



# Primary Standards Laboratory Vacuum Project

## Fact Sheet

The PSL maintains a variety of transfer and primary vacuum standards to assure accurate and traceable measurements for its customers. Transfer vacuum standards consist of Capacitance Diaphragm Gages (CDGs), Spinning Rotor Gages, and Ionization Gages with direct traceability to the Systeme International through the National Institute of Standards and Technology (NIST). The transfer standards cover a vacuum range from  $1 \times 10^{-7}$  Pa to 133 kPa. Primary calibrations are performed using an automated Forced-Balance Piston Gauge to calibrate transducers such as CDGs in differential or absolute mode from -15 to 15 kPa.

### Capabilities

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

The Vacuum Laboratory can accommodate one-of-a kind calibrations. It also provides consultation to customers on proper selection, maintenance, and use of standards and transducers.

### Ionization Gage Reference for direct comparison

Range	Best Uncertainty %, $k=2$	Remarks
$1 \times 10^{-7}$ Pa $\leq$ reading $\leq 1 \times 10^{-2}$ Pa	3%	$1 \times 10^{-9}$ to $1 \times 10^{-4}$ torr

### Spinning Rotor Gage Reference for direct comparison

Range	Best Uncertainty %, $k=2$	Remarks
$1.3 \times 10^{-4}$ Pa $\leq$ reading $\leq 0.13$ Pa	2%	N <sub>2</sub> ; $10^{-6}$ to $10^{-3}$ torr

### Capacitance Diaphragm Gages Reference for direct comparison

Range	Best Uncertainty %, $k=2$	Remarks
$1.3 \times 10^{-1}$ Pa $\leq$ reading $\leq 13.3$ Pa	0.3% – 2%	N <sub>2</sub> ; 0.1 torr range

### Capacitance Diaphragm Gages Reference using Forced-Balanced and Dead Weight Piston Gauges

Range	Best Uncertainty %, $k=2$	Remarks
0 Pa $\leq$ reading $\leq 6.0$ Pa	30 ppm + 0.025 Pa	N <sub>2</sub> ; 0.1 torr range
6.0 Pa $\leq$ reading $\leq 15.0$ kPa	30 ppm + 0.008 Pa	N <sub>2</sub> ; 0.1, 1, 10, and 100 torr ranges
15 kPa $\leq$ reading $\leq 133.3$ kPa	31 ppm	N <sub>2</sub> ; 1000 torr range

### Major Resources

- Semi-automated, direct-comparison high-vacuum system
- Fundamental multiorifice, high vacuum to intermediate vacuum system
- DHI FPG8601, forced balance piston gauge covers a range of -15 to 15 kPa
- High Vacuum, orifice flow, comparison system covers a range of  $1E-7$  to 13 Pa
- High Vacuum, orifice flow, fundamental system covers range of  $1E-6$  to 0.1 Pa



The High Vacuum System performs ionization gauge calibrations for the evaporation and exhaustor systems in neutron tube production. This system also supports primary vacuum calibrations at Savannah River, Y-12, and Los Alamos National Laboratories.



**High Vacuum System**

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