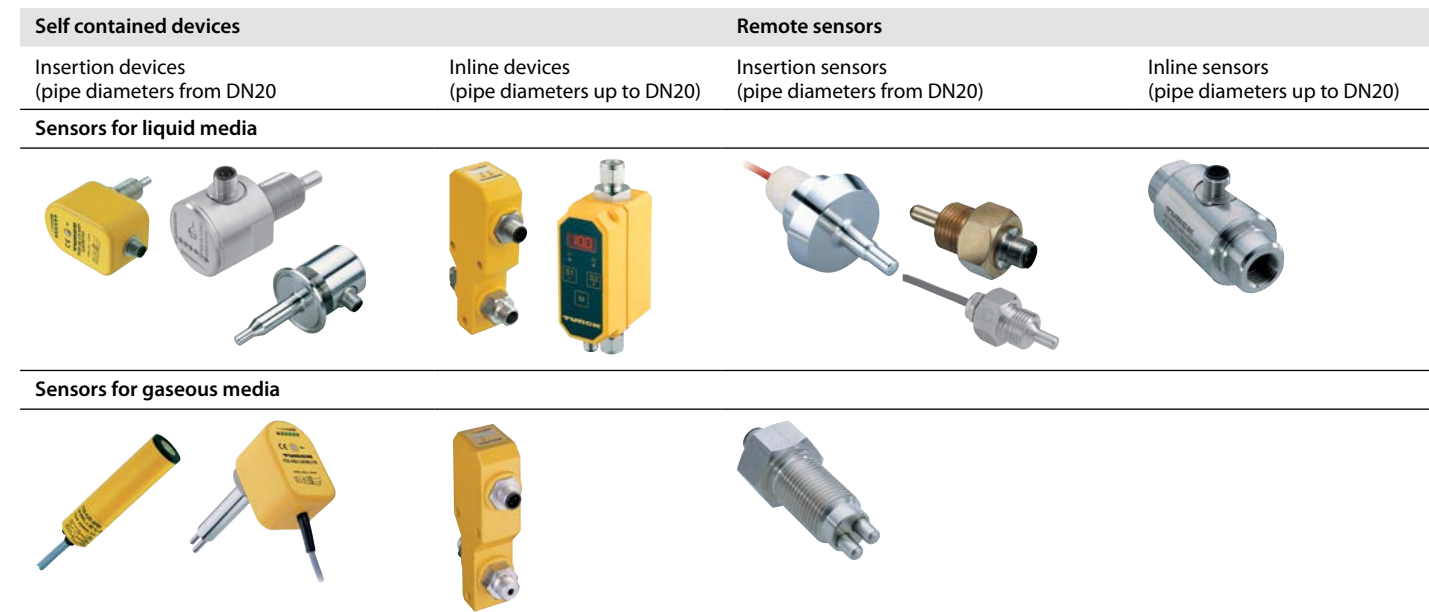


Flow/Flow Rate/Selection Guide



How to find the right sensor?

In order to find the right sensor, please consider your application requirements. Do you need a sensor for liquids, gases or the explosion hazardous area?

Subsequently it is important to know if: A self contained device with integrated processing electronics is required (advantage: local signal processing and display in one device) or a remote sensor combined with a signal processing unit (advantage: small housing style, ideal for mounting in confined spaces)?

Only Ex-remote sensors with separately connected signal processing unit can be mounted in explosion hazardous areas. It is thus important to know the class of Ex-zone where the sensor has to be applied because sensor versions for liquid and gaseous media are also available for explosion hazardous areas.

Signal processing units



Sensors for the Ex area: Zone 0 and 1



Ex-signal processing units



28 subsidiaries and over 60 representations worldwide!

FCS	-	G1/2	A4	-	A	P	8	X	-	H1	1	4	1	/	L080	/	5M
FCS	Functional principle	G1/2 A4 Design			A P 8 X Electrical version			H1 1 4 1 Electrical connection: connector			L120 Special versiond			5M Special cable lengths			
Flow meters FCI Calorimetric, inline flow sensor FCS Calorimetric, insertion flow sensor FCTS Insertion flow sensor with temperature monitoring FTCI Thermal flow meter FCMI Magnetic-inductive flow meter FCVI Vortex flow meter		Sensor-/Housing material A4 Stainless steel A4 (1.4404 or 1.4571) A4P Stainless steel A4 (1.4404 or 1.4571) CT Ceramics/teflon DY PVDF (Dyflor) HA2P Sensor stainless steel A2 (1.4305), housing plastic with union nut HB2 Hastelloy B2 (2.4617) HC22 Hastelloy C22 (2.4603) HC4 Hastelloy C4 (2.4610) P Plastic housing T PTFE TN Titanium alloy (3.7235)			Indications ...X Number of LEDs or multicolor LED Voltage range 8 19.2...28.8 VDC Output mode P PNP output N NPN output R Relay output Output function 2A 2 X NO, working current A 1 X NO, working current R 1 x NC, closed current V Changeover contact LI Analog output (I) LIU NO/NC programmable, analog + I + PNP LU Analog output (U) 2U NO/NC programmable 2 x PNP U NO/NC programmable NA Sensor with downstream electronics (processor unit FM) NAEX Sensor for Ex-zone 1 with downstream electronics (processor unit FMX) NAEXO Sensor for Ex-zone 0 with downstream electronics (processor unit FMX)			Assignment (Stelle 5) 0 M12 x 1 connector (modified) 1 M12 x 1 connector (standard) blank 2 m cable connection Number of contacts 4 4 contacts Connector type 1 Straight Connector type H1 Connector M12 x 1			Special version A Air-flow sensors gaseous media D003 Process connection Varivent D014 Process connection Tri-Clamp D024 Material Test certificate 3.1b D041 Sensor and mounting block glued together D090 High-temperature version up to 100 °C D100 High-temperature version up to 120 °C D500 High-pressure version up to 500 bar L065 Insertion depth 65 mm (incl. thread) L080 Insertion depth 80 mm (incl. thread) L115 Insertion depth 115 mm (incl. thread) L120 Insertion depth 120 mm (incl. thread) L200 Insertion depth 200 mm (incl. thread) M12 Process connection female thread M12 x 1.5 M16 Process connection female thread M12 x 1.5 5M Cable connection, 5 m 10M Cable connection, 10 m 24VDC Supply voltage 24 VDC 230VAC Supply voltage 230 VAC			Cable lengths 5M Cable connection 5 m 10M Cable connection 10 m			
Mechanical connection 50 Tri-Clamp, Ø 50.5 mm 68 Varivent, Ø 68 mm 10D08 Compression fittings for smooth barrel; outer Ø 10 mm 10R09 Compression fittings for smooth barrel; outer Ø 10 mm 10D10 Compression fittings for smooth barrel; outer Ø 10 mm 15D15 Compression fittings for smooth barrel; outer Ø 15 mm 18D15 Compression fittings for smooth barrel; outer Ø 18 mm 34D10 Tri-Clamp, Ø 34 mm (FCI with barrel-Ø 10 mm) D03 gland, 4 mm barrel Ø D04 Male thread G1/4", 4 mm barrel Ø D06 Male thread G1/4", 6 mm barrel Ø D09 Male thread G1/4", 9 mm barrel Ø D15 Male thread G1/2", 15 mm barrel Ø D20 Male thread G3/4", 19 mm barrel Ø DN25 Flange DN25/PN40 or Tri-Clamp DN25 G1/4 Thread G1/4" G1/2 Thread G1/2" GL1/2 Thread G1/2" long GL3/4 Thread G3/4" long H With coupling nut; female thread G1/2" or G1" K20 Smooth barrel Ø 20 mm M18 Threaded barrel M18 x 1 N1/2 Thread 1/2 NPT N1/4 Thread 1/4" NPT N3/4 Thread 3/4 NPT TCD04 Gland Ø 4 mm, inline sensor with 3.6 mm barrel Ø																	

Type code – Example

FCS-GL1/2A4P-AP8X-H1141/L080/D024:
 Insertion-flow sensor – thread G1/2" long, plastic housing, stainless steel sensor A4 – compatible with signal processing unit: NO, PNP output – M12 x 1 connector/insertion length 80 mm (incl. thread) / with material test certificate 3.1b

Overview Flow Sensors and Flow Meters



Flow Sensors

Flow speed or flow rate monitoring of liquid and gaseous media plays an important role in the field of factory and process automation.

There are multiple application possibilities for flow sensors but they mainly fulfill monitoring tasks in cooling circuits, exhaust ducts and air-conditioning systems. In order to detect, display and signal critical changes of flow rates or flow speed to the control system, electronic flow sensors or flow meters are increasingly applied.



Flow sensors

The detection of flow speed does not require exact and costly measuring but rather a reliable monitoring of limit values. Flow sensors thus have to provide a high degree of reproducibility. They detect not only limit values of flow speeds but also the flow drift, meaning the increase or decrease of flow speed. The output signal can either be analog or binary, depending on whether continuous measurement is required or the monitoring of a limit value.

Flow meters

Many processes require a steady flow rate of media in order to guarantee smooth operation and to maintain the quality level of production output. Therefore the measuring of flow rates not only requires a high degree of reproducibility but also accuracy. The current flow rate is shown on the display of the flow meter and a corresponding signal is given out. The output signal can either be analog or binary, depending on whether continuous measurement is required or the monitoring of a limit value.

Monitoring Flow Speed and Flow Rates

Flow sensors for liquid media

Compact devices for liquid media

- Sensors with integrated signal processor
- Sensor and signal processing unit incorporated in one housing, local adjustment and display
- Adjustment via potentiometer, easy handling
- Transistor, relay or current output
- Chemical resistant sensor materials: Hastelloy, titan, ceramics, plastic
- FCS series: Insertion principle
 - Suited for all nominal pipe diameters from DN20
 - Pressure resistance up to 100 bar
 - Adjustable range between 1 cm/s and 300 cm/s

FCI series: Inline principle

- Ideal for small nominal pipe diameters up to DN20,
- Suited for small and middle flow rates,
- No disturbing built-in components, free pipe cross section, no pressure loss
- Short response time within seconds
- Adjustable range between 1 ml/min and 30 l/min

Remote probes for liquids

- Sensors for the connection to intelligent evaluation units of the FM series
- Small housing styles and minimal space requirements

High protection class IP68, maximum mounting freedom

- Chemical resistant sensor materials: Hastelloy, titan, ceramics, plastic
- Adjustment and display at the signal processor in the cabinet
- FCS series: Insertion principle
 - Suited for all nominal pipe diameters from DN20
 - Different immersion lengths
 - High-pressure version up to 500 bar
 - High temperature version up to 120 °C
 - Adjustable range between 1 cm/s and 300 cm/s

FCI series: Inline principle

- Ideal for small nominal pipe diameters up to DN10, suited for small flow rates
- No disturbing built-in components, free pipe cross section, no pressure loss
- Short response time within second
- Adjustable range between 5 ml/min and 6 l/min



Flow meters for liquid media

FTCI series: Thermal inline flow meter

- Ideal for small nominal pipe diameters up to DN20, suited for small and middle flow rates of water and water/glycol mix
- No disturbing built-in components, free pipe cross section, no pressure loss
- Short response time within seconds
- Adjustable range between 1 l/min and 40 l/min
- Measuring tolerance $\leq 10\%$ of full scale
- Two transistor outputs or transistor and current output

FCVI series: Vortex flow meter

- Ideal for small nominal pipe diameters up to DN10, suited for small and middle flow rates of water
- Short response time within seconds
- Adjustable range between 2 l/min and 20 l/min
- Measuring tolerance $\leq 4\%$ of full scale
- Transistor and current output

FCMI series: Magnetic-inductive flow meter

- Ideal for small nominal pipe diameters up to DN15, suited for small and middle flow rates of electrical conductive media $\geq 20 \mu\text{S/cm}$
- No disturbing built-in components, free pipe cross section, no pressure loss
- Short response time within seconds
- Adjustable range between 1 l/min and 80 l/min
- Measuring tolerance $\leq 2\%$ of full scale
- Transistor and current output



Flow sensors for gaseous media

Compact devices for gaseous media

- Sensor and signal processing unit encapsulated in the same housing, local adjustment and display
- Easy adjustment via potentiometer
- Transistor, relay or current output
- FCS series: Insertion principle
 - Suited for all nominal pipe diameters from DN20
 - Pressure resistance up to 30 bar
 - Adjustable range between 0.5 m/s and 30 m/s
- FCI series: Inline principle
 - Ideal for small nominal pipe diameters up to DN10 therefore suited for small flow rates
 - No disturbing built-in components, free pipe cross section, no pressure loss
 - Short response time within seconds
 - Adjustable range between 0.5 m/s and 40 m/s

Remote-Probes für Gase

- Small housing styles and minimal space requirements
- High degree of protection IP68, maximum mounting freedom
- Adjustment and display at the processor in the control cabinet
- FCS series: Insertion principle
 - Suited for all nominal pipe diameters from DN20
 - High-temperature version up to 120 °C
 - Adjustable range between 0.5 m/s and 30 m/s



Intrinsically safe sensors for the explosion hazardous area

Intrinsically safe remote probes for liquids

- Small housing styles and minimal space requirements
- Sensors for zone 0 and 1 available, mounting in explosion hazardous area
- High degree of protection IP68
- Chemical resistant sensor materials: Hastelloy, titan, ceramics, plastic
- Adjustment and display at the signal processor in the cabinet
- FCS series: Insertion principle
 - Suited for all nominal pipe diameters from DN20
 - Different immersion lengths
 - High-pressure version up to 500 bar (only for mounting in zone 1)
 - High-temperature version up to 120 °C (only for mounting in zone 1)
 - Adjustable range between 1 cm/s and 200 cm/s

FCI series: Inline principle

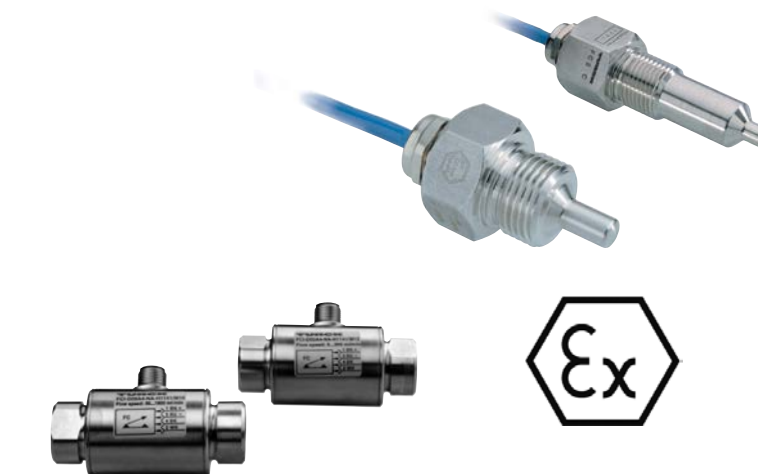
- Ideal for smaller nominal pipe diameters up to DN10, suited for smaller flow rates
- Short response time within seconds
- No disturbing built-in components, free pipe cross section, no pressure loss
- Adjustable range between 10 ml/min and 1.8 l/min

FCS series: Insertion principle

- Suited for all nominal pipe diameters from DN20
- High-temperature version up to 120 °C
- Adjustable range between 2 m/s and 20 m/s

Intrinsically safe sensors for gaseous media

- Small housing styles and minimal space requirements
- Sensors for zone 0 and 1 available, mounting in explosion hazardous area
- High degree of protection IP68, maximum mounting freedom
- Adjustment and display at the signal processor



Signal processing

Intelligent evaluation units for connecting remote probes

- High functionality
 - Intuitive user interface
 - MAX/MIN teaching and QuickTeach
- Simple parameterization
 - Hardware based via touch buttons
 - Software controlled via IO-Link or HART®
- Variety
 - Alternatively with transistor, relay or current output
 - FM for the connection of non-Ex remote probes
 - FMX as associated equipment for the connection of Ex remote-probes (zone 0 and zone 1)
- Comprehensive display and diagnostics
 - On-site via LED
 - Via Software



HART COMMUNICATION PROTOCOL

IO-Link