Flow/Flow Rate/Selection Guide

Self contained devices		Remote sensors	
Insertion devices (pipe diameters from DN20	Inline devices (pipe diameters up to DN20)	Insertion sensors (pipe diameters from DN20)	Inline sensors (pipe diameters up to DN20)
Sensors for liquid media			
			
Sensors for gaseous media			
			

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 hazardeous 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!

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FCS – G1/2 A4 – A P 8 X – H1 1 4 1 / L080 / 5M

FCS Functional principle

- **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

G1/2 A4 Design

- **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)
- **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

A P 8 X Electrical version

- **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)
  - **NAEX0** Sensor for Ex-zone 0 with downstream electronics (processor unit FMX

H1 1 4 1 Electrical connection: connector

- **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

L120 Special versiond

- **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

5M Special cable lengths

- **Cable lenghts**
  - **5M** Cable connection 5 m
  - **10M** Cable connection 10 m

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

Your Global Automation Partner

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 immerson 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 ≤ 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 ≤ 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 ≥ 20 µS/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 ≤ 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

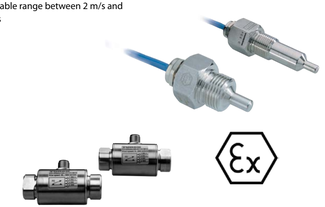
Intrinsically safe remote probes for liquids

- 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 immerson 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

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
- 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



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