



FRS4

REFERENCE PRESSURE STANDARD



The reliable standard for very low pressure

A non-rotating piston gauge with automatic control system

Proven performance, ease of use and long-term stability

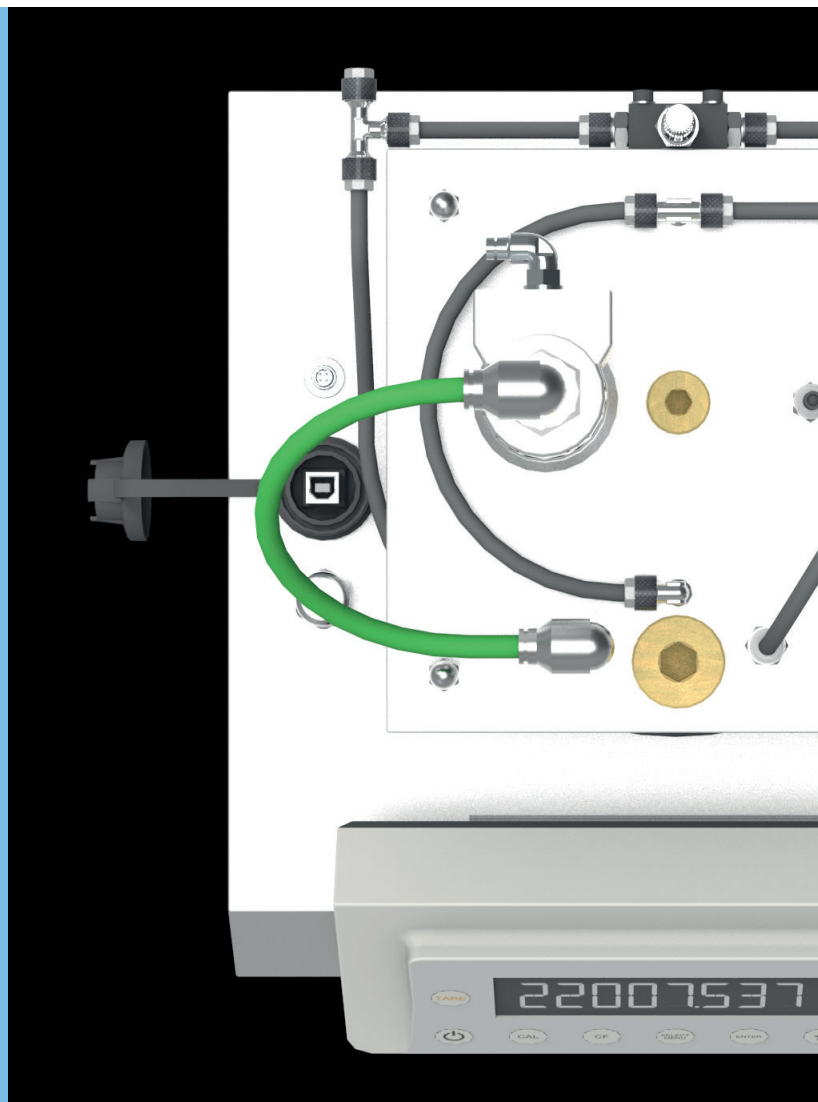
Providing long-term stability of calibration for laboratories around the world, the FRS4 is a piston gauge pressure calibrator for use in gauge and differential pressure modes.

The precision-manufactured piston assembly produces a differential pressure that is directly related to physical properties.

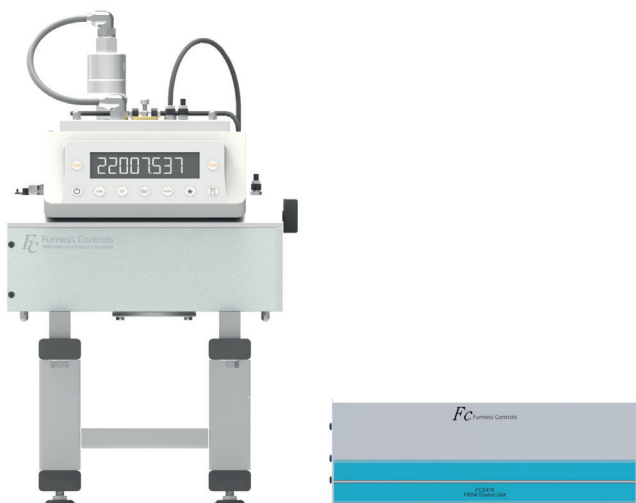
Highly stable, the instrument gives you confidence in the long-term traceability of your calibrations.

Unlike dead-weight testers, the FRS4 is quick to use and can automatically generate required test pressures.

The instrument is designed to make the calibration of a wide range of pressure gauges and transfer standards easy and fast.



The FRS4 Control System



For increased ease-of-use the control box can be used to set the desired pressure between the test and reference ports (differential mode) or the test port and atmospheric pressure (gauge mode) of the FRS4 instrument.

The controller regulates a flow of air to the FRS4 which establishes a proportional pressure across the piston.

The flow rate is controlled through a combination of the supply pressure and selectable flow restrictors with high and low flow settings, and two bypass settings which can be opened to reduce the air flow in either the high or low range. There is also an exhaust restrictor to reduce the effect of atmospheric pressure change.

All functions of the control box are controlled via RS232 serial communications from a computer or Programmable Logic Controller (PLC), with PC-based software available.



Excels at low pressure

High resolution readings at very lower pressures



Stability

Excellent long-term stability allows you to maintain traceability with long re-calibration intervals



Accuracy

The low uncertainty of readings of the FRS4 provides you with confidence in your calibrations



Portability

The FRS4 is easily transportable, allowing comparisons with stationary pressure standards



Ease of use

Control directly from a PC to set pressures automatically with the control box



Tried & tested

The FRS4 has proven its reliability in national and accredited laboratories for over 25 years





A Standard You Can Trust

Maintaining calibration traceability and accuracy is of utmost importance to national standards laboratories, calibration facilities, as well as the manufacturers of pressure measurement devices. It is crucial to have access to a pressure standard you can trust, with a long servicing period that allows you to maximise workload.

The FRS4 is designed to fulfil this role at very low pressures and will outperform other methods in terms of certainty and ease-of-use.

The device is based around a precision piston-cylinder assembly constructed from Invar, a nickel-iron alloy notable for its extremely low coefficient of thermal expansion (2 ppm/°C). Because of this, measurement uncertainties due to temperature variations are reduced to the region of 4 ppm at room temperature.

Traditional approaches to traceable low pressure generation usually involve dead-weight testers. While these instruments provide a direct link between standard masses and pressure, they are large and cumbersome, as well as slow and laborious to use. In addition, the cleaning regime required to maintain their proper operation is time-consuming, whereas, if supplied with clean dry air, the FRS4 can function reliably for 10 years or more without servicing.

With the FRS4 the process of pressure generation is fast and automated, while maintaining the direct link between the physical properties of the cylinder and the pressure.

Operation

The FRS4 operates in Gauge Mode or Differential Pressure Mode. In Gauge Mode the reference port is open to atmosphere, and the instrument generates a positive pressure allowing the calibration of gauge devices.

In Differential Pressure Mode, the reference port is also connected to the calibrated device, for example a differential pressure transmitter, and the instrument generates a pressure differential. At all times the instrument provides an accurate live reading of the generated pressure.

Adjustment of the pressure is accomplished simply by varying the flow of air through the piston-cylinder assembly, and the control box allows this process to be automated, reducing the work of the operator.

Supplied in four different versions, the FRS4 covers a range from zero to 40 kPa for the highest pressure version, and zero to 3.3 kPa for the lowest. The lowest pressure model can provide a resolution down to 0.001 Pa, all with an uncertainty of 0.005 % of reading (+0.02 Pa).

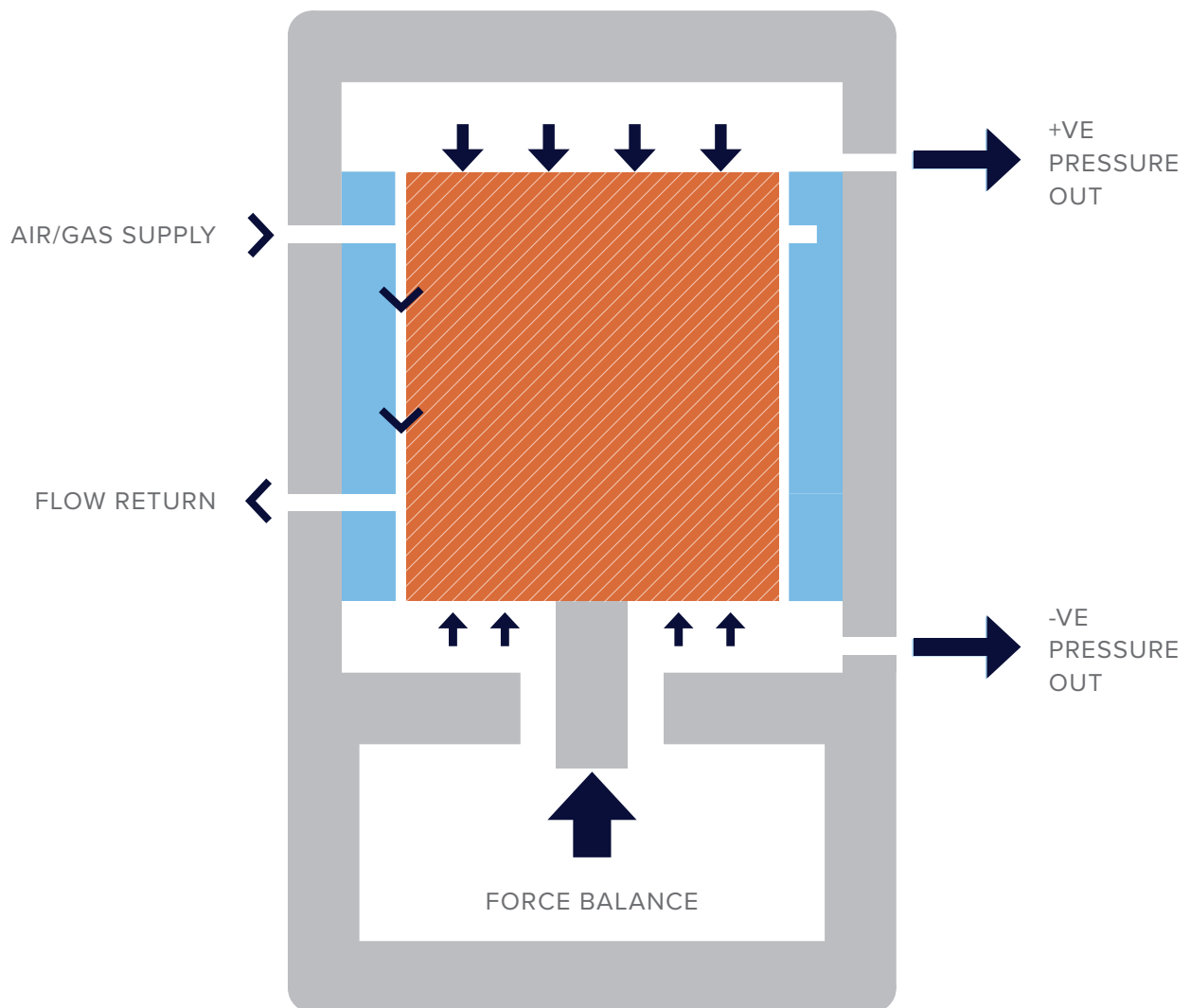
Installation and Portability

The FRS4 can be operated on a bench-top, and can easily be dismantled into its packing case for easy transport. This allows the possibility of calibration and checking of other large pressure standards at different sites. The instrument requires stable environmental conditions as found in a typical metrology laboratory, with no additional requirements.

Functional Diagram

Air or gas is supplied to the FRS4 at the top of the cylinder and flows to the return port near the base. The constricted space between the piston and cylinder results in a pressure differential between the top and bottom of the piston. The position of the piston is maintained laterally by a beryllium-copper flexure system, and the vertical position is maintained by the force balance.

The amount of force required to maintain the vertical position of the piston is exactly equal to the difference in force exerted by the gas on to the top surface of the piston compared to the bottom surface of the piston, plus the piston weight. Because the dimensions of the piston are known precisely, the force balance gives a reading of the pressure differential that is directly traceable to physical properties.



- Cylinder
- Piston

Pressure Measurement

Nominal Piston Area	10 cm ²	20 cm ²	45 cm ²	100 cm ²
Pressure Range	40000 Pa	20000 Pa	8500 Pa	3300 Pa
Resolution	0.01 Pa	0.005 Pa	0.002 Pa	0.001 Pa
Linearity	0.01 Pa	0.01 Pa	0.004 Pa	0.002 Pa
Uncertainty (typical)	± (0.005 % reading + 0.02 Pa)			

Pneumatic

Media Compatibility	Clean, dry air or non-corrosive gas
Air Supply Pressure (control unit)	Maximum 10 bar gauge, Minimum 5 bar gauge
Pneumatic Connections	Air supply – 6 mm push-on tube connector Flow return – 6 mm push-on tube connector Equalise valve pilot – 6 mm push-in tube connector Pressure and reference ports – ¼ BSP female threaded

Electrical

Supply Voltage	115 – 230 Vac, 50-60 Hz
Electrical connections	Power: detachable screw locking circular connector USB: Type B USB connector for printer or PC connection

Environmental

Storage Temperature	Minimum	-10 °C
	Maximum	70 °C
Operating Temperature	Minimum	10 °C
	Typical	18 – 22 °C
	Maximum	40 °C

Construction

Enclosure	Aluminium housing with anodised finish. Suitable for bench or floor mounting.
Dimensions	H 530 mm x W 345 mm x D 350 mm (when fitted on bench top stand)
Weight	35 kg ± 0.5 kg