



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Educated Design & Development, Inc. (ED&D)
901 Sheldon Dr.
Cary, NC 27513

Fulfills the requirements of

ISO/IEC 17025:2017

In the field of

CALIBRATION

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

A handwritten signature in black ink, appearing to read 'R. Douglas Leonard Jr.', is positioned above a horizontal line.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 20 December 2023

Certificate Number: AC-1425



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.
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 April 2017).

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

Educated Design & Development, Inc. (ED&D)

901 Sheldon Dr.
Cary, NC 27513
Bill Bisenius 919 469 9434

CALIBRATION

Valid to: **December 20, 2023**

Certificate Number: **AC-1425**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage Measure	(1 to 200) mV (50 to 100) Hz (100 to 400) Hz (2 to 750) V	35 μ V + 810 μ V/V 0.01 mV	Keithley 2001 Multimeter
	(50 to 100) Hz (100 to 400) Hz	2.4 mV + 140 μ V/V 46 μ V + 290 μ V/V	
AC High Voltage Measure	(0.1 to 30) kV (50 to 400) Hz	5.7 V + 0.35 mV/V	Vitrek 4620B High Voltage Meter with HVP-35 High Voltage Probe
DC Voltage Measure	(2 to 200) mV (0.2 to 1 000) V	3.5 μ V + 49 μ V/V 12 μ V + 8.6 μ V/V	Keithley 2001 Multimeter
DC High Voltage Measure	(1 to 30) kV	-64 μ V + 0.067 μ V/V	Vitrek 4620B High Voltage Meter with HVP-35 High Voltage Probe
AC Current Measure	(1 to 200) μ A (50 to 200) Hz 200 μ A to 2 A (50 to 200) Hz	0.044 μ A + 0.002 1 μ A/ μ A 3.3 μ A + 0.26 μ A/mA	Keithley 2001 Multimeter
	(2 to 50) A (50 to 200) Hz	0.23 A	Keithley 2001 Multimeter, Current Shunt
DC Current Measure	(2 to 200) μ A 200 μ A to 2 A	0.005 8 μ A + 1.6 μ A/mA 16 μ A + 0.15 μ A/mA	Keithley 2001 Multimeter
	(2 to 50) A	0.16 A	Keithley 2001 Multimeter, Current Shunt
Resistance Measure	30 m Ω to 3 Ω (3 to 300) Ω 300 Ω to 3 M Ω	45 μ Ω + 0.69 μ Ω /m Ω 23 m Ω + 0.58 μ Ω / Ω -5.6 Ω + 19 Ω /k Ω	Instek 802 Milli-Ohm Meter



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Resistance Measure	(20 to 200) Ω (2 to 200) kΩ (20 to 200) MΩ 200 MΩ to 1 GΩ	2.4 mΩ + 100 μΩ/Ω 14 mΩ + 98 μΩ/Ω -0.71 + 0.039 MΩ/MΩ 6.9 MΩ + 130 kΩ/MΩ	Keithley 2001 Multimeter
AC Hipot Testers Voltage	60 Hz (0.1 to 9) kV (5 to 30) kV	0.77 V + 0.99 V/kV -6.7 + 2.2 V/kV	Vitrek 4620B High Voltage Meter, HVP-35 High Voltage Probe, Keithley 2001 Multimeter
DC Hipot Testers Voltage	(0.1 to 9) kV (9 to 30) kV	-0.14V + 0.56 V /kV -13 + 2.1 V/kV	
DC Hipot Testers Current	(0.025 to 20) mA	16 μA + 0.15 μA/mA	Keithley 2001 Multimeter
AC Hipot Testers Current	(0.025 to 20) mA 60 Hz	3.3 μA + 0.26 μA/mA	
Ground Continuity Testers Resistance Current	(0.01 to 0.2) Ω Up to 50A 60 Hz	45 μΩ + 0.69 μΩ/mΩ 0.23 A	Resistor Array Keithley 2001 Multimeter Current Shunt
Leakage Current Testers AC Current	2 μA to 20 mA 60 Hz	3.3 μA + 0.26 μA/mA	Keithley 2001 Multimeter
AC Voltage Measure	(1 to 400) mV (50 to 100) Hz	2.6 mV	Keithley 2001 Multimeter
Resistance	30 mΩ to 3 Ω (3 to 20) Ω	45 μΩ + 0.69 μΩ/mΩ 23 mΩ + 0.58 μΩ/Ω	Instek 802 Milli-Ohm Meter
Resistance	(20 to 200) Ω (0.2 to 1) kΩ	2.4 mΩ + 100 μΩ/Ω 14 mΩ + 98 μΩ/Ω	Keithley 2001 Multimeter
Frequency	1 Hz to 1 MHz	0.62 mHz/Hz + 0.37 mHz	Keithley 2001 Multimeter
Electrical Simulation of Thermocouple Indicating Devices ²	Type J (0 to 1 200) °C Type K (0 to 1 372) °C Type T (0 to 400) °C Type E (0 to 1 000) °C	0.34 °C 0.33 °C 0.33 °C 0.33 °C	Omega CL3515R Calibrator



ANSI National Accreditation Board

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Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Hot Winding Resistance Tester Resistance	(20 to 200) Ω (2 to 200) kΩ	2.4 mΩ + 100 μΩ/Ω 14 mΩ + 98 μΩ/Ω	Keithley 2001 Multimeter
Hot Winding Resistance Tester Temperature	(-20 to 300) °C	0.33 °C	Omega CL3515R Calibrator with Type T Thermocouple probe

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometers	Up to 25.4 mm	5.9 μm + 0.17 μm/mm	Gage Blocks
Calipers	100 μm to 150 mm	38 μm + 16 μm/mm	Gage Blocks
Angle Meters Digital Protractors	Up to 90 °	0.54 ° + 0.008 4 °/° 0.22° + 0.000 55 °/°	Angle Blocks
Creepage & Clearance Gauges	20 μm to 25.4 mm	6.6 μin + 9.9 μin /in	Micrometer
Tirril Burners Length	Up to 150 mm	53 μm + 2.5 μm/mm	Caliper
Needle Flame Burner Radius Length	Up to 100 mm Up to 254 mm	5.9 μm + 0.46 μm/mm 5.9 μm + 0.46 μm/mm	Vision System
Glow Wire Elements Radius Length Outside diameter	Up to 100 mm Up to 254 mm Up to 25.4 mm	5.9 μm + 0.46 μm/mm 5.9 μm + 0.46 μm/mm 6.6 μin + 9.9 μin /in	Vision System Micrometer
Flame Height Gauges Length	Up to 254 mm	53 μm + 2.5 μm/mm	Caliper
Flame Height Gauges Length Angle	Up to 254 mm (0 to 360)°	5.9 μm + 0.46 μm/mm 0.13° + 0.002 2 °/°	Vision System
Choke Hazard Tester Length	Up to 254 mm	5.9 μm + 0.46 μm/mm	Vision System
	Up to 150 mm	53 μm + 2.5 μm/mm	Caliper

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Accessibility Probes			
Length	(1 to 300) mm (0.1 to 12) in	5.9 μm + 0.48 $\mu\text{m}/\text{mm}$ 230 μin + 19 $\mu\text{in}/\text{in}$	Vision System
Diameter	(1 to 2540) mm (0.1 to 10) in	5.9 μm + 0.46 $\mu\text{m}/\text{mm}$ 230 μin + 19 $\mu\text{in}/\text{in}$	Vision System
Radius	(1 to 150) mm (0.1 to 6) in	5.9 μm + 0.46 $\mu\text{m}/\text{mm}$ 230 μin + 18 $\mu\text{in}/\text{in}$	Vision System
Angle	(0.1 to 360) $^{\circ}$	0.13 $^{\circ}$ + 0.002 2 $^{\circ}/^{\circ}$	Vision System
Length	(1 to 25) mm	6.6 μm + 9.9 $\mu\text{m}/\text{mm}$	Micrometer
Diameter	(1 to 25) mm	6.6 μm + 9.9 $\mu\text{m}/\text{mm}$	Micrometer
Length	(0.5 to 24) in (10 to 600) mm	630 μin + 0.001 5 in/in 38 μm + 16 $\mu\text{m}/\text{mm}$	Digital Caliper
Diameter	(0.5 to 24) in (10 to 600) mm	630 μin + 0.001 5 in/in 38 μm + 16 $\mu\text{m}/\text{mm}$	Digital Caliper
Length	(1 to 18) in (2 to 460) mm	0.12 in + 0.083 $\mu\text{in}/\text{in}$ 3 μm + 2.1 $\mu\text{m}/\text{mm}$	Steel Rule
Length	1 in to 25 ft 25 mm to 7.6 m	0.13 in + 0.00 47 in/in 3.3 μm + 120 $\mu\text{m}/\text{mm}$	Tape Measure

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Impact Balls Mass	(500 to 2 000) g	0.48 g	Digital Scale
Impact Hammers ²	Up to 0.25 J (0.25 to 1.0) J (1.0 to 2.1) J	0.01 J (0.015 + 0.002E) J (0.046 + 0.002E) J	Impact Hammer Calibrator
Impact Hammer Calibrators	Up to 0.25 J (0.25 to 1.0) J (1.0 to 2.1) J	0.004 J 0.008 J 0.013 J	Steel rule and Digital Scale

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure Gauges	(-14 to 0) psig Up to 15 psig Up to 30 psig	0.0773 psi 0.089 psi 0.32 psi	Pressure Gages Dwyer DPG-100 Dwyer DPG-102 Omega DPG1000B-30G
Force Gauges	(0.5 to 20) lbf (20 to 112) lbf	0.005 7 lbf + 0.001 1 lbf/lbf 0.002 3 lbf + 0.001 2 lbf/lbf	Class F Weights
Force Effort	(0.5 to 20) lbf (5 to 200) lbf	0.024 lbf + 0.000 63 lbf/lbf 0.23 lbf + 0.000 52 lbf/lbf	Force Gauges
Ball Pressure Testers Radius Force	Up to 100 mm (0.5 to 45) lbf	5.9 μm + 0.48 μm/mm 0.23 lbf + 0.00052 lbf/lbf	Vision System Digital Force Gauge
Mass ²	(10 to 4 000) g	0.48 g	Digital Scale
Gas Flow	(0.1 to 2) L/m	0.076 L/m	Flow Meter Omega FMA 1816
Volumetric Flow, Liquids ²	(0.1 to 2) L/m (0.3 to 9) L/m (4.0 to 120) L/m (38 to 380) L/m	(0.11L + 0.09) L/m (0.062L + 0.4) L/m (1L + 0.83) L/m (0.031L + 1.2) L/m	Flow Meters Omega FTB601B Omega FTB602B Omega FTB606B Omega FTB694
(IPX 3 and 4) Spray Nozzles Flow Length Length Angle Inside Diameter Angle	(9.5 to 10.5) L/m (1 to 254) mm (1 to 150) mm (0 to 90) ° (14.7 to 15.3) mm (0 to 45) °	0.19 L/m 6.5 μm 53 μm + 2.5 μm/mm 0.13° + 0.002 2°/° 0.13 mm 0.13° + 0.002 2°/°	IEC 60529 Flow Meter Omega FTB606B Vision System Caliper Vision System Gauge Pins Vision System
(IPX 5 and 6) Jet Nozzles Flow Flow Inside Diameter	(11.9 to 13.1) L/m (95 to 105) L/m Up to 150 mm	0.39 L/m 1.5 L/m 53 μm + 2.5 μm/mm	IEC 60529 Flow Meters Omega FTB606B Omega FTB694B Caliper
(IP 5X and 6X) Dust Chambers Flow Pressure Time	Up to 2 L/m Air (-14 to 0) psig Up to 2 400 s	0.076 L/m 0.078 psi 0.56 s	IEC 60529 Flow Meter Omega FMA 1816 Pressure Gage Dwyer DPG-100 Stopwatch



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Mass and Mass Related

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(IPX 3 and 4) Oscillating Spray Testers ²			IEC 60529
Angle	(0 to 360) °	0.26 °	Digital Protractor
Length	Up to 150 mm	53 μm + 2.5 μm/mm	Caliper
Length	1 in to 25 ft	0.13 in + 0.00 47 in/in	Tape Measure
Time Interval	Up to 2 400 s	0.56 s	Stopwatch
Inside Diameter	Up to 0.4 mm	14 μm	Gauge Pin
Flow	(0.56 to 3.0) L/m	(0.006 2L + 0.4) L/m	Flow Meters
Flow	(0.56 to 9.0) L/m	(0.009 4L + 0.49) L/m	Omega FTB602B Omega FTB602B
(IPX 1 and 2) Drip Boxes ²			IEC 60529
Length	Up to 150 mm	53 μm + 2.5 μm/mm	Caliper
Flow	(0.1 to 2) L/m	(0.025L + 0.026) L/m	Flow Meter Omega FTB601B
UL Compliant Rain Test Apparatus			
Length	1 in to 25 ft	0.13 in + 0.00 47 in/in	Tape Measure
Angle	(0 to 90) °	0.26 °	Digital Protractor
Pressure	(0 to 15) psig	0.089 psi	Pressure Gages
Pressure	(0 to 30) psig	0.32 psi	Dwyer DPG-102 Omega DPG1000B
Turntables			
Time interval	Up to 2 400 s	0.56 s	Stopwatch
Copper Blocks			
Angle	(0 to 360)°	0.13° + 0.002 2°/°	Vision System
Length	Up to 254 mm	6.5 μm	Gauge Pin
Mass	(0.1 to 120) g	2.4 mg	Digital Scale
Tracking Testers			
Angle	(0 to 90)°	0.13° + 0.002 2°/°	Vision System
Length	Up to 254 mm	6.5 μm	Vision System
Length	Up to 150 mm	53 μm + 2.5 μm/mm	Caliper
Diameter	20 μm to 25.4 mm	6.6 μin + 9.9 μin /in	Micrometer
Voltage	(2 to 750) V		
Voltage	(50 to 100) Hz	2.4 mV + 140 μV/V	Keithley 2001 Multimeter
Voltage	(100 to 400) Hz	46 μV + 290 μV/V	
Current	200 μA to 2 A		
Current	(50 to 200) Hz	3.3 μA + 0.26 μA/mA	Keithley 2001 Multimeter
Force	Up to 1.9 N	2.3 mN	Digital Scale
Time interval	Up to 2 400 s	0.56 s	Stopwatch



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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Glow Wire Testers Force Time interval	Up to 1.9 N Up to 2 400 s	2.3 mN 0.56 s	Digital Scale Stopwatch
Automated Sharp Edge Testers Force Time interval Diameter Surface Roughness	(0.5 to 20) lbf Up to 2400 s Up to 150 mm (0.03 to 6.35) μm	0.024 lbf + 0.000 63 lbf/lbf 0.56 s 53 μm + 2.5 $\mu\text{m}/\text{mm}$ 0.19 μm	Digital Force Gauge Stopwatch Caliper Profilometer
Sharp Point Tester Force Length Length	(0.5 to 20) lbf Up to 254 mm Up to 150 mm	0.024 lbf + 0.000 63 lbf/lbf 0.48 $\mu\text{m}/\text{mm}$ + 5.9 μm 53 μm + 2.5 $\mu\text{m}/\text{mm}$	Digital Force Gauge Vision System Caliper
Surface Roughness Measurement ²	(0.03 to 6.35) μm	(0.18 + 0.015R) μm	Profilometer
Tumbling Barrels Length Length Angle Time interval	Up to 150 mm 1 in to 25 ft Up to 360 ° Up to 2 400 s	53 μm + 2.5 $\mu\text{m}/\text{mm}$ 0.13 in + 0.00 47 in/in 0.000 55°/° + 0.022° 0.56 s	Digital Caliper Tape Measure Digital Protractor Digital Stopwatch
Cord Anchorage Torque Testers Force Length Mass	(0.5 to 20) lbf Up to 254 mm (0.1 to 120) g	0.024 lbf + 0.000 63 lbf/lbf 0.48 $\mu\text{m}/\text{mm}$ + 5.9 μm 2.4 mg	Force Gauge Vision System Digital Scale
Socket Outlet Torque Balances Length Length Length Mass	Up to 254 mm Up to 150 mm Up to 25.4mm (0.1 to 120) g	0.48 $\mu\text{m}/\text{mm}$ + 5.9 μm 53 μm + 2.5 $\mu\text{m}/\text{mm}$ 6.6 μin + 9.9 $\mu\text{in}/\text{in}$ 2.4 mg	Vision System Digital Caliper Micrometer Digital Scale
Iron Drop Testers Force Length Time interval	(0.5 to 20) lbf Up to 150 mm Up to 2 400 s	0.024 lbf + 0.000 63 lbf/lbf 53 μm + 2.5 $\mu\text{m}/\text{mm}$ 0.56 s	Force Gauge Digital Caliper Digital Stopwatch

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Measure	(-200 to 300) °C	0.67 °C	Omega CL3515R Calibrator with Type T Thermocouple probe
Humidity Measure	(20 to 80) %RH	2.2 %RH	Digital Hygrometer
Environmental Chambers	(20 to 80) %RH	2.2 %RH	Digital Hygrometer
Environmental Chambers	(-200 to 300) °C	0.67 °C	Omega CL3515R Calibrator with Type T Thermocouple probe

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency Measure ²	0.1 Hz to 1 MHz	0.62 mHz/Hz + 0.37 mHz	Keithley 2001 Multimeter
Time Interval	Up to 3 600 s	0.56 s	Digital Stopwatch

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k=2$), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, 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.
2. E = energy in joules, F = frequency in MHz, L = flow in liters per minute, R = roughness in micro-meters, T = temperature in degrees Celsius, W = weight in grams.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1425.



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