bürkert
FLUID CONTROL SYSTEMS

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Product Overview
Sensors, Transmitters and Controllers

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Content

The Complete Control Loop Market Leader

Across thousands of individual solutions and spanning dynamic conditions of global competition our mission is to work towards your success.

We have decades of global experience and we have always been positioned at the forefront of sensor technology.

Our innovative approach to your success is to secure your process efficiency, lower your downtime, increase your safety and boost your competitive advantage.

We intend to collaborate with you where we can share our control loop experience.

All of our combined knowledge is available to you through consultation, engineering support, selection and commissioning.

Everyone in our organization is interested in listening to you with the aim of presenting you with only the most appropriate solution fluently in your daily application language.

Welcome to the Fascinating World of Fluid Control Systems

Measurement and control: When it comes to working with liquids and gases, we are at your side – as a manufacturer of sophisticated products, as a problem-solver with an eye for the big picture, and as a partner offering you reliable advice. Since we started in 1946, we have developed into one of the world's leading suppliers of Fluid Control Systems. At the same time we have kept our status as a family-owned business with a foundation of strong basic values to highlight the way we think and act.

EXPERIENCE

There are things which are not inherently yours. You have to gather them bit by bit. You receive them from others. And you constantly have to acquire them anew. That is what makes them so valuable. Experience is one of those things. For instance, because of our many years of experience with metering, controlling and analysing of fluids, we can provide our extensive services to you – from consulting, development, and 3D CAD simulating to testing and after-sales service. Whether individual product solutions or a pioneering new system for the entire control process: Benefit from our experience!

COURAGE

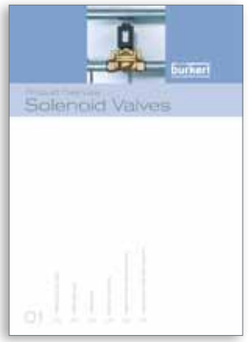
Those who only work toward optimizing things that already exist will eventually reach the limits – technically, financially, or personally. In order to overcome these limits, courage is needed: The courage to be different and trust one's own ideas; the courage to venture into the unknown, searching for new ways to develop products that have never existed before. We have this courage. By pooling and utilizing our competencies across all sectors, you benefit from our cumulative knowledge in metering of fluids – whether it is in water treatment, cooling or hygienic processing applications.

CLOSENESS

There are things we simply take for granted. Only when they are gone, do we realize how important these things really were. This applies in particular to closeness. Without closeness, it is very difficult to build relationships and a good understanding of one another. As an established medium-sized company, we know that. And that is why we are always there for you. Working with you, we develop the best possible solutions for your projects. Our global presence in 35 locations enables us to press ahead with sensor innovations for our customers around the world.

Bürkert Product Program

We are one of the few suppliers on the market to cover the complete control loop. Our current product range extends from solenoid valves through process and analytical valves to pneumatic actuators and sensors.



Bürkert offers a remarkable range of servo-assisted and direct acting solenoid valves. Read more about them in this brochure.

Bürkert offers unlimited modularity for process control with angle-seat, globe and diaphragm valves in the widest range of configurations.

Here you can find our product range of pneumatic valves, valve units and automation systems as well as information on our control cabinet building.

Here you can find our sensors, transmitters and controllers for measuring and controlling flow, temperature, pressure, level, pH/ORP and conductivity.

The brochure contains an overview of Bürkert miniature valves and micro pumps, which allow for precise and safe handling of small volumes of liquids.

This brochure provides technical background information as well as a detailed product overview for the mass flow controller and meter product range.

This brochure presents our solenoid control valves including their respective features, functions and typical applications.

Providing Process Vision

For more than 20 years we have been providing our customers with sensors, transmitters and controllers where fit-for-purpose is optimized. At the same time our sensor range has become a key ingredient of our offer to complete the control loop and take care of your process headaches.

From the outset our clients, large and small, have appreciated the practical orientation, man-machine interface and architecture of the sensor range characterized by extremely simple installation, commissioning, calibration and teach functionality. Standardized layout, electrical interfaces, process connections. and, above all, intuitive menus, make the whole range simple to work with.

Designed to Fit Our Clients Applications – Perfectly

When we define quality as fit-for-purpose, Bürkert sensors prove their exceptional quality in all relevant applications. Wherever you need to display process values, perform control functions, monitor alarms to control flow rates, monitor leaks or control pH values Bürkert sensors make the difference.

Some industries constantly demand higher communication technology with fieldbus interfaces and multi-channel designs. Some examples are FDT/DTM and wireless while others exhibit an increasing demand for “simple” monitoring with switching output. We take care of both and, at the same time, we combine our sensor knowledge into innovative systems.

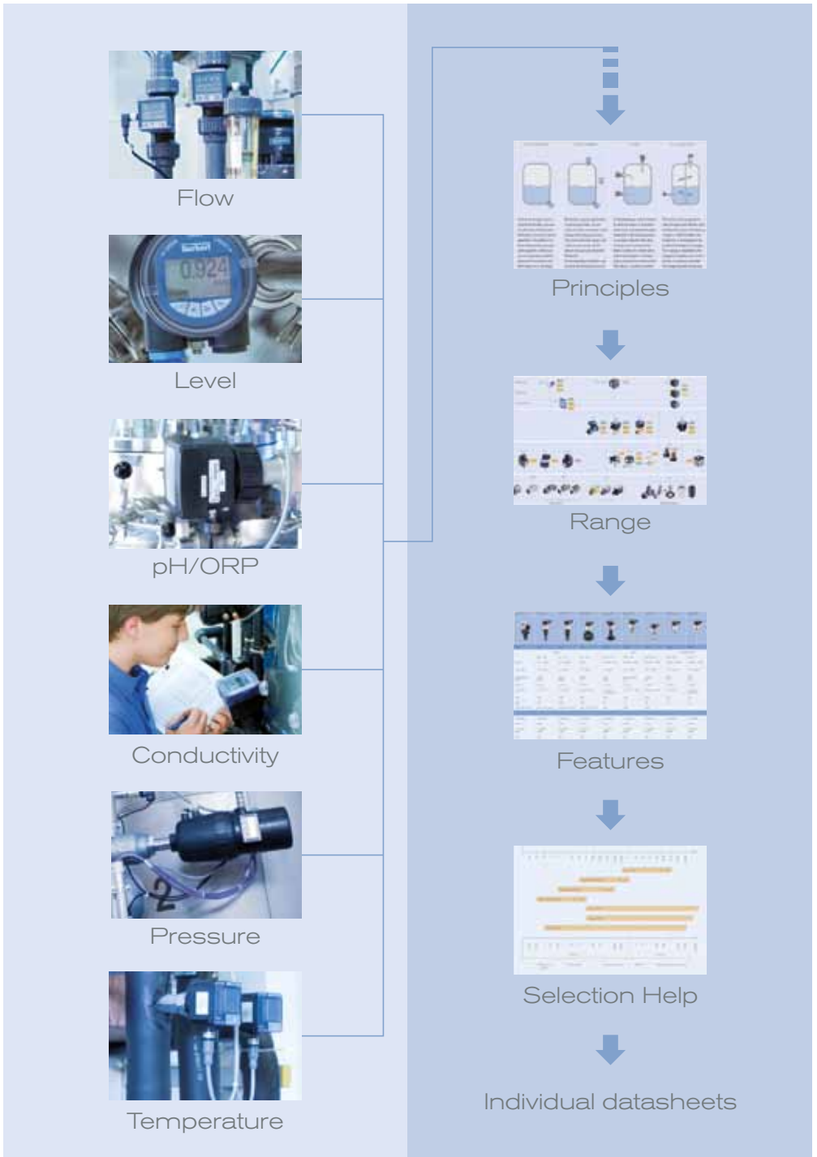
New Beautiful Design

ELEMENT is a complete system approach that allows you to solve process problems. It encompasses the total loop: valves, sensors and controllers in one beautifully simple architecture which can be relied on to monitor and control inert fluids, steam, corrosive solvents, chemicals or abrasive fluids in a wide variety of application environments. Combining the chemical characteristics of engineered polymers with the beauty and endurance of stainless steel, ELEMENT’s platform is rugged and clean. There is no paint, no pockets, no pneumatic lines.

Bürkerts ongoing development to combine control and communications technology with process control hardware is unparalleled. ELEMENT surpasses industry standards in flexibility, simplicity and intuitive thinking. Each device is a joy to commission, calibrate and use.

How to use this Brochure

Each measured process variable has information to help you choose the correct equipment for your purpose. In this brochure you will find technical principles, range overviews, features and selection help. Datasheets for each type are always available online at www.burkert.com.



A Complete World of Sensor Solutions

Flow, Batch and Ratio

Paddle wheel

Oval gear

Magmeter

Ultrasonic

Differential pressure

Level

Ultrasonic

Radar

Guided microwave

Tuning fork

Float switch

pH/ORP

Glass electrode

Enamel electrode

Conductivity

Conductive

Inductive

Pressure

Switch

Transmitter/display

Transmitter

Temperature

PT100 sensor

PT100 Switch

Transmitter

Transmitters and Controllers

Single channel universal controller

Positioners and process controllers

Dual channel analysis controller

Multi channel water chemistry controller

Multi channel universal controller

pH Controller

Analysis transmitter

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Accurate and Reliable Flow, Batch and Ratio

Flow monitoring and control is the foundation for the Bürkert sensor range.

In our factories we manufacture sensors (with raw signal output) and transmitters (with 4-20mA output) for a wide variety of customers around the world.

Liquid flow measurement is made by a wide range of principles which are explained in more detail on the next few pages but are composed of paddle wheel, magmeter, oval gear, ultrasonic and differental pressure.

Each type of sensor fits inside an architecture arranged around common interfaces and communication structures. They are characterized by similar menus, displays, totalizers, teach-in and volumetric calibration functions. Standard industry voltages, certifications, norms, and factory calibration certificates are always available. Materials such as PEEK, ceramics, and PVDF are used to ensure long life and chemical compatibility.

Flow expertise combined with our valve history is a perfect match for simple and accurate batch control and fast acting ratio control. The interface with our valves is designed to be as simple as possible and complete PID flow loops can be made with just two components.

We Make Ideas Flow.

Measuring Principles

Paddle wheel sensors may be differentiated by the material used for the paddle wheel (plastic or stainless steel) or on the basis of signal detection/evaluation (coil sensor, HT coil sensor, Hall sensor or optical sensor). This results in 4 different paddle wheel versions whose principles are described here.

Plastic paddle wheel (PVDF or PP) with inductive detection and pulse output

A PVDF or PP paddle wheel with four molded permanent magnets in the arms rotates on a precision, wear resistant ceramic spindle and two ceramic bearings. A Hall sensor detects the magnetic field of the rotating paddle wheel is placed outside of the fluid area. Two output signals are generated per revolution and the frequency changes proportionally with the speed of rotation of the paddle wheel. An integrated electronics board converts this signal to a square-wave frequency signal. Two output signals are generated per revolution and the frequency changes proportionally with the speed of rotation of the paddle wheel. An integrated electronics board converts this signal to a square-wave frequency signal.

Plastic paddle wheel (PVDF or PP) with inductive detection and sinusoidal output

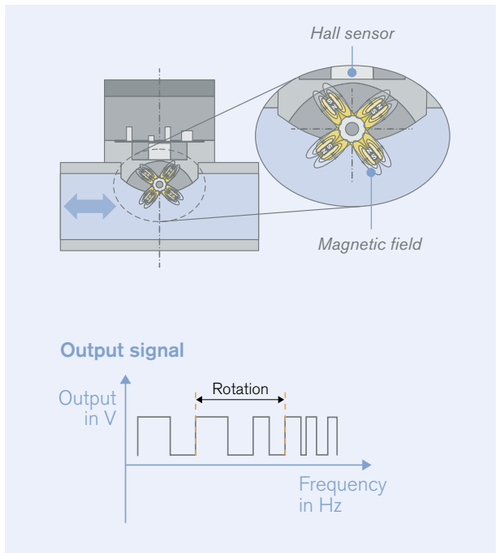
A PVDF or PP paddle wheel with four molded permanent magnets in the arms rotates on a precision, wear resistant ceramic spindle and two ceramic bearings. A coil with a ferrite core, detecting the magnetic field of the rotating paddle wheel, is placed outside of the fluid area. The frequency and voltage change in proportion to the rotational speed of the paddle wheel and two positive signals are generated per revolution. The rotation of the paddle wheel generates a sinusoidal voltage signal in the coil proportional to the flow rate. This sensor is two-wire and requires no additional auxiliary energy supply. A connected, batteryoperated display unit allows operation independent of mains voltage.

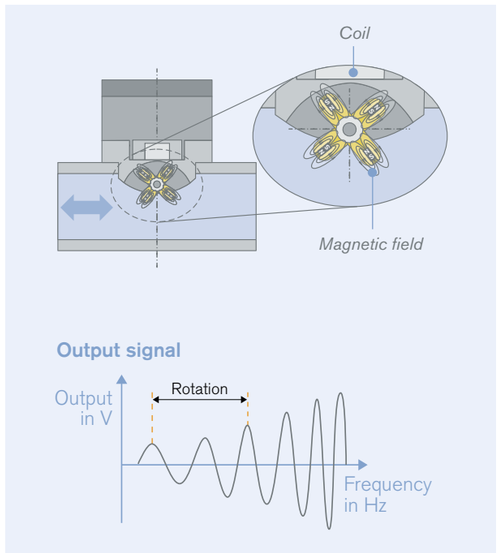
Plastic paddle wheel (PVDF) with optical detection and pulse output

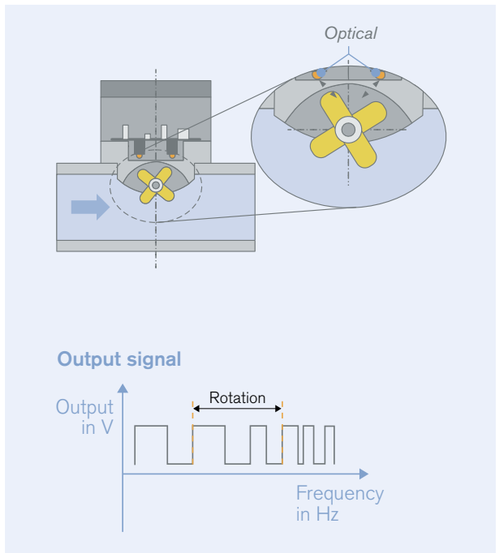
The paddle wheel is made of PVDF material and the spindle and two bearings are made of wear-resistant ceramic material (Al_2O_3). Two infrared transmitters (IR) and receivers are placed in the electronics housing outside of the medium area, separated by plastic which allows infrared radiation to pass through it. The rotation of the paddle wheel is detected with these IR diodes and the integrated electronics converts the reflected IR-Signal to a square wave frequency signal, proportional to the flow rate. This optical method allows the flow rate to be detected in media with ferromagnetic particles and to detect the direction of the flow.

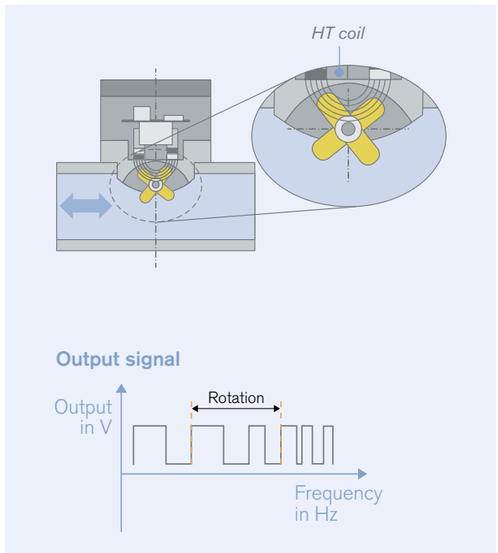
Stainless steel paddle wheel with inductive detection and pulse output

This paddle wheel consists of stainless steel with very low ferromagnetic characteristic. The spindle is made of a high tech ceramic or stainless steel and the bearing is made of PEEK or ceramic. Inside the top-mounted electronics is a HT coil with permanents magnets and electronics which converts the coil signal into a square wave frequency signal proportional to the flow rate. The frequency changes in proportion to the speed of rotation of the paddle wheel. Two positive output signals are generated per revolution. This method is particularly used for media with temperatures up to 160°C (320°F). Ferromagnetic particles and contaminants in the fluid do not restrict the range of application.









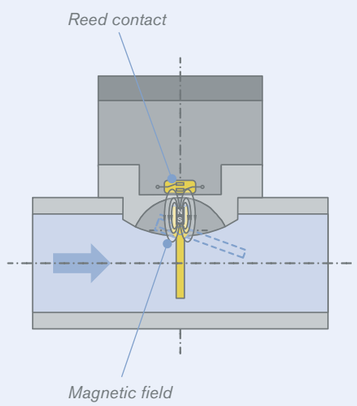
Plastic paddle with magnetic detection and switch output

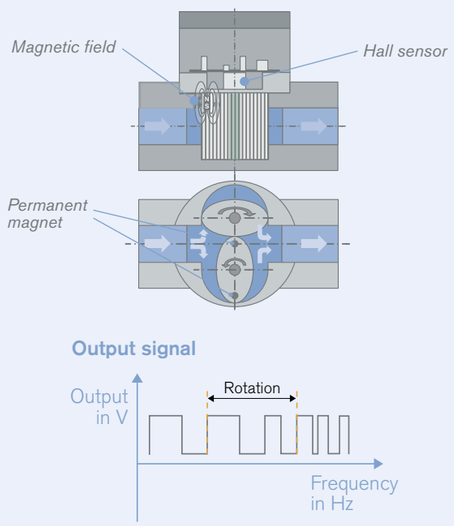
A permanent magnet is integrated into a paddle. The paddle is able to turn on a stainless steel spindle in the flow cross-section and is in vertical position if there is no flow. A reed contact is positioned above the paddle outside the medium area in the electronics housing. If a specific flow velocity is exceeded, the paddle is deflected in flow direction and switches the reed contact. The switching point can be set for increasing and decreasing flow velocities by means of an adjusting screw. The devices are available in the following versions:

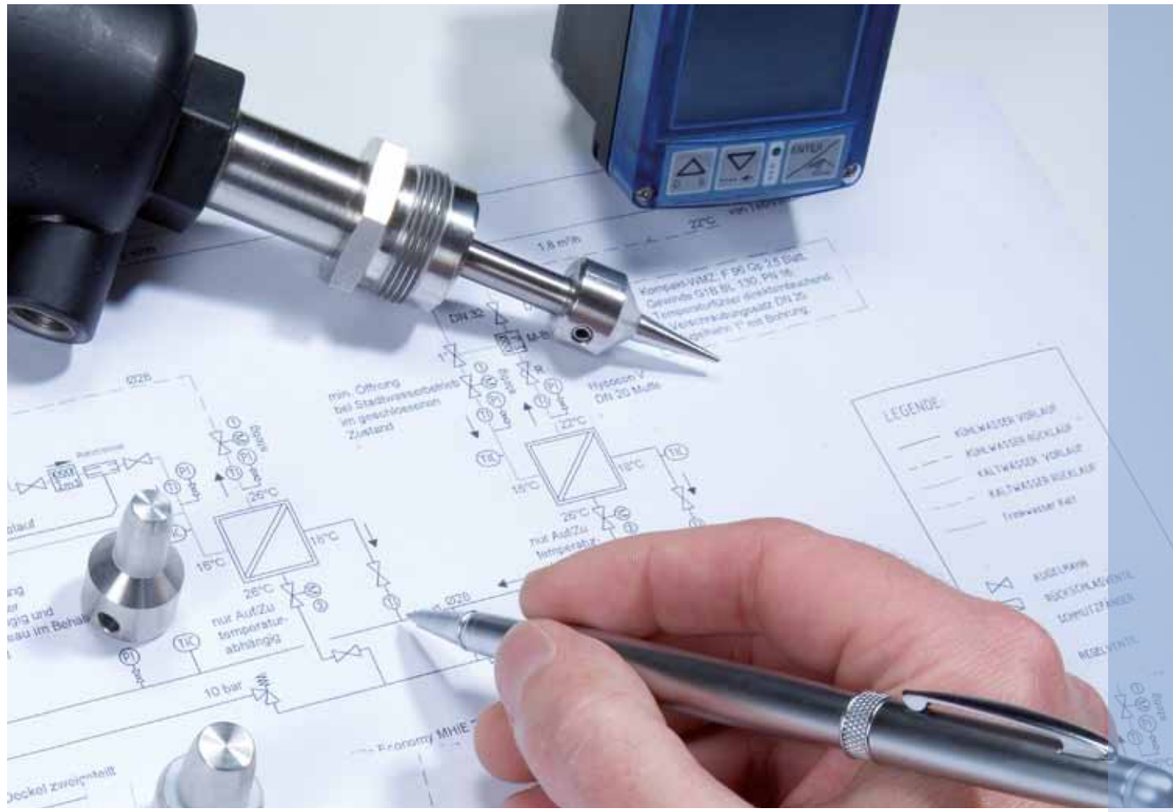
- **Normally open (NO).**
  The flow closes the contact.
- **Normally closed (NC).**
  The flow opens the contact.

Volumetric flow measuring: oval gear with inductive detection and pulse output

Two toothed oval rotors, mounted perpendicular to the flow direction in a special housing, are forced to rotate by a flowing fluid. Each rotor transmits fluid from inlet to outlet and forms a closed compartment when its major axis is aligned with the main flow direction. The volume passed per revolution of each rotor is four times the volume between the rotor and the oval housing when the rotor is confining liquid.
Two small permanent magnets positioned in one of the oval gears are used to detect the rotary movement. A Hall sensor which detects the magnetic field of the oval gear and generates two square-wave output signals is placed outside of the medium area in an electronics housing. The number of pulses is directly proportional to the number of chamber volumes pumped and therefore making this method particularly suitable for flow measurement of viscous media even at high pressure.







Measuring Principles – Non Moving Parts

Magnetic inductive flow meters

Magnetic inductive flow meters, also known as magmeters, obtain the flow velocity by measuring the changes of induced voltage of the conductive fluid passing across a controlled magnetic field. Magmeters may be designed as full bore magmeters or insertion magmeters.

Insertion magmeter

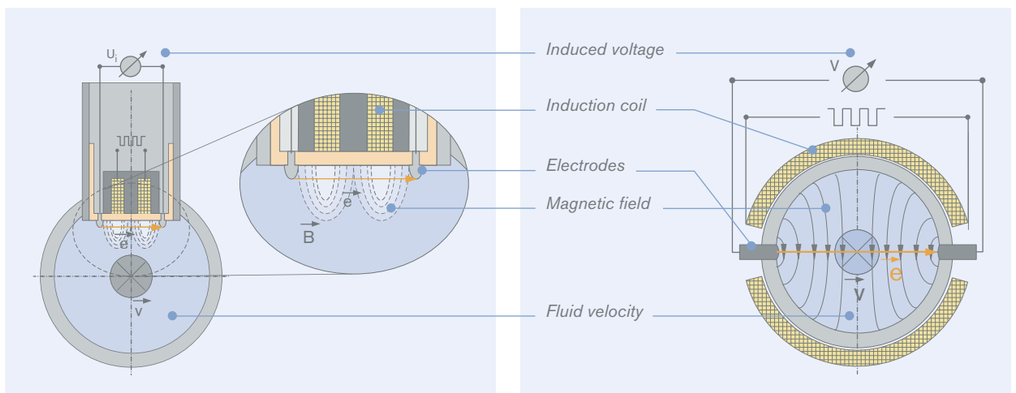
An Insertion finger sensor element is mounted on one wall side and is in contact with the fluid. An electric coil which is placed near the top of the finger generates a constant alternating magnetic field B in the flow path. According to Faraday's law of electromagnetic induction, a conductive fluid passing across the magnetic field induces a current flow between the 2 electrodes which can be measured as a voltage. The 2 electrodes are placed at the tip of the flow finger. The higher the flow speed v, the higher the created voltage. Integrated electronics convert the voltage signal into a standard signal (e. g. 4 - 20 mA or pulse).

The design of the Insertion magmeter is very compact and can also be easily installed into existing pipe systems. Insertion magmeters are suitable for flow measurement of virtually all conductive fluid media – even with a high level of contamination. Only non-conductive fluids <20 µs, coating type liquids or highly abrasive fluids restrict application options. Due to the fact that only one point of the pipes cross section is used to measure the fluid velocity, the accuracy is slightly less then that of a full bore magmeter.

Full bore magmeter

Two electrical coils are placed around the pipe of the flow to be measured and sets up a pair of electrodes across the pipe wall. The two coils generates a constant and homogeneous alternating magnetic field in the flow cross section. According to Faraday's law of electromagnetic induction, a conductive fluid passing across the magnetic field induces a current flow between the 2 electrodes which can be measured as a voltage. The higher the flow speed v, the higher the created voltage. Integrated electronics converts the voltage signal into a standard signal (e. g., 4 - 20 mA or pulse).

For the full bore magmeter, the induced voltage is detected by electrodes, which are arranged directly opposite of each other measuring the induced voltage of the entire pipe cross section. The advantage is that the entire flow profile can be detected. This results in very precise measurement of the medium velocity. Only non-conductive fluids <5 µs, fluids causing coatings or highly abrasive fluids restrict application options.



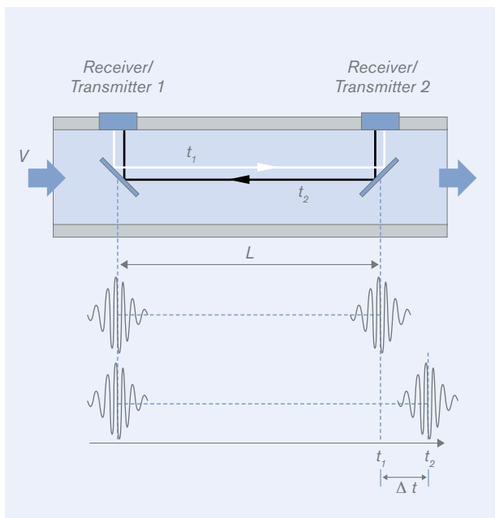
Ultrasonic flow meter

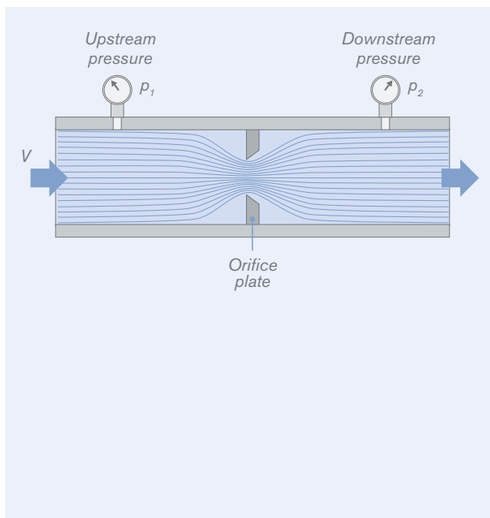
A pair of transducers each working as a receiver or transmitter, are placed in the wall pipe with a specific distance (L). Both transducers send out an acoustic wave signal at the same time to the downstream and the upstream receiver. The signals are reflected by 2 mirrors; one on the upstream side of the pipe and the other on the downstream side of the pipe. The traveling time of both signals is measured by an integrated electronic board. The time for acoustic waves to travel from the upstream transducer 1 to the downstream transducer 2 is shorter than the time it requires for the same waves to travel from the downstream to the upstream. The difference in traveling time is directly proportional to the flow speed (V). The larger the difference, the higher the flow velocity. With this measuring principle it is possible to measure all kinds of water based fluids with a turn down ratio of up to 1:250. Conductive as well as non conductive fluids can be measured without any problems and having no moving parts means the maintenance costs are negligible.

Differential pressure flow meter

Differential pressure flow meters employ the Bernoulli equation that describes the relationship between pressure and flow velocity.

A flat orifice plate with an opening is inserted into the pipe and placed perpendicular to the flow stream. As the fluid passes through the orifice plate, the restricted cross section area causes an increase in velocity and decrease in pressure. The pressure difference before and after the orifice plate is used to calculate the flow velocity. The larger the pressure difference, the higher the flow velocity. The turn down ratio between smallest and highest measurable flow is about 10:1. Conductive as well as non conductive fluids can be measured without any problems. Having no moving parts, the maintenance costs are negligible. The measurable liquids can vary between clean, dirty and viscous fluids. Depending on the orifice plate size, it may be necessary to filter the fluid.





Flow Range – Paddle Wheel Sensors

Reed contact | Output 4 - 20 mA | Frequency | Relay | Transistor (NPN, PNP) | Namur

Remote transmitter

Valve mount

Wall mount

Rail mount

Panel mount

8025 T — 4 ... 20 mA, 2x relay, frequency

8032 Display — transistor

8693 — transistor, 4 ... 20 mA

8611 — 4x transistor, 4 ... 20 mA, PI

8025 — 4 ... 20 mA, 2x relay, frequency

Compact transmitter

8032 — 4 ... 20 mA, relay, transistor

8036 — 4 ... 20 mA, 2x relay, frequency

8039 — transistor, relay, frequency

8026 — 4 ... 20 mA, 2x transistor, frequency

Sensor

8010 — reed contact

8030 HT — frequency

8030 — frequency

SE 30 Ex — Namur

8011 — frequency

8012 — transistor, frequency, 4 ... 20 mA

8031 — frequency

8020 — frequency

Fitting

S010 — switch

S030HT — flow meter – magnetic hall effect and coil

S030 — flow meter – magnetic hall effect and coil

S039 — flow meter – optical

S020 — insertion fittings

Inline fittings

Insertion fittings

Flow Features – Paddle Wheel

Please see datasheets for further information.

Sensors which provide perfect performance for clean, neutral or aggressive liquids in moderate pressures and temperatures





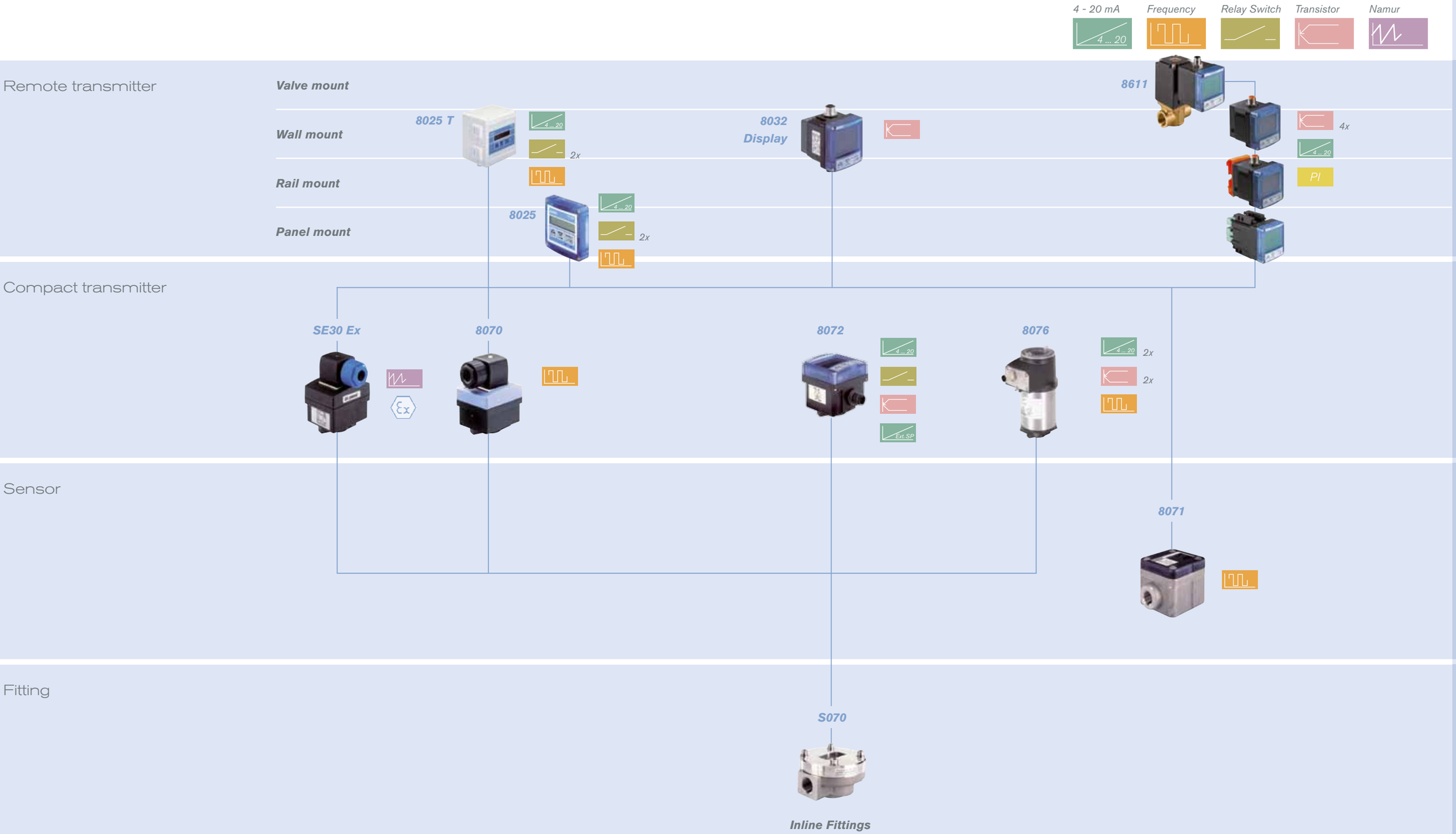







Sensor type	8010	8011	8012	SE30EX	8030 HT	8030	8032	8035B / 8036	8039	8020	8025B / 8036	8031
Sensor principle	Reed contact	Hall	Hall or optical	Hall	HT-coil	Hall	Hall	Hall	Optical	Hall	Hall	Hall
Flow rate range [l/min] Flow rate range [GPM]	4 - 1000 1 - 265	0.5 - 1000 .13 - 265	0.5 - 1000 .13 - 265	0.5 - 1000 .13 - 265	0.85 - 1000 .22 - 265	0.5 - 1000 .13 - 265	0.5 - 1000 .13 - 265	0.5 - 1000 .13 - 265	0.5 - 1000 .13 - 265	0.5 - 75000 .13 - 19,813	0.5 - 75000 .13 - 19,813	0.16 - 4 .04 - 1
Temperature/pressure range	see P/T chart pages 46/47	see P/T chart pages 46/47	see P/T chart pages 46/47	see P/T chart pages 46/47	see P/T chart pages 46/47	see P/T chart pages 46/47	see P/T chart pages 46/47	see P/T chart pages 46/47	see P/T chart pages 46/47	see P/T chart pages 46/47	see P/T chart pages 46/47	6bar (87psi) at 20 °C (68°F) Max 80 °C (176°F)
Nominal diameter	DN15 - DN50 (½ - 2" NPT)	DN6 - DN50 (6 mm - 2" NPT)	DN6 - DN50 (6 mm - 2" NPT)	DN6 - DN50 (6 mm - 2" NPT)	DN6 - DN50 (6 mm - 2" NPT)	DN6 - DN50 (6 mm - 2" NPT)	DN6 - DN50 (6 mm - 2" NPT)	DN6 - DN50 (6 mm - 2" NPT)	DN6 - DN50 (6 mm - 2" NPT)	DN15 - DN400 (½" - 2")	DN15 - DN400 (½" - 2")	G & NPT ⅛" - G ¼"
Wetted parts												
Paddle wheel Axis/bearing	PVDF Ceramic/Ceramic	PVDF Ceramic/Ceramic	PVDF Ceramic/Ceramic	PVDF Ceramic/Ceramic	SS Ceramic/Ceramic or Steel/PEEK	PVDF Ceramic/Ceramic	PVDF Ceramic/Ceramic	PVDF Ceramic/Ceramic	PVDF Ceramic/Ceramic	PVDF Ceramic/Ceramic or Steel/PEEK	PVDF Ceramic/Ceramic	POM/ECTFE Corepoint/ Sapir/Rubin
Seal	FKM, EPDM	FKM, EPDM	FKM, EPDM	FKM	FKM, EPDM	FKM, EPDM	FKM, EPDM	FKM, EPDM	FKM, EPDM	FKM, EPDM	FKM, EPDM	FKM, EPDM, FFKM
Body	PVC, PP, PVDF, Br, SS	PVC, PP, PVDF, Br, SS	PVC, PP, PVDF, Br, SS	PVC, PP, PVDF, Br, SS	SS	PVC, PP, PVDF, Br, SS	PVC, PP, PVDF, Br, SS	PVC, PP, PVDF, Br, SS	SS, Br	PVC, PP, PVDF, Br, SS	PVC, PP, PVDF, Br, SS	POM, ECTFE
Fluid properties	No fibres No ferromagnetic parts. < 1% contaminants	No fibres No ferromagnetic parts. < 1% contaminants	No fibres < 1% contaminants	No fibres No ferromagnetic parts. < 1% contaminants	No fibres < 1% contaminants	No fibres No ferromagne-tic parts. < 1% contaminants	No fibres No ferromagnetic parts. < 1% contaminants	No fibres No ferromagnetic parts. < 1% contaminants	No fibres < 1% contaminants	No fibres No ferromagnetic parts. < 1% contaminants	No fibres No ferromagnetic parts. < 1% contaminants	No fibres No ferromagnetic parts. < 1% contaminants
Viscosity [cSt]	<300	<300	<300	<300	<300	<300	<300	<300	<300	<300	<300	<5
Conductivity [µS/m]	No affect	No affect	No affect	No affect	No affect	No affect	No affect	No affect	No affect	No affect	No affect	No affect
Fitting type	S010	S012	S012	S030	S030 HT	S030	S030	S030	S039	S020	S020	integrated
Turndown	N/A	1:33	1:33	1:33	1:20	1:33	1:33	1:33	1:33	1:33	1:33	1:12
Electrical characteristics												
Basic function	Switch	Sensor	Sensor, Trans-mitter, Switch	Sensor	Sensor	Sensor	Sensor, Trans-mitter, Switch	Sensor, Trans-mitter, Switch, Batch, Totalizer	Sensor, Switch	Sensor	Sensor, Trans-mitter, Switch, Batch, Totalizer	Sensor
Output	Reed contact NO/NC	Pulse	4-20 mA, Pulse, Transistor	Namur	Pulse	Pulse	4-20 mA, Pulse, Transistor	4-20 mA, Pulse, Transistor, Relay	Pulse, Replace	Pulse	4-20 mA, Pulse, Transistor, Relay	Pulse
Display	No	No	No	No	No	No	Yes	Yes, removable	Yes	No	Yes, removable	No
Specifics	Compact	Compact	Compact	Compact	Compact	Compact	Compact, Wall	Compact, Wall	Compact	Compact	Compact, Wall, Panel	Compact

Flow Range – Oval Gear Sensors



Flow Features – Oval Gear

Please see datasheets for further information.

Sensors for clean viscous fluids where low flow is required

	Type 8070	Type 8071	Type 8072	Type 8075B / 8076	Type SE30EX
					
Fluidic characteristics					
Sensor principle	Hall	Hall	Hall	Hall	Hall
Flow rate range [l/min] Flow rate range [GPM]	2 - 1200 0.50 - 320	0.008 - 8.33 .002 - 2.2	2 - 1200 0.50 - 320	2 - 1200 0.50 - 320	2 - 1200 0.50 - 320
Temperature/pressure range	55 bar (800psi) at 120 °C (248°F) (depending on orifice)	55 bar (800psi) at 120 °C (248°F)	55 bar (800psi) at 120 °C (248°F) (depending on orifice)	55 bar (800psi) at 120 °C (248°F) (depending on orifice)	55 bar (800psi) at 120 °C (248°F)
Nominal diameter	DN15 - DN100 (NPT ½" - 4")	G & NPT G ¼" and ⅛"	DN15 - DN100 (NPT ½" - 4")	DN15 - DN100 (NPT ½" - 4")	DN15 - DN100 (NPT ½" - 4")
Wetted parts Rotor Axis/bearing Seal Body	 PPS, Aluminium, SS SS FKM (EPDM or PTFE) AL, SS	 PPS, SS Hastelloy C, SS FKM (EPDM) Aluminium, PPS, SS	 PPS, Aluminium, SS SS FKM (EPDM or PTFE) AL, SS	 PPS, Aluminium, SS SS FKM (EPDM or PTFE) AL, SS	 PPS, Aluminium, SS SS FKM (EPDM or PTFE) AL, SS
Fluid properties	No fibres. No ferromagnetic parts. Filtered.	No fibres. No ferromagnetic parts. Filtered.	No fibres. No ferromagnetic parts. Filtered.	No fibres. No ferromagnetic parts. Filtered.	No fibres. No ferromagnetic parts. Filtered.
Viscosity [cSt]	< 1 Mio	< 1 Mio	< 1 Mio	< 1 Mio	< 1 Mio
Conductivity [µS/m]	No affect	No affect	No affect	No affect	No affect
Fitting type	S070		S070	S070	S070
Turndown	1:25	1:50	1:25	1:25	1:25
Electrical characteristics					
Basic function	Sensor	Sensor	Transmitter, Switch	Transmitter, Switch, Batch	Sensor
Output	Pulse	Pulse	Pulse, 4 - 20 mA, Switch	Pulse, Relay, 4 - 20 mA, Switch	Namur NPN / PNP
Display	No	No	Yes	Yes	No

Flow Range – Magnetic, Ultrasonic and Differential Pressure

Output
4 - 20 mA | Frequency | Relay Switch | Transistor | Namur

Remote transmitter

Valve mount

Wall mount

Rail mount

Panel mount

8025 T

8025

SE56

2x

8611

4x

PI

8032
Display

Compact transmitter

8041

8045

2x

Sensor

8081

8719
8709

8718
8708

Fitting

S020

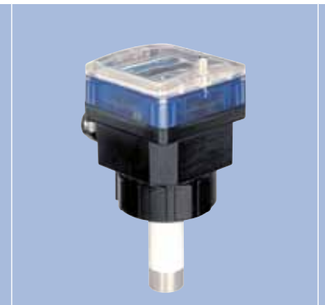
S056
S055
S051

Insertion Fittings

Full bore Fittings

Flow Features – Non-Moving Parts

Please see datasheets for further information.

							
Type	8041	8045	8051	8055	8056	8081	8718/8719
Sensor principle	Magmeter Insertion	Magmeter Insertion	Magmeter Full bore	Magmeter Full bore	Magmeter Full bore	Ultrasonic	Differential Pressure
Flow rate range [l/m] Flow rate range [GPM]	0.3 - 75000 0.8 - 19,813	0.3 - 75000 0.8 - 19,813	0.02 - 208 .005 - 55	0.02 - 4666 .005 - 1,233	0-02 - 4666 .005 - 1,233	0.06 - 200 .016 - 53	0.01 - 0.6 .003 - .016
Temperature/pressure range	See P/T diagram pages 46/47	See P/T diagram pages 46/47	-20 … 150 °C (-4 to 302°F) at16 bar (232psi) (depending on lining)	-20 … 150 °C (-4 to 302°F) at16 bar (232psi) (depending on lining)	-20 … 150 °C (-4 to 302°F) at16 bar (232psi)	16 bar (232psi) at 5 - 90 °C (41 to 194°F)	10 bar (145psi) at 10 - 40 °C (50 to 104°F)
Nominal diameter	6 - 400 (6mm - 8")	6 - 400 (6mm - 8")	3 - 20 (¼" - 1" NPT)	25 - 100 (1 - 4") (up to 400 on request)	3 - 100 (¼" - 4")	15 - 25 (¾" - 1 ¼" NPT on request)	G ¼, NPT ¼, flange
Wetted parts Sensorfinger Electrodes [Holder] Lining Seal Body	 SS, PVDF SS/Alloy (PEEK) analogue S020 PVC, PVDF, PP, SS	 SS, PVDF SS/Alloy (PEEK) analogue S020 PVC, PVDF, PP, SS	 SS/PTFE SS, Hasteloy C, Titanium, Platinum EPDM, FKM SS	 SS/PP(Ebonite)/ PTFE SS, Hasteloy C, Titanium, Platinum EPDM, FKM Carbon steel (painted)	 SS/PTFE SS SS (3A)	 PES (measuring tube) SS (tilting mirror) EPDM Brass	 SS (orifice plate) SS FKM/EPDM/FFKM SS
Fluid properties	Clean and contaminated media ferromagnetic parts < 1 %	Ferromagnetic parts < 1 %	Contaminated or sterile fluids	Contaminated or sterile fluids	Contaminated or sterile fluids	Water-like fluids with no fibres and less than1% solids	Water, alcohol
Viscosity [cSt]	< 1000	< 1000	< 1000	< 1000	< 1000	< 4	< 4
Conductivity [µS/cm]	> 20	> 20	> 5	> 5	> 5	No affect	No affect
Fitting type	S020	S020, Clamp	S051	S055	S056	Integrated	Integrated
Turndown ratio	1:50	1:50	1:500	1:500	1:500	1:250	1:10
Characteristics							
Basic function	Sensor, Transmitter	Switch, Sensor, Transmitter, Totalizer	Sensor, Transmitter, Batch Controller, Totalizer	Sensor, Transmitter, Batch Controller, Totalizer	Sensor, Transmitter, Batch Controller, Totalizer	Sensor	Sensor, Transmitter
Output	Relay, Pulse, 4 - 20 mA	Relay, Pulse, 4 - 20 mA	Transistor, Relay, Pulse, 4 - 20 mA	Transistor, Relay, Pulse, 4 - 20 mA	Transistor, Relay, Pulse, 4 - 20 mA	Pulse, 4 - 20 mA	0 - 5 V, 0 - 10 V, 0 - 20 mA, 4 - 20 mA
Display	No	Yes	Yes/no	Yes/no	Yes/no	No	LED

Batch/Ratio Controller Range

Ratio | Output 4 - 20 mA | Frequency | Relay Switch | Transistor | Batch

Wall mount

Panel mount

8025 B 2x

SE56 2x

8611 Ratio 4x

8025 B

8025 B 2x

8035 B 2x

8075 B 2x

8011

8012

8020

8030

8031

8041

8070

8071

8081

8056, 8055, 8051

Paddle wheel flow meter | Magmeter | Oval gear meter | Ultrasonic meter | Magmeter

Batch Controller Features

Bürkert batch controllers can control very precise dosing and filling operations. Two switching relay outputs serve to actuate valves for a single or double stage, precise dosing function. If required, one of the relays can be used as an alarm output in the event of an incomplete batch event. The dosing operations can be started manually or automatically. The design and materials allow use in virtually all types of fluids. It is possible to select the most appropriate measuring principle (paddle wheel, oval gear, ultrasonic, full bore magmeter or Insertion magmeter) depending on the properties of the medium. Selection tables, measuring principles and further information on selecting the appropriate sensor/fitting can be found in chapter 1: Flow measuring.

The following dosing and filling operations are possible with the 8025/8035 batch controllers:

- Local dosing: the user enters the quantity to be metered and initiates the dosage from the keypad.
- Local dosing with pre-set quantity: the user selects up to 7 pre-set volumes and initiates the dosage from the keypad.
- Remote control dosing using a 7 position rotary knob (selecting a pre-set quantity) or binary data inputs.
- Dosing controlled by a PLC unit using 3 binary data inputs for up to 7 preselected volumes.
- Automatic dosing controlled by variation of pulse duration. The quantity of the dose is directly proportional to the duration of a pulse.

8025B / 8036B

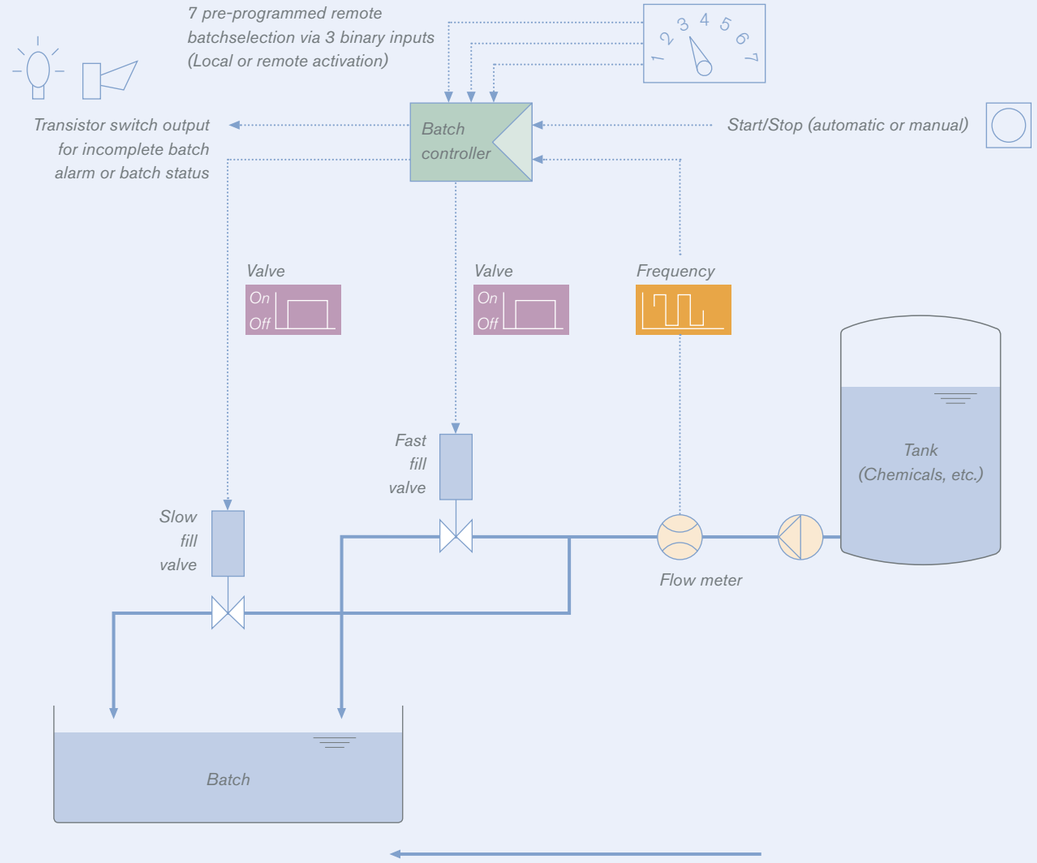
The compact version, type 8025 or 8035, combines a paddle-wheel flow sensor and an electronic module with a display in an IP65/ NEMA4 enclosure.

8025B

The remote version consists of an electronic module 8025 integrated in a front-over or integrated in an IP65 enclosure. The associated separate flow sensor should have a pulse output signal, like Bürkert sensor Type 8020, 8030… (see interconnection chart) or another flow sensor available from the market. The output signals are provided on a terminal strip.

Full bore magmeter 8051/8055/8056

The full bore magmeter, 8051/8055/8056, is available as remote or compact version in an IP67 enclosure. For highly precise and fast filling/dosing in hygienic applications, it is the batch controller of choice.



Ratio Controller Features

The Bürkert 8611 ratio controller can very precise control the ratio between a main flow (Q1) and a secondary flow (Q2). Both are mixed together to a process flow Q3. The controller can handle 2 independent control loops. The following ratio control modes are possible:

Dosing in relation to uncontrolled main flow Q1:
In relation to Q1, the secondary flow Q2 can be set as ratio to Q1 (%Q1).

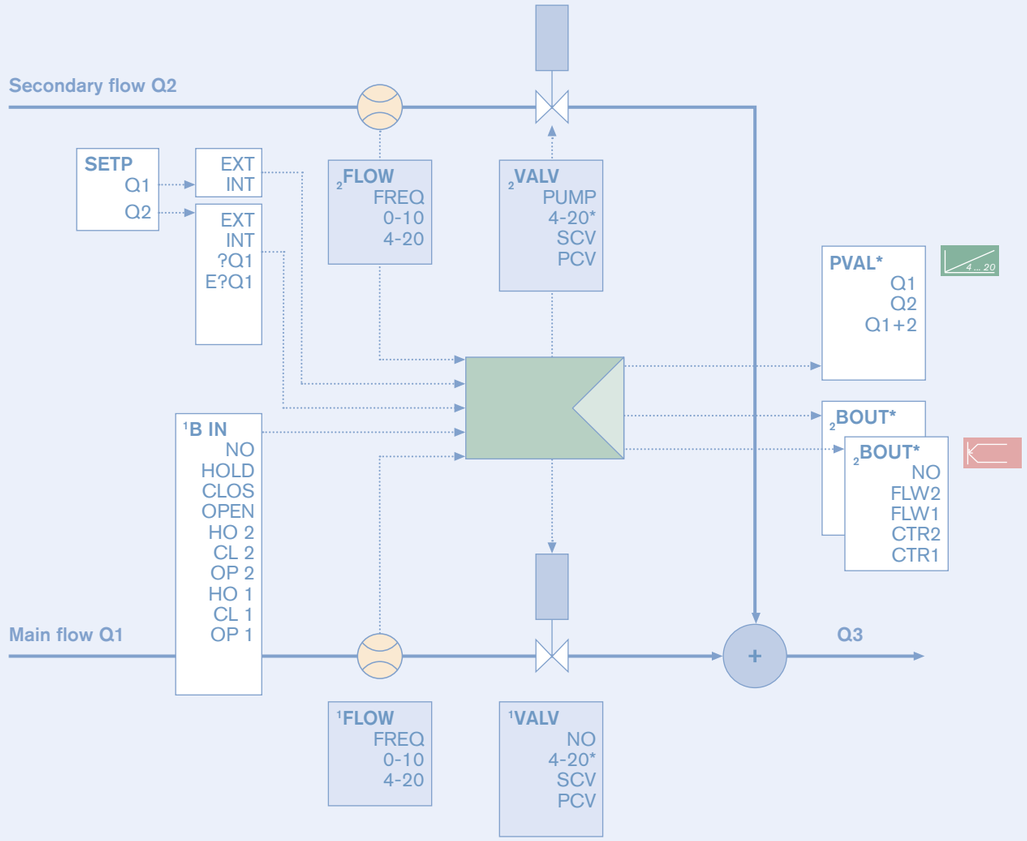
Dosing in relation to controlled main flow Q1:
In relation to the controlled Q1, the secondary flow Q2 can be set as a ratio to Q1 (%Q1).

For setting the main or secondary flow, the following control methods are possible:
– pump with 4-20mA signal (PUMP),
– solenoid control valves (SCV),
– process valves with 8810 positioning system (PCV) or
– any positioner with 4-20mA control signal (4-20).

For measuring the flow rate of Q1 and Q2, the following sensor types can be used:
– sensors with frequency signal (FREQ),
– sensors with 0-10V (0-10) or 4-20mA (4-20) signal.

The set point and the ratio can be set external via standard signal (4-20mA or 0-10V) or directly by the keypad.

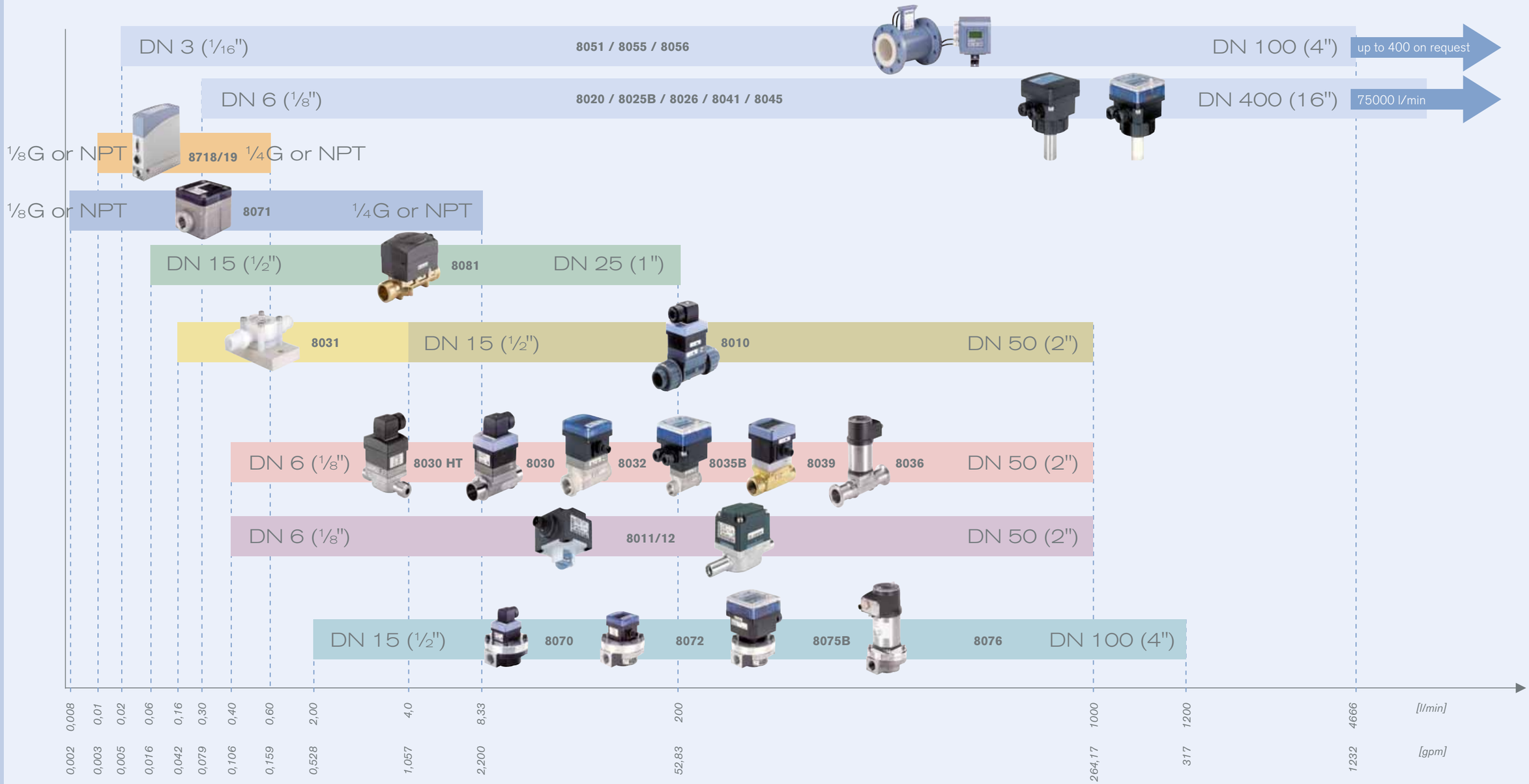
With the binary input (B IN), it is possible to activate different control functions like HOLD, open or close the valve etc. With 2 binary outputs, it is possible to define alarm signals.



** Not available in all configuration modes*

Selection Help – Flow

This table shows the measuring range of all flow meters depending on the flow technology.

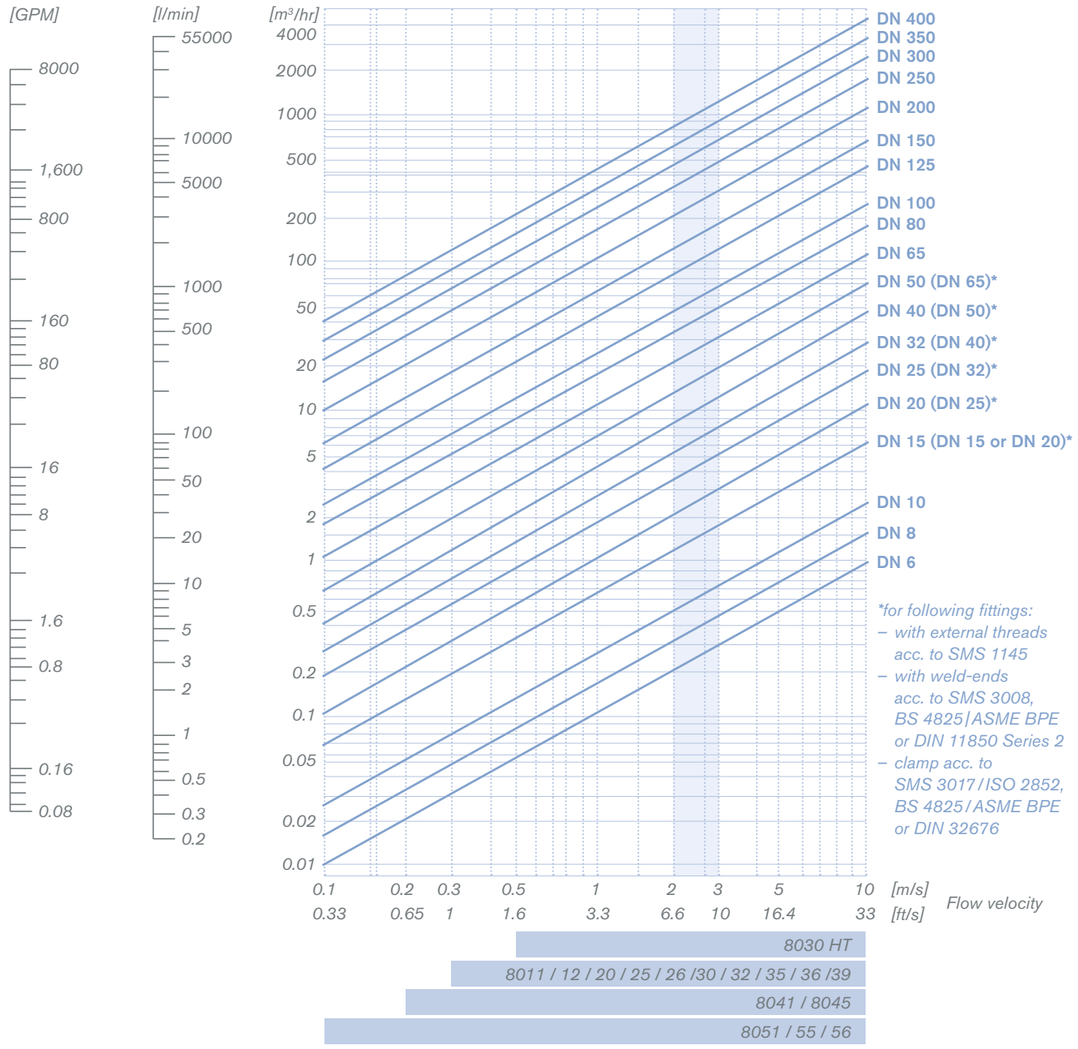


Selection Help – Flow Velocity Considerations

Depending on the sensor type, the right flow rate has to be chosen to get the best accuracy. The higher the flow velocity, the lower the measurement error, but the higher the pressure loss. On the next page you will find the relationship between flow velocity, pressure drop and accuracy (page 40-43). The following chart will help you find the correct fitting diameter for your application depending on flow velocity and sensor technology. Pipes for fluids similar to water are generally designed for an average flow velocity of approx. 2 to 3 m/s (6-10ft/s).

Flow rate

Diagram for nominal diameter selection



Selection Help – Viscosity Considerations

Viscosity describes the degree of internal friction (the interaction between the atoms or molecules). We distinguish between the term “dynamic viscosity” and “kinematic viscosity”. The interrelationship between these two is based on multiplication of the relevant substance density.

$$\eta = \nu^* \rho$$

The below table provides a general overview of conventional media. Viscosity has a major influence on piping design and installation procedures. At a given flow velocity with an increase in fluid friction due to media becoming more viscous, pressure drop in a pipe will rise. Under this condition either the flow velocity will drop or the upstream pressure must be increased to overcome the increased fluid friction. Medium temperature also influences fluid viscosity. With water, the change in viscosity can usually be ignored, but for other media such as oil, pressure loses due to increased viscosity must always be taken into account.

Units, dynamic viscosity:

$[\eta] = 1\ N/m^2 \cdot s = 1\ Pa \cdot s = 10^3\ mPa \cdot s = 10\ Poise = 10^3\ cP$ (centipose)

➔ 1 mPa s = 1 cP

Units, kinematic viscosity:

$[\upsilon] = 1\ m^2/s = 10^6\ mm^2/s = 10^6\ cST$ (centistroke)

➔ 1 mm^2/s = 1 cSt

Medium/Temp. [°C]	Dyn. viscos. η [cP]	Density ρ [kg/m³]	Kinem. viscosity υ [cST]
Water 20 °C	1.01	1000	1.01
Ethanol/20 °C	1.19	1580	0.75
Turpentine/20 °C	1.46	860	1.70
Juice	2 - 5	1040	1.93 - 4.8
Milk	5 - 10	1030	4.85 - 9.7
Glycol/20 °C	19.90	1110	17.9
Cream (body lotion)	70 - 150	1050	66 - 142
Olive oil/20 °C	107.50	919	117.00
Detergent 20 °C	360.00	1028	350.00
Transformer oil/20 °C	986.00	860	1146.50
Thin honey	1000 - 2000	1400	714 - 1428
Ketchup	5000	1430	3496

Viscosity value of conventional media

Selection Help – Flow Meter Accuracy

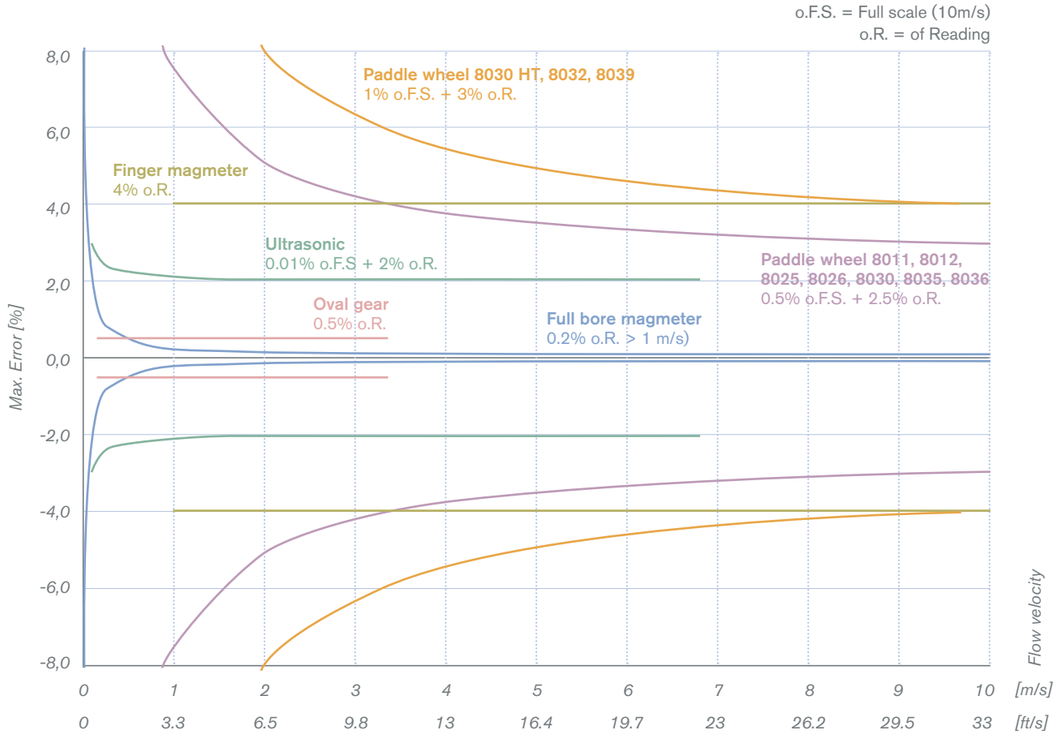
Consideration of Measurement Error

A decision to opt for a specific measuring method usually depends on the required accuracy. Basically, percentages refer either to the measured value or to the full scale value. The maximum measurement error refers to the full scale value and describes the sum of all possibly occurring individual deviations and is frequently shown graphically as a bell-shaped curve. This includes:

- Linearity over the entire measuring range
- Repeat accuracy (referred to the measured value)
- Production-related tolerances
- Installation tolerances as the result of installation in the pipe system.

The production-related tolerances and installation tolerances can be eliminated by field calibration (teach-in), greatly reducing measurement error.

Flow meter accuracies with standard K-factor calibration

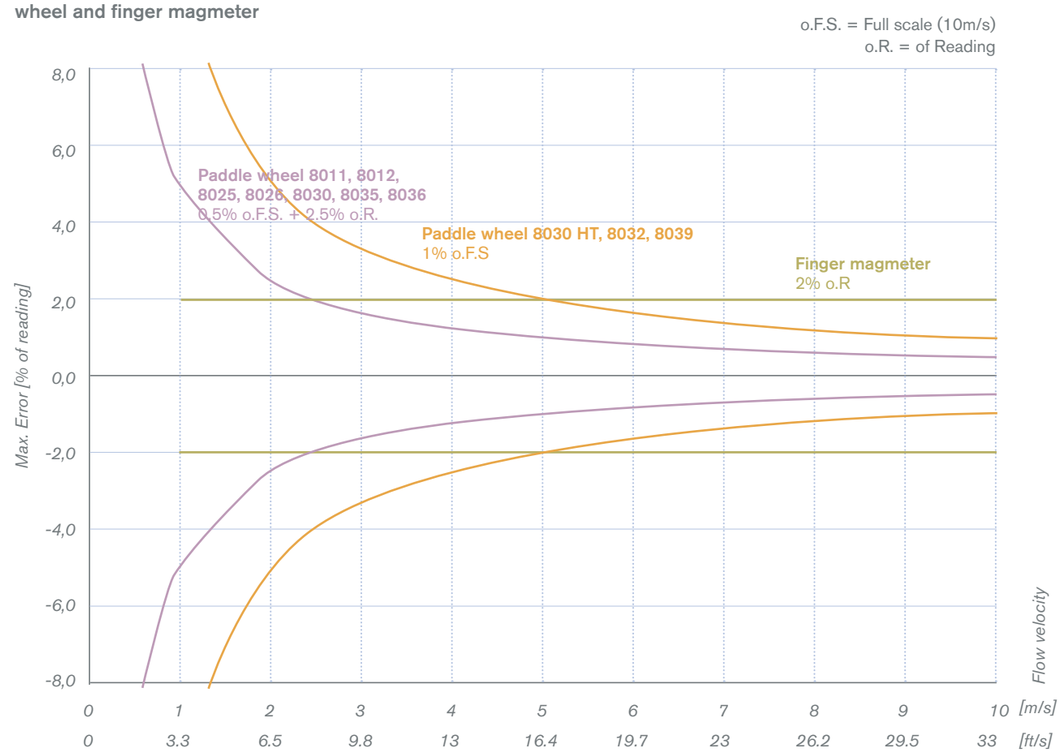


Selection Help – Flow Meter Accuracy with Teach In

Teach-in calibration

Many Bürkert flow devices can be calibrated in line for the precise determination of the K-factor (proportionality factor between pulse frequency and flow rate). “Volume” teach-in calibration involves filling a tank with a defined fluid volume. During this filling operation, the pulses generated by the flow sensor are counted by the electronics. After completion of the filling operation, the value of the filled volume is determined (e. g., with a balance or graduated container) and is entered on the keypad of the transmitter. The device calculates the determined K-factor after the entry has been confirmed. “Flow rate” teach-in calibration involves entering the flow rate of a reference device in the same pipe on the keypad during the operation. The K-factor is calculated after this entry is confirmed.

Flow meter accuracies with teach-in calibration for paddle wheel and finger magmeter

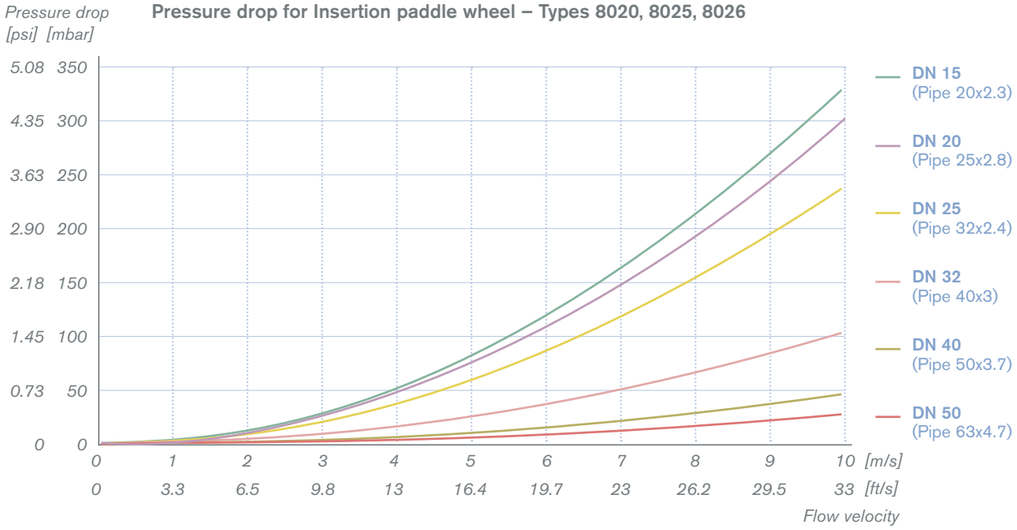


Selection Help – Pressure Drop

Pressure loss tables

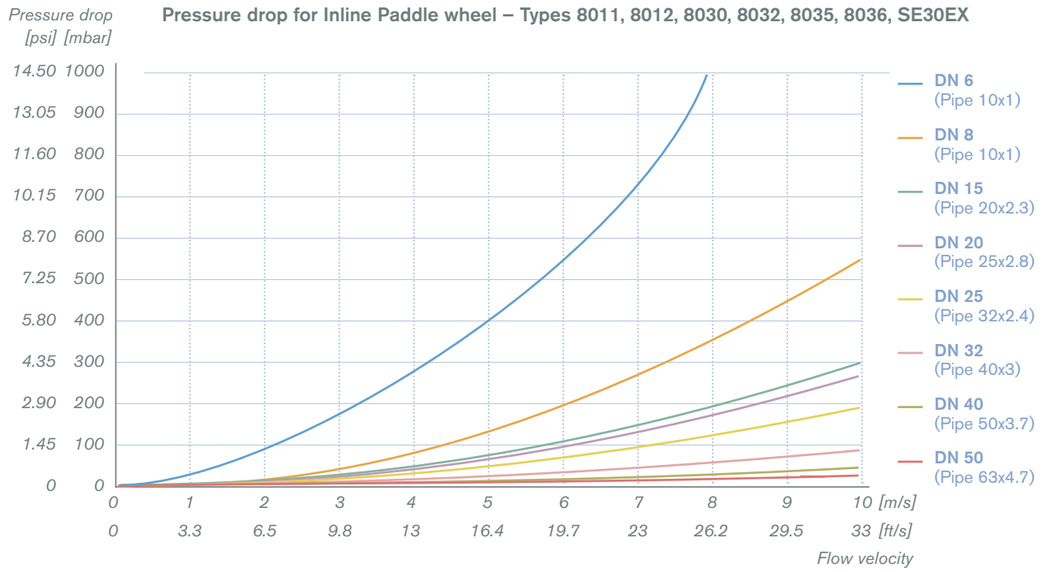
A pressure loss occurs, dependent on average flow velocity, in the case of fittings and pipes. To estimate the total pressure loss in a piping system it is necessary to be aware of the individual pressure losses. Here the first three diagrams show the pressure loss of the paddle wheel types and Insertion MID types for water/ 20 °C as a function of the nominal diameter and pipe connection.

Pressure drop for Insertion paddle wheel – Types 8020, 8025, 8026

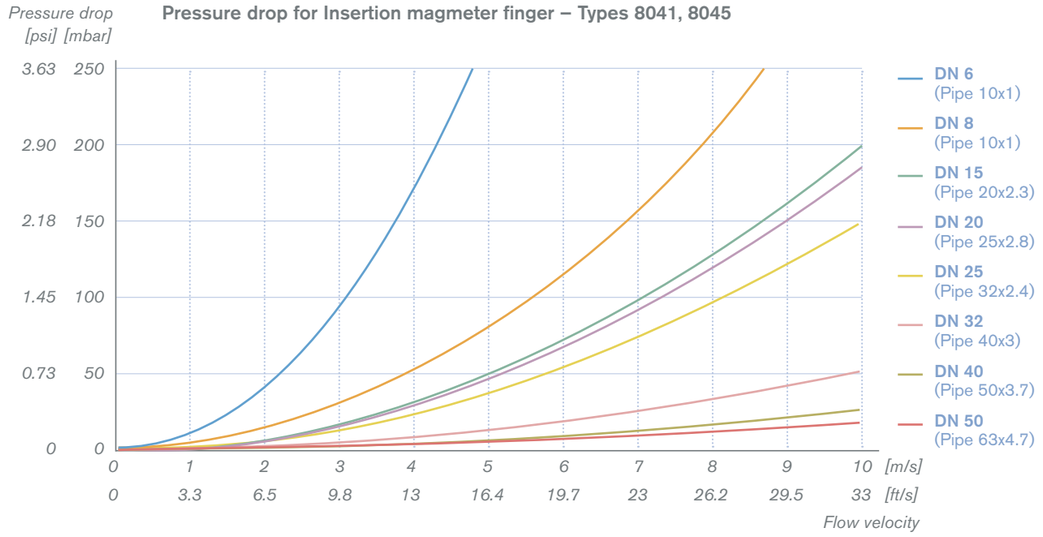


The pressure loss of the oval gear sensors depends very greatly on the viscosity of the medium while the pressure loss of fluids similar to water is virtually independent of the flow rate with this measuring principle. In more viscous media, the pressure loss increases with increasing viscosity. Likewise, it increases with rising flow velocity. The “Pressure loss, oval gear” diagram shows the pressure loss of an oval gear flow meter 8072 with different media as a function of the flow velocity.

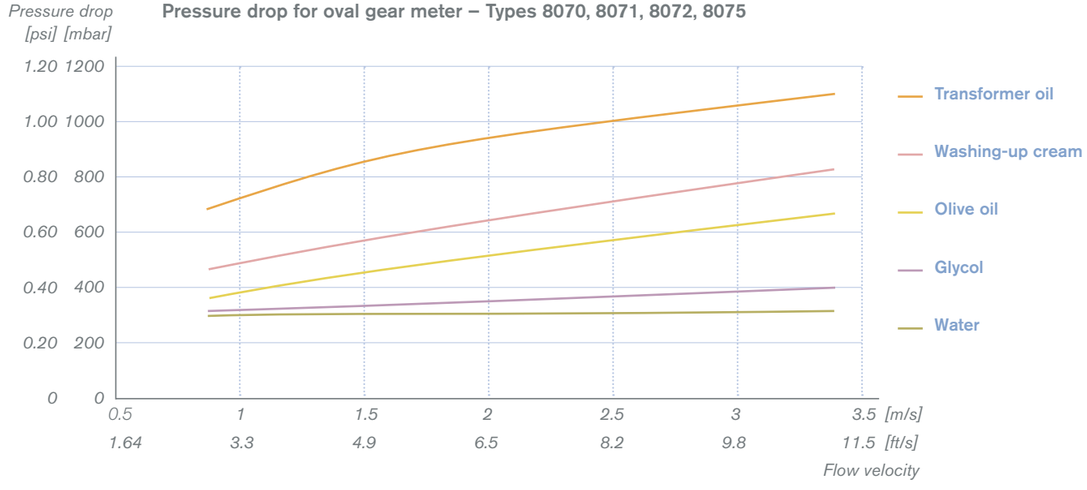
Pressure drop for Inline Paddle wheel – Types 8011, 8012, 8030, 8032, 8035, 8036, SE30EX



Pressure drop for Insertion magmeter finger – Types 8041, 8045



Pressure drop for oval gear meter – Types 8070, 8071, 8072, 8075



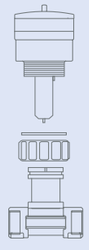
Modular Process Connections for Flow

Process connections for flow measuring instruments

Bürkert distinguishes between two fitting variants in relation to the installation of flow sensors in the process:

– Series S020 for Insertion sensors
– Series S030 for Inline sensors

Both fitting series feature a standard interface to the sensor modules, thus enabling very easy installation and fastening in the system. The special feature of Inline sensors S030 in comparison with Insertion sensors S020 lies in the fact that the electronic modules of the Inline system can be exchanged with no leakage during operation of the process. The measuring sensor is located in the fitting and the measurement signal is transmitted without physical contact (magnetically or optically) to the electronic module. This means that the measuring sensor does not need to be directly connected to the electronics. On the Insertion sensor, the measuring sensor is located in a finger which is immersed into the process. The sensor can be exchanged only after depressurizing the entire system in order to avoid leakage.



Installation of an Insertion Flow sensor using type 8025 as an example

Insertion fitting system S020

When using Bürkert finger sensors, it is necessary to use type S020 installation fittings of the correct nominal diameter. It is important to ensure that the correct finger length, dependent on nominal fitting diameter, is selected. We distinguish between a short sensor finger and a long sensor finger. Insertion series S020 fittings are available in plastic, brass or stainless steel. They consist of a connector with indentation, a plastic seal and a union nut for fixing the sensor in position. The connector is already permanently connected to a pipe fitting up to DN 50 (2"). A wide range of connection options for installation in a pipe are available (spigot, external thread, weld end, hygienic clamp or flange, etc.). In the case of nominal diameters from 65 to approx. 400 mm, it is advisable to use fusion spigots made of plastic, stainless steel, or a connection saddle made of plastic. Individual connectors which can be welded in (stainless steel) or screwed in (plastic) are recommended for installation in tanks.

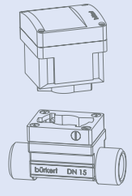
DN 6 - DN 50 (¼"-2")	DN 50 - DN 350 (2"-14")
T-fitting with divers pipe connections made of stainless steel or plastic	Fusion spigot with or without radius made of stainless steel
	

DN 65 - DN 400 (2.5"-16")	DN 80 - DN 400 (3"-16")
Threaded connectors and fusion spigots made of plastic (weld-o-let)	Connection saddle made of plastic
	

Inline fitting system S030 and S010

When using Bürkert Inline sensors, it is necessary to use type S030 installation fittings made of plastic, brass or stainless steel. In this series, the measuring sensor (a paddle wheel) is integrated in the fitting and is closed to the outside so that the system is not opened even if the electronic module is detached (no leakage). Signals are transmitted from the paddle wheel to the electronic module magnetically via an induction coil, Hall element or optically by means of infrared.

They consist of a pipe fitting with integrated measuring sensor (paddle wheel or magnetic paddle) and a screwed-on bayonet catch. The corresponding electronic module is inserted in this catch, rotated through 90° and locked with a screw. Series S030 fittings are available in the nominal diameter range from 6 to 50 mm with a variety of connection options for installation in a pipe (threaded port, external thread, weld end, clamp or flange, etc.) as are those in series S020. The type S010 fitting is a special case since it features an integrated paddle – in place of the paddle wheel on the S030. A molded magnet in the paddle triggers a reed contact in the electronic module after being appropriately deflected by the flows dynamic force. The overall dimensions of the S010 are the same as those of the S030. Version S010 was developed for flow switch type 8010. Inline series S030 or S010 fittings are available in plastic, brass or stainless steel.



Installation of an Inline Flow sensor using type 8032 as an example

DN 6 - DN 50 (¼"-2")	
Plastic housing with true union connection with solvent or fusion spigot	Plastic housing with solvent joint or weld-end connection
	
Brass housing with internal thread (threaded port)	Stainless steel housing with weld end
	
Stainless steel housing with internal thread	Stainless steel housing with flangs
	
Stainless steel housing with clamp connection	Stainless steel housing with internal thread
	

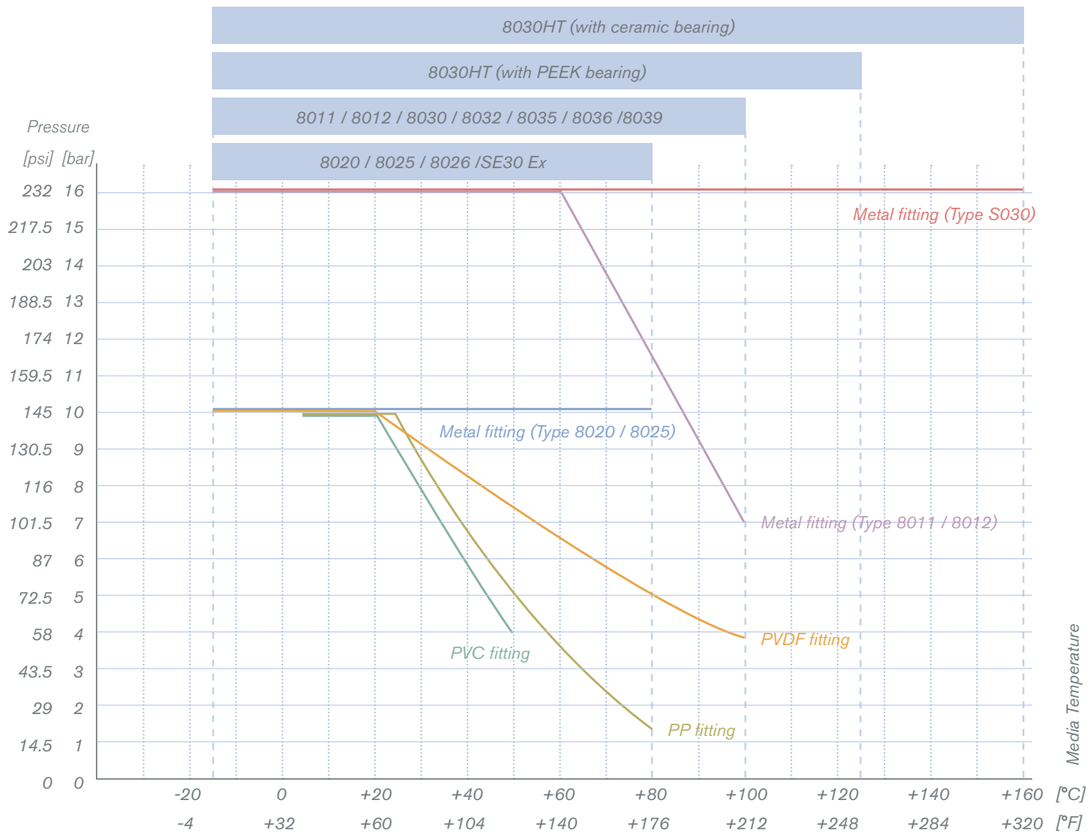
Examples of S030 Inline fittings

Pressure & Temperature Rating for Installed Inline and Insertion Flowmeters

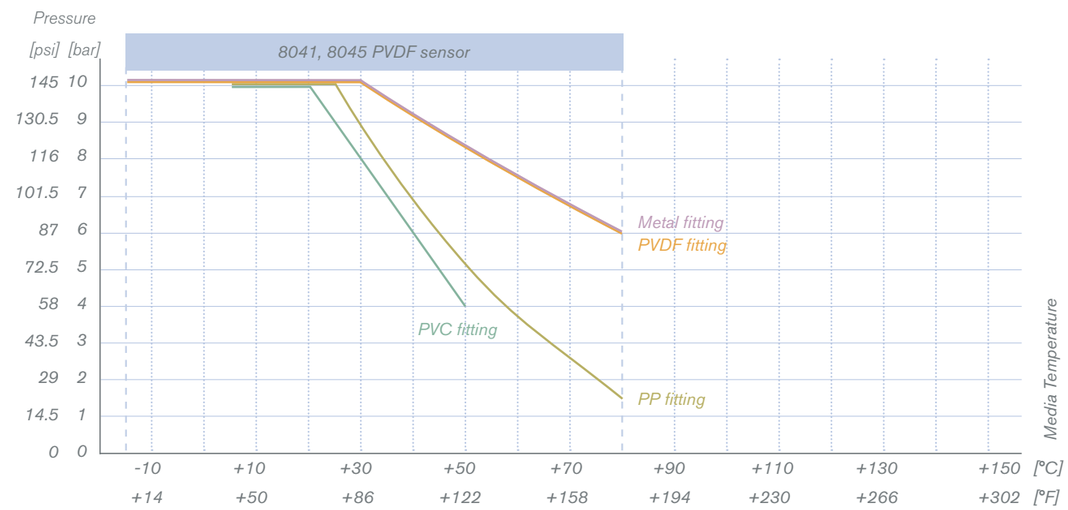
Pressure/temperature diagram for plastics

The pressure resistance of plastics drops with increasing medium temperature. This dependence is shown for pressure stages PN10 and PN16 in the following diagrams..

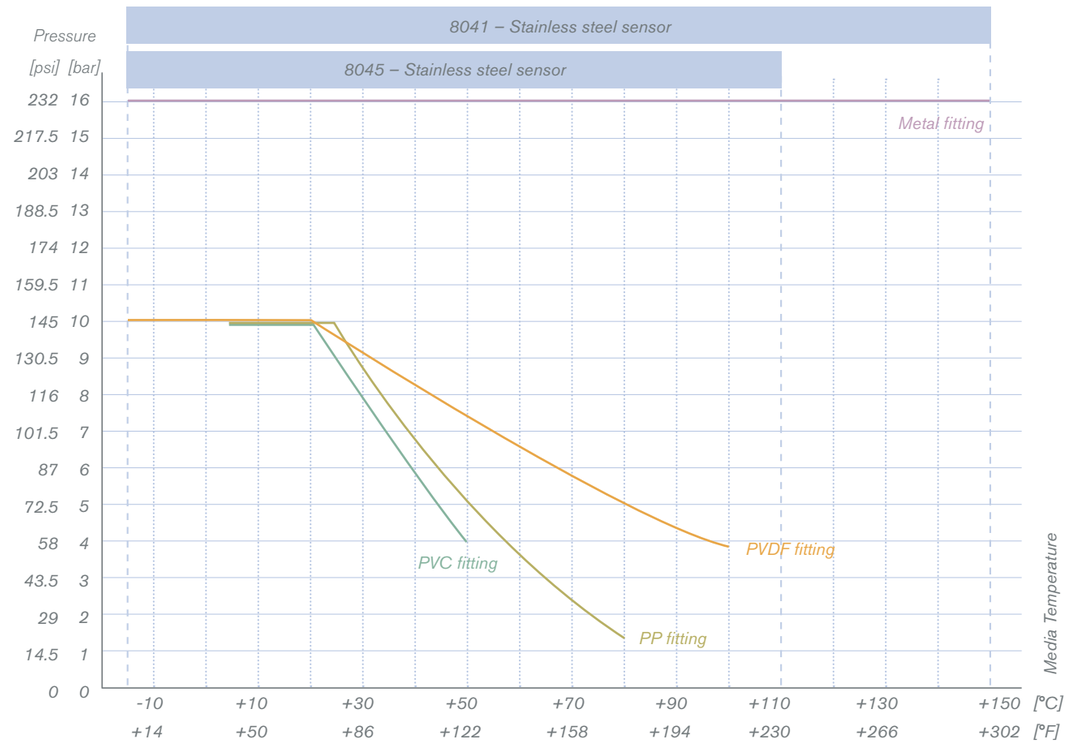
Paddle wheel flow sensors



Insertion magmeter with PVDF finger



Insertion magmeter with stainless steel finger



Our Level Best

Level measurement is an integral part of process control, and may be used in a wide variety of industries with many different requirements. We can divide level measurement into point level switching/alarming and continuous level monitoring/control.

Point level sensors are used to indicate the level has reached a single discrete liquid height which is a preset level. These sensors can be used to automate an on-off valve to fill liquid into a tank from a low to a high filling point in a tank. For point level we have supplied switches which employ these principles:

– Tuning fork
– Float

The more sophisticated continuous level sensors can provide complete level monitoring of a system. A continuous level sensor, as the name implies, measures the fluid level at all points within the measurement range, rather than at a specific, single point and carries out this task with or without contacting the media.

The continuous level sensor provides an analog output that directly correlates to the distance from the sensor position, the level in the tank and, with some programming, the volume. This analog signal from the sensor may be directly linked to a visual indicator or to a process control loop, forming a level management system.

Discrete sensors are often used in parallel to continuous sensors for overfill or leak positions (HH, LL). Exact level control is a key application for Bürkert as it involves a complete process loop and for continuous level we have supplied transmitters which employ these key principles:

– Ultrasonic
– Radar
– Guided microwave
– Hydrostatic

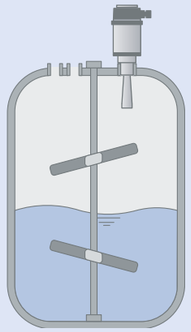
There is a level meter for every type of liquid in any shaped tank at any temperature. Application knowledge of both the sensor principles and the control loop is therefore the key to success. On the next few pages you will find descriptions of the operating principles behind our level world. Please take full advantage of our expertise by letting us help to design the installation and control the complete loop for you.

Level Measuring Principles

Ultrasonic

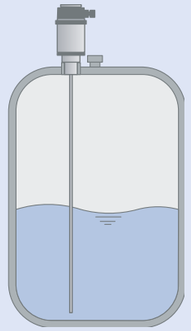
The transducer of the ultrasonic sensor emits short ultrasonic pulses, at 70 kHz to the measured product. These pulses are reflected by the product surface and received by the transducer as echoes. The running time of the ultrasonic pulses from emission to reception is proportional to the distance and hence to the level. An integrated temperature sensor detects the temperature in the vessel and compensates the influence of temperature on the signal running time. The determined level is converted into an output signal and transmitted as an measured value. If the tank geometry is known, the volume still inside the tank can be indicated. Various disturbance echo filters even enable use in containers with built-in fixtures generating a disturbance echo.

Radar



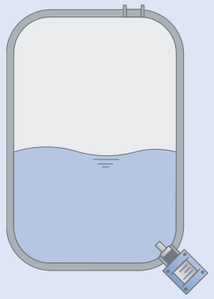
The radar transmitter consists of an electronic housing, a process fitting element the antenna and a sensor. The antenna emits short radar pulses with a duration of approximate 1 ns to the measured product. These pulses are reflected by the product surface and received by the antenna as echoes. Radar waves travel at the speed of light. The running time of the radar pulses from emission to reception is proportional to the distance and hence to the level. The determined level is converted into an output signal and transmitted as an measured value.

Guided Microwave



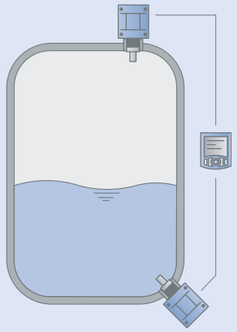
High frequency microwave pulses are guided along a steel cable or a rod. When they reach the product surface, the microwave pulses are reflected and received by the processing electronics. The running time is valuated by the instrument and output as distance. Time consuming adjustment with medium is not necessary. The instruments are preset to the ordered probe length. The shortenable rod versions can be adapted individually to the exact requirements.

Hydrostatic



A fluid column generates a specific hydrostatic pressure as a function of density and filling level. A pressure sensor attached to the bottom of a tank measures this pressure with respect to a reference pressure (generally ambient pressure). Conclusions are then drawn as to the filling level with the aid of the known fluid density. Hydrostatic level measurement is suitable for virtually all types of fluids and produces very precise measured values, dependent on the accuracy of the pressure transmitter.

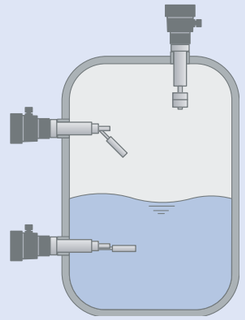
Hydrostatic DP



Restrictions apply to applications in pressurized tanks. In such cases, it is then necessary to also measure this gauge pressure. This can be done by using a second pressure sensor which detects the pressure above the filling level.

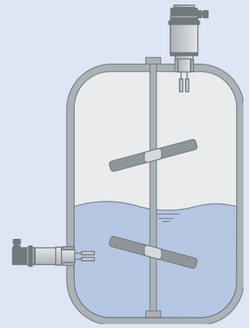
A corresponding evaluation unit corrects the measured value of the first pressure sensor on the tank bottom based on this value. The higher the internal pressure of the tank, the lower the share of hydrostatic pressure in the overall pressure, and the level measurement error increases. The measuring accuracy also drops further due to the use of two pressure sensors (addition of the measurement errors).

Float



A float floating on a fluid changes its vertical position in proportion to the level. A permanent magnet integrated in the float generates a constant magnetic field, thus causing a reed contact in this field to switch. On a float switch, a float with magnet is mechanically connected to a reed contact. This allows a switching contact to be produced for a level. A mechanical stop on the float switch prevents the float rising if the fluid level continues to rise, so that the circuit state does not change. The float moves back out of the switch position only when the fluid level drops below this stop. Restrictions apply to the use of fluids with a low density (lower than 0.7 g/cm³) and coating fluids.

Tuning fork



The tuning fork is piezoelectrically energized and vibrates at its mechanical resonance frequency of approx. 1200 Hz. When the tuning fork is submerged in the product, the frequency changes. This change is detected by the integrated oscillator and converted into a switching command. The integrated fault monitoring detects the following faults:

- interruption of the connection cable to the piezoelectric elements
- extreme material wear on the tuning fork
- break of the tuning fork
- absence of vibration

Level Range

Hart | Output 4 - 20 mA | Relay | Transistor (NPN, PNP) | Namur

Remote transmitter

Valve mount

Wall mount

Rail mount

Panel mount

8693

8611

8175 2x

8175 2x

8619 6x, 4x, 4x

8620 4x, 5x, 4x, PID

8611 4x, 4x, PI

Compact transmitter

Ultrasonic 3-wire

8170

8175 2x

Ultrasonic 2-wire

8176 ***8177*** ***8178***

Radar 2-wire

8136 ***8137*** ***8138***

Guided Microwave 2-wire

8185 ***8186***

Hydrostatic 3-wire

8326

Sensor

ON/OFF Switch

8110 ***8111*** ***8112***

Tuning Fork

8181

Floater

Level Transmitters – Features

		Type 8175	Type 8176	Type 8177	Type 8178	Type 8136	Type 8137	Type 8138	Type 8185	Type 8186	Type 8326
											
Fluidic characteristics											
Sensor principle		Ultrasonic				Radar			Guided Microwave		Hydrostatic
Measuring range	Liquids	0 – 10 m	0.25 – 5 m	0.4 – 8 m	0.6 – 15 m	0.05 – 20 m	0.05 – 30 m	0.05 – 20 m	0.08 – 32 m	0.08 – 4 m	0 – 40 bar
Vessel pressure		0– 2 bar	-0.2 – 2.0 bar	-0.2 – 2.0 bar	0 bar	Vacuum – 3 bar	Vacuum – 40 bar	Vacuum – 16 bar	Vacuum – 40 bar	Vacuum – 16 bar	Depending on pressure range
Process temperature		-40 – 80°C (176°F)	-40 – 80°C (176°F)	-40 – 80°C (176°F)	-40 – 80°C (176°F)	-40 – 80°C (176°F)	-40 – 130°C (266°F)	-40 – 150°C (302°F)	-30 – 150°C (302°F)	-40 – 150°C (302°F)	-30 – 105°C (221°F)
Wetted parts Seal Body		FKM or EPDM PVDF	EPDM PVDF	EPDM PVDF	EPDM SS	FKM PVDF	Klingersil, FKM SS	EPDM SS	FKM SS	FKM SS	FKM, EPDM SS
Accuracy		± 3 mm	± 4 mm	± 4 mm	± 6 mm	± 5 mm	± 3 mm	± 3 mm	± 3 mm	± 3 mm	< 0.15 % of span
Process connection		G or NTP 2"	G or NPT 1 ½"	G or NPT 1 ½"	Mounting strap	G or NPT 1 ½", mounting strap	G or NPT 1 ½", flange	Clamp2", varivent, flange	G or NTP ¾" or 1"	Clamp2" or DIN 11851	G or NTP 1", G1" (EHEDG)
Influence coating		High	High	High	High	High	High	High	Less	Less	Less
Influence steam / condensate		High	High	High	High	No	No	No	No	No	No
Avoid		Dust, foam, vacuum	Dust, foam, vacuum	Dust, foam, vacuum	Dust, foam, vacuum	Foam	Foam	Foam	Coating	Coating	
Electrical characteristics											
Basic function		Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter	Transmitter
Wiring		3-wire	2-wire	2-wire	2-wire	2-wire	2-wire	2-wire	2-wire	2-wire	2-wire
Output		4 - 20 mA Relay	4 - 20 mA HART	4 - 20 mA HART	4 - 20 mA HART	4 - 20 mA HART	4 - 20 mA HART	4 - 20 mA HART	4 - 20 mA HART	4 - 20 mA HART	4 - 20 mA
Echo filtration		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No influence
Display		Yes	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Approval			ATEX	ATEX	ATEX	ATEX	ATEX	ATEX	ATEX	ATEX	
Specifics		Compact-, Wall- and Panel version	Compact version	Compact version	Compact version	Compact version	Compact version	Compact version	Compact version	Compact version	Compact version

Level Switches – Features

	Type 8110	Type 8111	Type 8112	Type 8181
				
Fluidic characteristics				
Sensor principle	Tuning fork	Tuning fork	Tuning fork	Floater
Vessel pressure	-1 – 64 bar	-1 – 64 bar	-1 – 64 bar	10 bar (SS), 1 bar (PP)
Process temperature	-40 – 150 °C (302 °F)	-50 – 150 °C (302 °F)	-50 – 150 °C (302 °F)	-40 – 120 °C (248 °F)
Wetted parts Seal Body	 Klingersil SS	 FKM SS	 FKM SS	 – SS or PP
Accuracy	2 mm	2 mm	2 mm	
Process connection	G or NPT 1", Clamp2"	G or NPT 1", Clamp2"	G or NPT 1", Clamp2"	G, Rc, NPT ¾"
Influence coating	Less	Less	Less	High
Influence steam / condensate	No	No	No	No
Avoid	Coating	Coating	Coating	Dust, coating
Electrical characteristics				
Basic function	Switch	Switch	Switch	Switch
Wiring	3-wire	3-wire	3-wire	3-wire
Output	Transistor PNP, contactless switch	Double-3 Amp- Relay, NAMUR	Double-3 Amp- Relay, NAMUR	Relay (3 Amp)
Display	LED	LED	LED	LED
Approval		ATEX	ATEX	

pH and ORP … Analyse Your World

Water quality is often determined by these important transmitters and in applications like boiler water conditioning, cooling towers, swimming pools or reverse osmosis it is essential.

Analytical expertise combined with our valve history in engineered plastics has made perfect added functionality for simple, accurate pH control for solutions in tanks or Inline.

Our production facility in Triembach, France takes pride in designing and manufacturing both pH/ ORP transmitters and fully functional pH controllers for a continually expanding global client list.

Each pH sensor fits perfectly inside our analytical range and exhibits common interfaces and communication structures which are characterized by similar menus, displays, voltages, and calibration functions.

Factory calibration certificates are always available and materials such as enamel, PVDF, FKM, EPDM and stainless steel are used to ensure long life and chemical compatibility while a wide assortment of electrodes allows deployment into virtually all types of fluids.

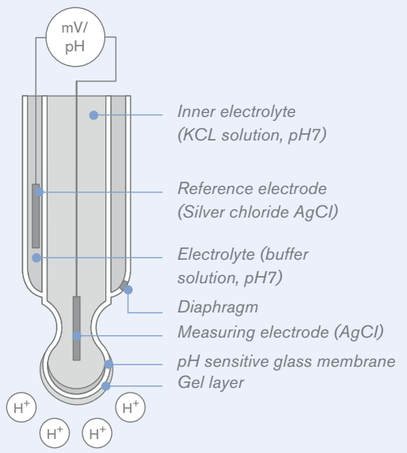
pH/ORP – Measuring Principles

pH measurement with glass electrode

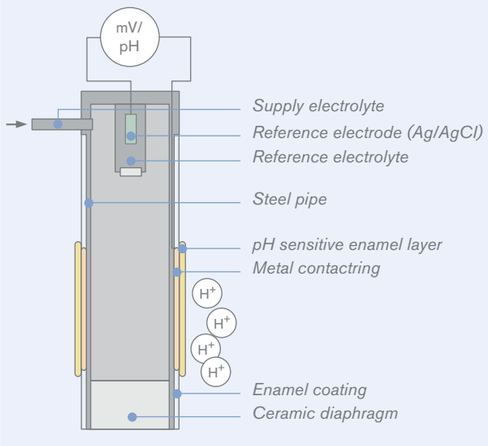
The hydrogen ion concentration (pondus hydrogenii or pH value) in an aqueous solution generates a potential difference at a measuring electrode, pH-sensitive glass diaphragm, with respect to a reference electrode (Ag/AgCl). This voltage is measured by a high-impedance pH measuring instrument and converted to a pH value. The relationship between pH value and voltage is linear, with a slope of 59.16 mV/pH. The slope is temperature- dependent and is compensated for by an integrated temperature sensor. Bürkert pH measuring instruments can be used in virtually all fluids on which pH measurement is required, depending on the selection of electrodes. The option of selecting between a compact device with display or a remote version with remote display ensures that the optimum solution is available for virtually any application.

pH measurement with enamel electrode

The 8201 pH sensor works as a single-rod measuring cell. The measuring electrode and reference electrode are combined in one element. An enameled steel pipe is used as the basic carrier. The measuring electrode is created by attaching an ion-sensitive enamel layer (yellow) with metallic voltage conductor (metal ring, positioned in the non-conductive blue enamel carrier layer). An ion exchange of H+ ions and Na+ ions takes place on the surface (gel layer) of this enamel layer. The Ag/AgCl reference electrode is located in the interior of the enamel pipe filled with electrolyte. A ground ceramic diaphragm is pressed into the lower end of the pipe. Voltage transfer takes place when the electrolyte makes contact with the measuring solution via the annular gap of the ground diaphragm. A Pt1000 for temperature compensation is also integrated in the sensor. The electrolyte used is 3-molar KCl, stored in a separate electrolyte vessel and permanently connected to the electrode via a small tube. The pressure of the electrolyte vessel is maintained slightly above process pressure.



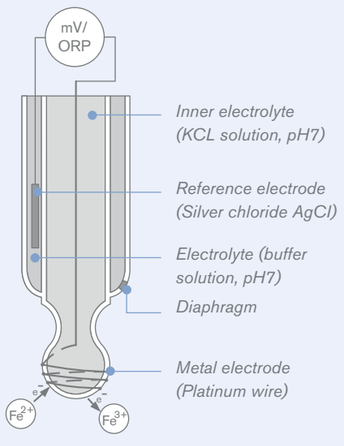
Principle of pH-measuring with glass electrode



Principle of pH-measuring with enamel electrode

ORP measurement

The oxidation-reduction potential electrode measures the potential of a solution on the basis of the presence of specific ions (e. g., CL or O3). It is the tendency of a chemical species to gain or lose electrons at a noble metal electrode. This potential occurs between a metallic measuring electrode (platinum or gold) and a reference electrode (Ag/AgCl). ORP is usually measured in millivolts. It provides information on the oxidizing or reducing capability of the solution. Similar to pH measuring instruments, the same devices can be selected due to the similarities of the +/-2000mV used for both the compact version and remote transmitters and controllers.



Principle of ORP- measuring with glass electrode

Temperature compensation

The pH of a solution is a function of temperature. If the temperature changes, so does the pH, even though the concentration of the acid or base causing the pH remains constant. With temperature, the sensitivity (voltage change per pH unit) changes. Temperature compensation is a way of converting the pH at the measurement temperature to the pH at a reference temperature. The reference temperature is almost always 25°C (77°F). For example:

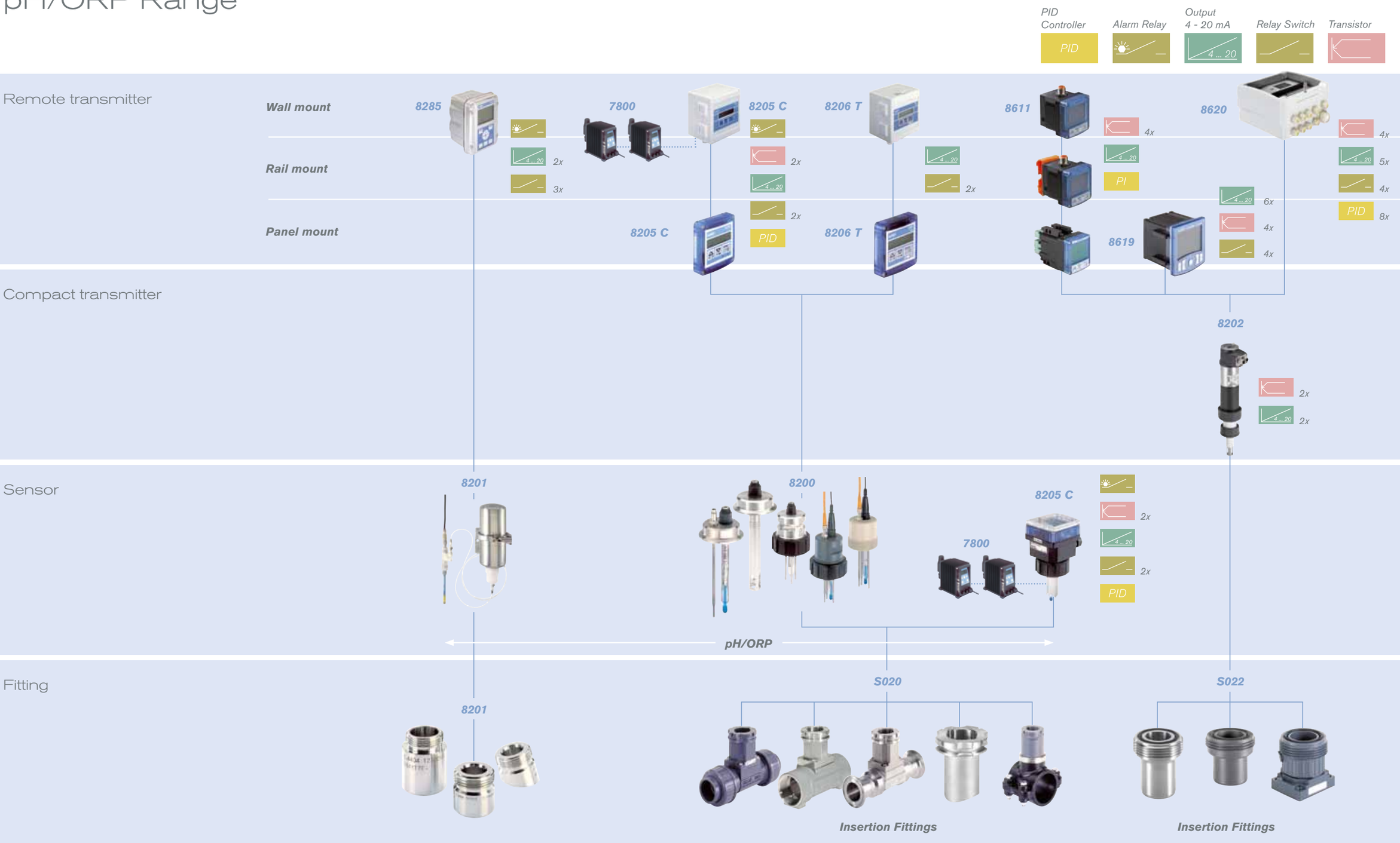
- Slope at 25°C (77°F): 59.16 mV/pH
- Slope at 100°C (212°F): 74.04 mV/pH
- This dependence is permanently compensated for with the integrated temperature probe, thus the values are always comparable.

Calibration

Electrodes cannot be produced with exactly identical characteristics. Offset and slope will vary with time and manufacturer that produce electrodes with different nominal values. The calibration matches the pH meter to the current characteristics of the electrodes. For this purpose a solution with a precisely known pH has to be used. The calibration process is generally performed by measuring in two different buffer solutions. This enables both offset and slope to be determined. Basically 3 possibilities of calibration procedures are possible:

- One-point calibration (only the pH equivalent to the buffer solution is known) offset and slope can not necessarily be determined unless a buffer solution of 7 is use.
- Product calibration (calibration with sampling)
- Two-point (Offset and slope can be detected)

pH/ORP Range


PID Controller
Alarm Relay
Output 4 - 20 mA
Relay Switch
Transistor
PID
4 ... 20
Remote transmitter
Wall mount
Rail mount
Panel mount
8285
2x
3x
7800
8205 C
2x
2x
PID
8206 T
2x
8611
4x
PI
8620
4x
5x
4x
PID
8x
6x
4x
4x
8619
8205 C
8206 T
8202
2x
2x
Compact transmitter
Sensor
8201
8200
8205 C
2x
2x
2x
7800
pH/ORP
Fitting
8201
S020
S022
Insertion Fittings
Insertion Fittings

pH/ORP Features

	Type 8200	Type 8201	Type 8202-pH	Type 8202-ORP	Type 8205	Type 8206
						
Fluidic characteristics						
Measuring range	0 – 14 pH	0 – 12 pH	-2 –16 pH	-2000 – 2000 mV	0 – 14 pH	-1575 – 1575 mV
Fluid pressure in bar	See P/T chart pages 78/79	Vacuum 6bar	See P/T chart pages 78/79	See P/T chart pages 80/81	See P/T chart pages 78/79	See P/T chart pages 78/79
Fluid temperature in °C	See P/T chart pages 78/79	0 – 140°C (284°F)	See P/T chart pages 78/79	See P/T chart pages 78/79	See P/T chart pages 78/79	See P/T chart pages 78/79
Material of wetted parts Sensor Seal Body	 PP, PVC, PVDF, SS FKM, EPDM PVC, PP, PVDF, SS	 Enamel, ceramic EPDM Stainless steel	 PVDF, SS EPDM PVC	 PVDF, SS EPDM PVC	 PVDF, SS FKM, EPDM PVC, PP, PVDF, SS	 PVDF, SS FKM, EPDM PVC, PP, PVDF, SS
Temperature compensation	PT 1000	PT 1000	Automatic with PT 1000	Automatic with PT 1000	Automatic with PT 1000	Automatic with PT 1000
Process connection	G 2" (S020), G 1" (thread)	Various hygienic clamps, Ingold	G 1 ½" (S022)	G 1 ½" (S022)	G 2" (S020)	G 2" (S020)
Fitting type	S020	8201	S022	S022	S020	S020
Electrical characteristics						
Basic function	Sensor	Sensor	Transmitter, Switch	Transmitter, Switch	Transmitter, Switch, Controller	Transmitter, Switch
Output	pH/ORP in mV-Signal for pH/ORP	Analog mV-Signal for pH	2 x 4 – 20 mA, 2 x Transistor	2 x 4 – 20 mA, 2 x Transistor	1 x 4 – 20 mA, 3 x Relay, 2 x Transistor	1 x 4 – 20 mA, 2 x Relay
Display	No		Yes, removable	Yes, removable	Yes	Yes
Compatible transmittes	Remote 8205	Remote 8285	Integrated	Integrated	Integrated	Integrated
Specifics		CIP-compatible, Inline sterilizable (SIP)			Panel and Wall mounted	Panel and Wall mounted

pH/ORP – Selection Help

Electrode		Logotrode pH 120	Unitrode pH 120	Ceratrode pH 120	Plasmatrode pH 120	Logotrode O.R.P. 120	Unitrode Plus O.R.P. 120	8201, enamel electrode	Flat pH	Flat ORP
Fluids		Clean ▪ *drinking water* ▪ *cooling water* ▪ *aquarium* ▪ *swimming-pool* ▪ *...*	Contaminated ▪ *effluent rinse water* ▪ *cooling water* ▪ *electro-plating* ▪ *paints* ▪ *cosmetics* ▪ … Containing sulfides / proteins ▪ *tannery* ▪ *animal breeding* ▪ *effluent* ▪ *foodstuffs* ▪ *cosmetics* ▪ *biotechnology* ▪ …	High pressure, high flow rate applications	Economical probe for drinking water, aquarium, swimming-pool …	Clean ▪ *cooling water* ▪ *waste water or slightly contaminated*	Clean ▪ *drinking water* ▪ *aquarium* ▪ *swimming-pool* ▪ … Contaminated ▪ *effluent rinse water* ▪ *cooling water* ▪ *electro-plating* ▪ *paints* ▪ … With low conductivity ▪ *pure rain water* … *> 2 µS/cm* Containing sulfides / proteins ▪ *tannery* ▪ *animal breeding* ▪ *effluent* ▪ *foodstuffs* ▪ *cosmetics* ▪ *biotechnology* ▪ …	Inline measuring in food and beverage applications CIP – In process CIP cleaning SIP – In process steam sterilizing	Contaminated-viscous, suspended solids, small volumes, paints, cosmetics, foodstuffs	Contaminated-viscous, suspended solids, small volumes, paints, cosmetics, foodstuffs
Measuring range		2 … 14 pH	0 … 14 pH	0 … 14 pH	0 … 14 pH	-2000 … +2000 mV	-2000 … +2000 mV	0 - 12 pH	0 - 14 pH	± 2000 mV
Fluid pressure		0 - 6 bar (87psi)	0 - 6 bar (87psi)	0 - 16 bar (232 psi)	0 - 6 bar (87psi)	0 - 6 bar (87psi)	0 - 6 bar (87psi)	0 - 6 bar (87psi)	0 - 6 bar (87psi)	0 - 6 bar (87psi)
Fluid temperature		-10 to +60 °C (140°F)	0 to +130 °C (266°F)	0 to +130 °C (266°F)	-10 to +40 °C (104°F)	-10 to +50 ° (122°F)	0 to +130 °C (266°F)	0 to +140 °C (284°F)	0 to +80 °C (176°F)	0 to +80 °C (176°F)
Ambient temperature	Operation	0 to +60 °C (140°F)	0 to +60 °C (140°F)	0 to +60 °C (140°F)	0 to +60 °C (140°F)	0 to +60 °C (140°F)	0 to +60 °C (140°F)	0 to + 50 °C (122°F)	0 to 60°C (140°F)	0 to 60°C (140°F)
	Storage	4 to +30 °C (86°F)	4 to +30 °C (86°F)	4 to +30 °C (86°F)	4 to +30 °C (86°F)	4 to +30 °C (86°F)	4 to +30 °C (86°F)		4 to 30°C (86°F)	4 to 30°C (86°F)
Minimal conductivity		2 µS/cm	2 µS/cm	50 µS/cm	2 µS/cm	2 µS/cm	2 µS/cm	2 µS/cm	50 µS/cm	50 µS/cm
Max. pressure at max. temperature		See P/T chart p. 78/79	See P/T chart p. 78/79	See P/T chart p. 78/79	See P/T chart p. 78/79	See P/T chart p. 78/79	See P/T chart p. 78/79	6 bar at 140°C	3.5 bar at 80°C	3.5 bar at 80°C
No. of diaphragms		1	2	3	1	1	2	1	1	1
Diaphragms		“single pore™”	“single pore™”	HP ceramics	“single pore™”	“single pore™”	“single pore™”	grinding diaphragm	double junction	double junction
Reference electrolyte		polymer	polymer	gel	polymer	polymer	polymer	Liquid (3 mol KCL)	Acrylamide gel (KNO_3, 3.5 mol KCL-AgCL)	Acrylamide gel (KNO_3, 3.5 mol KCL-AgCL)

Conductivity

Conductivity tells us the amount of dissolved solids there is in a solution and is one of the most important and common analytical measurements in the process environment.

Its applications range from determining the quality of baby food to the prevention of scale in a boiler. It can measure ultra-pure water in a pharmaceutical facility or metal ions in a plating process.

Bürkert understands the broad scope and accuracy requirements of your individual process whether your needs require inductive principles, where no metal contacts the media, or the more common principle where contacting electrodes determine media properties using a direct resistive measurement.

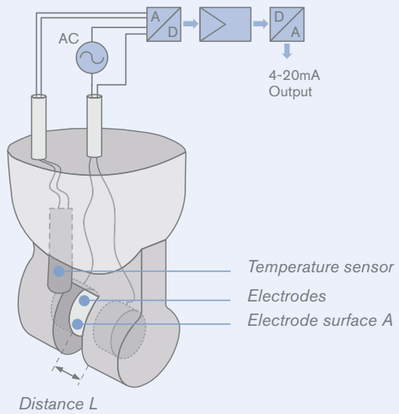
Conductivity is measured by a two main principles (conductive and inductive) which are visually explained in in the next pages. Whichever you choose, Bürkert sensors have common electrical and process interfaces with pH/ORP transmitters and controllers. Conductivity, pH and ORP have similar menus, displays, teach-in and volumetric calibration functions and all the materials have been chosen carefully to fit common applications using PEEK and PVDF to ensure long life and chemical compatibility.

Conductivity – Measuring Principles

Conductivity is a measurement of the ability of a solution to conduct an electric current. For metals the conductivity is given by the electrons. In fluids the number of ions such as metal or salt ions have direct influence to the conductivity. Higher ionic concentration yields higher conductivity. There are basically 2 measuring principles: The conductive principle and the inductive principle. Common to both is that the measuring device produces an alternating electrical voltage between 2 electrodes. Dependending on the conductivity, a direct proportional current flow will be induced. The applied voltage generates a current that is determined by the resistance of the medium (Ohm's law). A second influence to the measured value is the cell constant of the measuring cell itself. The cell constant describes the geometry of the electrodes by distance L between the electrodes and the measuring area A and is defined by its quotients K=L/A. The conductivity of the solution is calculated on the basis of this known cell constant K and by measuring the generated current.

Conductive conductivity – 2 electrode cell

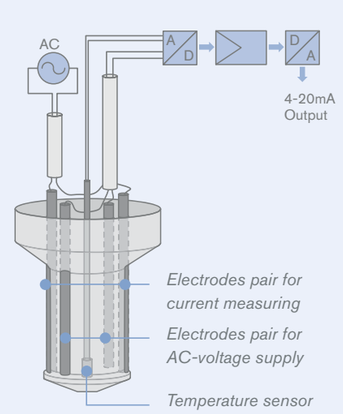
The measuring of the conductivity can be done with 2-electrode cells or 4-electrode cells. The electrodes are in direct contact with the medium. In a traditional 2-pole cell, an alternating current is applied between the 2 poles and the resulting voltage is measured. In order to be able to cover a broad conductivity range, measuring fingers with various cell constants are used. The lower the conductivity, the lower the cell constant must be. The conductivity of ultra-pure water up to concentrated solutions can be measured depending on the cell constant selected. Measuring cells with cell constants K=1, K=0.1 and K=0.01 are available. A PT1000 temperature sensor is integrated for temperature compensation.



Conductive principle, 2-pole electrode

Conductive conductivity – 4 electrode cell

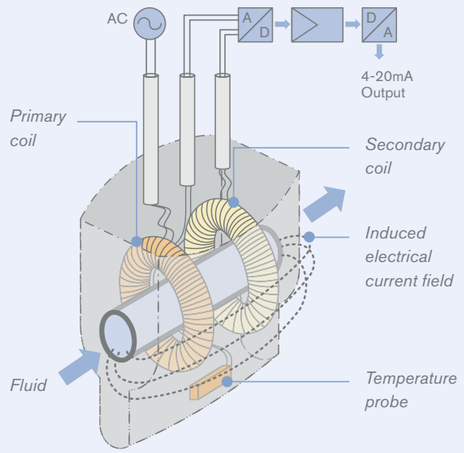
In a 4-pole cell, a current is applied to two opposite electrodes (current electrodes) in such a way that a constant potential difference is maintained between the other two electrodes (potential electrodes). As this voltage measurement takes place with a negligible current, these two potential electrodes are not polarized. Having no polarization effect enables the sensor to measure with one cell constant in a very large conductivity range.



Conductive principle, 4-pole electrode

Inductive conductivity

An inductive conductivity cell consists of two coils: a field coil and a receiver coil. The coils are integrated in a finger-shaped housing. A bore is routed through the finger and the coils are integrated into it. The fluid encloses the finger and flows also through the bore. A sinusoidal AC voltage stimulates the field coil. This produces a current field in the fluid due to the conductivity of the fluid. This current field generates a voltage in the receiver coil. By measuring this voltage and knowing the cell constant, it is possible to determine the conductivity. A temperature sensor is integrated in the tip for temperature compensation to get a highly accurate and reliable 4-20mA output. This measuring method allows use in very problematic fluids. Owing to separation of the medium, all that needs to be ensured is that the housing has adequate resistance if used in such media. Since the measuring electrode has a very broad measuring range, different cell constants are not required. Use of the device is, however, not possible in very pure media since no measured value can be detected below a specific conductivity.



Inductive principle

Conductivity Range

PID Controller | Alarm Relay | Output 4 - 20 mA | Relay Switch | Transistor

Remote transmitter

Wall mount

8225

8611
4x
4 ... 20
PI

8620
4x
4 ... 20 5x
4x
PID 8x

8285
4 ... 20 2x
3x

8619
4 ... 20 6x
4x
4x

Rail mount

Panel mount

8225

8619
4 ... 20 6x
4x
4x

Compact transmitter

8223
4 ... 20

8226
2x
4 ... 20

8222
4 ... 20

Sensor

8220

8221

conductive | inductive | conductive

Fitting

S020

Insertion Fittings

S022

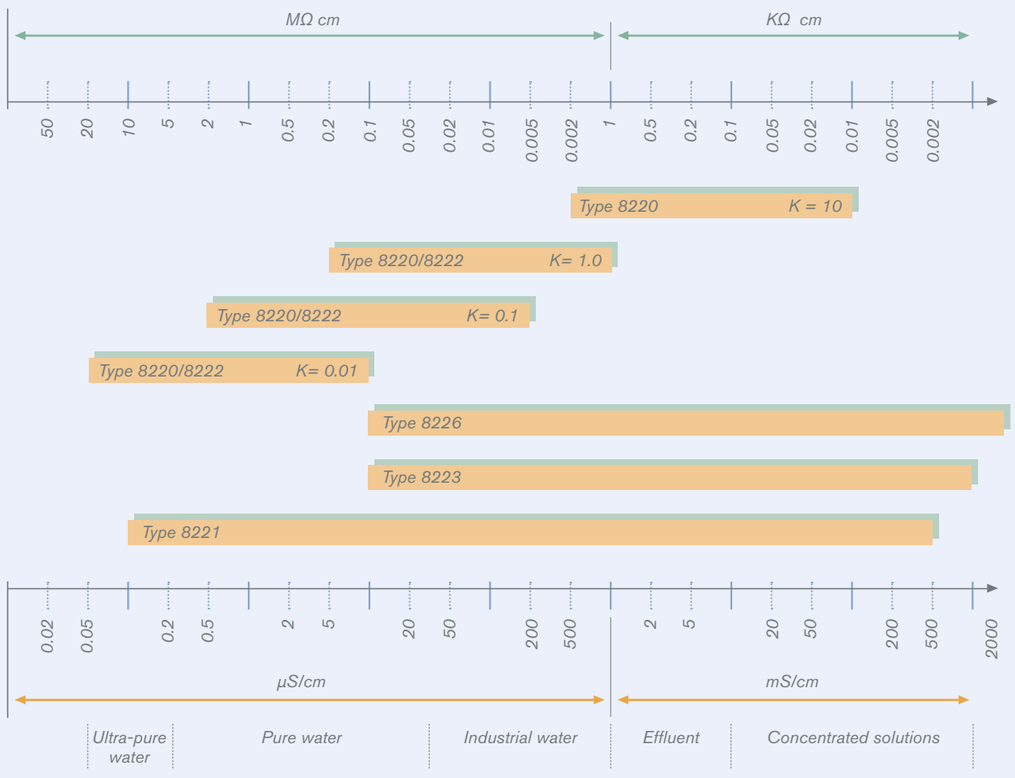
Insertion Fittings

Conductivity Features

	Type 8220	Type 8221	Type 8222	Type 8223	Type 8226
					
Fluidic characteristics					
Measuring range	0,05 µS/cm to 200 mS/cm	0,1 µS/cm to 500 mS/cm	0,05 µS/cm to 10 mS/cm	10 µS/cm to 1 mS/cm	0,05 µS/cm to 200 mS/cm
Fluid pressure in bar	max. 10 bar (145psi)	max. 10 bar (flat electrode) (145psi)	max. 16 bar (232psi)	max. 6 bar (87psi)	max. 6 bar (87psi)
Fluid temperature in °C	-15 to 100 °C (212°F)	-20 to 150 °C (302°F)	-20 to 150 °C (302°F)	-10 to 80 °C (176°F)	-15 to 120 °C (248°F)
Max. pressure at max. temperature	See P/T chart pages 78/79	Insertion 6 bar at 135 °C Flush 10 bar at 150 °C	See P/T chart pages 78/79	See P/T chart pages 78/79	See P/T chart pages 78/79
Wetted parts Sensor Seal Body	 PVDF, SS FKM, EPDM Br, SS, PVC, PP, PVDF	 PEEK, SS EPDM Stainless steel	 PVDF, SS EPDM PVC, PP, PVDF	 PP, PVDF, PEEK EPDM Br, SS, PVC, PP, PVDF	 PP, PVDF, PEEK FKM, EPDM Br, SS, PVC, PP, PVDF
Temperature compensation	PT 1000	PT 1000	Automatic with PT 1000	Automatic with PT 1000	Automatic with PT 1000
Process connection	G 2" (S020)	Various hygienic clamps	G 1 ½" (S022)	G 2" (S020)	G 2" (S020)
Fitting type	S020	Clamp ½", 2" Varivent	S022	S020	S020
Electrical characteristics					
Basic function	Sensor	Sensor	Sensor, Transmitter, Switch	Sensor, Transmitter,	Sensor, Transmitter, Switch
Output signal	Analog raw signal	Analog raw signal	2 x 4 – 20 mA, 2 x NPN/PNP	4 – 20 mA	4 – 20 mA, relay
Output value			Conductivity and temperature	Conductivity or temperature	Conductivity or temperature
Display	No	No	Yes	No	Yes
Compatible transmitters	Type 8225	Type 8285	Integrated	Integrated	Integrated

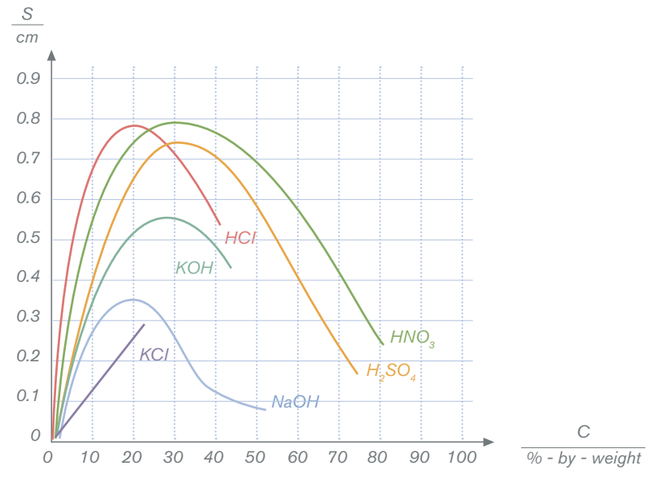
Conductivity – Selection Help

The selection of conductivity electrodes depends on the conductivity to be measured. The below figure shows an overview of the available conductivity sensors and the possible conductivity range.

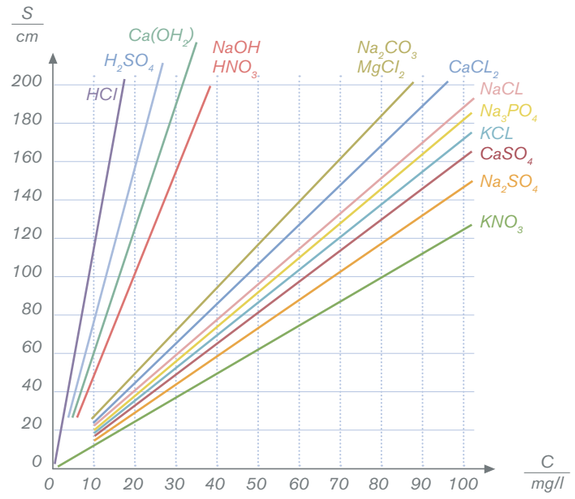


Conductivity of various concentrated and aqueous solutions

The two diagrams provide an overview of the conductivity values of solutions frequently used.



Conductivity of different fluids in dependance of the concentration. (Concentration in % by weight)

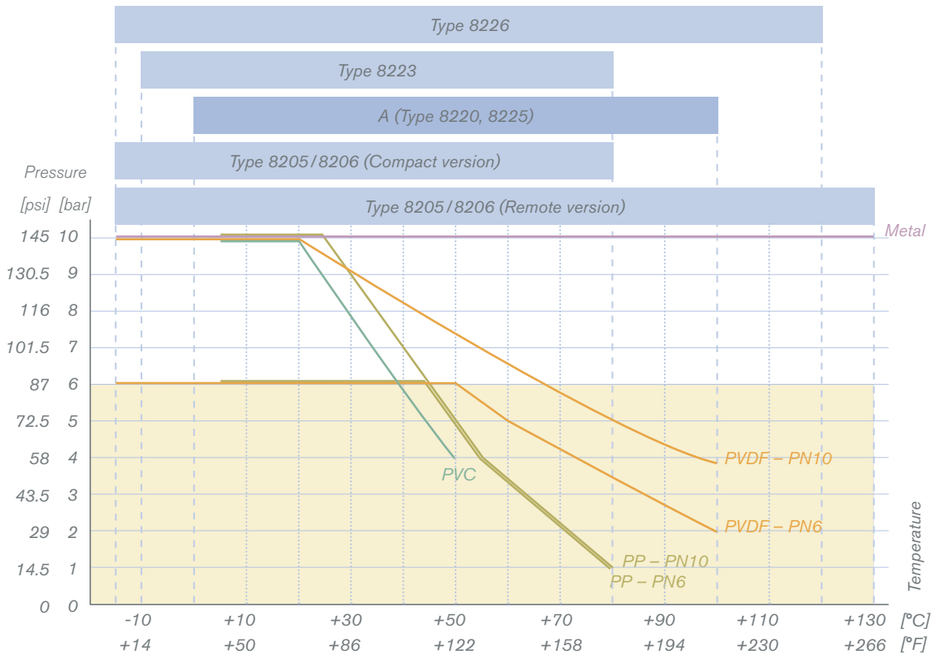


Conductivity of different fluids in dependance of the concentration. (Concentration absolute in mg/l)

Process Connection for pH / ORP / Conductivity – Selection Help

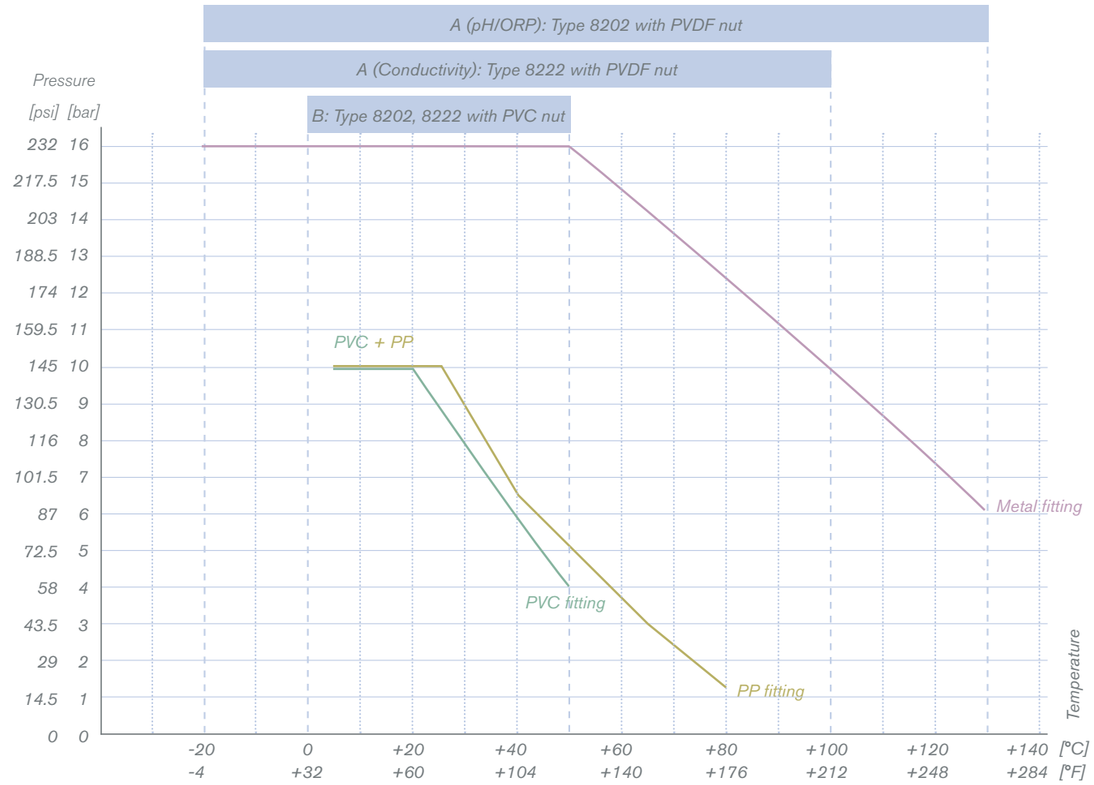
The pressure resistance of plastics drops with increasing medium temperature. This dependence is shown for different sensor types in relation to the plastic materials, temperature and pressure.

Pressure / temperature chart for Sensors with Fitting S020



Max. pressure range 8223, 8226, 8205

Pressure / temperature chart for Sensors with Fitting S022



Process Connections for pH/ORP and Conductivity

Process connections for pH/ORP/Conductivity measuring

Bürkert distinguishes between 2 fitting variants to install the analytical sensors into the process:

– Fitting system S020 with G 2" nut

– Fitting system S022 with standard G1 ½" thread

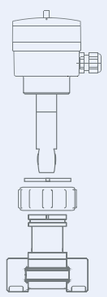
Insertion fitting system S020

Insertion series S020 fittings are available in plastic, brass or stainless steel. They consist of a connector with indentation, a plastic seal and a union nut for fixing the sensor in position. The connector is already permanently connected to a pipe fitting up to DN 50. A wide range of connection options for installation in a pipe are available (spigot, external thread, weld end, Triclamp or flange, etc.). In the case of nominal diameters from 65 to approx. 100 mm, it is advisable to use fusion spigots made of plastic. Individual connectors which can be welded in (stainless steel) are recommended for installation in tanks.

Combining the S020 with sensor for pH, ORP or conductivity measurement

Available fitting DN		
T-fitting S020 	DN 15 (½")	DN 65 (2½")
Welding tab S020 	DN 50 (2")	DN 200 (8")
Fusion spigot S020 	DN 65 (2½")	DN 200 (8")
ph/ORP/Conductivity Types 8200 - 8205 - 8206 - 8220 - 8223 - 8225 - 8226	DN 15 (½")	DN 200 (8")

For detailed information's see datasheet Type S020.



Installation example of a finger sensor in fitting S020

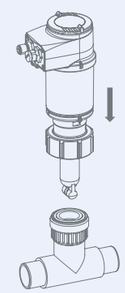
Insertion fitting system S022

Insertion series S022 fittings are available in PVC, PVDF and PP. They consist of a metric or ASTM G 1 ½" thread for connecting the Insertion sensors 8202 or 8222.

Combining the S022 adaptors with analytical ELEMENT transmitters for pH, ORP and conductivity measurement

Available fitting DN		
Adapter for standard plastic tees (PVC or PP) 	DN 32 (1¼")	DN 100 (4")
	DN32 (DN6 with reduction) to DN100 with tee fittings	
Welding tab for stainless steel tees or direct mounting into bigger pipes or vessels 	DN 32 (1¼")	DN 100 (4") …
	DN32 (tee fitting) or bigger (consider min. immersion depth)	
Screw-on for plastic pipes or plastic vessels PVC or PP 	DN 50 (2")	DN 100 (4") …
	Process connection G or NPT 1 ¼" (consider min. immersion depth)	
Conversion kit for tee fittings S020 	DN 15 (½")	DN 65 (2½")

For detailed information's see datasheet Type S022.



Installation example of a finger sensor in fitting S022

When the Pressure is on

Through our various applications we have assembled a range of pressure sensors which fit both within complete control loops and our customized system solutions.

From biotech to surface technology and from water treatment to the boiler room we cover the applications of our core customers with a complete range of pressure switches and transmitters designed with ruggedness, durability and accuracy in mind.

The measuring instruments output are a standardized 4-20mA or a voltage output and are easily installed, commissioned and calibrated.

Design and materials enable use in virtually all purities, viscosities and temperatures of fluids from ultrapure water to effluent and from molasses to helium in standard, hygienic or explosive environments.

Our diaphragm seals, supplied with relevant certification, protect our instruments from extremely aggressive, toxic, abrasive or high temperature fluids and are appreciated and recognized internationally for more difficult applications.

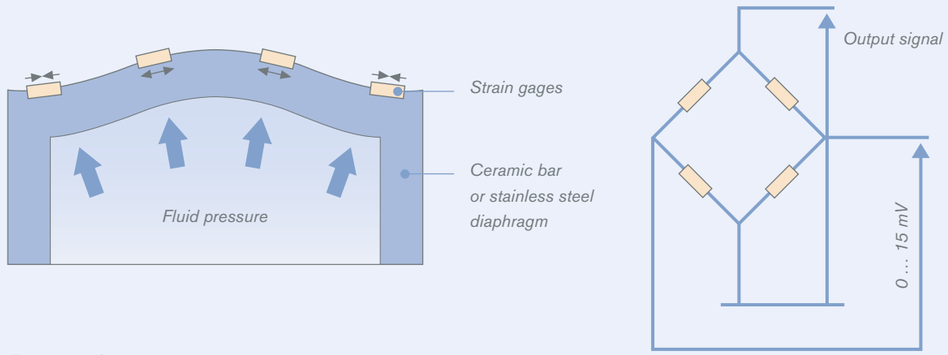
When integrated with our control valves and PID controllers we can control loops from the pressures associated with tank level measurement to hundreds of atmospheres and our material selection and quality ensures that you have control under pressure.

Pressure Measuring Principles

Pressure sensors are used for control and monitoring in thousands of everyday applications and are used to indirectly measure other variables such as fluid flow, speed, and level. The pressure transducer translates the mechanical effect of force per unit area by generating a signal as a function of the pressure imposed. This signal, when conditioned and amplified becomes a standard industrial signal such as 4-20mA or 0-10VDC.

The basic transducer is made from a strain gauge which makes use of the changes in resistance that some materials experience due to change in its stretch or strain. Making use of the change in conductivity of material when experiencing different pressures sounds simple but when zero, span, miniturization, linearity, temperature and durability are essential there can be no corners cut. Strain gauge type sensors can vary drastically in technology, design, performance, application suitability and cost.

From the many technologies available we have produced a range of gauge and absolute pressure instruments with accuracies to 0.1% which fit our global customers' requirements from gas handling to steam technologies. Our principles mean that we deliver stable, reliable instruments and control loops to quickly meet your project demands with certificates of calibration and traceability.



Exagerated flex to show compression / tension

Explanatory information on measuring range turn-down

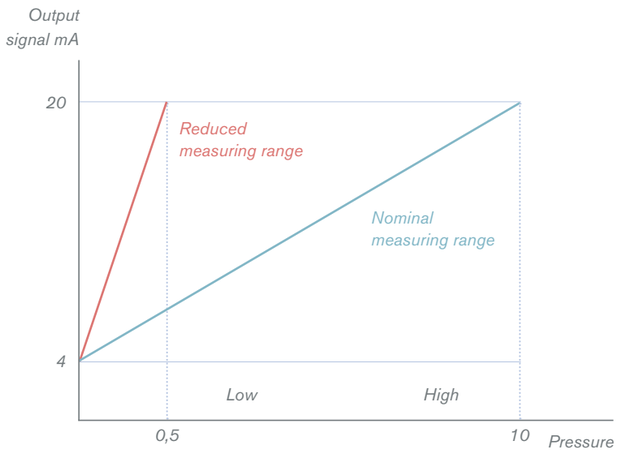
Certain pressure measuring instruments allow the nominal pressure measuring range to be turned down to 1/20 (e. g., a nominal range of 0 - 10 bar can be reduced to 0 - 0.5 bar). The accuracy decreases as the turndown factor increases. The following applies as a general rule:

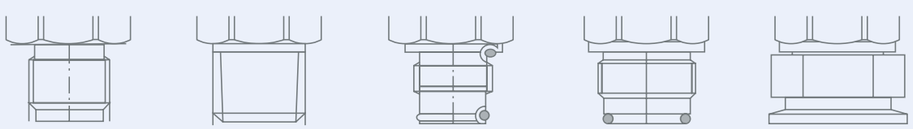
– Turn down <= 1/5: No change in accuracy

– Turn down > 1/5: New accuracy = nominal accuracy x (turn-down factor /5)

(e. g., turn-down 1/20, nominal accuracy 0.15 %, new accuracy = 0.15 x 20/5 = 0.6 %)

Measuring range turn-down





Multiple process connections: G, NPT, Flush, EHEDG, Clamp

Pressure Range

Pressure Features

		Type 8311	Type 8314	Type 8323	Type 8327	Type 8326
						
Fluidic characteristics						
	Measuring range	0 to 50 bar (725psi)	0 to 100 bar (1450psi)	0 to 25 bar (362psi)	0 to 16 bar (232psi)	0 to 40 bar (580psi)
	Measuring principle	Ceramic measuring cell	Ceramic measuring cell	Thin filmstr. gauge piezoresistive	Thin filmstr. gauge piezoresistive	Thin filmstr. gauge piezoresistive
	Materials coming into contact with media	Stainless steel, FPM	Stainless steel, FPM	Stainless steel, FPM	Stainless steel, FPM	Stainless steel, FPM
Fluid properties	Max. medium temperature	100 °C (212°F)	-15 to 125 °C (257°F)	-80 to 100 °C (212°F)	-80 to 100 °C (212°F)	-30 to 105 °C (221°F)
	Clean	■	■	■	■	■
	Contaminated	With flush diaphragm		With flush diaphragm	With flush diaphragm	With flush diaphragm
	Hot or aggressive	With pressure transm.	With pressure transm.	With pressure transm.	With pressure transm.	
	Hygiene	With flush diaphragm EHEDG		With flush diaphragm EHEDG	With flush diaphragm EHEDG	With flush diaphragm EHEDG
Electric characteristics						
Basic function	Switch	■				
	Transmitter	■	■	■	■	■
	Transmitter in accordance with ATEX				■	
Output	Transistor (max. 0.7 mA/80 V DC)	■				
	Relay (max. 3 A/250 V A G)	■				
	4 - 20 mA	■	■	■	■	■
	ASI bus	■				
Supply voltage	10 - 30 V DC	■	■	■		
Equipment features	Display	■				■
	Keypad	■				
	Bargraph	■				■
	Teach-in calibration	■				■
	Simulation	■				■
	Hysteresis mode	■				
	Window mode	■				
Design	Compact device	■	■	■	■	■
Expansibility	Stand alone	■	■	■	■	■
	With Bürkert remote electronics		■	■	■	■
	To PLC or other external electronics	■	■	■	■	■

Hot Ideas and Cool Solutions

Temperature is often cited as the most commonly controlled process variable and it is certainly everyday business for us to help our customers achieve success in their temperature control loops in either heating or cooling systems.

The heat exchange process always relies on accurate temperature monitoring, switching and control. We have integrated thousands of temperature control solutions in factories and on process skids around the world and we understand the intricacies of achieving optimum results.

Our range of temperature sensors, switches and transmitters is configured to provide you peace of mind. As we need to offer long term durability and reliability. The basis for all our temperature measurements is the Pt100 sensor. Stainless steel design enable application in virtually all purities, viscosities and pressures of fluids from simple recycled cooling water to burner gases.

When integrated with our control valves and PID controllers we produce perfect, fast response temperature loops. Inherent modularity ensure you can choose a sensor, a transmitter, a thermowell, a display or a complete control system to meet your most demanding application.

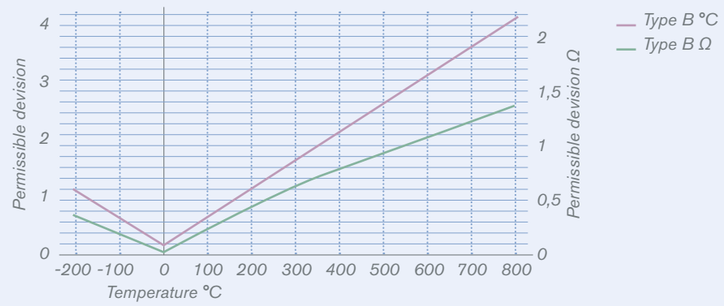
Whether you are cooling an injection molding process or pasteurizing orange juice we can help you realize a hot idea or produce a cool solution.

Temperature Measuring Principles

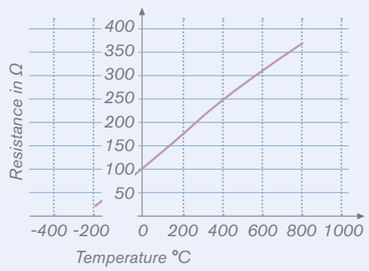
Resistance temperature sensors (Pt100 technology) is proven in providing the durability necessary in the industrial processes where Bürkert helps its customers. While thermocouples use the Seebeck effect to generate a voltage, resistance thermometers use electrical resistance and require a power source to operate. Resistance thermometry utilizes the temperature dependence of the electrical resistance of metals. The electrical resistance of metals increases with increasing temperature. This Positive Temperature Coefficient (PTC) is well understood in platinum which is why the Pt100 is the basis for our measurements.

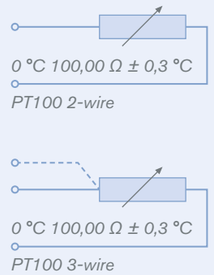
In order to measure the resistance of the sensor, the voltage drop across the sensor is measured while a current of 1mA flows through the circuit. This simple two-wire circuit also measures the electrical resistance of the cables and therefore three-wire circuits are normally employed in industrial environments to eliminate this error. Platinum offers high chemical resistance, good reproducibility of the electrical properties and simple processing. The nominal value of a PT100 sensor is 100 Ω at 0 °C. This raw resistance measurement can be routed right to one of our PID enabled control valves or can be amplified to produce a standard 4-20mA signal or can be used to switch a relay or though hardware onto a fieldbus.

Permissible devision in accordance with DIN EN 60751

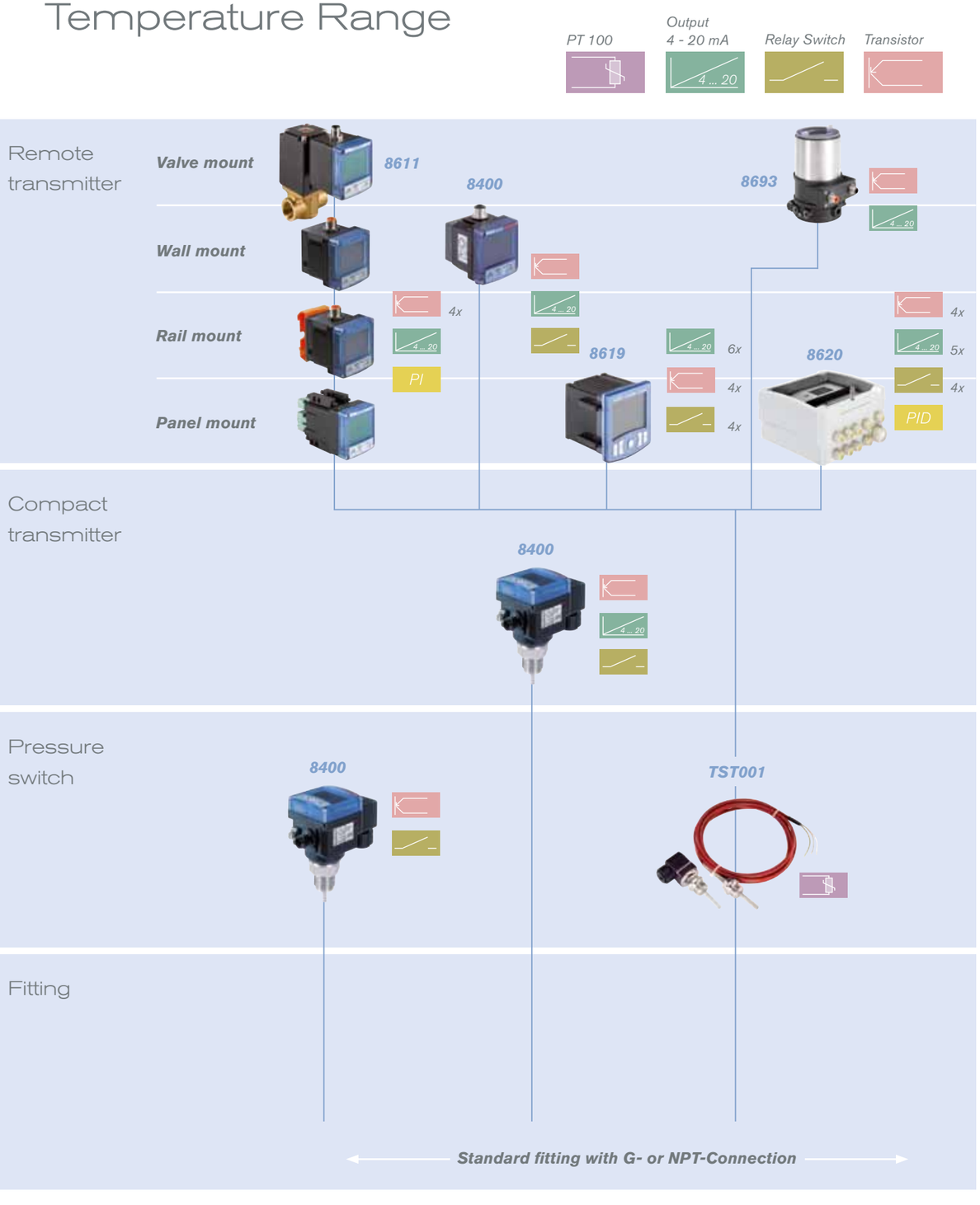


PT 100 resistance characteristic





Temperature Range



Temperature Features

		Type 8400	TST001
			
Fluidic characteristics			
	Measuring range	-40 to +125 °C (257°F)	max. 200 °C (392°F)
	Measuring principle	PT 100	PT 100
Sensor material	Stainless steel	PN 16	PN 16
	Brass	PN 16	
Fluid properties	Clean	■	■
	Contaminated	■	■
Electric characteristics			
Basic function	Switch	■	
	Sensor		■
	Transmitter	■	
Output	Transistor	■	
	Relay (max. 3 A/250 V A G)	■	
	4 - 20 mA	■	
	ASI bus	■	
	Resistance		■
Supply voltage	None		
	10 - 30 V DC	■	
Equipment features	Display	■	
	Keypad	■	
	Teach-in calibration	■	
	Simulation	■	
	Hysteresis mode	■	
	Window mode	■	
Design	Compact device	■	■
	Control panel installation	■	
	Field device	■	■

Transmitters and Controllers

A large range of sensors needs an optimum offering of transmitters and controllers.

Our transmitters take the raw signals from the sensors and amplify or convert them into standard industrial signals or digital information while displaying the process variable as clearly as possible. Our controllers become the heart of reliable loops whether they are positioned at the sensor, in a panel, on a wall or integrated onto a control valve. Its is that flexible and that simple.

With multiple channels, relay outputs and protocols such as RS485, Profibus, and Ethernet as standard we offer solutions for all your process variables. Data logging, process tune, digital calibration, SD card interfaces and specific user friendly programming for cooling towers, boilers and reverse osmosis means we can control pumps or valves, in real time, in any application.

Each device fits inside an architecture arranged around common interfaces and communication structures which are characterized by similar menus, displays, materials and connections. You can decide when to centralize or decentralize intelligence and the interface with our valves is designed to be as simple as possible and complete PID flow loops can be made with just two components.

Simplicity and flexibility from one source.

Transmitter and Controller Range

Type 8611eCONTROL –Single Channel Universal Controller

Thanks to its compact design, the universal 8611 controller is specially designed for compact control system applications. It is compatible with a wide range of proportional control valves and connects with an electro pneumatic servo-system for pneumatically actuated process control valves. The PI process controller is equipped with many additional functions. The actual process value can be supplied as one of three inputs; a standard current (4-20 mA), frequency or Pt100 signal directly to the universal controller. The process switching points can be set via a 4-20 mA signal or with the keypad.

ELEMENT Range of Process Controllers

A range of compact positioners and controllers for integrated mounting on pneumatically operated process can either control the loop or transmit process variables to centralized control. All the features of a separate controller or transmitter are ready inside the beautiful new ELEMENT design. Communications through 4-20mA, ASInterface or Profibus are standard allowing these unique valve mount controllers to save you time and money.

Type 8619 MultiCELL – Dual Channel Controller

Bürkert's 8619 transmitter/controller is the latest addition to Bürkert's process control program. The 1/4DIN panel mounted controller incorporates a large backlit LCD display for viewing up to 6 possible process variables including up to two analytical instruments, two temperatures and up to 3 hall flow sensors. Additional input and output modules can be added to further enhance the controller's capabilities with additional 4-20mA and binary inputs and outputs. An SD card is standard for data logging and up/down loading of parameterization files.

Type 8620 – mxCONTROL

Multi-parameter controller designed to automate the control of rocess variables within a water treatment system (e.g. boiler, cooling tower or reverse osmosis system). Sophisticated electronics and state of the art control algorithms ensure that optimum process control is maintained at all times, with minimal operator intervention. It saves time and space by allowing parameterization and data logging of a wide number of control variants via an SD card slot, USB connection or via an Ethernet interface. Up to eight functions can be performed simultaneously by utilizing up to 23 I/O points.

Type 1150 – Multi Channel Universal Controller

The type 1150 is a process and program controller with up to 8 controller channels or 4 program channels. The controller features up to 8 analog inputs and 6 logic input, as well as six expansion slots for switched or analog outputs. The Setup can easily be done with a program via PC. The layout of the screen templates can be individually adapted and adjusted.

Type 8205 – pH Controller

The pH controller is available in different models:
– Compact pH controller with integrated pH electrode
– Remote pH controller, for panel or wall mounting, to connect to the Bürkert Type 8200 pH sensor. (max. 10m)

The pH controller is designed for use in static or dynamic process of pH-control. The output signals control a valve or a pump by means of pulses whose time duration or frequency is computed according to users parameters and the pH-value of the fluid.

Type 8285 –Analysis Transmitter

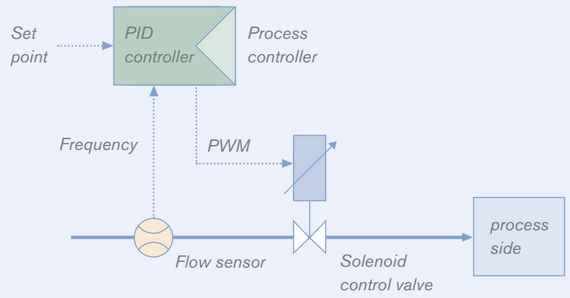
The 8285 modular process analysis system is designed to measure and process liquid analysis parameters. The base unit contains the power supply, signal outputs, binary inputs and the front with graphic display with backlighting. Three slots are available, which, depending on the applications, can be occupied with modules for pH, conductivity or also with a module with additional outputs. The hygienic, polished stainless steel enclosure version allows application in the field of biotechnology and in the pharmaceutical and chemical industries.

Transmitter and Controller Features

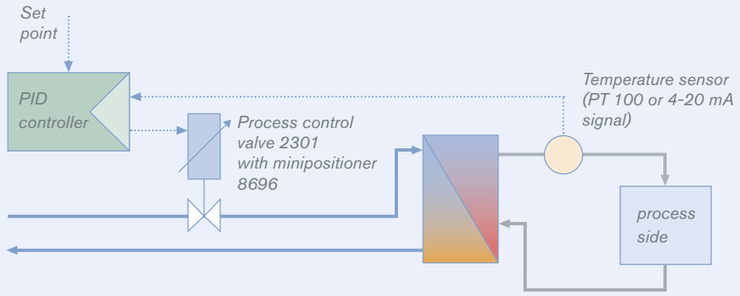
								
Type		8611	8693	8619	8620	1150	8205	8285
Mounting size		54x54x50mm1/16 DIN Cut out	90x156mm	¼ DIN Cut out	230x204x119mm	144x130x170mm ¼ DIN Cut out	126x120x90mm (Wallmount)	163x213x150 mm (Wallmount)
Housing		Wall-/Rail-/Panel- and Valve mount	Top mount on process valves	Panel mount	Wall mount	Panel mount	Compact, Wall- or Panel mount	Wall-/Pipe-/Panel mounting
Display		8-digit, 2-line with backlight	128x64 pixels, backlight	160x128 pixels 4" monochrome, backlight	128x64mm pixels, two colored backlight	5" color screen, 320x240 pixels, backlight	15x60mm, 8-digit LCD	240x160 pixels, LCD, backlight
Controller type		PI, 2-P control, cascade	PID control	PID	PID, cascaded, 2-Point	P, I, PD, PI, PID control, cascade	P, PI, PID	
Power supply		24 VDC +/- 10%	24 VDC	12-36VDC	100..240 VAC	20-30VDC, 100-240 VAC	15-30VDC, 115/230 VAC	24 – 230 V AC/DC
Controller channels		1 channel (2 for ratio control)	1 channel	2 channels	8 channels	8 channels	1 channel	2 channel measurement
Inputs	Analog	4 (4-20mA, RTD)	Sensor (RTD, 4-20mA) Set point (0/4-20mA or 0-5/10V)	pH-Sensor ORP-Sensor PT1000	Up to 4 (4-20mA)Up to 4 (RTD)	Up to 8 (4-20mA, 0-10V, RTD, Thermocouple)	pH-Sensor, PT1000	2 (pH & conductivity), PT1000
	Digital	1	1	2	Up to 4	Up to 6		1 transistor
	Frequency	2 (Flow)	1 (Flow)	2	Up to 4			
Output	Analog	1 (4-20mA)	1 (0/4-20mA or 0-5/10V)	Up to 4 (4-20mA)	4 (4-20mA)	Up to 8 (4-20mA, 0-10V)	1 (4-20mA)	2 (4-20mA)
	Digital	3 transistor (NPN or PNP)	2	Up to 4 transistor	4 transistor	Up to 8	2 transistor	
	Relay				5	Up to 8	1	4
Interface		RS485 on request	Profibus, Devicenet	RS485	RS485, Ethernet	Profibus DP		
Remarks		Predefined Loops for Pressure, Temperature, Flow. Data for Sensor- and Solenoid control valves are memorized. Ratio Control function on request	Process controller and positioner in combination with Bürkert process control valves	SD-Card for data logging & Configuration.	Predefined Program modules for boiler water control, cooling tower control, RO-water control, Ion exchange control, conductivity and pH conrol. Configuration with Setup-program. SD-card for data logging & configuration	Customized pictures and text can be displayed. Configuration with Setup-program.	Static or dynamic pH control.	Modules for pH and conductivity. Measuring rejection rate for RO water.

Typical Sensor Loop Applications

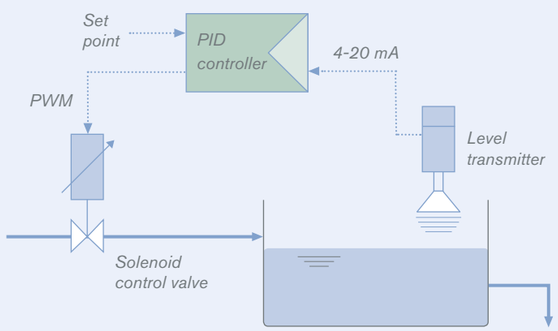
Flow control



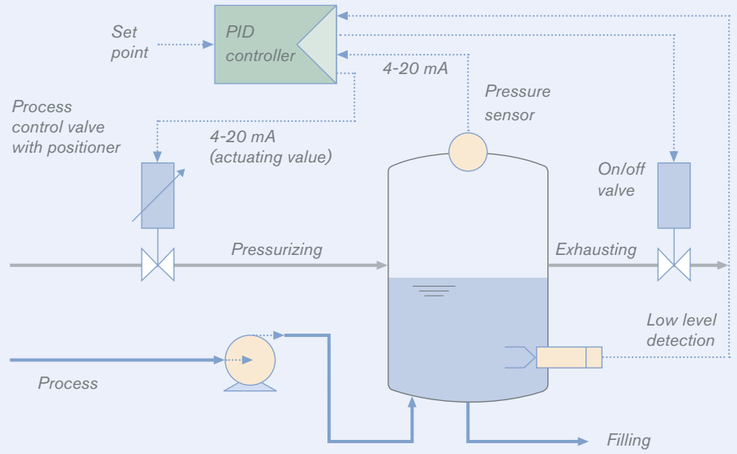
Temperature control



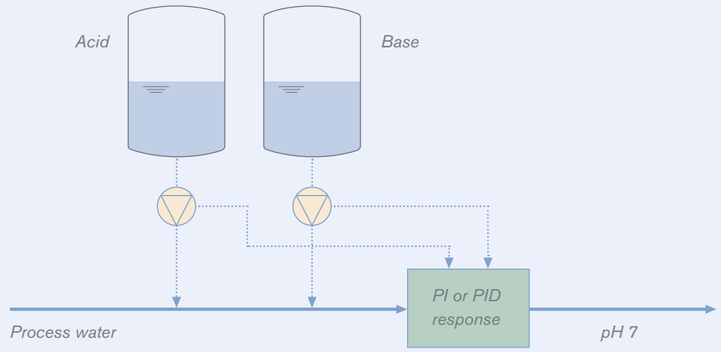
Level control



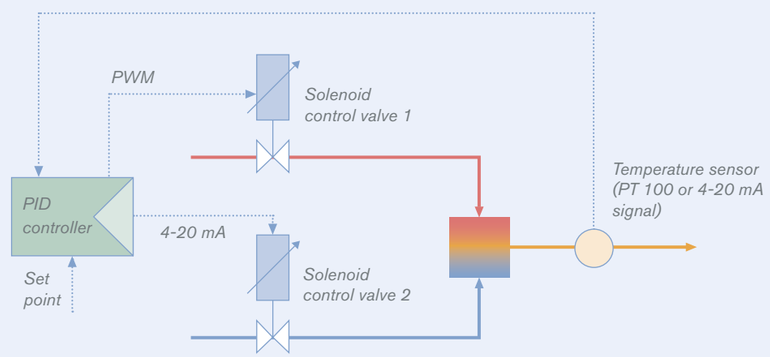
Pressure control of vessels for filling process



pH-control



Mixing of hot and cold water



Added Value Systems

Bürkert has a unique perspective in the process control and instrumentation industry as we are the only single brand which combines a complete range of valves, instruments, pneumatic actuation, networking and controllers from a single source.

With our dedicated world-class engineers and our superlative manufacturing facilities we can deliver systems which meet your exact requirements.

Your reliable Bürkert sales consultant and our system engineers work in concert to ask the right questions and provide the right hardware. Transparent operations, up to date situation, review procedure, engineering change notices, portals through SAP and secure intranet are normal in our projects.

For a world class system experience, insist on Bürkert people to be part of your next project.

Connect

As a globally flexible, lean, focused and innovative company we are the partner of choice for fluid control systems in more than 35 countries. Whether you are in Stuttgart, Singapore, Chicago or Sydney, everywhere in the world, we are close to you and therefore know at first-hand about your specific tasks and problems.

Following our principle of “one face to the customer”, you have a competent, reliable consultant by your side at all times, who listens to your needs and presents a solution in your daily application language … crossing conventional boundaries and creating synergies between industries in pursuit of your ideal solution.

Systemhaus crews in Charlotte (USA), Suzhou (China), Dresden, Ingelfingen and Dortmund are continuously in innovation mode. They creatively engineer cost effective solutions to meet difficult process challenges for our customers.

Conceive & Innovate

Your project team starts working for you: from your reliable sales consultant, qualified industry specialists to dedicated system engineers – Bürkert puts the necessary experts together.

For the entire duration of the project they work together, combining their experience and clarifying all the requirements in close cooperation with you to come up with a feasible draft of your solution within the shortest timeframe.

CAD-created animations or simulations, combined with extended manufacturing, materials, tool design, construction and assembly knowledge enable us to provide a rough but firm production concept for your system at an early stage.

Plan & Specify

In Phase 3 the project is planned in detail. A specification sheet and refined solution concept are developed. This defines exactly what you expect from the system and what it must provide to ensure that all components meet your requirements.

At the end of this phase you are presented with a detailed product definition, a production specification and precise commercial conditions and agreements.

Structured project management based on open communication, effective coordination and thorough documentation ensures fast and reliable results.

Do & Check

Good communication, coordination and documentation at all project phases make sure that we are on the right track, developing the right solution, to allow us to quickly move on to prototyping.

Thanks to the latest technology, we are able to build a prototype made of metal or plastic or a functional model to test flow for example within 24 hours.

We provide you with samples; we perform tests and, of course, obtain all the necessary local and global approvals to make sure the system can go to production.

From here we work in concert with one of our production facilities in Ingelfingen, Gerabronn, Criesbach, Öhringen or Triembach according to their individual core manufacturing competencies.

Complete

Our work does not end with the perfect delivery of components and systems. We offer a comprehensive program to our global clients interlinking services ranging from maintenance and service contracts, operator training and integrated logistics.

Our customer service is available around the clock, offering support through internet, telephone or our qualified, experienced people at your site.

We aim to provide only the utmost in customer experience. Something you will tell your friends about.

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