

Metrology Solutions and Calibration Technologies

The Engineers and Technicians on the Metrology & Calibration Team are highly qualified individuals who average over 25 years in the applications of physical, dimensional and electrical instrument calibration. The Engineers routinely solve manufacturing issues involving unique measurement problems.

At Pratt & Whitney Rocketdyne, we have established the process for the calibration of machine tools. This allows our machines to have a dual purpose, first to machine the hardware and then to inspect the critical dimensions for correctness to print requirements. Pratt & Whitney Rocketdyne also has unique calibration processes for torque calibration up to 10,000 ft-lb, high accuracy gas pressure calibration up to 15,000 psi, and high flowrate calibration with Nitrogen up to 12 lbs/sec.

Pratt & Whitney Rocketdyne's calibration technicians are experts in the calibration of equipment to manufacturing specifications using only high quality standards. The equipment shown is just a sampling of the standards available to support your calibration requirements.



Pratt & Whitney Rocketdyne Metrology & Calibration Expertise include:

High Torque

Pneumatic High Pressure / High Accuracy

Gas and Liquid Flow Rate

Machine Tool Travel Accuracy

Flowrate Calibration Capabilities



Gas Piston Flow Prover

FLOWRATE:

Water, Oil, or Solvent: 0.1 to 200 gpm @ $\pm 0.027\%$

Nitrogen or Helium: 1 SCCM to 12 lbm/sec @ $\pm 1/2\%$

Reference standard is piston prover, weight change rate, or certified sonic nozzle

Experience includes rotameters, turbine meters, mass flow meters, and bubble meters



Liquid Piston Flow Prover

High Torque Analyzer



TORQUE:

2 in-oz to 40,000 ft-lb @ $\pm 0.1\%$

Reference standards are torsion transducers, lever with force transducers, or lever with dead weight

Experience includes torque wrenches, torque transducers, torque multipliers, dynamometers, hydraulic tighteners, and computerized torque-to-yield wrenches

Motion



Laser interferometer testing machine tool travel accuracy

MOTION:

Up to 200ft @ <5 ppm

Laser interferometer measuring travel, pitch, yaw, and straightness

Experience includes machine tools, coordinate measuring machines, and surface plate flatness

Mass and Weight

MASS and WEIGHT:

Up to 55 lb @ ± 50 ppm

Reference standards are equal arm balances with reference masses



Pressure



Tilting piston gas dead weight tester

PRESSURE:

Nitrogen: 0 psia to 15,000 psig
@ ± 50 ppm

Oil: 0 psig to 40,000 psig
@ ± 50 ppm

Reference standards are dead weight testers

Experience includes gauges, transducers, transmitters, and manometers



High pressure gas dead weight tester with booster



High pressure oil dead weight tester

Force

FORCE:

Up to 1000 lb @ $\pm 0.025\%$

Up to 5,000 lb @ ± 0.5 lbf

Up to 50,000 lb @ ± 5 lbf

Reference standards are dead weight and/or proving rings

Experience includes transducers, force gages, load washers, and bolt stretchers



50,000lb tension/compression tester with proving ring

Moisture

MOISTURE:

10% to 75% relative humidity
@ $\pm 1\%$ RH

-70°C to +20°C dew point @ $\pm 0.3^\circ\text{C}$

Reference standard is a chilled mirror hygrometer

Experience includes chart recorders, dew pointers, trace moisture analyzers, etc.



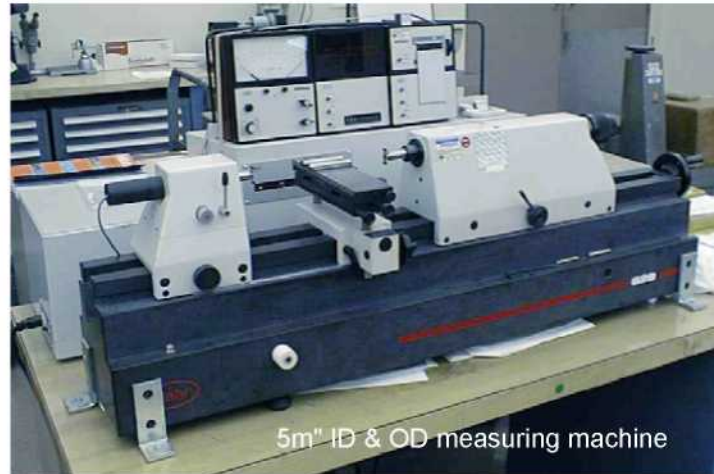
Portable moisture generator and analyzer

Length

LENGTH: 0 to 48" @ $\pm 10 \mu$ "

End standard measuring machine

Experience includes length, inside diameter, outside diameter, and, pitch diameter



Optical Linear Measurement

OPTICAL LINEAR MEASUREMENT:

Three coordinates, 8" x 4" x 1"
@ ± 0.00015 "

Computer aided measuring microscope

Experience includes artifacts with artificial flaws used as ultrasonic and X-ray standards



Optical Flatness Measurement

OPTICAL FLATNESS MEASUREMENT:

Up to 5" diameter @ $\pm 2 \mu$ "

Laser interferometry with a reference flat

Experience includes optical flats



Angle Measurement

ANGLE MEASUREMENT:

0° to 90° @ ± 0.1 arc-sec

Angle gage blocks

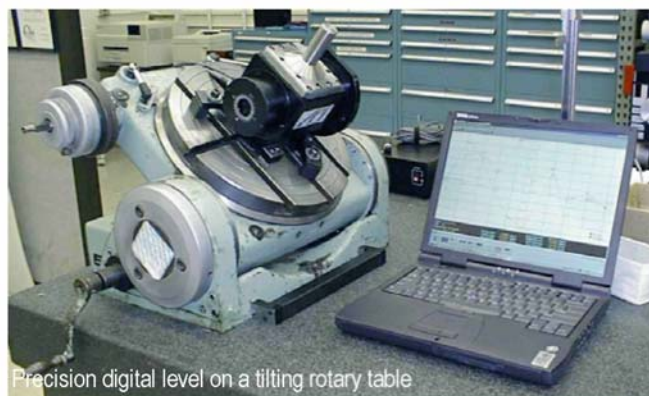
Experience includes
calibration of autocollimators

0° to 360°

Indexing table with
photoelectric digital
autocollimator (@ ± 3 arc-sec)

Swivelcheck precision digital
level (@ ± 0.5 arc-sec in a
vertical plane)

Experience includes
calibration of rotary tables,
indexing tables, rotary machine
tool and coordinate measuring
machine axes



Resistance

RESISTANCE:

0 to 100 m Ω @ as good as 11 ppm
Standard resistors with
bridge



Acceleration

ACCELERATION:

Up to 40,000 lbf @ 120 g

Vibration transducers with
acceleration
standard



Voltage

AC VOLTAGE:

Up to 100 volts @ 1 mHz

Up to 1 kV @ 100 kHz

AC voltage standard

AC CURRENT:

Up to 2.2A and 10 kHz

Current standard

DC VOLTAGE:

Up to 1100V @ 8ppm

AC voltage standard

Up to 100 kV @ 1%

Park high voltage divider

DC CURRENT:

Up to 2.2A

Current standard

AC PHASE:

Up to 400 kHz @ $\pm 0.1^\circ$

Below 32 kHz @ $\pm 1^\circ$

VOLTAGE RATIO:

AC up to 1 kHz @ ± 5 ppm

AC up to 10 kHz @ ± 60 ppm

DC @ ± 10 ppm

- Ratio transformer



Misc..

VISCOSITY:

100 to 100,000 cp

- Reference standards are certified silicone based liquids
- Experience includes viscometers and viscosity cups

HELIUM LEAK STANDARDS:

Down to 1×10^{-8} cc/sec

- Mass spectrometer with reference leak standard

FABRICATION OF STANDARD HYDROCARBON GAS MIXES:

Down to 2 ppm

Mixed by pressure ratios under temperature controlled conditions

Mixes include Alcohol, Methane, Cyclohexane, Freon, and Oxygen

DYNAMIC BALANCING MACHINES:

Up to 400 lb rotors accurate to 5 microinches