



Primary Standards Laboratory

Metrology Program

Fact Sheet

Pressure

The Primary Standards Laboratory (PSL) maintains a wide variety of primary pressure standards to ensure accurate and traceable measurements for its customers. All the primary pressure standards are directly traceable to the National Institute of Standards and Technology (NIST).

Primary pressure standards consist of air piston gauges and oil piston gauges. Quartz transducers are used as transfer standards.

The effective areas of piston gauges at various pressures are obtained by using air and oil gauge cross-float systems operating in the gauge mode. A gas (usually nitrogen) is used as the pressure-transmitting medium in an air-piston gauge cross-float calibration at pressures ranging from 1.4kPa to 6.9 MPa (0.2 to 1000 psig). Oil is used as the pressure medium in an oil piston gauge cross-float calibration at pressures ranging from 1.4 to 275 MPa (200 psig to 40 kpsig).

A stand-alone air-piston gauge system performs calibrations of gauges and transducers in absolute or gauge mode in pressures ranging from 1.4 kPa to 6.9 MPa. An oil deadweight piston gauge is used to calibrate other gauges and transducers for pressures from 1.4 to 275 MPa.

Capabilities

Below is a representative sample of our uncertainties. We are NVLAP accredited under Lab Code 105002-0 by the National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program (NIST/NVLAP) in most of our capabilities. For full details see <http://ts.nist.gov/standards/scopes/1050020.pdf>

Pneumatic Deadweight Piston Gauges (absolute mode) - Direct Pressure Comparison

Range	Best Uncertainty (± ppm, k=2)	Remarks
0.0014 - 0.170 MPa	31	N ₂ ; 0.2 – 24 psia
0.014 – 0.480 MPa	28	N ₂ ; 2 – 70 psia
0.4 - 7 MPa	46	N ₂ ; 52 – 1k psia

Pneumatic Deadweight Piston Gauges (gauge mode) - Direct Pressure Comparison

Range	Best Uncertainty (± ppm, k=2)	Remarks
0.0014 - 0.175 MPa	29	N ₂ ; 0.2 – 24 psig
0.014 – 0.480 MPa	26	N ₂ ; 2 – 70 psig
0.4 - 7 MPa	44	N ₂ ; 52 – 1 kpsig

Pneumatic Deadweight Piston Gauges - Cross Float Method

Range	Best Uncertainty (± ppm, k=2)	Remarks
0.0014 - 0.170 MPa	35	N ₂ ; 0.2 – 24 psig
0.014 – 0.480 MPa	33	N ₂ ; 2 – 70 psig
0.4 - 7 MPa	46	N ₂ ; 52 – 1 kpsig

Hydraulic Deadweight Piston Gauges - Direct Pressure Comparison

Range	Best Uncertainty (± ppm, k=2)	Remarks
2.8 - 28 MPa	44	Oil; 0.4 – 4 kpsig
14 - 140 MPa	61	Oil; 2.0 – 20 kpsig
28 - 280 MPa	59	Oil; 4.0 – 40 kpsig

Consultation is provided to customers on proper selection, maintenance, and use of standards and transducers.

Major Resources

- Ruska Model 2481 oil piston gauge for cross-floating or gauge calibration.
- Ruska Model 2465 air piston gauge for cross-floating or gauge calibration.
- Recently purchased a DHI, Model PG7601 automated mass handling piston gauge that will enable calibrations up to 1000 psi gas. This system will free the operators from handling mass platters.
- Dynamic pressure calibration system; 0 - 30,000 psi.
- Recently purchased a DHI Automated Mass Handling Piston Gauge that will enable calibrations up to 1000 psigas. This system will free the operator from handling the mass platters.

Selected Accomplishments

- Performed surveys and audits of commercial pressure calibration facilities and qualified them as DOE/NNSA-approved commercial calibration laboratories.
- Sponsored a precision pressure measurement workshop that brought together pressure measurement experts from DOE, NIST, U.S. Army, NASA, and industry.

Hydraulic Deadweight Piston Gauges – Cross Float Method

Range	Best Uncertainty (±) ppm, k=2	Remarks
2.8 - 28 MPa	46	Oil; 0.4 – 4 kpsig
14 - 140 MPa	67	Oil; 2.0 – 20 kpsig
28 - 280 MPa	61	Oil; 4.0 – 40 kpsig



Automated Mass Handling System 1000 psi Pressure Range

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