SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994

FLUKE CALIBRATION, PHOENIX – PRIMARY PRESSURE AND FLOW LABORATORY
4765 East Beautiful Lane
Phoenix, AZ 85044
Tim Mueller Phone: 877 355 3225

CALIBRATION

Valid To: March 31, 2025 Certificate Number: 1599.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 5]:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Calibration of Devices Measuring the Electrical Output of Flow & Pressure Devices	(1 to 100) mV DC 100 mV to 1 V DC (1 to 10) V DC (10 to 100) V DC (1 to 21) mA Up to 120 Ω	0.0058 % + 0.0064 mV 0.0046 % + 0.059 mV 0.0045 % + 0.082 mV 0.0056 % + 0.69 mV 0.013 % + 0.000 24 mA 0.0014 % + 0.005 Ω	Fluke 8846, Agilent 34401A Agilent 3458A

II. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Gas Flow N_2 & Air – Argon Helium Carbon Dioxide Sulfur Hexafluoride Hydrogen Propane Nitrous Oxide Methane All Gases	(0.1 to 1) sccm 1 sccm to 6000 slm 5 sccm to 3200 slm 10 sccm to 1800 slm 5 sccm to 155 slm 1 sccm to 6.2 slm 20 sccm to 200 slm 20 sccm to 10 slm 10 sccm to 20 slm 8 sccm to 16 slm (1 to 500) sccm	0.50 % 0.090 % + 0.001 sccm 0.090 % 0.090 % 0.090 % 0.090 % + 0.001 sccm 0.090 % 0.090 % 0.090 % 0.090 % 0.096 %	Gravimetric determination & successive addition technique; flow units, sccm & slm are defined in SEMI E12-96 Rate of rise

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

III. Mechanical

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
Mass – Measure			
Nominal Values	(2, 3.2, 4.0, 4.5, 5.0, 6.2, 6.4, 10.0, 10.1) kg	0.0001 %	True mass determinations for use with piston gauges
	(0.8, 1.0, 1.6) kg	0.000 13 %	
	(0.1, 0.2, 0.3, 0.4, 0.5) kg	0.0002 %	
All Values	1 mg to 12 kg	0.0005 % or 0.5 mg, whichever is greater	
Pressure – Gas			
Effective Area of Piston – Cylinder	(5 to 500) kPa (500 to 1000) kPa (1000 to 5000) kPa (5000 to 11 000) kPa (11 to 20) MPa (20 to 50) MPa (50 to 100) MPa	0.000 56 % 0.000 64 % 0.000 76 % 0.000 77 % 0.0012 % 0.0013 % 0.0015 %	By comparison with the Fluke calibration piston-cylinder pressure calibration chain
Calibration of Secondary Standards & Pressure Devices	(0 to 15) kPa (5 to 500) kPa (500 to 1000) kPa (1000 to 5000) kPa (5000 to 11 000) kPa (11 to 110) MPa	0.0025 % + 8 mPa 0.0009 % + 0.05 Pa 0.0010 % 0.0012 % 0.0014 % 0.0023 %	Absolute Absolute & gauge
	(-15 to 15) kPa	0.0025 % + 5 mPa	Gauge
	(-90 to 550) kPa	0.001 % + 0.3 Pa	Differential mode line pressure from -90 kPa to 550 kPa
	(-990 to 990) kPa	0.0014 % + (0.1 Pa + 0.000 13 % x *LP*)	HL differential: *LP* (line pressure) range: (10 to 1000) kPA
	(-50 to 50) MPa	0.0035 % + (0.000 13 % x *LP*)	Line pressure range: (1 to 100) MPa

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Pressure – Oil			
Effective Area of Piston Cylinder	(0.2 to 50) MPa (50 to 100) MPa (100 to 200) MPa (200 to 500) MPa	0.0013 % 0.0015 % 0.0022 % 0.003 %	By comparison with the Fluke calibration piston-cylinder pressure calibration chain
Calibration of Secondary Standards & Pressure Devices	(0.1 to 20) MPa (20 to 100) MPa (100 to 200) MPa (200 to 500) MPa (500 to 700) MPa	0.0017 % + 14 Pa 0.002 % 0.003 % 0.0047 % 0.03 %	Gauge & absolute
Pressure – Oil			
Calibration of Secondary Standards & Pressure Devices[3]	(0.1 to 20) MPa (20 to 50) MPa (50 to 70) MPa (70 to 140) MPa (140 to 200) MPa (200 to 350) MPa (350 to 500) MPa	0.0018 % + 14 Pa 0.0023 % 0.0025 % 0.0033 % 0.0038 % 0.0055 % 0.0075 %	Gauge & absolute
Calibration of Pressure Devices[3] –			Gauge & absolute (except where noted)
Gas	(0 to 133) Pa	0.5 % + 0.15 Pa	Absolute; using capacitance diaphragm pressure transducer
	(1.4 to 5) kPa (5 to 550) kPa (5 to 550) kPa (550 to 2750) kPa (550 to 2750) kPa (2750 to 11 000) kPa (11 to 20) MPa (20 to 50) MPa (50 to 103) MPa	0.0015 % + 1 Pa 0.0015 % + 0.01 Pa 0.0015 % + 0.2 Pa 0.0017 % 0.0017 % + 0.2 Pa 0.0017 % 0.0019 % 0.0027 % 0.0038 %	Absolute Gauge Absolute Gauge Absolute
	(-7.5 to 7.5) kPa	0.006 % + 0.07 Pa	Differential; using quartz bourdon tube pressure transducer
	(-1.4 to -100) kPa	0.0015 % + 0.05 Pa	Negative gauge

IV. Thermodynamics

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Temperature – Measure	(15 to 30) °C	0.03 °C	Fluke thermistor
Relative Humidity – Measure	(5 to 95) % RH	3 % RH	Vaisala humidity probe

V. Time & Frequency

Parameter/Equipment	Frequency	CMC[2, 4, 6] (±)	Comments
Frequency – Measure	1000 Hz	0.0008 %	HP 53131A

[1] This laboratory offers commercial calibration service and field calibration service.

[2] Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMCs represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

[3] Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] In the statement of CMC, percentages are to be read as percent of reading, unless indicated otherwise.

[5] This scope meets A2LA's *P112 Flexible Scope Policy*.

[6] The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

Accredited Laboratory

A2LA has accredited

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Phoenix, AZ

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and R205 – Specific Requirements: Calibration Laboratory Accreditation Program. 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*).

Presented this 6th day of March 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1599.01
Valid to March 31, 2025

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.