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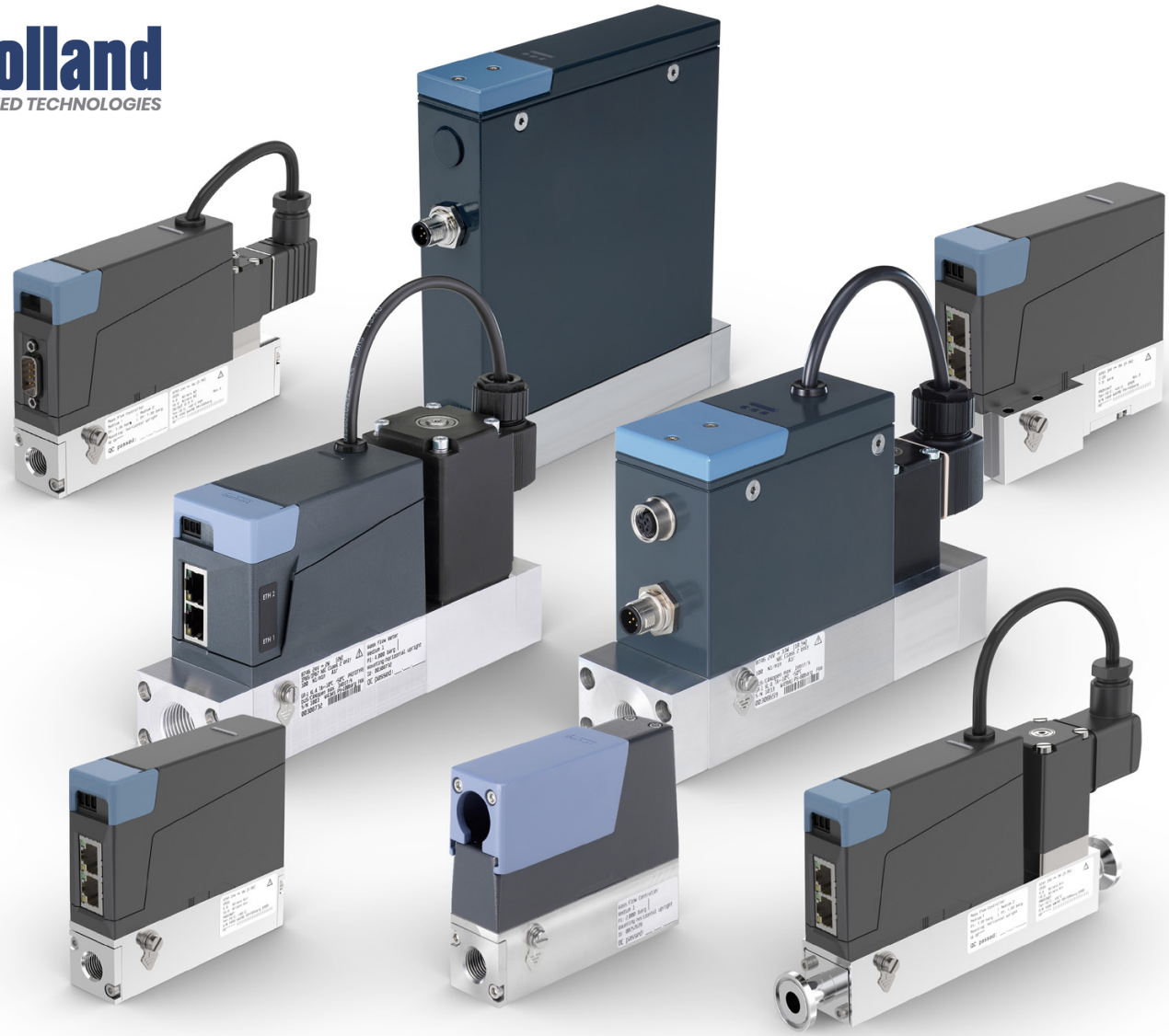

Flow and Pressure Controllers for Gases & Liquids

Product range overview

Pioneers of Flow.

bürkert
FLUID CONTROL SYSTEMS

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Source: Customer reference
Härterei Carl Gommann GmbH

It’s a perfect match: Your application and Bürkert

Since 1946 it has all been about fluidics for us. We know how to handle neutral, aggressive and toxic gases and liquids. We know the needs of our customers, as we have a deep knowledge of the applications our products are used in. Measuring reliably and controlling complex processes precisely, this is what our products have been used for decades. We know the struggles and challenges that come with controlling gases and liquids and have a deep understanding of all parts of the control loop.

Therefore, our mission is to reduce the complexity of the entire fluid control loop for our clients. With an eye on creating a regenerative economy, we’re always curious and excited about innovating sustainable digital and physical solutions. As an outsourcing and sparring partner, we empower clients to focus on their core business. Just like we do.

Thus, with our pool of experience we are also able to provide an individual solution for your application. This brochure will get you started with a detailed product overview of the world of Bürkert Flow and Pressure Controllers.

Now, let’s take a look!

Easy flow and pressure

With Bürkert integrated Flow and Pressure Controllers for Gases and Liquids

In general, fluids can exist in the gaseous or liquid state. Each aggregate phase needs to be handled differently, and the physical measurement principles used vary for each of the devices. We have more than 30 years of experience in the field of mass flow controllers and over the past years our portfolio was steadily extended:

Mass Flow Controller (MFC)/ Meter (MFM) for gases

use the thermal/ calorimetric measurement technique

Liquid Flow Controller (LFC)/ Meter (LFM)

use a differential pressure cell to measure the flow of the liquid

Mass Flow Controller (MFC)/ Meter (MFM) for gases and liquids

use the Coriolis sensor principle

Electronic Pressure Controller (EPC)

use an absolute pressure cell to measure the pressure of the gas

1994 — today

Product overview at a glance

Liquid	Gas				
Flow					Pressure
LFC/LFM	MFC/MFM				EPC
 8752	 8741	 8743	 8745	 8756	 8761
MFC/MFM					
 8756	 8742	 8744	 8746		 8762

Controller and Meter

Inner values matter most

All Bürkert Flow and Pressure Controllers are compact, integrated devices, designed to control the flow or pressure of gases or liquids.

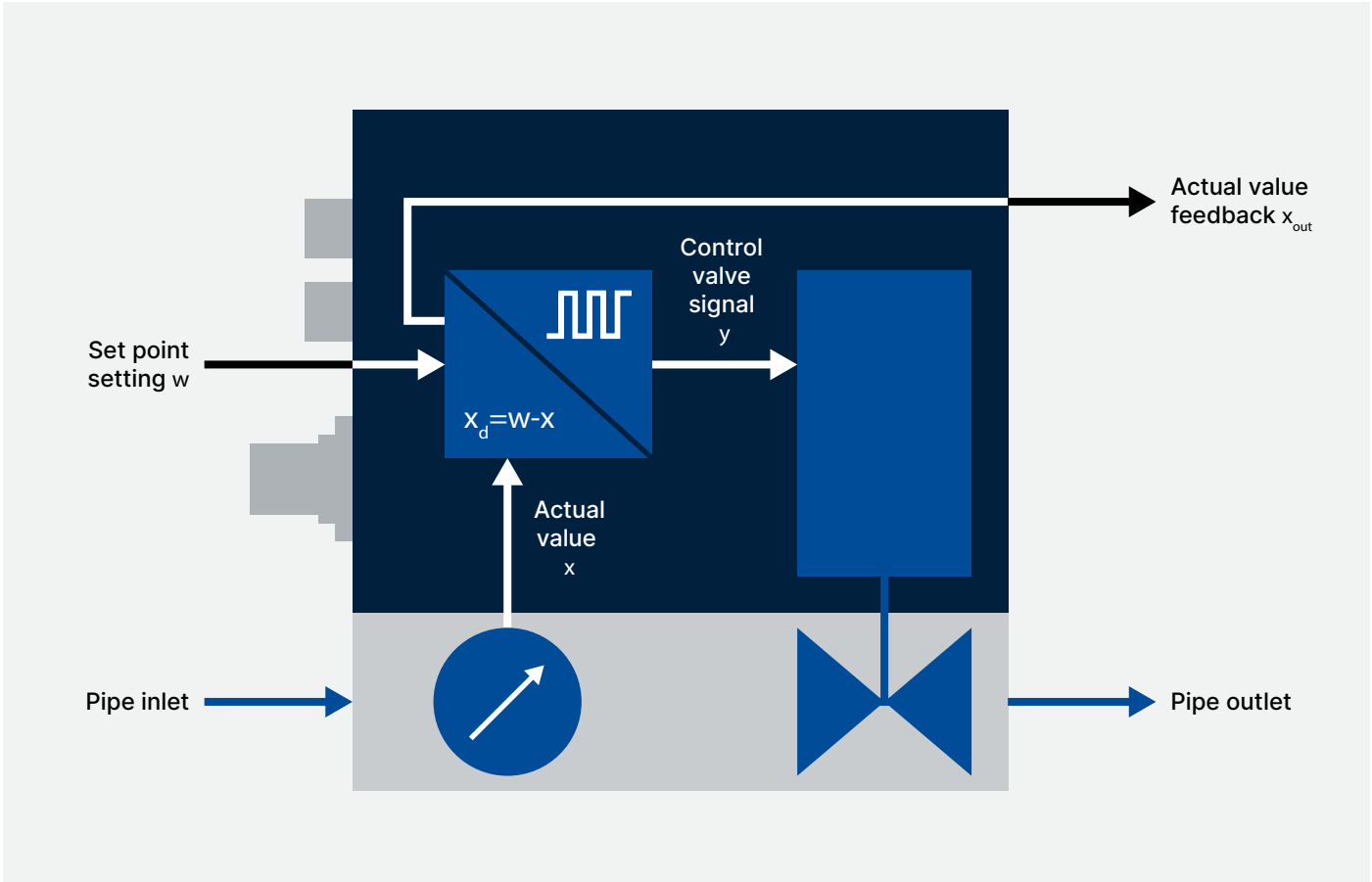
What all devices have in common is, that they control a present reference value – regardless of disturbance variables such as pressure fluctuations or temporary occurring flow resistances, e.g. caused by filter contamination.

The reference value setting is made electrically via analogue signal or fieldbus. The actual value measured by the sensor is compared in the controller with the reference value. The controller gives a signal to the actuator as a correcting variable and varies it according to the registered control deviation. The actual value is also transmitted externally via analogue signal , fieldbus or Ethernet communication. With the data provided by the device, the customer is able to control and analyse its processes at any time. With its easy installation, the compact structure of the Flow or Pressure Controller ensures the convenient operation of a complete (closed) control loop. Additional work and costs, e.g. wiring and harmonising individual components, incorporating pipe lengths (inlet/outlet pipe for flow conditioning), are ruled out.

In case a process requires only the measurement and not a complex control: Bürkert Flow Meters are the right choice. The only difference compared to a flow controller, is that the actuating valve does not exist.

Main components

- Sensor
- Electronics
- Actuator



Electronics and Communication

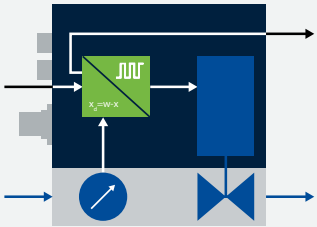
Smart control for precise performance: Bürkert's integrated microprocessor system continuously processes both setpoint and actual flow values, ensuring real-time actuator control. Using a built-in calibration curve, the sensor signal is accurately converted into a true flow rate. The PI-based control algorithm dynamically adjusts the actuator to maintain optimal performance. All control parameters are factory-calibrated, so you benefit from maximum precision and efficiency right from the start.

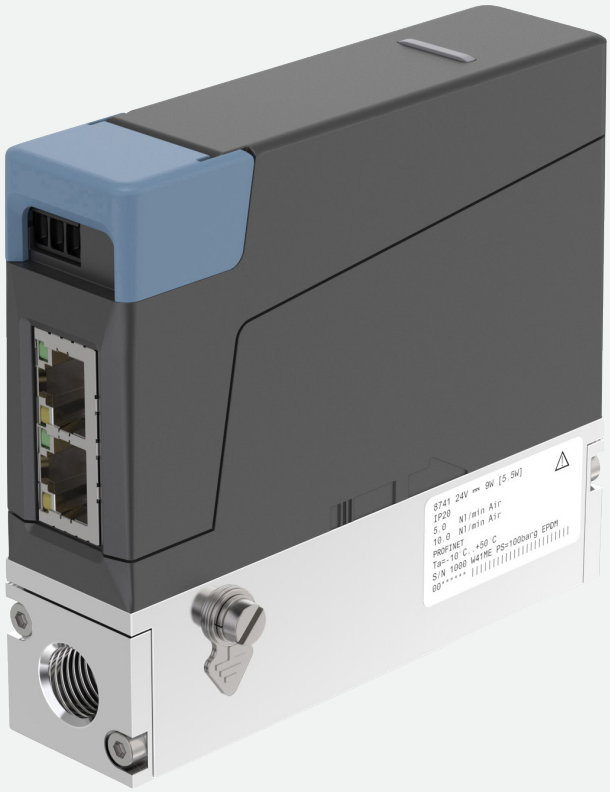
Depending on the device type, the set point value and actual value signals can be predefined and fed back by various communication options: In modern industrial plants the communication with fieldbuses and Industrial Ethernet has often remarkable advantages.

Bürkert's free software tool "Bürkert Communicator" can be used to access all types of Flow and Pressure Controllers remotely to easily parametrise the device, supervise the process and safe relevant data.

Features

- Easy and intuitive user handling
- Diagnose, maintenance and auto-tune functions
- Various communication options





Modbus

CANopen

PROFIBUS

PROFINET

EtherNet/IP

EtherCAT

bus

Actuators

The following applies to controller devices only.

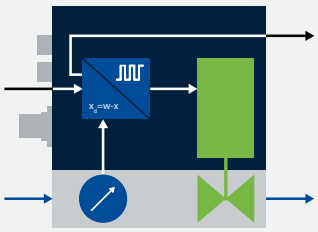
Basically, there a two different types of proportional valves to be used with the Bürkert controller devices for gases and liquids.

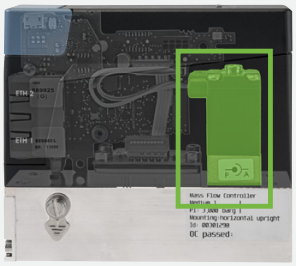
Electromagnetic valves are used to control low to medium flow rates or pressure. This simple, direct-acting construction keeps the control valves small, compact and cost-optimised. These are the properties that make electromagnetic control valves especially ideal for closed process control loops, where their precisely reproducible control positions and short response times make them particularly impressive.

Electromotive driven valves are used to control high flow rates. Due to their technology, they can achieve larger nominal sizes at the same pressure or higher pressures at the same nominal sizes and are still compact valves.

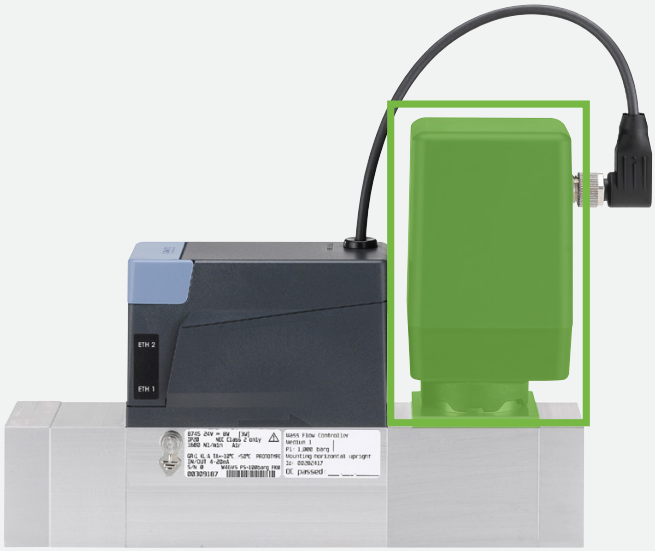
Features

- Internally or externally located
- Electromagnetic valve (small, compact, efficient)
- Electromotive valve (high pressure, high flow)





MFC Type 8741 with internal electromagnetic valve



MFC Type 8745 with external electromotive driven or electromagnetic valve

Mass Flow (Gas)

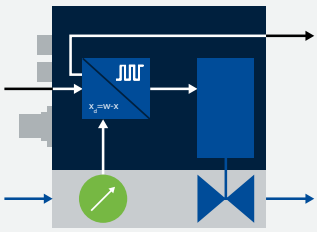
The flow sensor element represents the heart of every Mass Flow Controller. The physical law is well known – heat always flows towards lower temperatures. So if a body has a higher temperature than its environment, it will give off its heat energy to the neighbouring mass. So our thermal/calorimetric measurement technique utilises this principle, i.e. heat conduction and transportation in gases.

Thermal flow sensors for determining the mass flow rate of gases essentially consist of a heating element and temperature sensors, which can be installed both in and outside the gas flow channel. The heating element heats the gas flowing through, and the temperature sensors detect the dissipated heat volume. The respective dissipated heat energy is a function of the current mass flow. The mass flow literally defines the weight of the flowing medium, more specifically – this is the weight of the gas that flows through the device in a specific time unit.

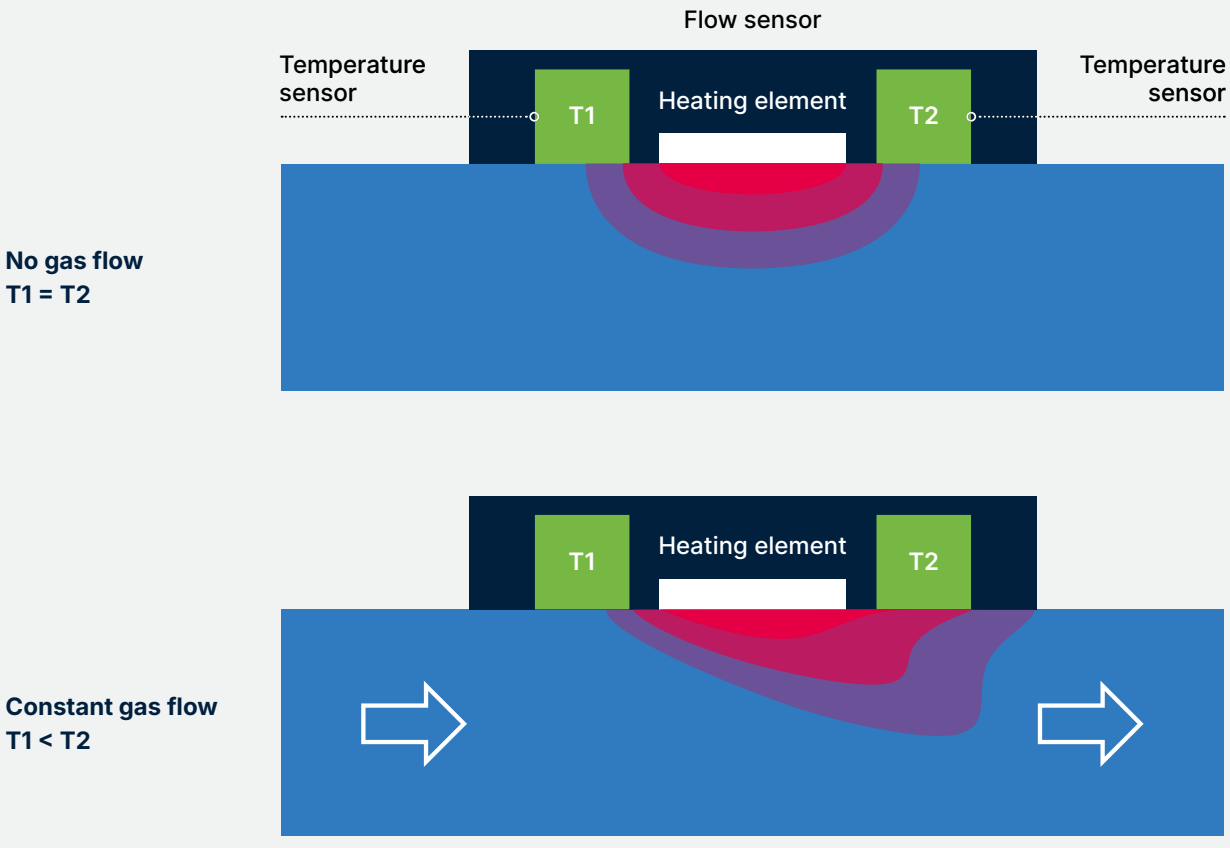
So there are good reasons for measuring the mass flow and not its volume flow – because gases are compressible. Depending on its pressure and temperature, both the density and therefore its volume will change. In many applications mass flow measurements therefore are more relevant than volume flow measurements.

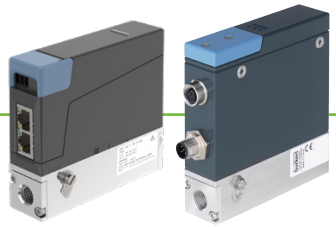
Features

- Efficient
- Reliable and proven technology



Calorimetric measurement principle





Type 8741 / Type 8742

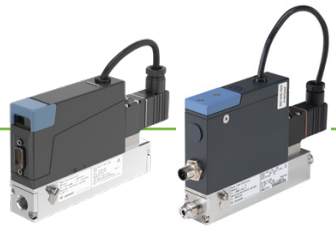
- Nominal flow ranges from 0.01 l_N/min to 160 l_N/min*
- Suitable for neutral gases (real gas calibration)
- Four calibration curves possible
- Fieldbus and Industrial Ethernet communication available
- High protection class IP65

TYPE 8741 / TYPE 8742

Mass Flow Controller and Meter for Gases

Within the Type 8741/8742, the MEMS flow sensor is in direct contact with the gas. Therefore, the sensor reacts extremely quickly to flow changes. The MFC can control set point or actual value changes within hundred milliseconds. With its high sensitivity even at the smallest flows, the MFC is suitable for a wide range of applications.

High accuracy and repeatability	**Very fast response times**
Optional: USP Class VI, FDA, EC 1935 compliant	**Turndown ratio up to 1:500**



Type 8743 / Type 8744

- Nominal flow ranges from 0.01 l_N/min to 100 l_N/min*
- Media-separated sensor, high quality chemical resistant parts
- Fieldbus and Industrial Ethernet communication available
- High protection class IP65

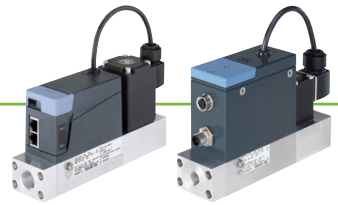
TYPE 8743 / TYPE 8744

Mass Flow Controller and Meter for Gases

Types 8743 / 8744 use a capillary thermal sensor element that is media-separated. As the sensor element is not in direct contact with the process gas, the MFC is particularly suitable for applications with demanding gases/gas mixtures. Due to the linear dependency (measuring signal to flow rate), the MFC can simply be calibrated with nitrogen and later be used for other gases and gas mixtures by applying conversion factors.

High accuracy and repeatability	**suitable for aggressive gases**
Optional: USP Class VI, FDA, EC 1935 compliant	**Conversion factor (switching of gases and gas mixtures w/o calibration)**

* Valid for nitrogen under norm conditions, 273 K, 1013 mbara



Type 8745 / Type 8746

- Nominal flow ranges from 50 l_N/min to 2500 l_N/min*
- Suitable for neutral gases (real gas calibration) and ammonia (conversion factor)
- Four calibration curves possible
- Fieldbus and Industrial Ethernet communication available
- High protection class IP65

TYPE 8745 / TYPE 8746

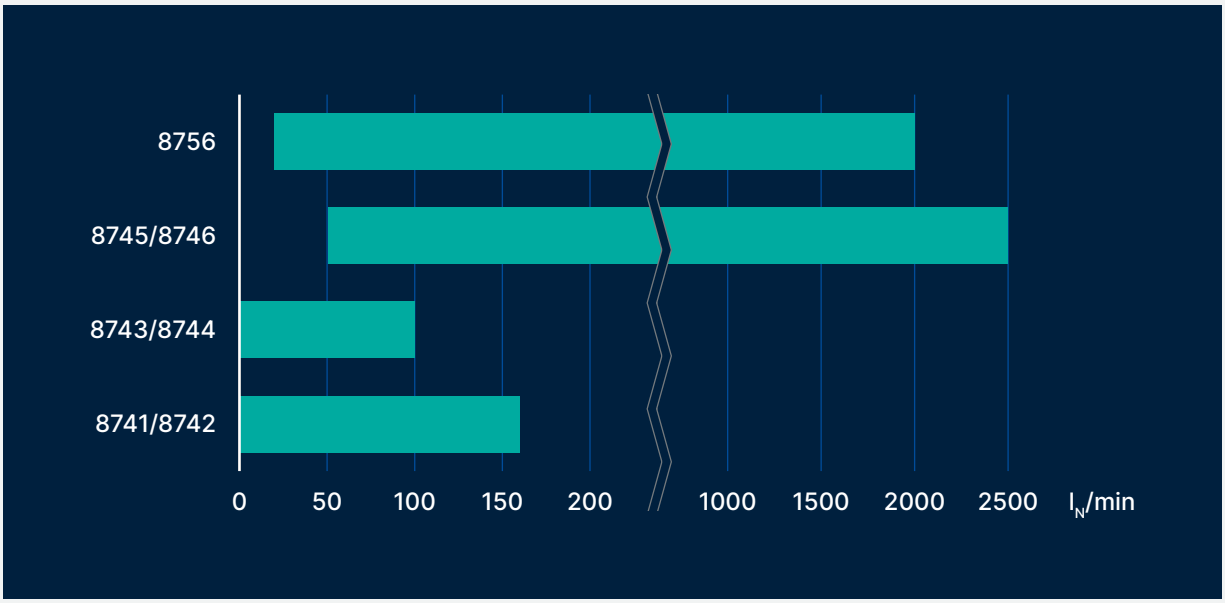
Mass Flow Controller and Meter for Gases

The MFC Typ 8745/8746 uses a thermal inline sensor that is located directly in the gas stream and therefore reaches very fast response times. The device is characterized by a low pressure loss. As the MFC is also suitable for high flow rates, two variants of proportional valves as actors are available: electromagnetic or electromotive driven valve.

High accuracy and repeatabiliy	**Very fast response times**
Optional: USP Class VI, FDA, EC 1935 compliant	**High flow range with low pressure drop**

* valid for nitrogen under norm conditions, 273 K, 1013 mbara

Overview nominal flow range for gases



The possible max. nominal flow range for nitrogen under norm conditions is shown, the actual calibration of the MFC is done according to the customer's request.

See page 13 for more information on Type 8756.

System innovation

System development

A MFC is used whenever a gas needs to be precisely measured or controlled. However, most applications, contain more than one gas. This leads to the installation of Multi MFC System. There are different options to create a tailor-made system that fits best for your individual requirements.

1 Standard MFCs and Gateway

If you need to integrate multiple Bürkert standard MFCs in a superior control system, you can use a Bürkert solution consisting of a Gateway (i.e. ME43 or ME63) and multiple standard MFCs. The preconfigured gateway manages the communication with the standard MFCs, your only effort will be to connect the gateway with the PLC.

2 Modular semi-standardized MFC System

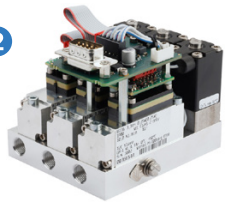
It's a semi-standardised modular system consisting of assemblies that can be put together flexibly and according to your requirements. The solution will be an economical multi-channel flow control system for gases up to 20 l/min.

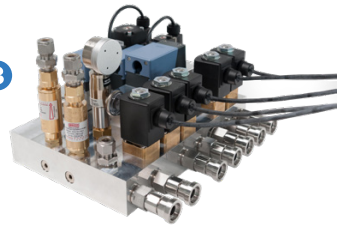
3 Your individual tailor-made system

If you need even more flexibility and have additional requirements, we would be happy to support you with your customized solution from our Systemhaus, tailored to your individual needs.

The result will be a ready to use system that can comprise MFC, LFCs, EPCs as well as other sensors and valves.







What fits best for your application?

Let's find out.

Bürkert Systemhaus

Easy implementation of digital communication

Simple start-up as plug-and-play solution

Solutions for gas and liquid applications

Multiple functions (flow, pressure ...) can be implemented

Mass Flow (Gas or Liquid)

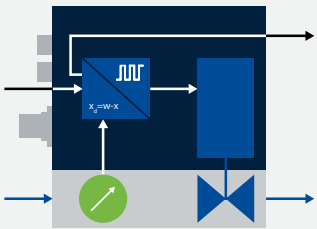
This advanced flow measurement technology relies on a physical principle (Coriolis) that occurs when a medium is accelerated within a vibrating system – enabling highly precise and direct mass flow measurement. Thanks to this method, the sensors are suitable for virtually all types of gases and liquids, regardless of their properties.

The Bürkert Coriolis Flow Controller contains a measurement tube which is set into sinusoidal vibration (see deflection at time t1 in the illustration). Detectors at the start and end of the measurement tube pick up the corresponding deflection at specific points in time. As soon as a liquid or gas flows through the tube, the tube is deflected with a phase shift at both ends at time t2. This phase shift is proportional to the mass flow and provides a conclusion on the mass flow.

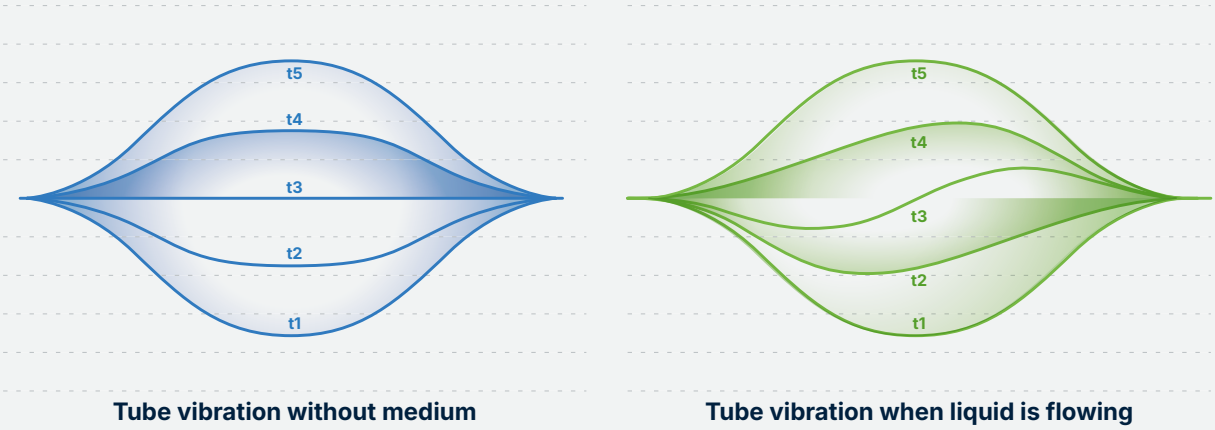
The Coriolis effect is independently of the conductivity of the medium with no need for an inlet/outlet section or specific flow profiles of the gases and liquids. The result delivers not only precise flow data (via phase shift), but also valuable insights into the medium's density (via frequency) and temperature.

Features

- Very high accuracy
- Long-term stability
- Suitable for liquids and gases
- Density and temperature available



Coriolis Flow Measurement



Tube vibration without medium

Tube vibration when liquid is flowing



Type 8756

- Nominal flow range from 10 ml/min to 2500 ml/min (valid for water)
- Nominal flow ranges from 20l_N/min to 2000 l_N /min (valid for nitrogen*)
- Suitable for gases and liquids (viscosity 0.3...1000 mPas)
- Media-separated sensor, high quality chemical resistant parts
- Fieldbus and Industrial Ethernet communication available
- High protection class IP65

TYPE 8756

Mass Flow Controller and Meter for Gases and Liquids

The MFC Type 8756 is the ideal solution for highly precise measurement and control of gas or liquid flows – even in small quantities during batch processes. Thanks to its Coriolis-based measurement principle, it operates completely independently of the medium. Variations in pressure or temperature have no effect on measurement accuracy, ensuring consistently reliable results under all conditions.

In addition to the flow rate, the density and temperature of the gas or liquid are also available. The device design enables a stable flow measurement that is extremely robust to external vibrations.

Suitable for aggressive gases and liquids

High zero-point stability

Optional: USP Class VI, FDA, EC 1935 compliant

Very high accuracy and excellent repeatability

* under norm conditions, 273 K, 1013 mbara

Variants of Type 8756



Flow Meter



Flow Controller with pump



Flow Controller with proportional valve



Flow Controller Modular for 3rd party actuators



Batch Controller

Technology innovation

Dosing solutions

Dosing applications can be found in all kinds of industries. If ingredients, additives or flavorings are added, the right quantity is important. Therefore, accuracy and velocity are essential in order to avoid additional costs. This is a challenge for the upstream dosing system, which must provide a constant level of precision throughout.

In such applications, manual dosing is not reliable enough – and conventional solutions made up of individual components reach their limits too. Ultimately, even minimal differences in the viscosity of the dosing medium can quickly lead to imprecise dosing.

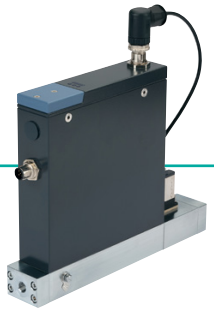
As a fluidics specialist, we decided to take on this challenge and developed the µLDC and the Coriolis MFC as a solution made up of proven and perfectly coordinated standard components. Regardless of the primary pressure of the dosing medium, it ensures precise dosing.
The speed of the measurement is the key to its success.

Both contain a dosing sensor, a dosing valve and an electronics assembly with software and a communication interface to enable to be incorporated into your process. This allows for automatic and precise monitoring and control of the dosing process combined with rapid response times in the event of an error or a change in the process.

Thanks to its many variants and modular design, the µLDC and the Coriolis MFC will fit perfectly into your process – as a ready-to-use solution requiring very little maintenance and no complicated manual intervention or teach-in process.



µLDC
Liquid Flow Controller
Dosing Range: 0,5µl...50ml*



8756
with Batch Controller
Dosing Range: 50ml...1000ml

You are interested in dosing solutions?

Get in contact with us:

info@burkert.com

- **Maximum precision – even when dosing conditions change**
- **Simple start-up as plug-and-play solution with no need for teach-in**
- **Sustainable use of expensive reagents**
- **Monitoring and documentation of dosing process**

*currently only available as customized solution

Typical application

Flow control for CVD Metal coating process with liquid precurser

Coatings make tools or metal surfaces wear resistant and durable. CVD (Chemical Vapour Deposition) processes are based on the deposition of solids from the gas phase.

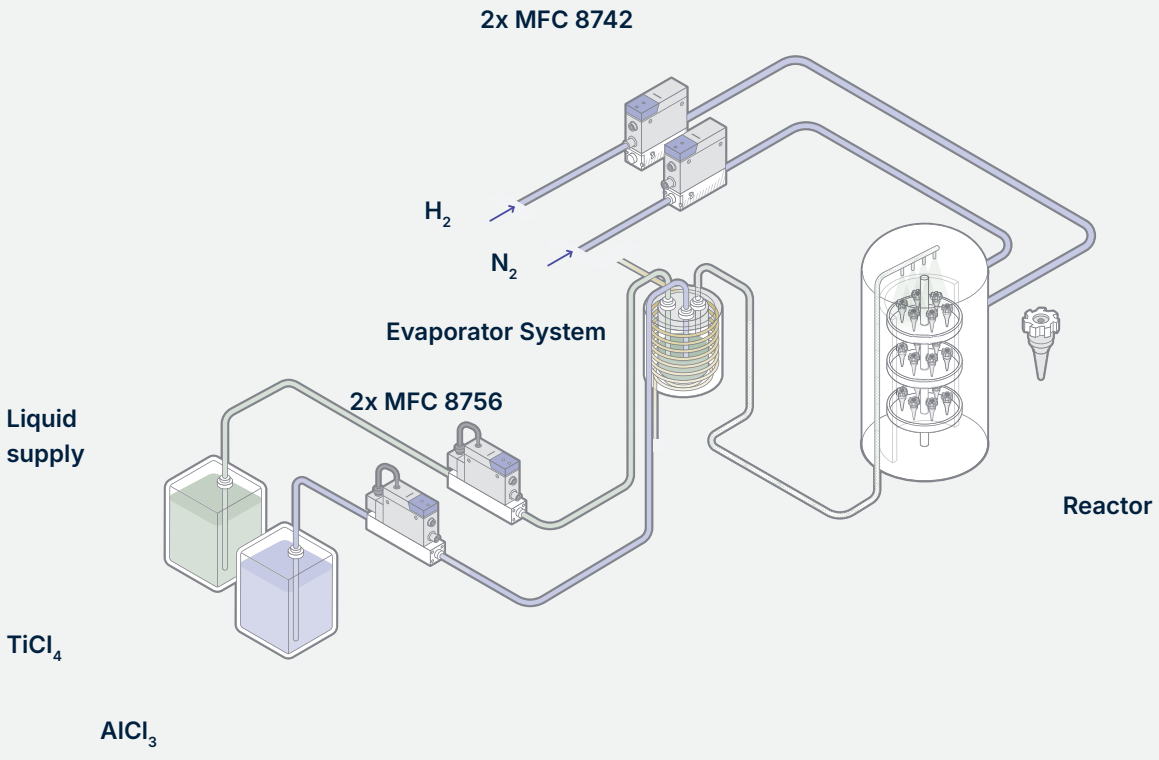
CVD is a thin film technology: Liquid material passes through a dosing system before it evaporates and enters a reactor. Gaseous material is deposited as a fine, solid film on the metal surface.

Bürkert Coriolis mass flow meters (MFM) and mass flow controllers (MFC) are used in the dosing system to precisely dose microscopically small quantities of liquid.

Find out more about this application:

CVD Metal Coating

CVD Metal Coating with Liquid Precurser



Volume Flow (Liquid)

One common way to measure liquid flow is by using a narrowing in the flow path. As the liquid passes through, the pressure drops – and this difference is used to calculate the flow rate.

The following simplified principles of fluid mechanics form the basis for flow measurement using the differential pressure method:

When measuring flow using the differential pressure method, a constriction (e.g. an orifice) is therefore used in the flow channel. If there is no flow, the pressure sensor upstream of the orifice plate measures the same pressure as downstream.

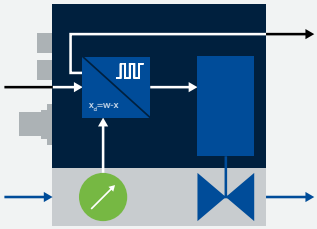
As soon as the medium flows, the velocity of the liquid increases as it flows through the orifice, resulting in a pressure drop behind the orifice, known as Bernoulli-effect.

$\Delta P \sim Q^2$

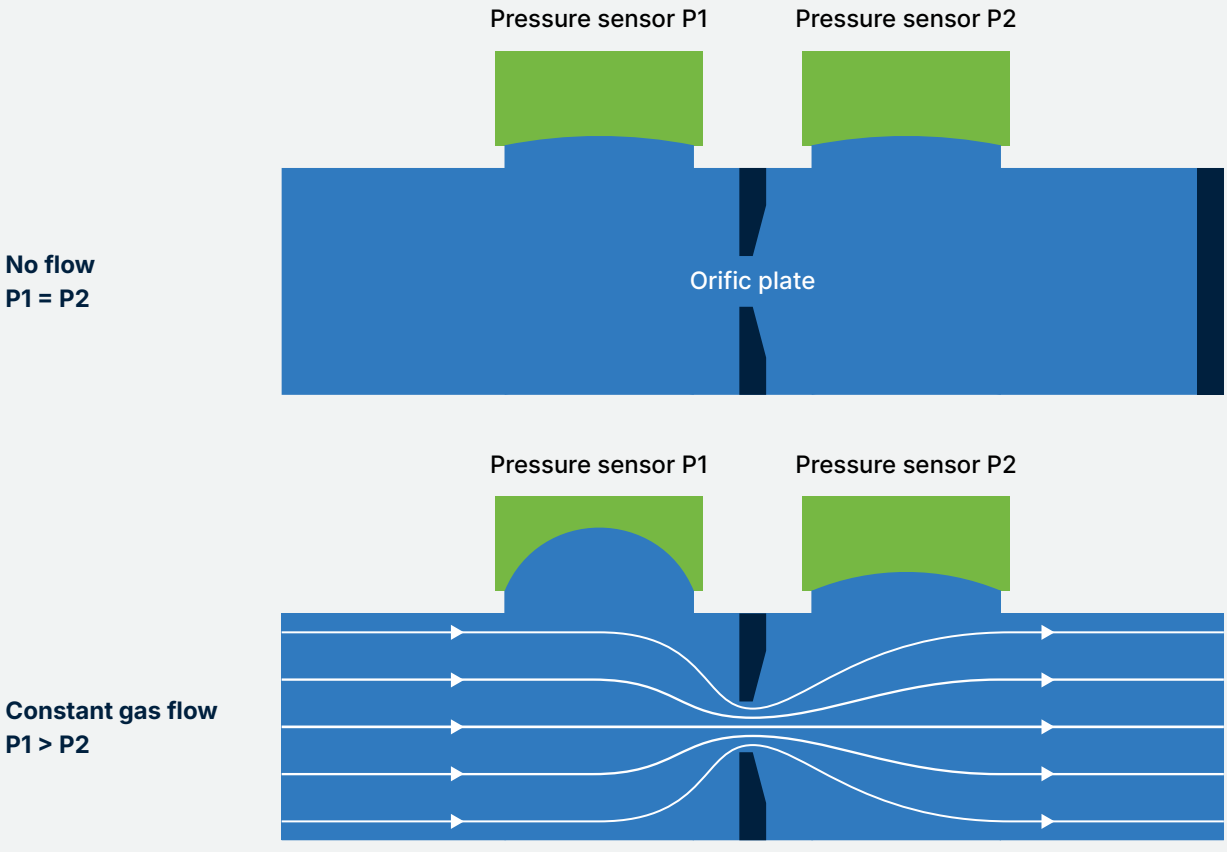
This differential pressure is proportional to the square volume flow.

Features

- High measurement dynamics
- Efficient



Differential pressure measurement





Type 8752

- Nominal flow ranges from 15 ml/min to 900 ml/min (valid for water)
- Suitable for liquids with a low viscosity (0,4...4 mPAs)
- Fieldbus and Industrial Ethernet communication available
- High protection class IP65

e Shop

TYPE 8752

Liquid Flow Controller and Flow Meter

The LFC Type 8752 uses a differential pressure cell to measure the flow of the liquid. Due to its direct contact with the liquid and the measurement principle, the sensor is very dynamic and allows a fast measurement and control.

The LFC can be used with clean, neutral liquids that have a low viscosity.

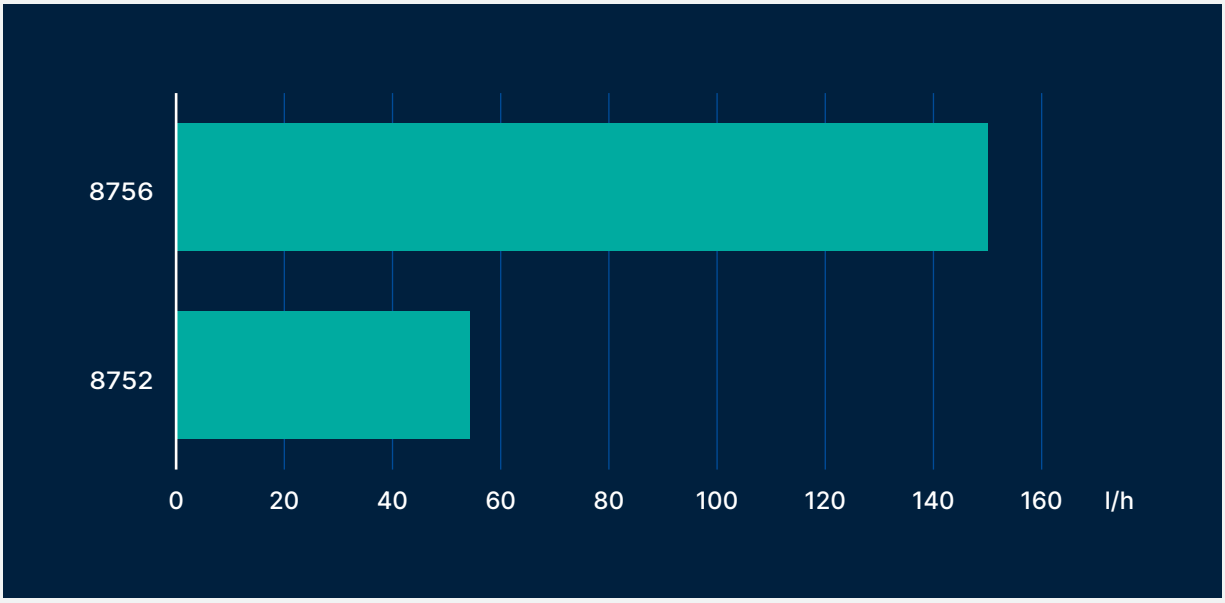
High accuracy and repeatability

Good price/ performance ratio

Optional: USP Class VI, FDA, EC 1935 compliant

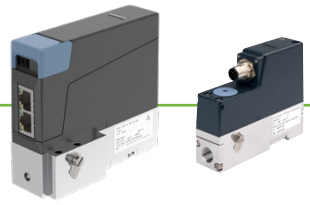
Conversion factor for liquids other than water

Overview nominal flow range for liquids



The possible max. nominal flow range for water is shown,
the actual calibration of the LFC is done according to the customer's request.

Pressure (Gas)



Type 8761 / Type 8762

- Absolute pressure control up to 4 bara
- Suitable to use with MFCs
- Fieldbus and Industrial Ethernet communication available
- High protection class IP65

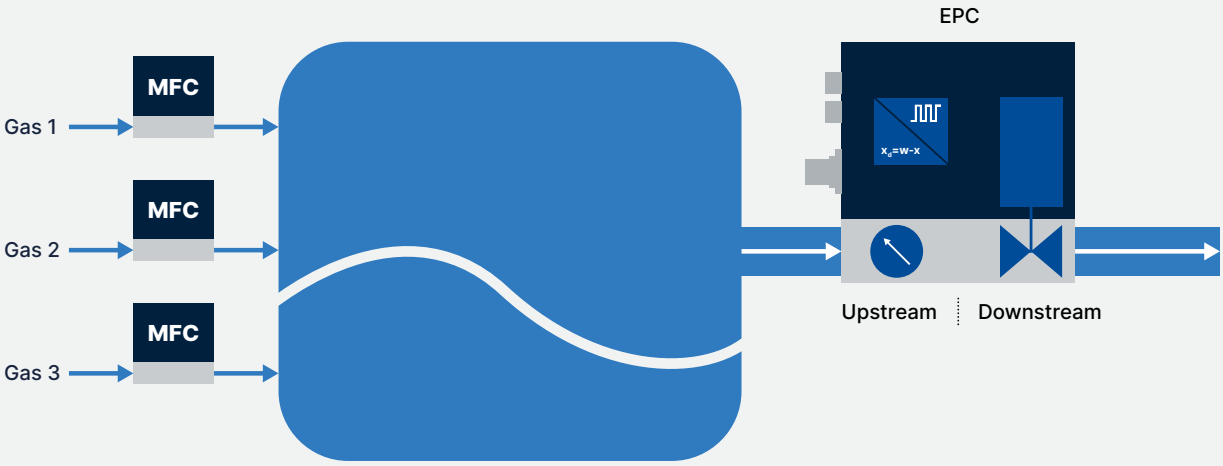
TYPE 8761 / TYPE 8762

Electronic Pressure Controller for gases

The EPC Type 8761 uses an absolute pressure measuring cell as a sensor element to precisely control the pressure of a gas flow. The flow pressure at the inlet of the device (upstream) is controlled. A low-friction proportional valve as an actuator ensures high response sensitivity and in combination with the PI controller a good control characteristics of the device.

High accuracy and repeatability	**Very fast response times**
Optional: USP Class VI, FDA, EC 1935 compliant	**Suitable for gases and gas mixtures**

Typical application of the EPC with MFCs



Three gases are mixed in a process chamber to form a specific atmosphere needed for an industrial process. The MFCs control the gas flows at the inlet of the process chamber.

The EPC is installed at the outlet of the process chamber to precisely control the pressure within the chamber. This is called upstream pressure control.

Technology innovation

Calibration

Air, oxygen, nitrogen, helium, propane, argon, methane, carbon dioxide, hydrogen, ammonia, sulphur dioxide, natural gas, fission gas, forming gas... or aceton, ethanol, methanol, water, hydrogen peroxide... This is only a small extract of the various operating gases, gas mixtures and liquids our devices can be used with. In order to guarantee the maximum precision when it comes to flow measurement, every single device is calibrated to the individual operating conditions.

Real gas calibration

If the highest precision is required, calibration with the operating gas is recommended. Another gas can only be reliably controlled or measured when a second calibration curve has been stored. Exceptions to this are gases with similar properties such as nitrogen and oxygen. A conversion factor across the entire flow range is sufficient.

Conversion factor

For aggressive or demanding gases and gas-mixtures, calibration via conversion factor is the preferred option. Due to the linear dependency (measuring signal to flow rate) of the capillary MFC, the device can simply be calibrated with nitrogen and later be used for other gases and gas mixtures.

Regarding our LFCs, they are calibrated with water and a conversion factor is used for the operating medium.

Extremely precise flow references are used in the calibration test stands, which are based on

- DAkkS (Deutsche Akkreditierungs-stelle GmbH)
- NIST (National Institute of Standards/USA)



Did you know:

We also offer calibration as a service for you.

Maximum precision with real gas calibration

On-field calibration as service

Conversion factors for aggressive and demanding gases, gas-mixtures and liquids

Calibration certificate

Overview Flow Devices

	Gas		
Type	8741 / 8742	8743 / 8744	8745 / 8746
Operating Media	Neutral, pure gases	Aggressive, toxic and neutral pure gases	Neutral, pure gases and additional ammonia
Sensor principle	Thermal		
Wetted Sensor	Yes	No	Yes
Max. nominal Flow range[1]	10 ml_N/min-160 l_N/min	10 ml_N/min-100 l_N/min	50-2500 l_N/min
Measuring accuracy	± 0.8 % RD ± 0.3 % FS	± 0.8 % RD ± 0.3 % FS	± 1.5 % RD ± 0.3 % FS
Repeatability	± 0.1 % FS	± 0.1 % FS	± 0.1 % FS
Turndown ratio	Up to 1:500	Up to 1:100	Up to 1:100
Settling time (t95)	< 300 ms	< 2 s	< 500 ms
Max. operating pressure[2]	25 bar	10 bar	25 bar
IP Protection class	IP20/IP65	IP20/IP65	IP20/IP65

[1] Valid for nitrogen under norm conditions, other gases may differ

[2] Maximum operating pressure depends on medium and nominal valve size

	Liquid	
8756	**8752**	**8756**
Aggressive, toxic and neutral pure gases	Water and other liquids with low viscosity (0.4...4 mPAs)	Various liquids also with high viscosity (0.3...1000 mPas)
Coriolis	Differential pressure	Coriolis
No	No	No
2000 l_N/min @ 100 bar	10-600 ml/min	size 1: 0.05 kg/h-25 kg/h size 2: 0.25 kg/h-150 kg/h
± 0.5 % RD	± 1.5 % RD ± 0.5 % FS	size 1: ± 0.2 RD or ± 1.4 g/h size 2: ± 0.1 RD or ± 15 g/h
0.05%	± 0.5 % FS	size 1: ± 0.1 % RD or ± 0.7 g/h size 2: ± 0.05 % RD or ± 7.5 g/h
Up to 1:3000	Up to 1:10	size 1: 1:500 size 2: 1:600
<50 ms	< 500 ms	< 50 ms
100 bar	6 bar	100 bar
IP65	IP65	IP65

Customisation & development

THE BÜRKERT SYSTEMHAUS FACILITIES ARE RESPONSIBLE FOR THE EFFICIENT, INNOVATIVE AND COST-EFFECTIVE DEVELOPMENT OF YOUR FLUIDIC SOLUTIONS





Our state-of-the-art Systemhaus facilities specialise in developing fluidic assemblies and solutions according to your precise requirements. A motivated and dedicated team of sales consultants, industry specialists and engineers will work hand in hand to make your project a success – with every aspect of the process under one roof! All of our production infrastructure is located on site, which allows us to respond quickly and flexibly.
This combination and concentration of expertise and resources in one place translates into huge gains in efficiency and quality for you.

Why choose Bürkert as your solution partner?

- Interdisciplinary collaboration between Bürkert experts ensures seamless communication and prevents loss of information – for exceptionally efficient processes.
- All process steps, ranging from development, prototype assembly and tool construction through to production, take place in one location – for fast-paced development and seamless quality.
- We don't think in terms of narrowly defined industry contexts; we are always exploring new possibilities with regard to handling liquids and gases – for new, original solutions that surpass the standards in your industry.
- We will use suitable system platforms for your individual solution – for a short time to market and significant cost savings.

With our extensive capacity and full range of services, we will take responsibility for as much of the development process as you want us to and will coordinate all interfaces in order to provide pioneering, integrated solutions.

Bürkert Systemhaus

Automation & digitalisation

FLEXIBLE, NEUTRAL, COMPLETE: OUR APPROACH TO FIND THE BEST SOLUTION





Better efficiency, quality and cost-effectiveness: Incorporating optimised automation and digitalisation into your processes, applications and fluidic challenges will ensure that you stay ahead of the competition. As your expert partner, Bürkert will support you every step of the way. Our priority is to make sure you achieve the best possible results. This means that we will consider different manufacturers when advising you – the components we recommend won't necessarily come from us.

Why choose Bürkert as your solution partner?

- We understand your processes, applications and challenges – and will use these insights to develop automation solutions perfectly tailored to your tasks.
- Our advice is neutral and objective – which gives us the freedom to truly find the perfect solution for you.
- Our experts will use innovative approaches and select creative solutions to keep you one step ahead of the competition.
- Unlike other partners, we are not just here to supply components – we will work with you to ensure your success by means of a complete automation and digitalisation concept.
- If you wish, we can take care of the concept, planning and implementation – all from a single source. You won't have to worry about interfaces, compatibility or fine tuning.

When it comes to finding the best solution, we always give 100% – whether you want to assign individual subtasks to us or entrust us with the entire automation and digitalisation process from initial advice right through to start-up.

Typical application

Fermenter/Bioreactor

Laboratory bioreactors and fermenters are playing an important role in the food and pharmaceutical industries.

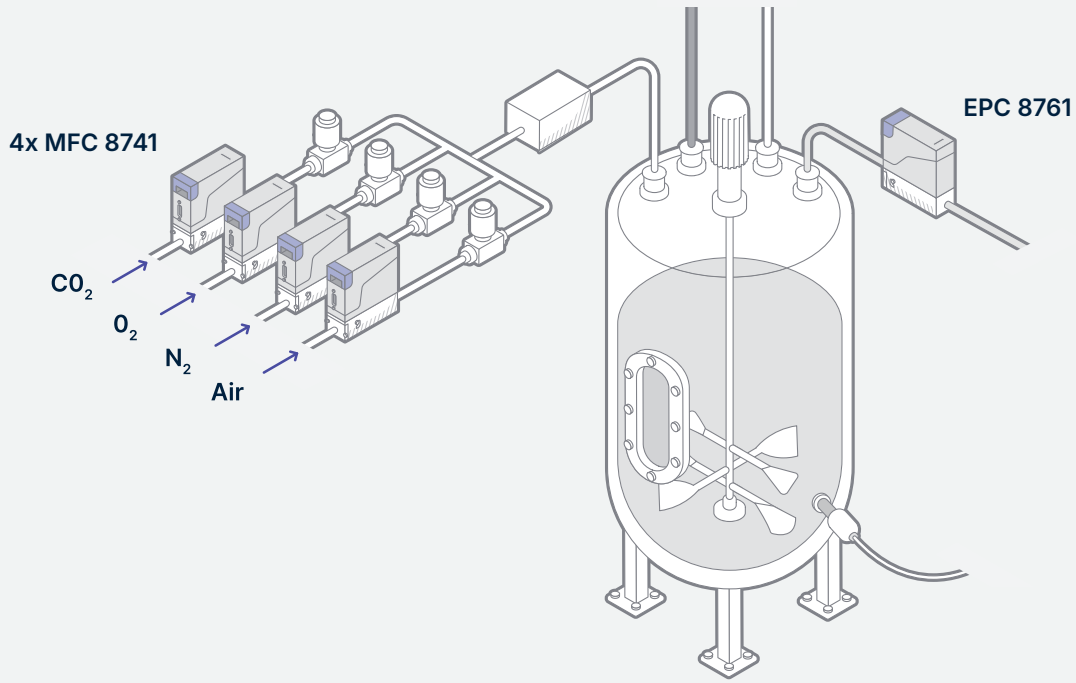
The common requirement is always to control the atmosphere within the fermenter precisely. The exact composition of the gas atmosphere (N_2, O_2, air, CO_2) is controlled by the MFCs located at the inlet of the fermenter. The pressure is precisely controlled and constantly kept by the EPC which is located at the outlet of the fermenter.

This is the key to ensure the required quality of the end product.

Find out more about this application:

Fermentation processes

Fermentation: Precise gas control for reproducible processes



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