



# Primary Standards Laboratory Pressure Project

## Fact Sheet

### Pressure

The PSL maintains a wide variety of both primary pressure standards and secondary transfer standards to ensure accurate and traceable measurements for its customers. Capabilities include hydrostatic pressure comparisons from 0.2 psi to 100,000 psi, and dynamic pressure comparisons from 300 psi to 80,000 psi, with rise times as low as 3 milliseconds. Primary pressure standards consist of pneumatic and hydraulic Deadweight Piston Gauges (DPGs). Secondary transfer standards consist of pressure controller/calibrators with varying ranges of Quartz Reference Pressure Transducers. For National Security Enterprise customers, DPG effective area determination is available for various styles of pistons, via the cross-float method, with working ranges from 0.2 psi to 72,500 psi.



**Automated Mass Handling Deadweight Piston Gauge System  
(1.5 psi – 1,000 psi)**

### Capabilities

Below is a representative sample of the Pressure Laboratory's uncertainties. The PSL is National Voluntary Laboratory Accreditation Program (NVLAP) accredited under Lab Code 105002-0 by the NIST/NVLAP in most of its capabilities. For full details, see <http://ts.nist.gov/standards/scopes/1050020.pdf>

- **New Capabilities:** The Pressure Lab is undergoing a recapitalization effort and has made significant improvements to its capabilities to better serve the growing needs of the National Security Enterprise, as well as Sandia's line orgs. In late FY17, the Pressure lab will be able to perform hydrostatic pressure measurements up to 100,000 psi, as well as support the effective area determinations of piston gauges up to 72,500 psi.

### Major Resources

- Fluke/Ruska Model 2481 hydraulic deadweight piston gauge system for cross-floating or gauge calibration up to 280 MPa (40,000 psi).
- Fluke/Ruska Model 2465 pneumatic deadweight piston gauge system for cross-floating or gauge calibration up to 7 MPa (1,000 psi).
- Fluke/DHI pressure controller/calibrator system "10K Pressure Bench" for gauge calibrations up to 70 MPa (10,000 psi)
- Dynamic pressure calibration system; 0 to 80,000 psi with an approximate rise time of 3 – 4 ms.
- Fluke/DHI automated mass handling deadweight piston gauge system for automated cross-floating and gauge calibration up to 7 MPa (1,000 psi).
- Tenney Temperature Oven for Pressure transducer temperature sensitivities measurements from -75°C to 200°C is available upon request.
- Oxygen cleaning service is available upon request. Test and cleaning methods are based on accepted modifications of: ASTM G93-03, ASTM E1235-08, and ASTM G131-96.

### **Pneumatic Deadweight Piston Gauges: Direct Pressure Comparison**

Range	Best Uncertainty ppm, k=2	Remarks
1.4 kPa to <45 kPa	25	N <sub>2</sub> ; 0.2 to <6.5 psi
≥45 kPa to 177.2 kPa	18	N <sub>2</sub> ; ≥6 psi to 25.7 psi
11.7 kPa to 714.6 kPa	20	N <sub>2</sub> ; 1.7 psi to 103.6 psi
13.8 kPa to 7.0 MPa	25	N <sub>2</sub> ; 2.0 psi to 1000 psi
200 kPa to 110 MPa	~50	N <sub>2</sub> ; 30 psi to 16,000 psi





10K Pressure Bench (0.2 psi – 10,000 psi)

### Hydraulic Deadweight Piston Gauges: Cross-Float Method

Range	Best Uncertainty ppm, k=2	Remarks
2.8 MPa to 28 MPa	45	Oil; 0.4 kpsi to 4.0 kpsi
14 MPa to 140 MPa	42	Oil; 2.0 kpsi to 20.0 kpsi
28 MPa to 280 MPa	55	Oil; 4 kpsi to 40.0 kpsi
200 kPa to 500 MPa	~50	Oil; 30 psi to 72,500 psi

### Pneumatic Deadweight Piston Gauges: Cross-Float Method

Range	Best Uncertainty ppm, k=2	Remarks
1.4 kPa to <45 kPa	21	N <sub>2</sub> ; 0.2 psi to <6.5 psi
≥45 kPa to 177.2 kPa	18	N <sub>2</sub> ; ≥6 psi to 25.7 psi
11.7 kPa to 714.6 kPa	22	N <sub>2</sub> ; 1.7 psi to 103.6 psi
13.8 kPa to 7.0 MPa	25	N <sub>2</sub> ; 2.0 psi to 1000 psi
200 kPa to 110 MPa	~50	N <sub>2</sub> ; 30 psi to 16,000 psi

### Hydraulic Deadweight Piston Gauges: Direct Pressure Comparison

Range	Best Uncertainty ppm, k=2	Remarks
1.4 MPa to 28 MPa	34	Oil; 0.2 kpsi to 4.0 kpsi
14 MPa to 140 MPa	38	Oil; 2.0 kpsi to 20.0 kpsi
28 MPa to 280 MPa	52	Oil; 4 kpsi to 40.0 kpsi
200 kPa to 500 MPa	~50	Oil; 30 psi to 72,500 psi

### Secondary Direct Pressure Comparison

Range	Best Uncertainty %, k=2	Remarks
1.4 kPa to 110 kPa	0.011% of Reading, 0.0033% of AutoRanged Span, or 0.001% of Full Scale pressure, whichever is greatest.	N <sub>2</sub> ; 0.2 psi to 16 psi
13.8 kPa to 689.5 kPa	0.011% of Reading, 0.0033% of AutoRanged Span, or 0.001% of Full Scale pressure, whichever is greatest.	N <sub>2</sub> ; 2.0 psi to 100 psi
13.8 kPa to 2.1 MPa	0.011% of Reading, 0.0033% of AutoRanged Span, or 0.001% of Full Scale pressure, whichever is greatest.	N <sub>2</sub> ; 2.0 psi to 300 psi
344.7 kPa to 6.9 MPa	0.011% of Reading, 0.0033% of AutoRanged Span, or 0.001% of Full Scale pressure, whichever is greatest.	N <sub>2</sub> ; 50.0 psi to 1.0 kpsi
1.4 MPa to 20.6 MPa	0.0136% of Reading or 0.0041% of Full Scale Pressure, whichever is greatest	N <sub>2</sub> ; 203 psi to 3.0 kpsi
7.1 MPa to 70.0 MPa	0.015% of Reading or 0.0045% of Full Scale Pressure, whichever is greatest	N <sub>2</sub> ; 1.0 kpsi to 10.2 kpsi
7 MPa to 700 MPa	~0.5%	Oil; 1k psi to 100k psi

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