omega/\Omega$ 95 $\mu\Omega/\Omega$	Fluke 5720A (90-day spec)
AC Voltage - Measure	(1 to 12) 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 (10 to 120) 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 300 kHz to 1 MHz (0.1 to 1.2) 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	0.72 mV/V + 0.34 μ V 0.58 mV/V + 1.3 μ V 0.58 mV/V + 1.3 μ V 1.3 mV/V + 1.3 μ V 5.8 mV/V + 1.3 μ V 46 mV/V + 2.3 μ V 0.35 mV/V + 5 μ V 0.15 mV/V + 2 μ V 0.21 mV/V + 2 μ V 0.38 mV/V + 2 μ V 0.99 mV/V + 2 μ V 3.5 mV/V + 1.1 μ V 12 mV/V + 1 μ V 0.27 mV/V + 0.34 mV 90 μ V/V + 0.13 mV 0.17 mV/V + 0.13 mV 0.35 mV/V + 0.13 mV 0.93 mV/V + 0.13 mV 3.5 mV/V + 0.11 mV 12 mV/V + 0.11 mV	Agilent 3458A Opt 002

Electromagnetic - DC/Low Frequency

Parameter/ Equipment ²	Range	Calibration and Measurement Capability [Expressed as Uncertainty (\pm)]	Reference Standard or Equipment
AC Voltage - Measure	(1 to 12) 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 (10 to 120) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (0.1 to 1) kV (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.2 mV/V + 3.4 mV 90 μ V/V + 1.3 mV 0.17 mV/V + 1.3 mV 0.35 mV/V + 1.3 mV 0.93 mV/V + 1.3 mV 3.5 mV/V + 1.1 mV 0.12 V/V + 11 mV 0.32 mV/V + 5 mV 0.23 mV/V + 2 mV 0.23 mV/V + 2 mV 0.41 mV/V + 2 mV 1.4 mV/V + 2 mV 0.47 mV/V + 50 mV 0.47 mV/V + 20 mV 0.76 mV/V + 20 mV 1.6 mV/V + 20 mV 3.5 mV/V + 20 mV	Agilent 3458A Opt 002
AC Voltage - Source	(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	0.22 mV/V + 4 μ V 85 μ V/V + 4 μ V 75 μ V/V + 4 μ V 0.18 mV/V + 4 μ V 0.46 mV/V + 4 μ V 0.9 mV/V + 10 μ V 1.2 mV/V + 25 μ V 2.5 mV/V + 20 μ V 0.22 mV/V + 12 μ V 85 μ V/V + 7 μ V 75 μ V/V + 7 μ V 0.18 mV/V + 7 μ V 0.42 mV/V + 17 μ V 0.75 mV/V + 20 μ V 1.2 mV/V + 25 μ V 2.5 mV/V + 45 μ V	Fluke 5720A

Electromagnetic - DC/Low Frequency

Parameter/ Equipment²	Range	Calibration and Measurement Capability [Expressed as Uncertainty (\pm)]	Reference Standard or Equipment
AC Voltage - Source	(0.22 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 (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 (300 to 500) kHz 500 kHz to 1 MHz (0.22 to 1.1) kV (15 to 50) Hz 50 Hz to 1 kHz	0.22 mV/V + 40 μ V 80 μ V/V + 15 μ V 40 μ V/V + 8 μ V 70 μ V/V + 10 μ V 0.11 mV/V + 30 μ V 0.34 mV/V + 80 μ V 0.9 mV/V + 0.2 mV 1.5 mV/V + 0.3 mV 0.22 mV/V + 0.4 mV 80 μ V/V + 0.15 mV 40 μ V/V + 50 μ V 70 μ V/V + 0.1 mV 95 μ V/V + 0.2 mV 0.26 mV/V + 0.6 mV 0.9 mV/V + 2 mV 1.3 mV/V + 3.3 mV 0.22 mV/V + 4 mV 80 μ V/V + 1.5 mV 47 μ V/V + 0.6 mV 75 μ V/V + 1 mV 0.13 mV/V + 2.5 mV 0.8 mV/V + 16 mV 4.2 mV/V + 40 mV 70 mV/V + 80 mV 0.26 mV/V + 16 mV 60 μ V/V + 3.5 mV	Fluke 5720A
AC Voltage - Source	(1 to 100) V 40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz (100 to 750) V (30 to 50) kHz (50 to 100) kHz	80 μ V/V + 4 mV 125 μ V/V + 6 mV 0.36 mV/V + 11 mV 0.36 mV/V + 11 mV 1.3 mV/V + 45 mV	Fluke 5720A with Fluke 5725A

Electromagnetic - DC/Low Frequency

Parameter/ Equipment ²	Range	Calibration and Measurement Capability [Expressed as Uncertainty (\pm)]	Reference Standard or Equipment
AC Current - Measure	Up to 120 μA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (0.1 to 1.2) mA (10 to 20) Hz 20 Hz to 1 kHz (1 to 5) kHz (1 to 120) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (0.1 to 1) A 10 Hz to 1 kHz (1 to 5) kHz	4.6 mA/A + 40 nA 1.7 mA/A + 40 nA 0.7 mA/A + 40 nA 4.6 mA/A + 0.2 μ A 1.7 mA/A + 0.2 μ A 0.45 mA/A + 0.2 μ A 4.7 mA/A + 20 μ A 1.7 mA/A + 20 μ A 0.7 mA/A + 20 μ A 0.4 mA/A + 20 μ A 4.6 mA/A + 200 μ A 1.2 mA/A + 200 μ A	Agilent 3458A Opt 002
AC Current - Source	(22 to 220) μA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (0.22 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 (5 to 10) kHz	0.23 mA/A + 16 nA 0.14 mA/A + 10 nA 0.11 mA/A + 8 nA 0.25 mA/A + 12 nA 0.9 mA/A + 65 nA 0.23 mA/A + 40 nA 0.14 mA/A + 35 nA 0.11 mA/A + 35 nA 0.18 mA/A + 0.11 μ A 0.9 mA/A + 0.65 μ A 0.23 mA/A + 0.4 μ A 0.14 mA/A + 0.35 μ A 0.11 mA/A + 0.35 μ A 0.18 mA/A + 0.55 μ A 0.9 mA/A + 5 μ A 0.23 mA/A + 4 μ A 0.14 mA/A + 3.5 μ A 0.11 mA/A + 2.5 μ A 0.18 mA/A + 3.5 μ A 0.9 mA/A + 10 μ A	Fluke 5720A
AC Current - Source	(0.22 to 2.2) A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (2.2 to 11) A 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.24 mA/A + 35 μ A 0.39 mA/A + 80 μ A 0.6 mA/A + 0.16 mA 0.4 mA/A + 0.17 mA 0.85 mA/A + 0.38 mA 3.3 mA/A + 0.75 mA	Fluke 5720A/5725A

Time and Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (\pm)]	Reference Standard or Equipment
Frequency - Source, Fixed Point	10 MHz	8×10^{-13} Hz/Hz 6 months aging rate	Fluke PM6681R with NIST GPS 76100S Traceability
Frequency - Source	1 Hz to 30 MHz	30 nHz/Hz	Fluke 5720A Wideband with Agilent 53132A
Frequency - Measure	1 Hz to 225 MHz	30 nHz/Hz	Agilent 53132A

Notes:

1. Calibration and Measurement Capabilities (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of $k=2$.
2. This laboratory offers filed calibration services.
2. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1349.



Vice President