Trigas DM
Durchflussmesser-Manufaktur

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TriFlow TF 004 / 030 / 100 / 200

Low Flow
Liquid Calibrator System

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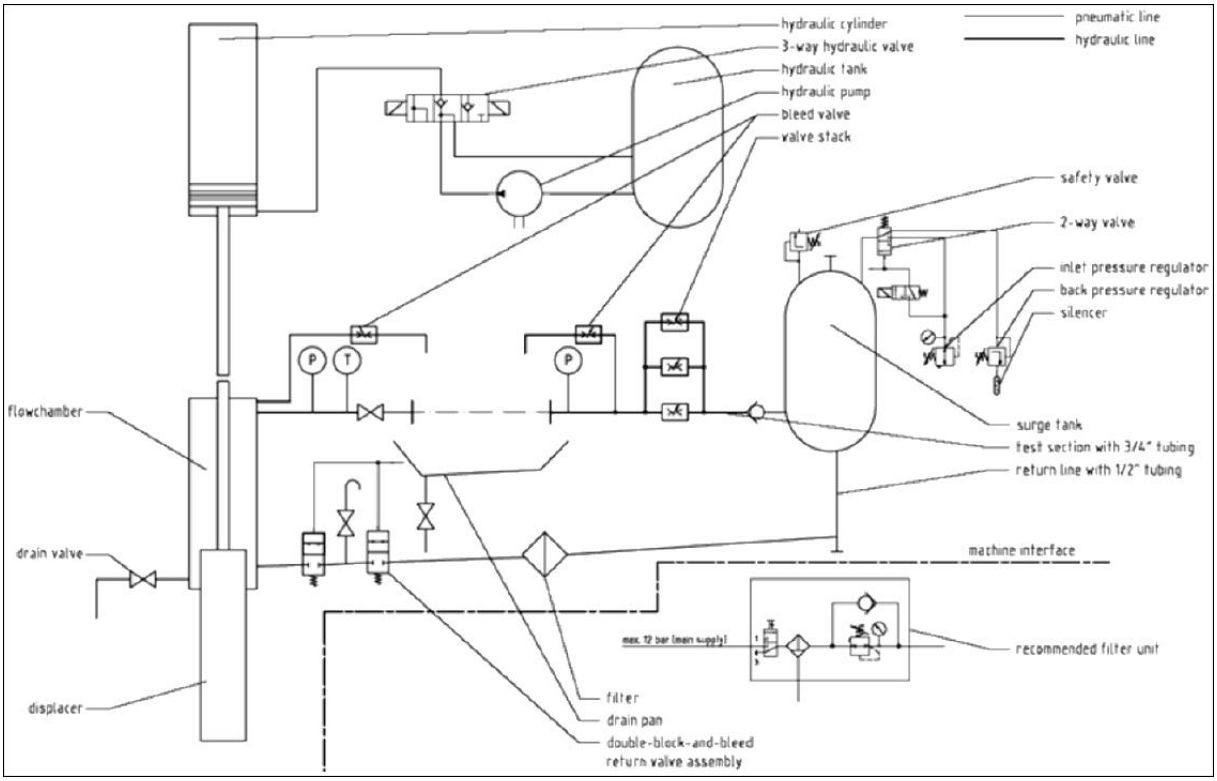
The TriFlow TF Series Displacer Primary Liquid Flowmeter Calibration System is the ideal solution for applications where highly accurate flowmeter calibration is required. It offers a combination of high performance, efficiency and user friendliness.

Exceptional accuracy and stability are achieved through the use of a precisely honed, chrome-plated stainless-steel cylinder inserted into a fluid container and displacing a precisely known volume which then becomes the reference for the calibration.

Hydraulically operated and based on positive displacement operating principle, it quickly and accurately calibrates virtually any type of flowmeter. To overcome the low flow limitations of conventional piston flow calibrators, a performance-boosting and innovative Displacer Cylinder principle has been employed. The insertion of the Cylinder inside a fluid container displaces a volume of test fluid equal to the volume of the cylinder.

The movement of the Displacer Cylinder generates a continuous train of electrical pulses by use of a linear encoder attached to the Cylinder guide shaft. Each pulse represents an extremely small but very precise volume of fluid.

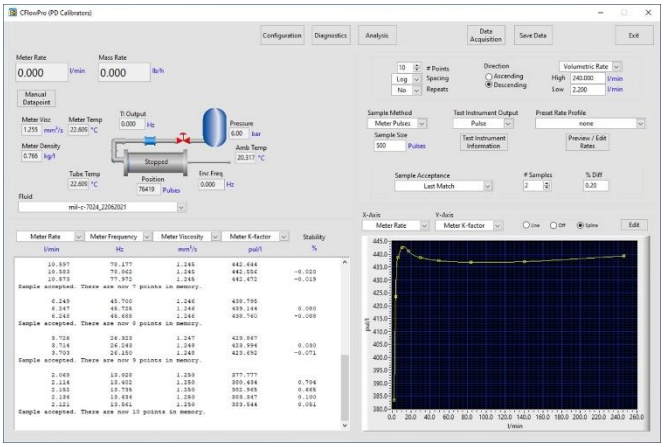
Positive Displacement Calibrators are virtually immune to the effects of test fluid viscosity, density and compressibility. Traceability to National and International Standards (PTB, LNE, NEL, NIST etc.) is easily achieved and maintained through the use of appropriately certified dimensional and temperature standards.



2021-11-24 V01-EN

Sophisticated Data Acquisition, Data Analysis and Reporting

The popular CFlowPro LabVIEW based data acquisition and control software ensures optimal man-machine interface and ease of operation. It is specifically designed for flow calibration activities. CFlowPro is currently used by hundreds of flow laboratories worldwide including several National Metrology Institutes. It is the culmination of years of effort and extensive testing to ensure the accuracy of the flow calculation algorithms which operate seamlessly in the background. Features Include:



- Data Acquisition User Interface where all crucial information is readily viewable on a single screen
- Extensive Calibration Report Generation Library
- Calibration files are stored in MS Excel compatible format for easy customization and importation into other software programs
- Temperature and pressure corrections to compensate for the effects of outside influences
- Density and compressibility correction for mass flow applications
- Cubic spline curve-fitting to compensate for the non-linearity of P/T transducers
- Extensive built-in diagnostics using a graphical interface to make process fault identification quick and easy
- Advanced graphical presentations of all calibration variables can easily be generated
- Simultaneous graphing of historical data allows easy evaluation of process changes

Advanced Hardware Features

The TriFlow Calibrator IO hardware has been designed to be accurate and robust with a standard Notebook or Desktop PC serving as control console. Features include:

- Digital and analog (24 bit) signal processing is performed within the hardware interface unit which communicates with the PC via serial link
- Double Chronometry and Quadrature methods are employed to eliminate timing errors and improve overall accuracy
- Temperature inputs (Ambient, Calibrator and Meter Under Test) are used for flow rate correction
- Pressure inputs (Calibrator and Meter Under Test) are used for flow rate correction
- Automation options offer capability to fully program the calibration process and place it under computer control

2021-11-24 V01-EN

Specifications

Model	Flow Range	Lowest Possible Flow Rate*
TF 200	0.1 to 200 l/min	0.004 l/min (4 ml/min)
TF 100	0.05 to 100 l/min	0.002 l/min (2 ml/min)
TF 030	0.015 to 30 l/min	0.0005 l/min (0.5 ml/min)
TF 004	0.002 to 4 l/min	0.00005 l/min (0.05 ml/min)

** Minimum flow is affected by lubricity and viscosity of the fluid used*

Accuracy:	+/- 0.03 % of reading
Repeatability:	+/- 0.02% of reading, depending on the type of flow meter being tested and the application conditions
Pressure Range:	Up to 12 bar (higher pressures available)
Temp. Range:	10-50 °C
Viscosity Range:	Up to 10,000 Centistokes
Flow Meter Inputs:	Practically any type of Volumetric or Mass Flowmeter or Totalizer can be calibrated:

- Frequency generating flowmeters: Turbines, Coriolis, Gear / Oval Gear Meters, Vortex etc.
- Analog generating flowmeters (0-20/4-20 mA, 0-5/0-10 VDC): Magnetic, Ultrasonic, Venturi etc.
- Visual output flowmeters: Variable Area Meters, Totalizers etc.

TF Series Advantages over conventional Piston Calibrators

Accuracy of Flow Measurement

- TF Series: Guarantees +/-0.03% accuracy even at the lowest of flowrates because the critical dimension is the Outside Diameter of the displacer cylinder which can be manufactured to very tight tolerances.
- Piston Calibrators: Their accuracy is related to the precision of the Inside Diameter of the flow tube. Inside diameters are inherently much more difficult to manufacture to tight tolerances as they also are difficult to measure accurately. +/-0.03-0.05% is possible with the larger tube sizes, but becomes increasingly difficult to maintain as the diameter of the flow tube decreases.

2021-11-24 V01-EN

TF Series Advantages over conventional Piston Calibrators (continued)

Ease of Maintenance & Recertification

- TF Series: Their design allows positive leak detection and ease by which the critical dimensions of the Displacer cylinder can be measured and monitored - which allows us to certify the calibrator dimensionally. This minimizes the requirements for periodic preventive maintenance. Periodic seal changes are not required and Water Draw is optional and used only as a means for extra confirmation of continuing reliable operation.
- Piston Calibrators: Are subject to hidden leaks and require periodic, time-consuming preventive seal change and Water Draw in order to ensure confidence that the calibrator is working properly.

Stability of flow

- TF Series: The Displacer Cylinder is being pulled by the hydraulic cylinder during data acquisition resulting in smoother motion.
- Piston calibrators: The piston is being pushed, making them more susceptible to uneven movement.

Low Flow Capability

- TF Series: Positive force from the hydraulic cylinder eliminates seal stick-slip. This enables the calibrator to be used at very low displacer velocities resulting in turndown ratios of more than 50000:1. Turndown is limited only by the practicality of measuring encoder frequency when the displacer is moving very slow.
- Piston Calibrators: The piston is pushed with compressed air which adds sponginess to the system and causes stick/slip at the low flowrates. Maximum reliable turndown range is usually not more than 2000: 1, especially with non-lubricating fluids.

Leak detection

- TF Series: Calibrators come with an inherent but very important advantage: The design is such that there cannot be any hidden leaks. All potential leakage paths are exposed and can easily be inspected visually.
- Piston Calibrators: May be subject to internal leaks that cannot be visually observed. Piston seal leakage inside of the flow tube can only be inferred through leak tests and Water Draw, leak confirmation is only possible by complete disassembly of the calibrator main element.

Air elimination

- TF Series: Vertical Flow element configuration allows positive air elimination. Air rises to the top and is simply bled out through a bleed valve at the highest point of the flow chamber.
- Piston calibrators: Horizontal flow tube configuration makes air elimination difficult, normally requiring that the calibrator is raised at a slight angle to allow air to collect at the highest point before it can be eliminated.

2021-11-24 V01-EN

TF Series Advantages over Gravimetric Calibrators

Size, Space Requirements

- TF Series: Very compact. Its size is primarily determined by the length of the required test section.
- Gravimetric Flow calibrators, also known as Catch-and-Weigh systems, require large tanks, diverter piping, weight scales, etc., which makes them much larger than Volumetric Displacer and Piston Calibrators and Provers of the same flow range capability.

Cost — Manufacturing & Maintenance

- TF Series: Their minimalistic design and relative ease of manufacture of the critical components result in low costs for both production and maintenance.
- Gravimetric calibrators: Much more costly to buy, implement and maintain because of their complexity and bulk, yet comparable capability to the TF series.

Fluid Requirements

- TF Series: Inherently require small quantities of fluid to operate. For example, the displaced volume on the smallest TF series calibrator is only 0.5 liters. This results in significant cost advantages and makes fluid change fast and efficient.
- Gravimetric equipment: Requires much larger volume of fluid for calibration. As a result, changing fluids can take several hours or even days.

Time required for Data Acquisition

- TF series: Can take data as fast as the operating features of the flowmeter under test will allow. Data point speed of acquisition is only limited by the ability of the Meter Under Test to achieve and maintain stable output. Reliable flowmeters with fast response characteristics literally require only a few seconds to obtain calibration points.
- Gravimetric calibrators: Very time consuming because the complete sample mass must always be collected for each data point. At low flowrates, catching-and-weighing the complete sample may take several minutes or hours.

Accuracy of Flow Measurement

- TF Series: Capable of practically instantaneous readings of flowmeters under test. The short duration of data points minimizes the risk that unstable flow conditions will affect the calibration readings.
- Gravimetric calibrators: Calculate an average flowrate over the entire sampling period which at low flowrates may be very long (see above), consequently requiring constant flowrate over the same period of time in order to ensure measurement reliability and accuracy.

ISO 9001:2008 CERTIFIED
For Flow Measurement
And Calibration ✓


CERTIFICATE

Trigas FI GmbH

ISO 9001:2008

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About us

Durchflussmesser-Manufaktur

As a specialist with 35 years of experience in flow measurement technology, TrigasDM offers high-quality measuring instruments, electronics and calibrators for liquids and gases.

Made in Germany

The development and production of our products takes place exclusively in the community of Neufahrn, 20km north of Munich and 5 minutes from the airport.

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