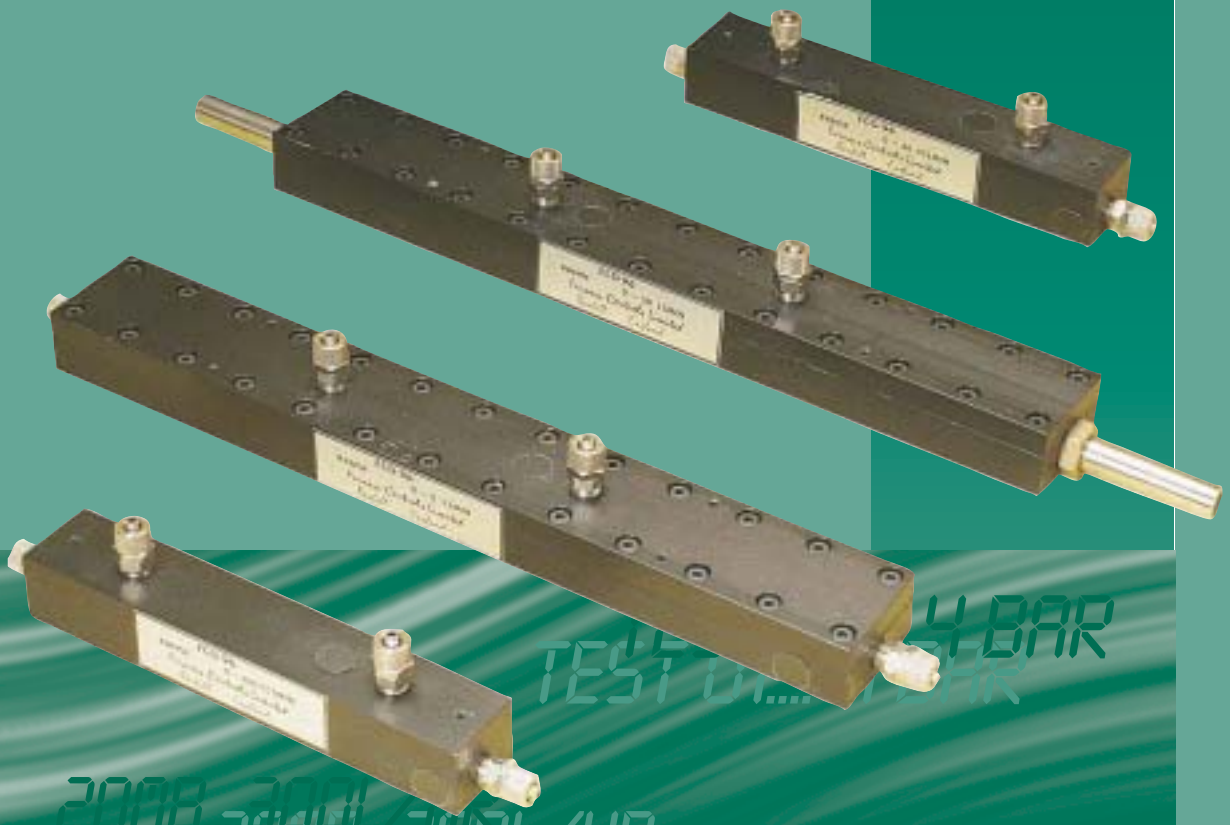
Furness Controls Limited

low pressure

LAMINAR FLOW ELEMENTS

FCO96



- Primary flow elements for volume flow measurement of air and gases from 0.1 ml/min to 10,000 litres/min

Furness

Description

The FCO96 series of Laminar Flow Elements (LFE's) is a family of primary flow devices for the measurement of low volume air and gas flows from 0.1 ml/min to 10,000 litres/min. The FCO96 LFE's provide the ability to measure accurately and repeatably the low flows encountered in sampling systems, injectors and respiration applications.

Flow measurements are often made by orifice plate, venturi or nozzle, where the differential pressure generated is related to flow through square law. The FCO96 Laminar Flow Elements have a linear relationship between differential pressure and flow which allows a much higher turndown to be achieved. Laminar flow conditions are achieved below a Reynolds number of 2000.

The FCO96 Laminar Flow Elements generate a low differential pressure, offering little restriction to flow. Typical is a value of 10 mmH^2O for full flow rate. Suitable measuring instruments are the Furness Controls range of micromanometers, transducers, transmitters and indicators.

Applications

- Core Porosity Testing
- Vacuum Cleaner Testing
- Injector Testing
- Airline Metering
- Gas Burner Setting
- Respiration Monitoring
- Catalytic Converter Testing
- Air Filtration Control

Theory

Laminar flow conditions are present in a gas when the Reynolds number is below the critical figure of 2000. Above this figure the condition of fluid is considered to be turbulent. Below this figure the pressure difference over a given length is linear with flow rate.

Furness Controls' FCO96 Laminar Flow Orifices are designed around a Reynolds number of 500, putting them well within the linear flow range. Each device is engineered to provide flow expansion/reduction chambers at the inlet/outlet, so that the flow is linear to differential pressure at the measuring points.

Installations

The FCO96 Laminar Flow Elements are provided with compression plain or flange fittings for the end flow connections. The actual sizes vary according to range, and are detailed under 'Dimensions'. The differential pressure connections are generally suitable for 6 x 4mm tubing.

The orientation of the Laminar Flow Element is not important and does not affect the calibration. It should be ensured that the incoming and outgoing flow tube connections are maintained at the same internal diameter for at least ten diameters run, otherwise interference with the flow pattern could result in calibration shift. It should be noted that the air or gas should be clean, build-up of dirt on the contact surfaces will result in a gradual deterioration of performance.

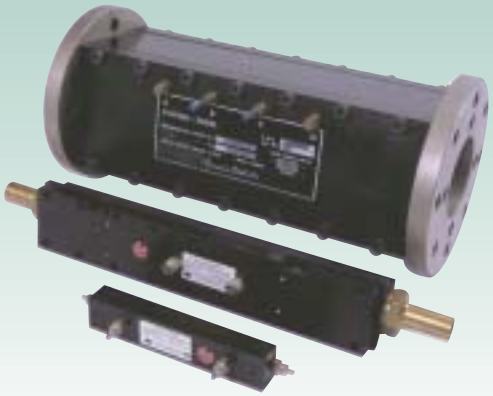
The pipe connections must be leak-tight.

Relative Viscosity Of Gases

FCO96 series of Laminar Flow Elements are calibrated for air and gas of a given iscosity. They can be re-calibrated for different gases using the relative viscosities in the table below. Increasing the density may result in a non-linear relationship.

Laminar Flow Elements can be corrected for viscosity of different gases using the formula shown below.

$$\text{Volume of Gas} = \frac{\text{Volume of Air}}{\text{Relative Viscosity}}$$



Models and Ranges

Model	Range	Nominal DP
FCO96-20 C:	0 to 20 ml/min	5 to 10 mmH^2O
FCO96-200 C:	0 to 200 ml/min	5 to 10 mmH^2O
FCO96-2 L:	0 to 2 l/min	5 to 10 mmH^2O
FCO96-5 L:	0 to 5 l/min	5 to 10 mmH^2O
FCO96-20 L:	0 to 20 l/min	5 to 10 mmH^2O
FCO96-30 L:	0 to 30 l/min	5 to 10 mmH^2O
FCO96-200 L:	0 to 200 l/min	5 to 10 mmH^2O
FCO96-2000 L:	0 to 2,000 l/min	5 to 10 mmH^2O
FCO96-10000 L:	0 to 10,000 l/min	5 to 10 mmH^2O

Specifications

Principle	Volume flow primary flow elements using laminar flow Based on Reynolds numbers below 500
Resolution	According to DP instrument Used
Accuracy	<±1% Reading
Static Pressure	0 to 7 Bar G
Transducers & Readouts	use Furness Controls' low-range differential pressure transducers, transmitters and indicators, resolution around 1:2000
Gas Types	Any dry clean non-corrosive gas
Material of Construction	Aluminium, brass, epoxy resins and steel on FCO96-2000 L

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Furness Controls has a UKAS certified laboratory which offers pressure calibration from 0 to 40 kPa and Flow calibration from 0.1 ml/min to 2000 litres/min

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