



The pressure and vacuum group, is part of the Force and Pressure Metrology Division in the Centro Nacional de Metrología (National Metrology Center, CENAM, Mexico). The activities in charge of this group are:

- Calibration of high accuracy instruments (for Mexican secondary laboratories, mainly),
- Advice in pressure and vacuum,
- Research and development projects (for external clients and inside CENAM),
- Training (courses, in-laboratory practical training),
- Assessment of technical capability,
- Proficiency tests.

LABORATORIES

The pressure and vacuum group has three laboratories:

- Vacuum national standard,
- Pressure national standards,
- Pressure and vacuum reference standards.

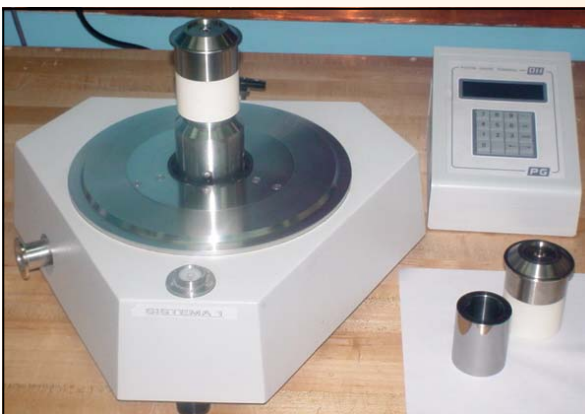
Pressure National Standards Laboratory

The laboratory has, as national standards, a mercury column with interferometric length measurement and two, 50 mm diameter piston, pressure balances.

The mercury column HG6 is an improved version of the IMGC HG5 (from Italy) and it has a range from 2,5 kPa up to 120 kPa, and an expanded uncertainty of $\pm(0,5 \text{ to } 2,5) \text{ Pa}$. It can be operated to measure absolute, differential or relative pressure.



For the two pressure balances, there are 3 piston-cylinder assemblies with a 50 mm piston diameter. The measurement range starts at 2,5 kPa and is up to 175 kPa with a maximum relative expanded uncertainty of $\pm 15 \times 10^{-6}$, relative to the reading.



Vacuum National Standard Laboratory

This laboratory has a static expansion system (also called serial expansion system), considered a primary standard for vacuum measurement.

This system of multiple static expansion was designed, developed and constructed by CENAM (with the expert advice from PTB of Germany). It has a measuring range from $1 \times 10^{-5} \text{ Pa}$ to 1 kPa, with an expanded relative uncertainty from (respectively), $\pm 9 \times 10^{-3}$ up to $\pm 2,5 \times 10^{-3}$, relative to the reading



For the calibration of leaks (equivalent to low gas flow) the pressure change ratio at constant volume method is used. The measurement range is from $5 \times 10^{-9} \text{ mol/s}$ to $2,2 \times 10^{-2} \text{ mol/s}$ with an expanded relative uncertainty from (respectively), $\pm 5 \times 10^{-2}$ up to $\pm 3 \times 10^{-2}$, relative to the reading.

Two barometric pressure chambers allow changes in pressure from 1 kPa to 115 kPa and make possible the calibration of barometers or altimeters with no connection port.

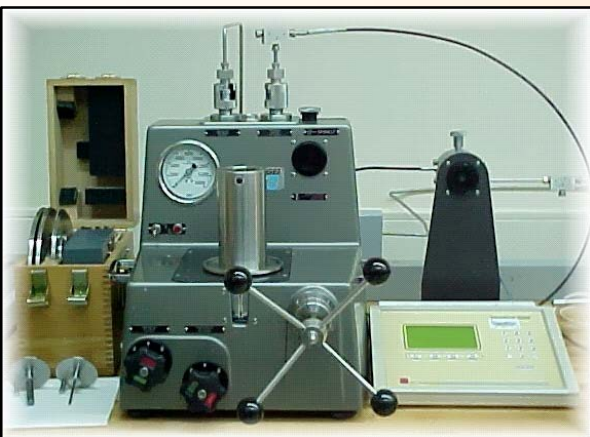


Pressure and Vacuum Reference Standards Laboratory

In this laboratory, there are 7 pressure balances (2 of them can be used for absolute pressure measurements) used as its main standards. A total of 10 different piston-cylinder assemblies are available for different pressure measurement ranges, using gas or oil as manometric fluid.



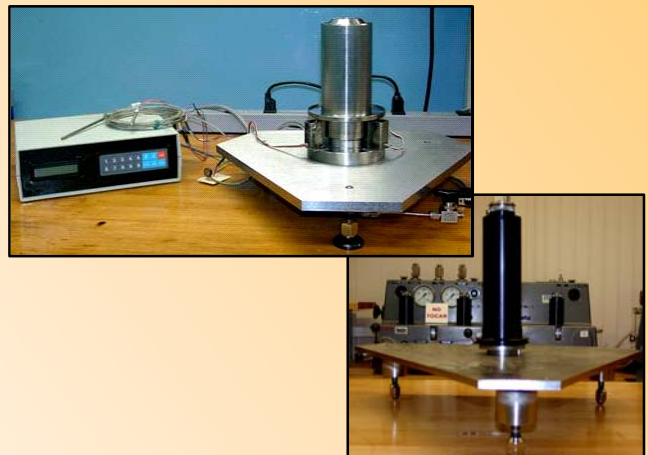
For gas media, the measurement range is from 10 kPa up to 80 MPa, with an expanded relative uncertainty of, respectively, $\pm 15 \times 10^{-6}$ to $\pm 50 \times 10^{-6}$, relative to the reading.



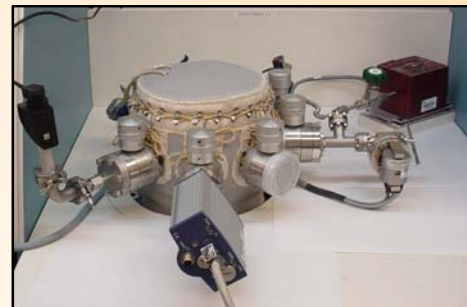
For oil media, the pressure measurement range starts at 0,2 MPa and is up to 500 MPa, with an expanded relative uncertainty of, respectively, $\pm 45 \times 10^{-6}$ to $\pm 200 \times 10^{-6}$, relative to the reading.



A couple of pressure balances bases, with terminal, have been built in our pressure laboratory for cross floating calibrations.



For vacuum, the laboratory has a direct comparison system. The measuring range is from 100 μ Pa to 10 kPa with an expanded relative uncertainty of, respectively, $\pm 3 \times 10^{-2}$ to $\pm 6 \times 10^{-3}$, relative to the reading.



PRESSURE AND VACUUM GROUP

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LATEST PAPERS PUBLISHED

IN ENGLISH:

Torres-Guzman J. C., Santander L. A., Jousten K. [CENAM, PTB]; *Realization of the medium and high vacuum primary standard in CENAM, Mexico. Metrologia, 2005, 42, n° 6, S157-S160 [on-line].*

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CNM-MMF-PT-001. Last edition 2005.

Torres Guzmán J. C., Santander Romero L. A., Olvera Arana P., *Balanzas de presión (Pressure balances)*
CNM-MMF-PT-003. Last edition 2005.

Torres Guzmán J. C., Olvera Arana P., *Manómetros secundarios (Secondary manometers)*
CNM-MMF-PT-005 Last edition 2005.

Santander Romero L. A., *Medición de Vacío (Vacuum Measurement)*
CNM-MMF-PT-006. Last edition 2005.

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