TetraTec® Instruments



GEOMETRY MEASUREMENT SYSTEM

CoM4.Geo

Measuring geometry where no optics can reach

TETRATEC INSTRUMENTS GMBH · STEINENBRONN · GERMANY

01 — THE METHOD

A cross-section you do not need to see.

Optical and tactile methods need access to the point of measurement. A pneumatic method only needs a path that air can flow through: the flow follows the geometry even where no sensor and no camera can reach.

0.1 µm
RESOLUTION
diameter 0.8 to 2 mm

0.3 %
ACCURACY OF READING
flow 1 to 12 L/min, (k=2) < 1.0 %

17025
DIN EN ISO/IEC
accredited, D-K-17589-01-00

THE ESSENTIALS

Measurement without a line of sight

The cross-section is determined via the flow resistance. Internal and concealed geometries thus become accessible.

Resolution 0.1 µm

In the diameter range from 0.8 to 2 mm. The basis is flow measurement with an accuracy better than 0.3 % of reading.

Laminar flow element as the basis

The differential pressure is proportional to the volumetric flow. The characteristic curve is linear and corrected by calibration.

Dynamic measurement

Measurement takes place during stable flow. The instrument forms a mean value from the continuous measurement.

Test sequences in the instrument

The CoM4.SYS controller runs configured test programs by itself and supplies mean values and statistics.

Compact enclosure

19 " desktop enclosure, 4 U, 495.5 × 449 × 192 mm, about 12.5 kg.

WHEN THIS METHOD FITS

Pneumatic measurement is possible only for parts that air can flow through and whose test cross-section determines the flow resistance of the gas path. Where both hold, the method has the advantage wherever optics and probes cannot reach. Where they do not hold, another method is the right one – which one, we clarify with you before the design.

Operating principle

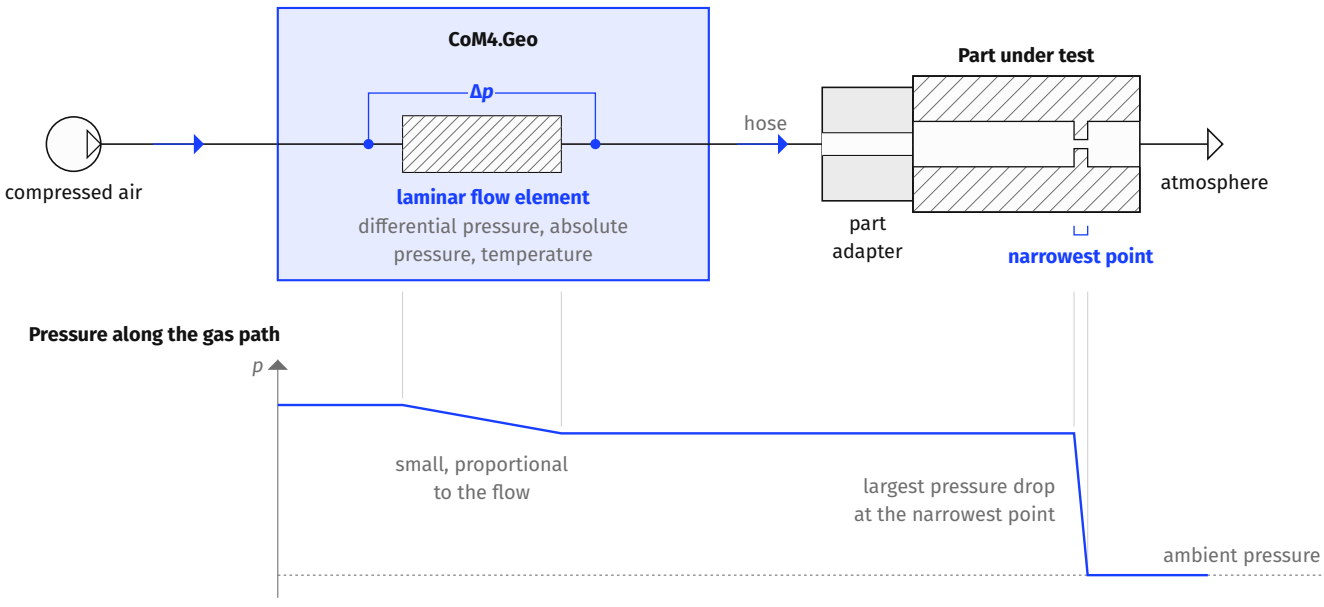
A laminar flow is established in the capillaries of the laminar flow element, so the law of Hagen-Poiseuille applies: the differential pressure across the element is proportional to the volumetric flow. The instrument calculates the volumetric flow from the measured differential pressure, absolute pressure and temperature.

You adapt the part under test downstream of the measuring section. If its restriction determines the flow resistance of the entire gas path, its geometry can be inferred from the measured volumetric flow. This requires that no other point determines the resistance; a long, narrow hose can do so as well. And the restriction must correspond sufficiently well to an established flow model: a capillary, a subcritically operated orifice or a supercritically operated nozzle. For mixed forms there is no reliable model.

As standard, CoM4.Geo measures supercritically operated, orifice-like restrictions. If the ratio of back pressure to upstream pressure falls below the critical value, about 0.53 for air, the gas flows through the restriction at the speed of sound. The cross-sectional area then follows directly from flow and speed of sound, regardless of its shape: a circular bore is measured just as well as a crescent-shaped opening.

Capillaries and subcritically operated orifices can be tested where required; they are not part of the standard scope. For a capillary, the flow resistance depends on both cross-section and length: calculating the cross-section requires the length to be specified, and vice versa. For a subcritically operated orifice, the diameter ratio β and the location of the pressure measurement come into play, as well as the shape of the area and a possibly turbulent inflow and outflow. Only comparative measurements are possible there.

MEASURING PRINCIPLE



TYPICAL APPLICATIONS

- Testing of bores and nozzle cross-sections
- Functional testing of parts with through-flow
- Measurement at optically inaccessible locations
- Quality assurance in production lines
- Series testing with configured test programs
- Comparative measurements in the laboratory

> *The airflow reaches what remains hidden from camera and probe.*

02 — DESIGN

The cross-section first, then the adaptation.

VERSIONS

- Desktop enclosure 19 ", 4 U, with or without handles
- Rack enclosure for installation in the test bench
- Part adaptation according to your component geometry

ACCESSORIES

- Part adapters, manufactured to drawing
- HUMTMP temperature and humidity probe
- Filter and oil/water separator to ISO 8573-1
- Factory or DAkkS calibration certificate

KEY SPECIFICATIONS

Diameter	**0.8–2 mm**
Resolution	**0.1 µm**
Flow rate air	**1–12 L/min**
Accuracy	**< 0.3 % of reading**
Measurement uncertainty (k=2)	**< 1.0 % of reading**
Power supply	**90–260 VAC, max. 80 W**
Inlet pressure	**max. 8 bar**
Temperature	**0–50 °C**
Degree of protection	**IP 20**
Interface	**Ethernet, USB 2.0**
Weight	**approx. 12.5 kg**

Complete data in the technical datasheet.

FROM ENQUIRY TO RECURRING CALIBRATION

1. **Record the measuring task**
   Measuring range, test volume, cycle time and operating conditions – the design follows from these.
2. **Design and calibrate the instrument**
   Assembly, calibration in our own accredited laboratory, calibration certificate with stated uncertainty.
3. **Integrate and support**
   Integration into your production, training and the recurring calibration at the agreed interval.

We check whether your part can be measured pneumatically.

REQUEST A DESIGN

TetraTec Instruments GmbH · Gewerbestraße 8, 71144 Steinenbronn, Germany
T +49 7157 5387-0 · info@tetratec.de · www.tetratec.de