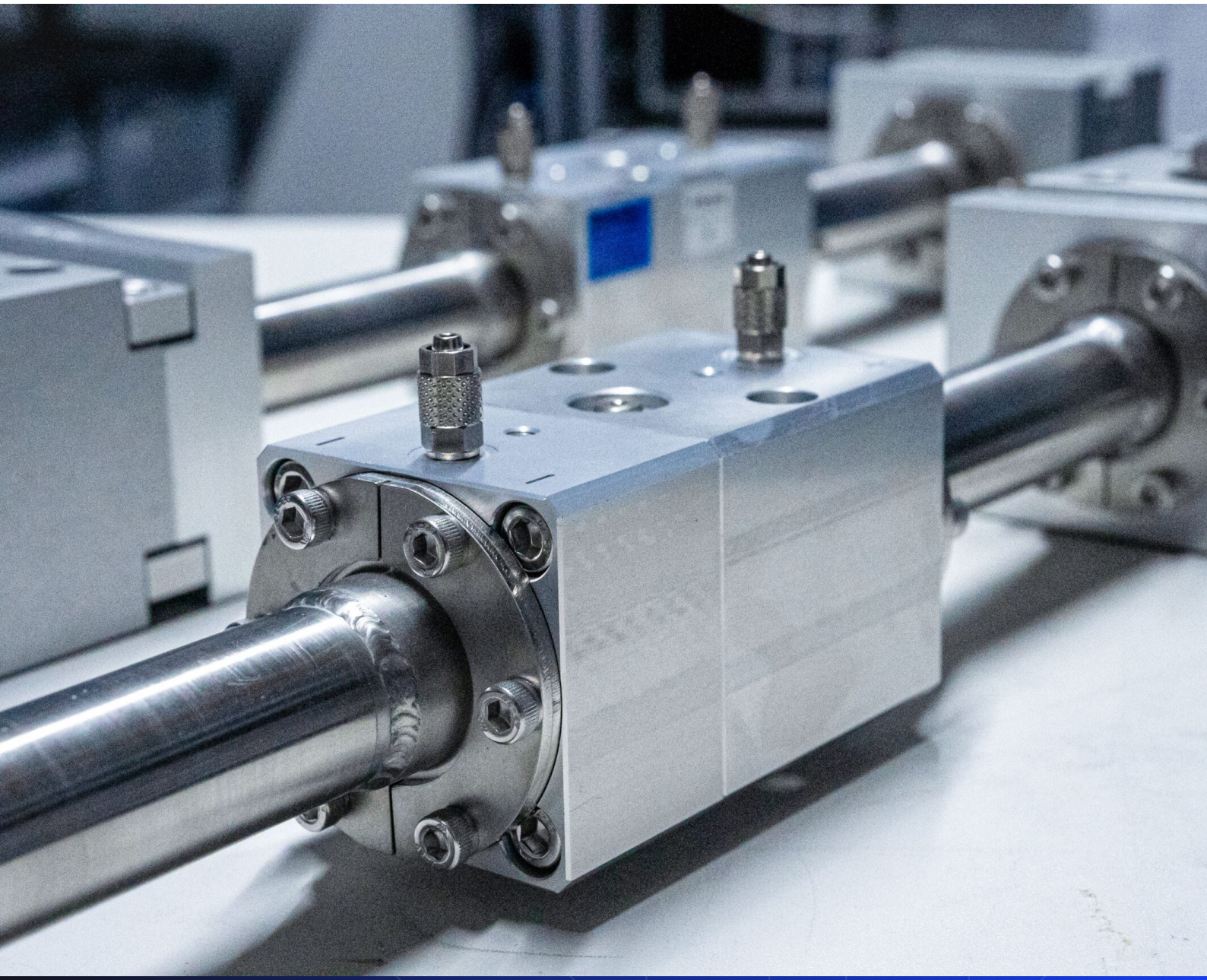
TetraTec® Instruments

CALIBRATION · MEASUREMENT · ENGINEERING



COMPANY PROFILE

Trust in precision.

THREE BUSINESS AREAS · FOR AIR AND GASES

Calibration Laboratory

DAkkS and factory calibration, in the laboratory and on site

Measurement Technology

Sensors and systems for flow, pressure, leak testing

Engineering

Test and measuring systems, integrated into your production

TETRATEC INSTRUMENTS GMBH · STEINENBRONN · GERMANY

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WHAT WE STAND FOR

Traceability | DAkkS accredited | Complex measuring tasks | Fundamental research | Volume flow | Pressure | Temperature | Humidity | Non-air gases | Measuring systems | Laminar Flow Elements | Critical nozzles | Capillary leak standards | Leak testing | On-site calibration

TETRATEC IN FIGURES

since 2002
TETRATEC INSTRUMENTS
from the merger of two specialists

3
BUSINESS AREAS
one point of contact

approx. 50
EMPLOYEES
at the Steinenbronn site



01 — THE COMPANY

Your partner for systems and service.

TetraTec Instruments develops, manufactures and calibrates measuring equipment for automated flow measurement, pressure control and leak testing of parts, components and devices – exclusively for applications involving air and gases.

The company was formed in 2002 through the merger of two specialists: TetraTec Software und Engineering GmbH, founded in 1993, and EP Instruments Messtechnik + Kalibrierung GmbH, founded in 1996, which had already been working together since 1997. This combination of software, systems and calibration expertise created a company that covers a measuring task in full – from the sensor through the evaluation to the traceable calibration certificate.

The quality management system has been certified to DIN EN ISO 9001 by TÜV Rheinland since 2004, and the calibration laboratory has been accredited to DIN EN ISO/IEC 17025 by the German accreditation body DAkkS since 1999. As a member of the technical committees of the German Calibration Service (DKD), TetraTec is in continuous professional exchange with the Physikalisch-Technische Bundesanstalt (PTB).



Three business areas, one standard



01

Calibration Laboratory

DAkkS and factory calibration for volume and mass flow, pressure, temperature, humidity and electrical quantities – in our laboratory or at your site.



02

Measurement Technology

Defined instruments and sensors for gas flow, pressure and leak tightness: modular in design, delivered calibrated and ready to integrate into existing plant.



03

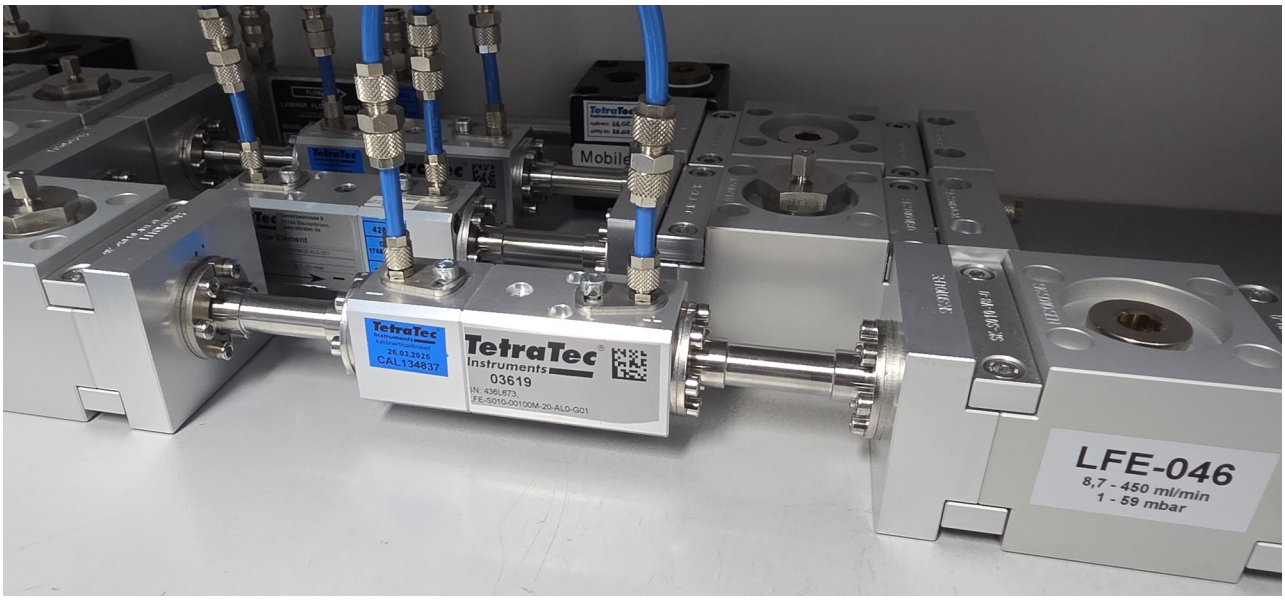
Engineering

Test and measuring systems that are not available off the shelf: designed for your task, built in house and integrated into your production.

02 — CALIBRATION LABORATORY

Accredited calibration – for air and gases.

The calibration laboratory in Steinenbronn has worked to DIN EN ISO/IEC 17025 under DAkkS registration number D-K-17589-01-00 since 1999. Calibration is carried out with measuring systems of our own design – as a DAkkS or as a factory calibration.



A dedicated method with a dedicated standard is available for each accredited measurand; the overview on page 7 shows which. The results are traceable to the Physikalisch-Technische Bundesanstalt (PTB) and in part to METAS in Switzerland.

Internal and external comparison measurements validate the methods continuously. On request we calibrate on the move at your site – likewise with a DAkkS certificate, and without your instruments having to leave your operation.

SCHEDULES AND TURNAROUND TIMES

The standard turnaround time is three weeks from receipt of the goods. If time is short, we calibrate by the express procedure within five or three working days.

DAKKS OR FACTORY CALIBRATION?

Which certificate is the right one depends on how it will be used: the DAkkS certificate for traceable evidence in regulated environments, the factory calibration certificate often for internal test equipment monitoring. Both are produced in the same laboratory and with the same standards – we will advise you which route suits your instruments.

Accredited measuring ranges

- **Volume flow, air:** 0.12 mL/h to 10,000 m^3/h
- **Mass flow, air:** 0.144 mg/h to 12,000 kg/h
- **Non-air gases:** nitrogen, hydrogen, methane, helium and argon 10 L/h to 9 m^3/h, carbon monoxide 10 L/h to 1.5 m^3/h, propane 0.5 L/h to 600 L/h
- **Leak standards** (air, pVTt method): 0.12 mL/h to 3 L/h
- **Pressure:** 14 mbar to 70 bar absolute, –1 to 70 bar gauge
- **Temperature:** 0 to 90 °C
- **Humidity:** 10 to 95 % r. H.
- **Electrical quantities:** direct voltage 0 to 60 V, direct current 0 to 3 A, DC resistance 0 to 12 MOhm

ACCREDITED ON SITE

Four measurands we also calibrate in your plant, with a DAkkS certificate: volume flow of air from 60 mL/h to 4,700 m^3/h, mass flow from 72 mg/h to 5,640 kg/h, temperature from 5 to 50 °C and gauge pressure from –680 mbar to 6.8 bar. Your instruments stay where they are installed.

ACCREDITATION

Registration no. D-K-17589-01-00, accredited since 1999 – first within the German Calibration Service, since 2010 by the DAkkS. Extended in 2017 to include pressure, temperature, relative humidity and electrical quantities.

LABORATORY AT A GLANCE

Standard	**ISO/IEC 17025**
References	**PTB, METAS**
Member of	**DKD committees**
QM system	**ISO 9001**

DAkkS Deutsche Akkreditierungsstelle D-K-17589-01-00

TÜVRheinland ZERTIFIZIERT Management System ISO 9001 www.tuv.com ID 9108612107





10,000 m^3/h
LARGEST VOLUME FLOW
accredited, air

0.12 mL/h
SMALLEST VOLUME FLOW
accredited, air

7
NON-AIR GASES
accredited for calibration

Traceability: from the reading to the standard

A calibration certificate is only as sound as the chain behind it: every standard we calibrate with must itself be traceable to the International System of Units (SI) – without a gap, and with a stated measurement uncertainty at every step. We document that chain with every calibration certificate.

THE CHAIN AT A GLANCE

1 **Your test equipment**
In use at your site or sent to our laboratory for calibration – where every chain begins.

2 **TetraTec working standard**
Calibrated in our own laboratory in Steinenbronn, accredited to DIN EN ISO/IEC 17025.

3 **DAkkS calibration**
Supervised by the Deutsche Akkreditierungsstelle GmbH, which has acted as the national accreditation body of the Federal Republic of Germany since 2010. Before that, accreditation was granted by the German Calibration Service – ours dates from 1999.

4 **National standard, PTB**
Physikalisch-Technische Bundesanstalt in Braunschweig and Berlin, successor since 1950 to the Physikalisch-Technische Reichsanstalt founded in 1887.

5 **International System of Units, SI**
The worldwide reference – the common starting point of every traceable measurement.

GERMAN CALIBRATION SERVICE (DKD)

Since 1977 the DKD has been the PTB's platform for calibration laboratories in Germany – today a network of more than 400 laboratories and companies. TetraTec contributes to its technical committees and so keeps direct professional contact with those who maintain the national standards.

since 1999
ACCREDITED
first in the DKD, since 2010 DAkkS

> 15,000
CALIBRATIONS PER YEAR
for air and gases

> 5,000
OF THEM DAKKS CALIBRATIONS
to DIN EN ISO/IEC 17025



Measurands at a glance

Every measurand has its own method and its own standard. This overview assigns one to the other; the accredited ranges of accreditation D-K-17589-01-00 are on page 5. Beyond the accredited ranges, factory calibrations in extended measuring ranges are possible – talk to us about your case.

Volume and mass flow
Critical nozzles, gas meters, Laminar Flow Elements, pVTt

Pressure
Piston gauges and electrical pressure sensors

Temperature
Resistance thermometers in a liquid bath

Humidity
Dew point mirror in a humidity generator

Electrical quantities
System multimeters and fixed resistors

Non-air gases
Drum-type and rotary piston gas meters, Laminar Flow Elements

THE BODIES AND THE STANDARD

DAkkS

Deutsche Akkreditierungsstelle GmbH: since 2010 the national accreditation body of the Federal Republic of Germany; accredits testing and calibration laboratories to DIN EN ISO/IEC 17025.

PTB

Physikalisch-Technische Bundesanstalt: Germany's national metrology institute, successor since 1950 to the Physikalisch-Technische Reichsanstalt founded in 1887.

DKD

Deutscher Kalibrierdienst, the German Calibration Service: the PTB's professional network for accredited calibration laboratories in Germany, see left.

ISO/IEC 17025

The worldwide standard for the competence and traceability of testing and calibration laboratories, current edition 2017.



03 — MEASUREMENT TECHNOLOGY

Systems and sensors for every measuring task.

Combining electronics, flow measuring elements, sensors and calibration produces systems that solve demanding test tasks as well. All assemblies are modular in design and can be adapted to changing requirements.



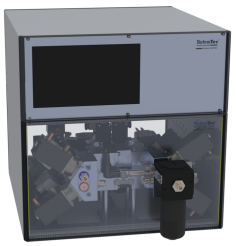
PRODUCT GROUPS

Measuring and calibration systems | Laminar Flow Elements | Differential pressure transmitters | Mass flow meters | Critical nozzles | Capillary leak standards | **Leak test systems** | Functional test systems | Pressure control systems | Electrical pressure transducers | Temperature and humidity probes

What distinguishes the CoM4 family is its computing power: every measuring cycle evaluates the full gas physics. Gas property models for air and pure gases combine pressure, temperature and humidity into the standard volume flow, and the cycle time does not suffer for it. Operation is through a 4-inch touch display or the browser interface, connected over Ethernet TCP/IP; on request the instruments are delivered with a factory or DAkkS calibration certificate from our own laboratory.

Three basic systems of the family cover the most frequent test tasks; the following page presents them. The complete portfolio with all flow elements, sensors and accessories is covered by the separate product catalogue.

The three most requested standard systems



MEASURING AND CONTROLLING FLOW

CoM4.Flow-Quattro

Four cascaded Laminar Flow Elements are permanently built into the instrument, which automatically switches to the element that suits the current flow. Measuring, controlling and dosing in one compact system – with integrated electronic pressure control for pressure and vacuum operation.

Flow range, air	**2–20,000 NmL/min**
Turndown ratio	**1:10,000**
Accuracy	**< 0.2 % of reading**

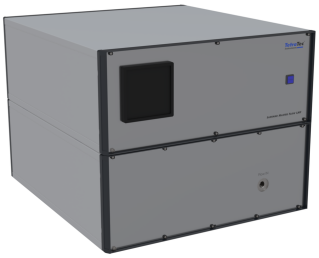
LEAK TESTING

CoM4.Leak-Compact

Leak testing by the pressure decay method: the pressure drop of the test piece is measured against a tight reference volume and output either as a standard volume flow or as a pressure drop. Up to 95 test programs are stored as type files.

Test pressure	**variable, up to 6 bar**
Differential pressure	**–20 to +20 mbar**
Repeatability	**0.1 Pa/s**
Format	**19-inch rack unit, 4 U**





GENERATING VOLUME FLOWS

CoM4.Gallery

A dosing system for defined air and gas volume flows based on critically operated nozzles, in suction or pressure mode. The nozzles have a fixed binary graduation and are combined into groups of up to eight nozzles.

Limits, suction mode	**approx. 5 mL/min to approx. 35 L/min**
Limits, pressure mode	**approx. 12 mL/min to approx. 200 L/min**
Turndown per unit	**1:200**
Accuracy, suction mode	**< 0.1 % of reading**
Accuracy, pressure mode	**< 0.15 % of reading**
Data acquisition	**up to 100 Hz**

INDIVIDUAL COMPONENTS AND ACCESSORIES

Not every task needs a complete system. Laminar Flow Elements, differential pressure transmitters, critical nozzles, electrical pressure transducers and temperature and humidity probes are also available individually – as are the capillary leak standards of the KL series pictured on the right, from 0.002 NmL/min to 1.5 NL/min, accredited without a gap.



04 — ENGINEERING

From the problem to the proof.

A manufacturer wants to sell a part – a nozzle, a valve, a housing. Their customer sets hard limits. The question is then not how to measure, but: how do we prove that the limits are met? That is where our work begins.

OUR APPROACH

1. **Define the test task**
   Iteratively and together with you: what actually has to be tested? It is often not obvious at the outset that the task can be solved by measuring air or gas flow.
2. **Select and combine methods**
   Our core competence is assigning the correct measuring method to a test task – usually a combination of flow, leak and functional testing.
3. **Validate the method itself**
   On a second level it is not the part that is tested but the test method: with master parts, comparison measurements and capability studies.
4. **Secure the evidence**
   The result is one that holds up in front of your customer and in an audit.

HOW WE WORK

- **Requirements and concept**
  Record the test task, run a preliminary test in our laboratory, submit a quotation
- **Design**
  Adaptation, measuring section, pneumatics and electrics as separate assemblies
- **Prototype**
  Proof on your part before you invest in equipment
- **Manufacture and implementation**
  Assembly, piping, wiring and software in house
- **Commissioning and validation**
  Calibration, capability study, endurance measurements
- **Acceptance and handover**
  Acceptance report, documentation, operator training
- **Maintenance and support**
  Wearing parts, spares and recalibration over the service life

OUR ROLE IN THE PROJECT



Quality guardian

Guarantor of precision and conformity: reliable tests, reduced risk, stable processes.



Adviser and sparring partner

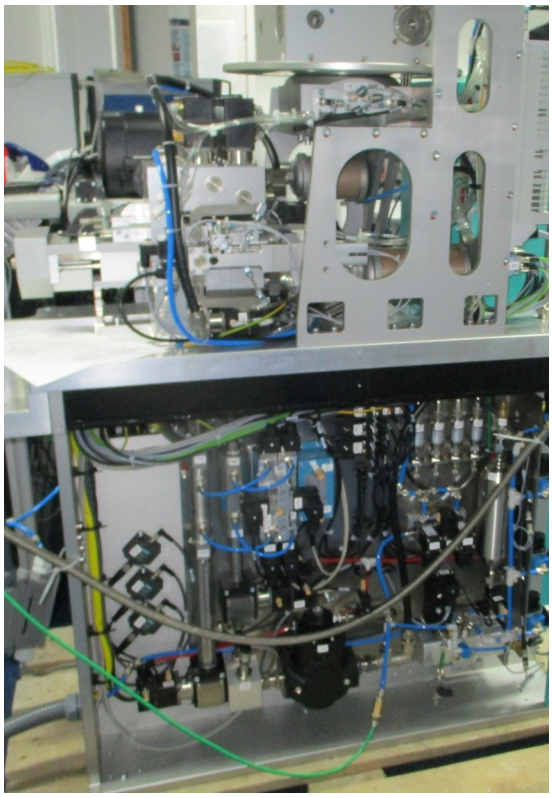
Critical, honest, constructive: we point out room for improvement and sharpen decisions.



Project pilot

From planning to implementation – and always within the agreed time and budget.

Project example



END-OF-LINE TESTING

Test module for five valve types

A manufacturer of electromagnetic actuators and valves tests solenoid valves at the end of the assembly line, in designs for different customers. Every valve has to demonstrate that it meets the specified flow characteristics and is internally tight, in part as a function of the drive current of the solenoid – without an operator and at the cycle time of the line.

The result is a test module that the customer integrates into their own robot cell. Inside it the robot changes not only the test pieces but, where required, the complete adaptation as well – automatically, using RFID-coded adaptation sets. Since 2019 we have manufactured more than 15 identical modules, every one of them to the same accepted build standard.

Test piece	**solenoid valve, up to 5 designs**
Test medium	**dry, oil-free compressed air**
Adaptation change	**automatic, by robot**

WHY GAS FLOW IS THE MEASURAND

A solenoid valve opens and closes through the force of its coil – the flow characteristic plotted against the drive current therefore shows directly whether the solenoid is correctly dimensioned and whether the valve armature switches cleanly. That is exactly the curve the module records, channel by channel for up to four selectable ports of the test piece.

The same measuring section answers the second question at once: is the valve tight when it is closed? One measuring principle thus yields both the characteristic curve and the leak-tightness proof – how the measuring section is built for that is shown on the following page.

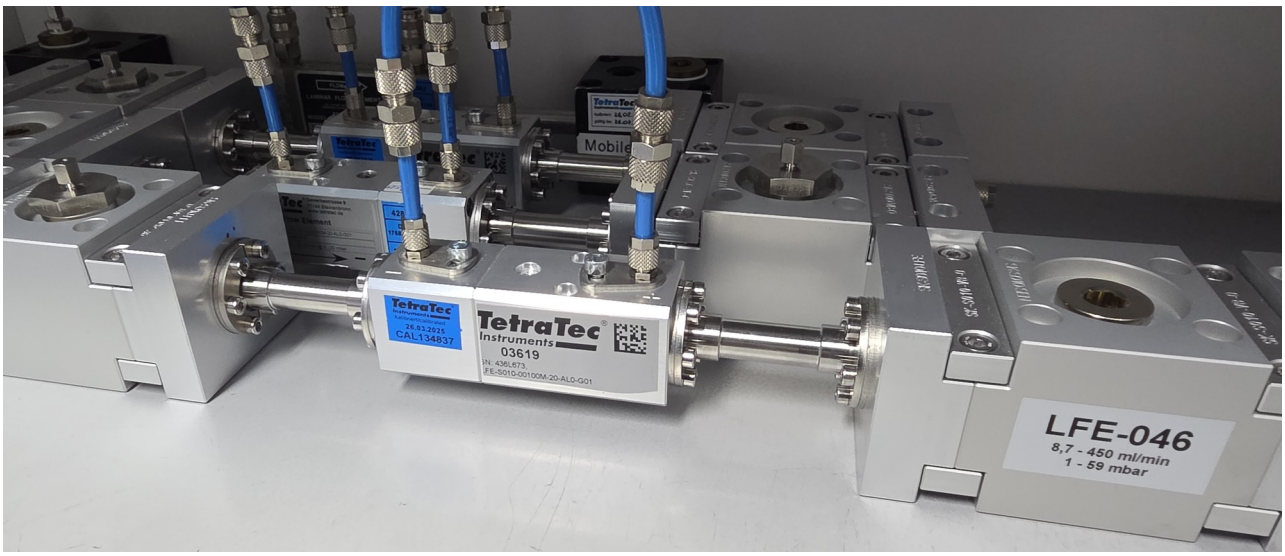
TEST SCOPE PER VALVE

- Flow characteristics against drive current, depending on valve type and test channel
- Internal leak tightness in the closed state
- Functional test through the air flow, supported by a defined shaking movement of the test piece
- Zero adjustment before every measurement
- Master measurements with tight, min and max masters
- Automatic pass/fail assessment, sorting by the robot

ONE BUILDING BLOCK OF A LARGER LINE

The test module is intended for installation in the customer's production plant. A fully automated line with robotic handling takes several such modules: the cell handles loading, cycle timing and sorting, the module delivers the measurement and the assessment.

Design and measuring chain

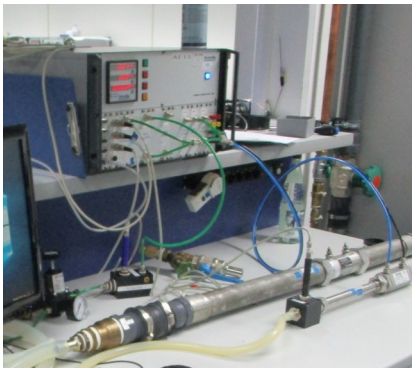


At the heart of the module is a measuring section with two Laminar Flow Elements: a small one for the leakage (0–20 L/min) and a large one for the operating flow (0–210 L/min), both calibrated at 20 mbar differential pressure. Pneumatically switched selector valves place the appropriate element in the measuring path.

The test pressure comes from a precision pressure regulator with a downstream volume flow booster. Absolute and gauge pressure – at four selectable channels –, differential pressure, temperature and humidity all enter the calculation; the output is the standard volume flow. Two S320 controllers evaluate on a 25 ms cycle, operate the valves and assess the test pieces.

TECHNICAL DATA

Measuring section	**2 Laminar Flow Elements**
Leakage measurement	**0–20 L/min**
Flow measurement	**0–210 L/min**
Test channels	**4, selectable**
Control	**2 x S320 controller, 25 ms cycle**
Supply	**230 V AC, air up to 10 bar**



EVERYTHING FROM ONE SOURCE

Measuring elements, pressure sensors, evaluation electronics, firmware and PC software all come from TetraTec – as do the calibration certificates of the sensors and the calibrated master parts. That shortens fault finding when it matters: there is one point of contact for the entire measuring chain.

Design and verification

FROM ORDER TO ACCEPTANCE

1 **Requirements analysis**
Specification and coordination with the customer's engineering department, for each valve type

2 **Design**
Test module, RFID-coded adaptation sets and the parking column for the change

3 **Manufacture**
Measuring section, pneumatics, control cabinet and test software for each module

4 **Commissioning**
Leak, offset and endurance measurements for each module

5 **Validation**
Calibration and verification of the entire measuring chain, in part DAkkS accredited

6 **Acceptance**
Final acceptance with the customer, documentation and calibration certificates

7 **Series**
Every further module to the same build standard, with its own acceptance

8 **Service**
Maintenance schedule, wearing parts and recalibration from one source

> *We supply solutions – for measurable success.*
>
> ENGINEERING SOLUTIONS, TETRATEC INSTRUMENTS

> 10
LARGE TEST RIGS PER YEAR
built and maintained

> 25
STANDARD SYSTEMS PER YEAR
built and maintained

since 1993
EXPERIENCE IN PLANT ENGINEERING
from TetraTec Engineering

05 — YOUR NEXT STEP

Let us talk about your measuring task.

Describe your application to us – we will tell you which method can measure it and how we would integrate that into your production. We answer queries within 24 hours, Monday to Friday.

HOW WE SUPPORT YOU

1 · FIRST CONVERSATION

Test task, target quantities and unit numbers. The result: a sound technical assessment – free of charge.

2 · MEASUREMENT ANALYSIS

A preliminary test of your part in our laboratory – with no prior investment in equipment.

3 · IMPLEMENTATION

Series solution, integration, acceptance with calibration certificate, then maintenance and recalibration.

Free initial consultation

Tell us the details of your application. We will find the method that matches your requirements – from a single sensor to a fully automated test cell.

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YOUR CONTACT

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Head of Sales and Marketing

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A first assessment of your test task, an appointment for the measurement analysis, a quotation.

TetraTec Instruments in Steinenbronn

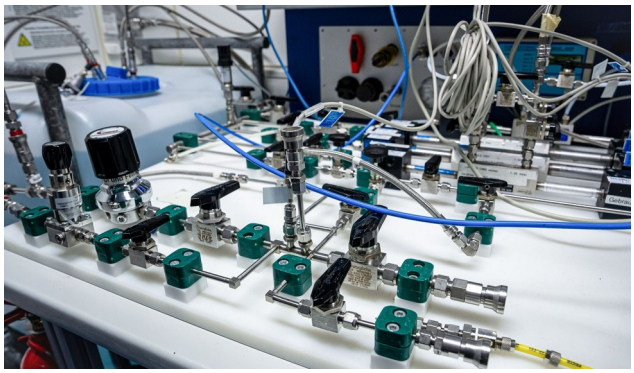
The company's headquarters are in Steinenbronn near Stuttgart in the district of Böblingen – conveniently placed between the A 81 (Heilbronn–Singen) and the A 8 (Karlsruhe–Munich) motorways and close to Stuttgart Airport. Around 50 staff work here in development, manufacturing, the calibration laboratory and service under one roof. What is built here we also maintain and recalibrate ourselves.

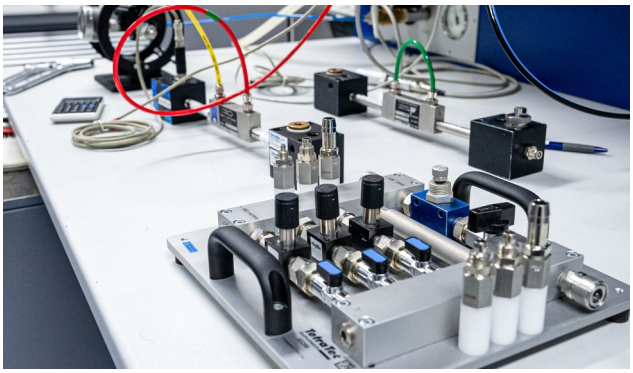












Trust in precision.

Trust in precision.

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ACCREDITATION

DAkkS D-K-17589-01-00
DIN EN ISO/IEC 17025
DIN EN ISO 9001 (TÜV Rheinland)
Member of the DKD

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