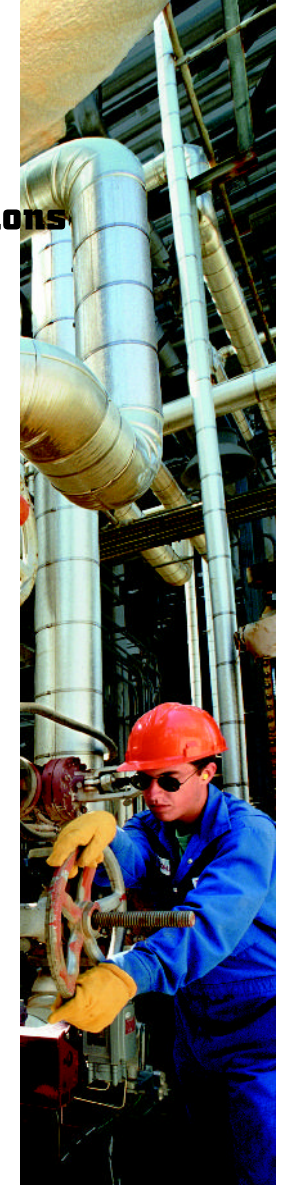
Flow & Temperature

a variety of styles for all of your flow applications



Our wide range of flow products has been specifically designed to fit customer needs. Sensors range from in-line models to self-contained devices, to probe designs with separate signal processor. **TURCK** flow sensors perform with many different media, monitoring liquids, gases and airflow.

What is your flow application?

- monitoring coolant to a critical piece of machinery
- measuring airflow with analog output across a filter
- food and beverage with sanitary requirements
- insertion probe with a separate signal processor
- measuring very low flow rates or minor changes within the flow rate

Whatever the application, **TURCK** has the solution. Our rugged design and repeatability bring a new level of reliability to flow sensing. We meet IP 67 and NEMA 13 standards with various styles. Other versions have pressure resistance up to 7250 psi, and others are able to withstand aggressive materials including acids and caustics.

Solid State with no Moving Parts

All **TURCK** flow and temperature sensors operate on the calorimetric principle. With this technology there are no moving parts that may become stuck or break off. Impure or “dirty” flows are less likely to have an effect on performance, unlike mechanical devices that tend to become frozen or stuck in the “open” position. No matter how demanding your application, you now have a solution that installs easily and gives you the dependable performance you require without extensive downtime.

Product Features

- All wetted parts made of Stainless Steel, Titanium, Hastelloy or Teflon®.
- Reliable calorimetric principle design assures repeatability of ±5% regardless of flow speed.
- Omni-directional monitoring allows you to monitor the flow in any direction.
- Automatic temperature compensation compensates for sudden shifts in flow temperature within specified extremes.

Highest Temperature Gradient in the Industry for Superior Response

TURCK flow monitors have a temperature gradient of 250°C/minute, which is 15 times higher than similar flow devices. This allows them to respond very rapidly to changes in flow rate and makes them especially suited to applications such as monitoring coolant flow to weld tips.

Self-contained Temperature Monitor

TURCK now offers a temperature monitor with digital readout and two switching outputs. This fully programmable device is easy to set up for a wide variety of applications. The two outputs are independent from one another and have adjustable hysteresis. The outputs can also be programmed for normally open or normally closed operation making it easy to perform window functions with “high” and “low” parameters. This unit is fully self-contained and the housing may be rotated for optimal viewing purposes.

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Flow Monitors, Insertion Style

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Flow Monitors, In-Line Style, Self Contained

NEW

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Flow and Temperature Part Number Key

Example:

FCS	-	GL1/2	A2P	-	LIX	-	H1141	/	A
Body Style		British Parallel 1/2 (Longer Probe)	303 Stainless w/ PBT Plastic Housing		4-20 mA Analog Output		***eurofast*** Connection		Optional Modifier

Style	Connection	Material	Circuitry	Connection	Modifier (Optional)	Probe Length	D Number
FCI Inline Flow	N 1/2 NPT 1/2	A2 303 Stainless	NA Requires MK or MS	H1141 ***eurofast***	A Airflow Calibrated	L030 30mm Probe Length	D100 100 Deg. C
FCS Insertion Probe	N 3/4 NPT 3/4	A4 316 Stainless	NAEX Intrinsically Safe Requires MS	H1140 ***eurofast***	No Modifier Fluid Calibrated	L120 120mm Probe Length	D500 500 bar
TC01 Temperature	G 1/4 British parallel 1/4	TN Titanium	AP8X N.O. PNP	B1151 ***minifast***			
	G1/2 British parallel 1/2	HC22 Hastalloy	AN8X N.O. NPN	B3141 ***microfast***			
	GL1/2 British Parallel 1/2 (Longer probe)	HB Hastalloy	ARX N.O. Relay	B3151 ***microfast***			
	D03 Inline 3 mm	DY Diphlora	VRX N.O., N.C. Relay				
	D04 Inline 4 mm	T Teflon (PTFE)	LIX 4-20 mA Analog				
	D09 Inline 9 mm	P Plastic (PBT)	LIAP8X 4-20 mA Analog w/PNP discrete output				
	D10 Inline 10 mm						
	K20 Airflow 20 mm Barrel						

Flow Conversions

The calorimetric principle is dependent on the fluid speed, and not the volumetric flow rate. On the following pages are conversion charts from flow speed to volumetric flow rate.

SCFM = $1.0737 \times ID^2 \times FSM$

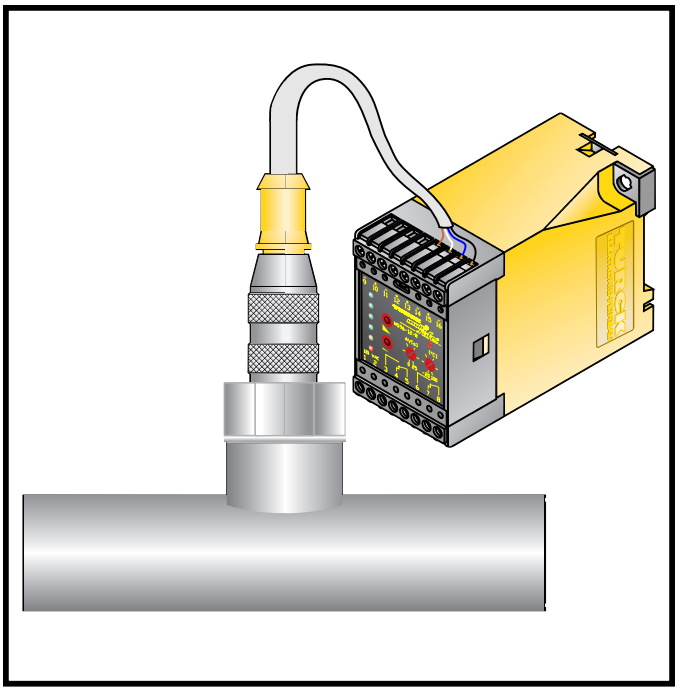
GPM = $0.0803 \times ID^2 \times FS$

FT/S = $0.0328 \times FS$

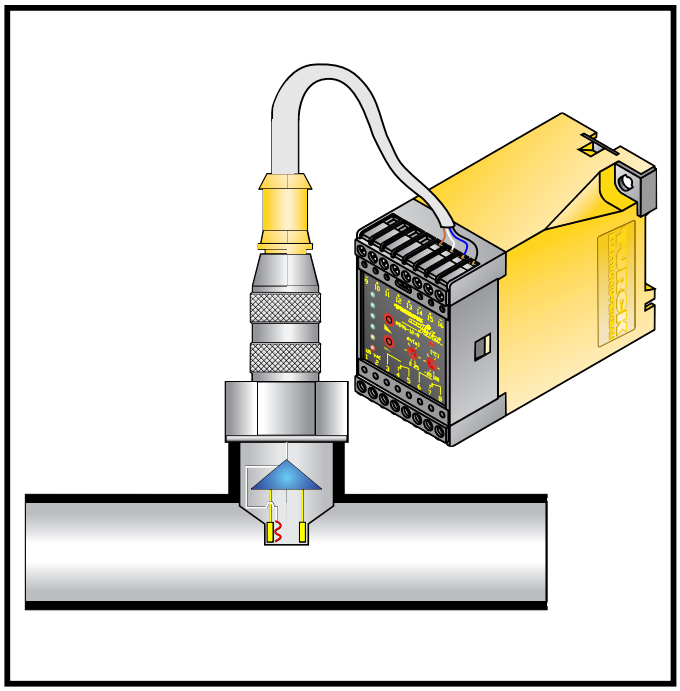
FT/S = $3.2808 \times FSM$

SCFM: standard cubic feet per minute
GPM: gallons per minute
FT/S: feet per second
ID: Inner Diameter of pipe in inches
FS: Flow Speed of fluid in cm/s
FSM: Flow Speed of fluid in m/s

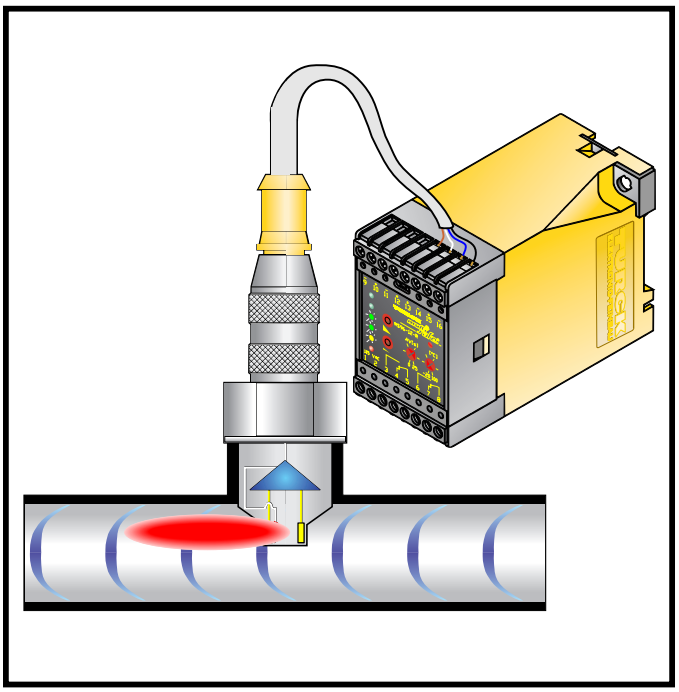
Typical Applications



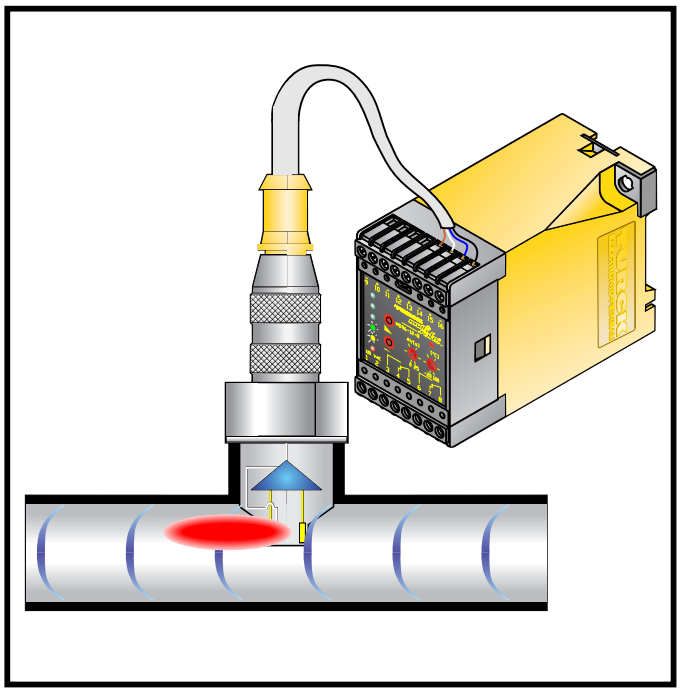
This diagram is an example of an "insertion" style flow monitor which operates on the calorimetric principle. This flow monitor is connected to an MS96-12R signal processor that has relay output connections.



Two temperature resistors located in the probe are connected to a wheatstone bridge. The resistor on the right represents the "reference" resistor, which is heated to the temperature of the medium to be sensed. The resistor on the left is placed next to a heat element that heats to a temperature a few degrees above the medium temperature.

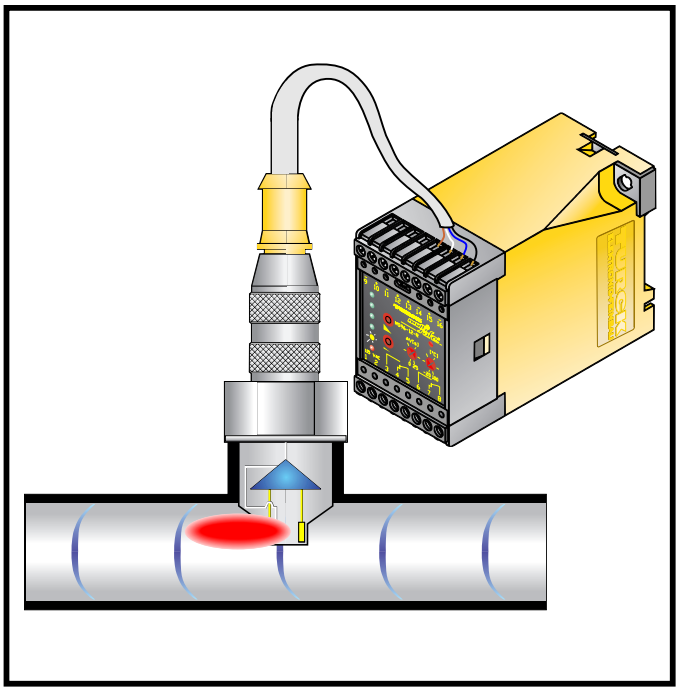


As flow inside the pipe increases, heat is removed from the heat resistor. This results in an increase in the number of green LEDs lit on the MS96-12R signal processor, which is interpreted as an "above setpoint" condition (the relay output is energized).

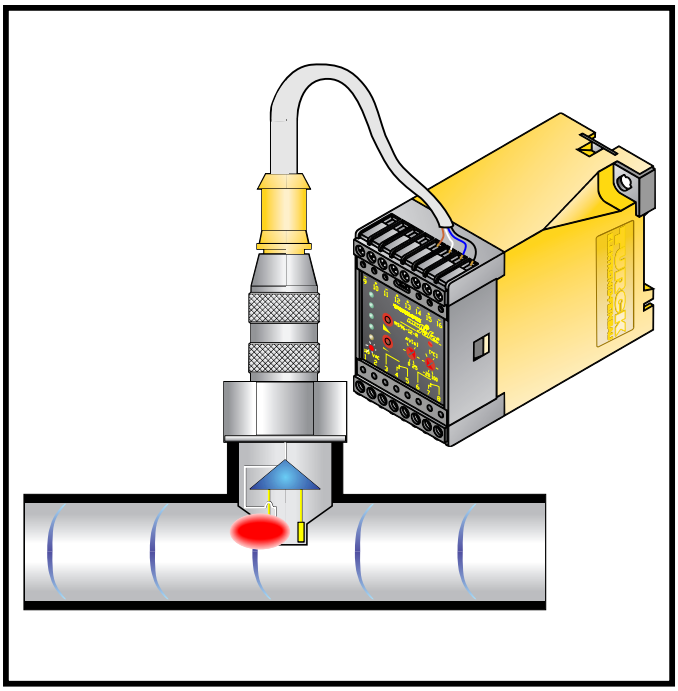


As the flow inside the pipe decreases, heat is still being removed, but at a slower rate. The number of LEDs decreases to only one green. This is still in an "above setpoint" condition (the relay output is still energized).

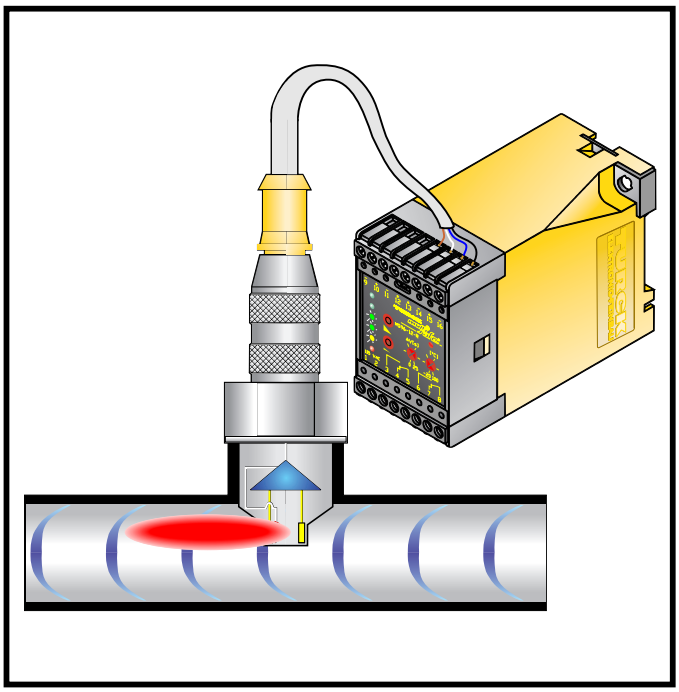
Typical Applications



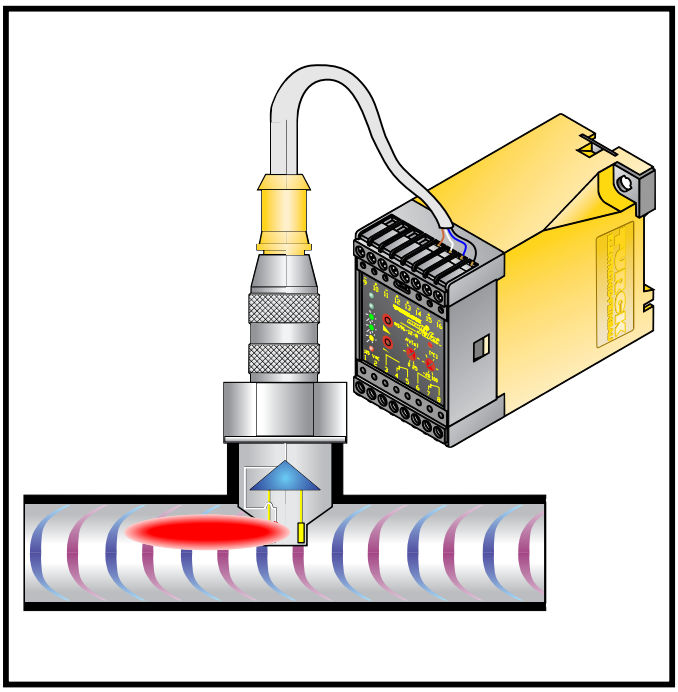
Flow in the pipe decreases even more in this diagram. Now only the yellow LED on the signal processor is lit. This indicates that flow is at the adjusted setpoint (the relay output is still energized).



Flow in the pipe finally decreases to the point in which it is at a "below setpoint" condition. This results in the red LED lighting and output relay de-energizing. Some possible causes of a "below setpoint" condition may be a leak in the pipe, a faulty pump or possibly a clogged filter.



After checking out the problem and taking corrective action, you are ready to start the application again. In this diagram, flow has increased to its original "above setpoint" condition where the two green LEDs are lit and the output relay of the MS96-12R is energized.



This diagram illustrates a normal flow rate but excessive temperature in the medium. The MS96-12R offers temperature detection between -20° to 100°C. This function allows you to set your application to a desired maximum temperature limit and if the medium temperature exceeds this setting, the output temperature relay de-energizes and the red temperature LED on the MS96-12R lights.

Principles of Operation

TURCK flow controls use no mechanical parts to monitor the flow speed of liquids and gasses. These solid state flow switches operate on the calorimetric principle: the measure of heat transfer from an object to a fluid.

The **TURCK** solid state flow monitors use two temperature dependent resistors similar to RTDs. One of the resistors (R_1) monitors the temperature of the surrounding fluid. The other resistor (R_2) is connected to a heating element. The heating element heats R_2 to a temperature that is slightly above the surrounding fluid temperature. When there is no fluid flow, the difference in resistance between R_1 and R_2 is a fixed value. As fluid moves over the flow monitor probe, heat is conducted away from the heating element causing the temperature on R_2 to decrease. This heat loss changes the difference in resistance between R_1 and R_2.

The resistance difference is measured by a Wheatstone bridge circuit. A change in resistance difference causes a change in the bridge voltage. The flow set point is determined by comparing the bridge voltage to a reference voltage.

Figure 1

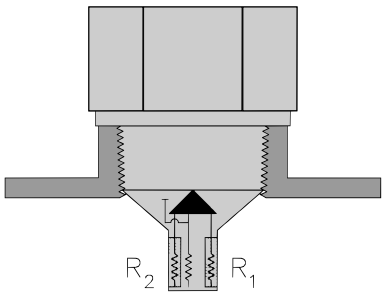
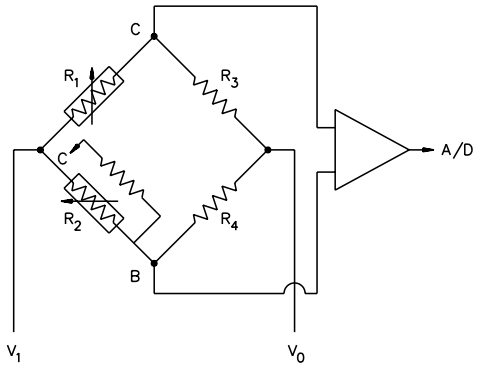


Figure 2



R_1 - Monitors fluid temperature
R_2 - Heated by heating element
R_3 - Internal resistor
R_4 - Internal resistor

Operating Range

Heat loss on the heating element will likewise determine the sensitivity of the monitor. The heat loss becomes a function of flow velocity and thermal conductivity of the fluid. The lower the thermal conductivity of the fluid, the faster the fluid has to flow to be detected.

Flow monitor operating ranges vary from one type of fluid to the other. These operating ranges are proportional to the speed of the fluid that the monitor can detect.

At the same flow rate compared to water, air can conduct away from the heating element only a fraction of the heat. For example, for A2/A4 stainless steel insertion type monitors the operating range for air flow is from 2 to 30 m/s, and for water from 1 to 150 cm/s. For oil, the range is between the 3 to 300 cm/s.

Response Time

Temperature Gradient

The temperature gradient of a fluid indicates the change in fluid temperature within a specified time (unit of measure: °C (°F)/min). The temperature gradient of a device defines the maximum temperature rise that can be compensated by the monitor without malfunction.

The monitor has the ability to compensate for **sudden thermal shifts within the specified extremes**. Sudden temperature changes exceeding the specified tolerances (temperature error) may cause the device to malfunction. Only when the monitor has adapted to the new temperature, will it provide an accurate measurement.

The temperature gradient for **TURCK** flow controls is 250°C/min - 15 times higher than standard flow devices which makes for a particularly accurate switch-point stability during variations in temperature.

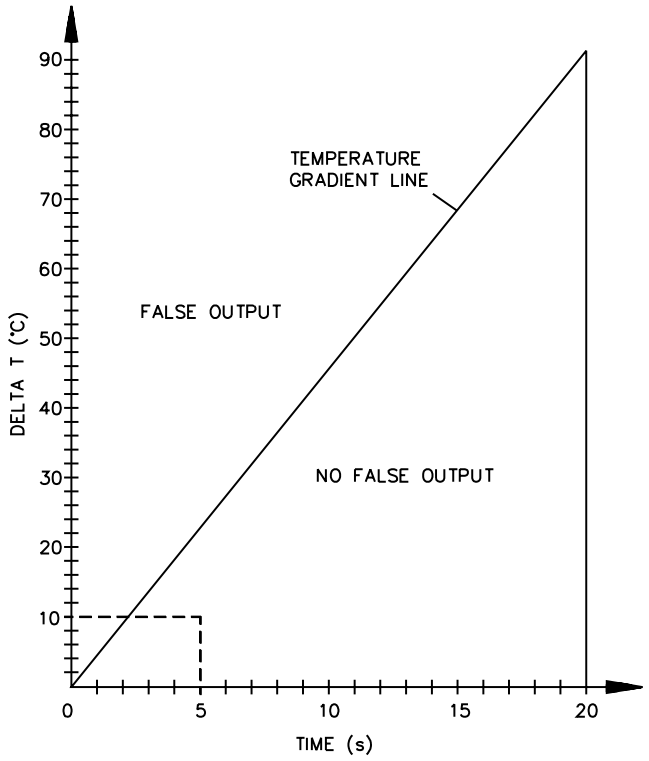
The sensitivity to temperature rise of **TURCK** flow monitors has been reduced to a minimum (<12 s) and can accurately be determined in advance. This characteristic is the result of the optimum calorimetric principle and special monitors construction.

- Housing thickness 0.8 mm
- Symmetrically positioned monitor probes
- Fully potted monitors
- Components, quality and layout

Fahrenheit = (1.8 X C°) + 32

Graph 1

Temperature Gradient for Stainless Steel Housing



Graph 1 can be used to determine if the **TURCK** flow monitor can compensate for a temperature change to a sensed medium. The dotted line in the graph indicates that a 10°C change has occurred in a time period of 5 seconds. Points (5,10) intersect in the "No False Output" region of the graph. This example illustrates an acceptable degree of temperature change in the application. As a result, the flow monitor can compensate for the fluid temperature change.

Response Time (continued)

Availability

The availability is the time required, after power has been applied, for the flow monitor to reach a stable operating condition. The availability provides for the time needed to energize the flow monitor and the time needed for the flow monitor to stabilize at the fluid's temperature.

Switch On / Switch Off Time

The switch on time is the time required for the flow monitor to detect and indicate that the flow speed is increasing. The switch off time is the time required for the flow monitor to detect and indicate that the flow speed is decreasing.

Effects of Housing Material

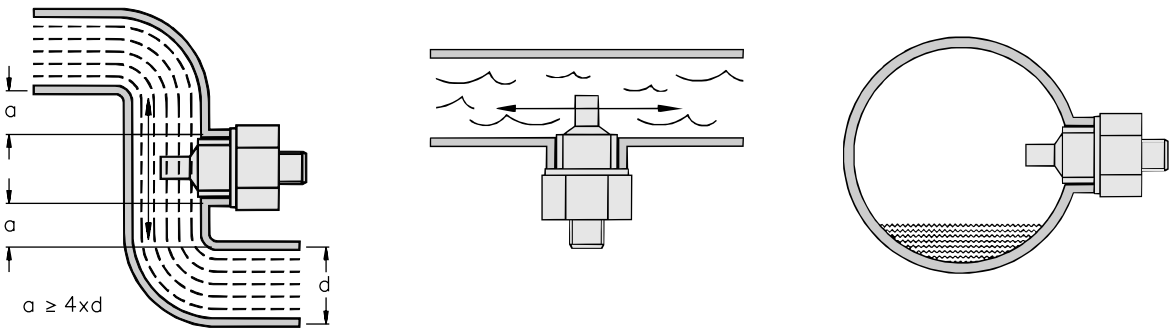
The switch on time, the switch off time and the temperature gradient of the flow monitor is dependent on the housing material. The Teflon® flow monitors have a low thermal conductivity causing a slower response time to fluid temperature changes and to changes in the flow speed.

Mounting Instructions

Areas of turbulent flow occur whenever there is a change in the pipe construction (e.g. pipe inlets, pipe outlets, pipe elbows). To avoid an inaccurate output, the following guidelines should be observed:

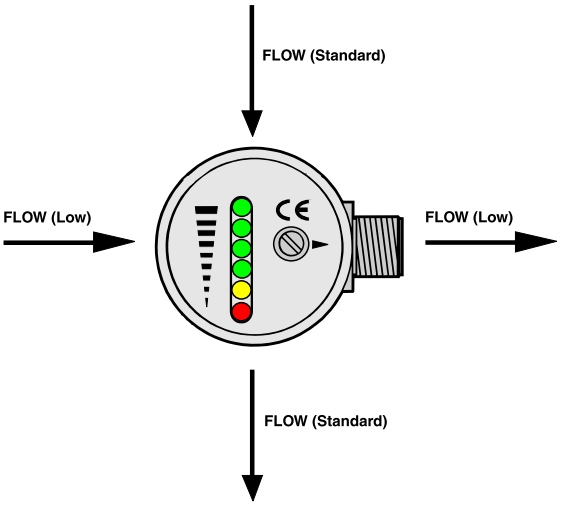
A) Pay special attention to the minimum distance (a≥4xd) to tube bend and intersections.
B) Flow monitor must be mounted from below in applications where medium does not completely fill the pipe.
C) If a possibility of deposit build-up exists, mount the flow monitor at the side of the pipe.

A) **B)** **C)**

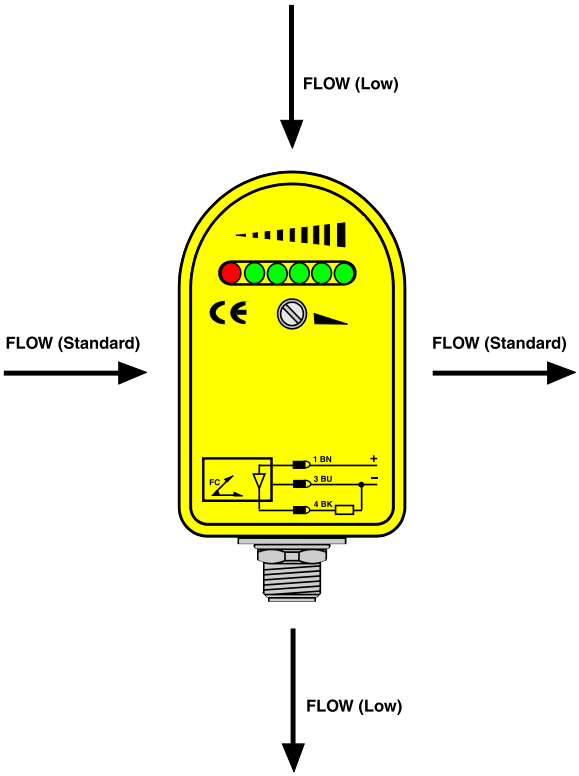


Proper Orientation for TURCK Flow Monitors

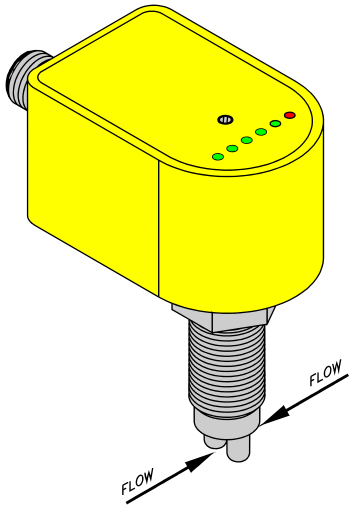
Self-Contained Metal Housing



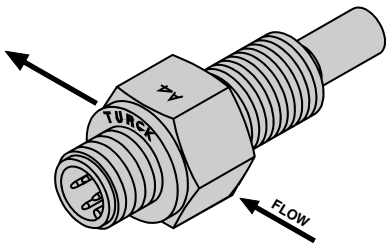
Self-Contained Plastic Housing



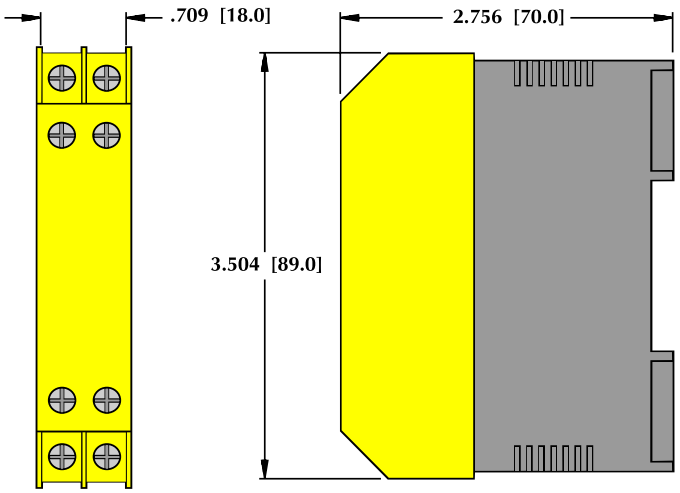
Dual Tipped



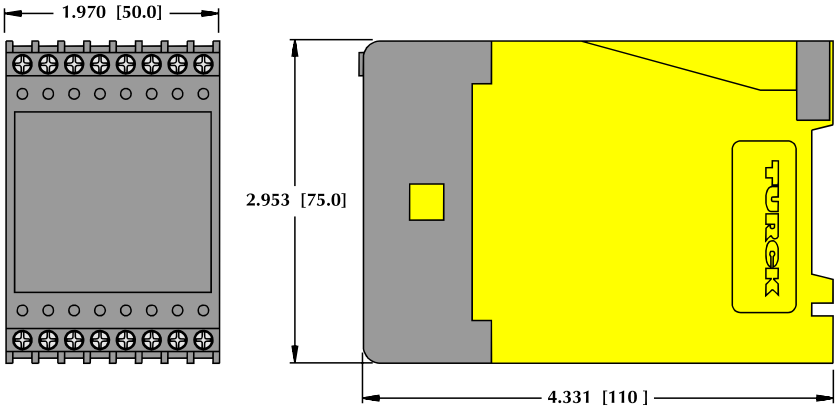
Insertion Style



multimodul® Dimensions



multisafe® Dimensions

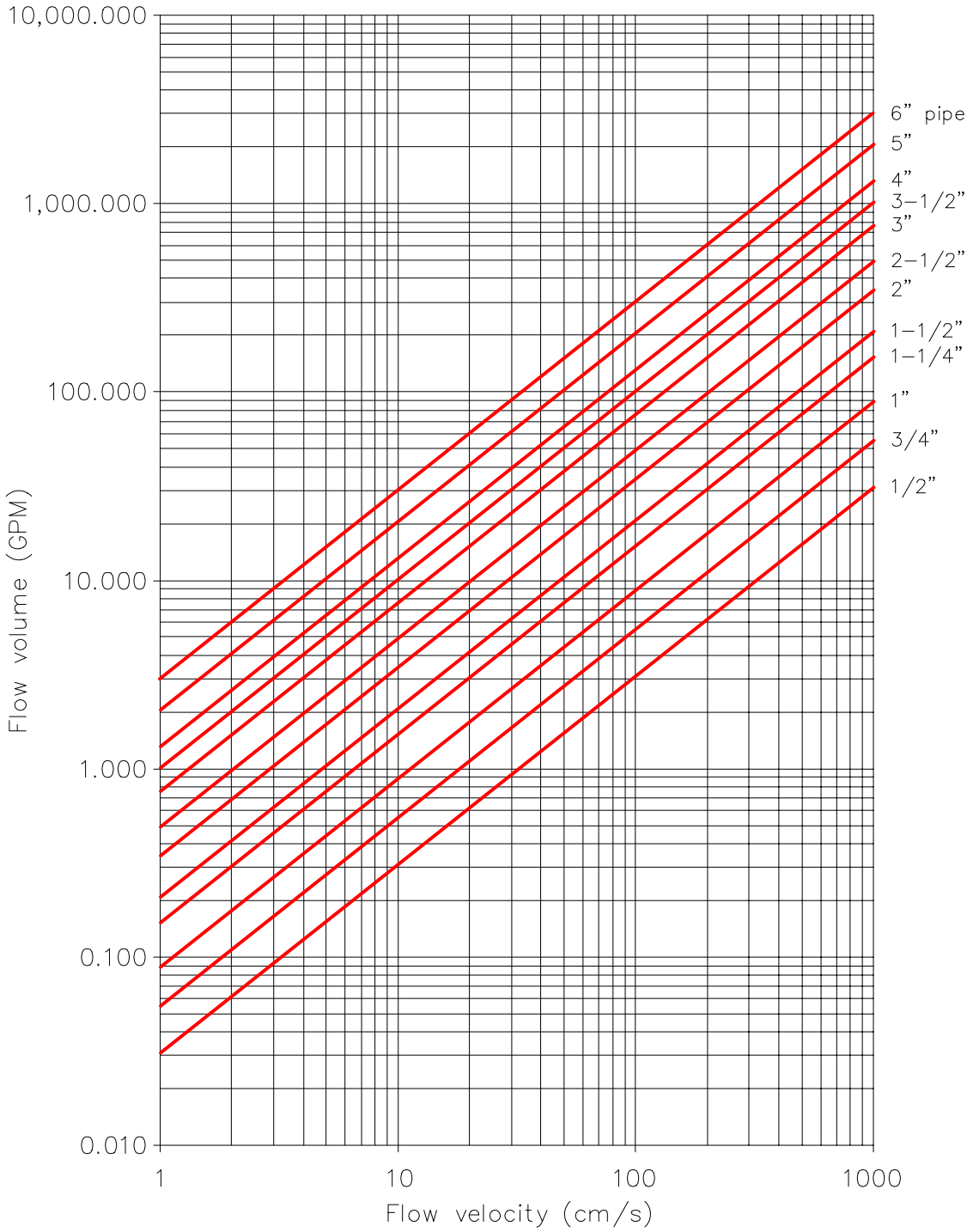


Notes:

Liquid Flow Conversion Chart (water)

Flow velocity to flow volume for schedule 40 pipes of various sizes (Graph 2).

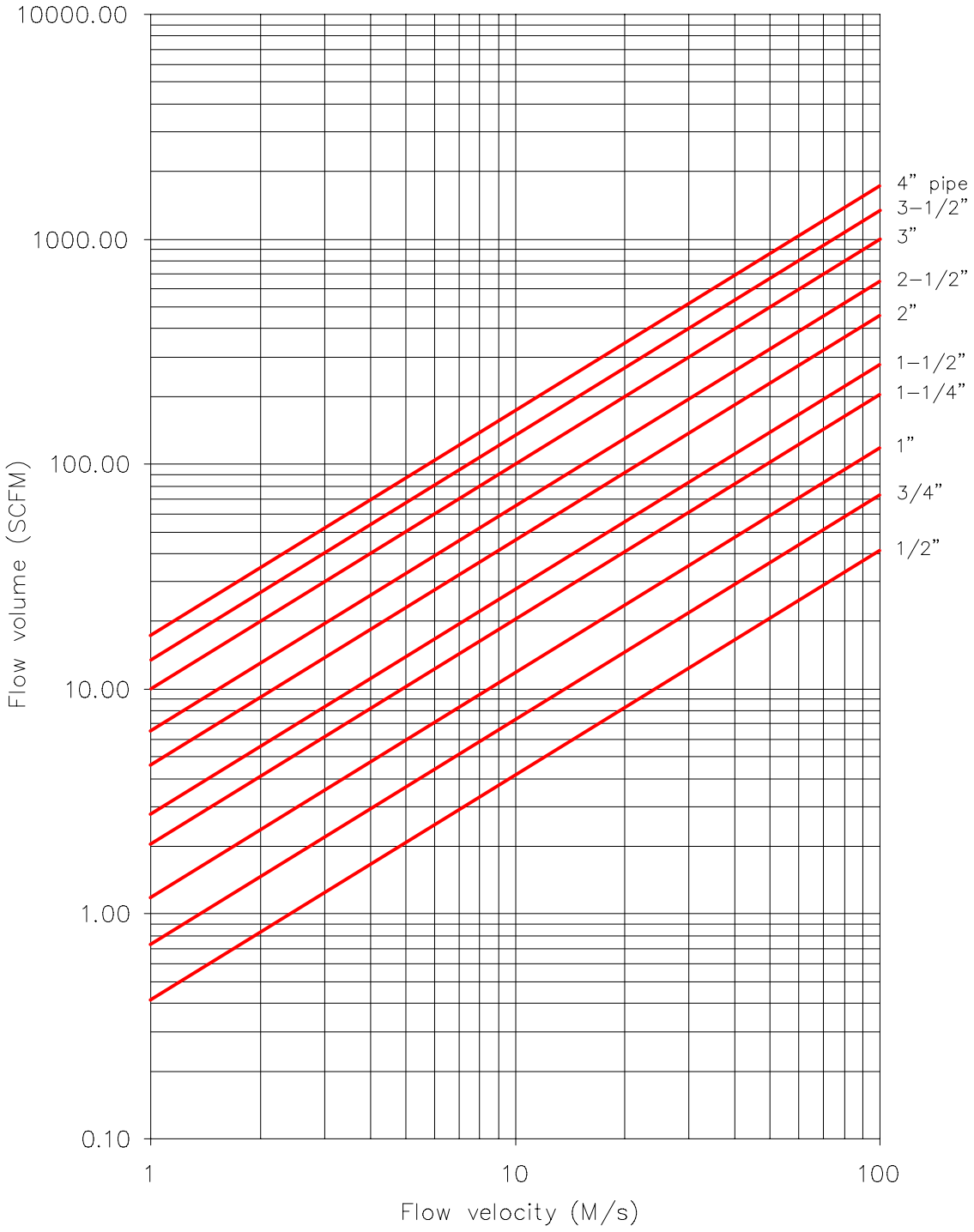
Graph 2



Gas Flow Conversion Chart

Flow velocity to flow volume for schedule 40 pipes of various sizes (Graph 3).

Graph 3



FCS-N1/2 A4P-ARX-B3141
FCS-N1/2 A4P-ARX-B1151

- **Self-contained compact housing for monitor and signal processor**
- **Pressure resistance up to 870 psi**
- **Enclosure meets IP 67, NEMA 1, 3, 4, 4x, 12, 13**
- **Maximum setpoint accuracy during changes in flow temperature**
- **Simple adjustment by means of potentiometer**
- **Relay output for 250 VAC/4 A, N.O.**

With the FCS series self-contained devices, the flow monitor and the signal processor are incorporated in one compact housing. This device is ideal for monitoring liquid flow speed in the 2 to 295 ft/min range.

The flow monitor is designed to be installed directly into a pipeline, with the sensing probe inserted into the flow. This makes it suitable for various pipe diameters.

The unit provides 1/2 NPT thread mounting and is rated for pressures up to 870 psi. The probe is made of 316TI stainless steel and the housing is made of plastic.

Switch actuation point adjustments (in reference to flow rate) are achieved by means of a potentiometer located under the protective screw cap on the front of the device.

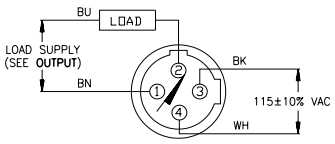
Each of the six LEDs display the difference between the actual flow speed in comparison to the flow speed that the setpoint is adjusted to.

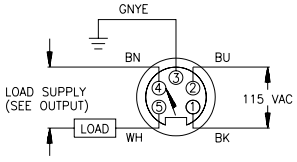
Red LED:	flow is below set point
Yellow LED:	flow is at or above set point
Green LEDs:	degree of deviation in excess from setting (1, 2, 3 or 4 LEDs are on or illuminated)

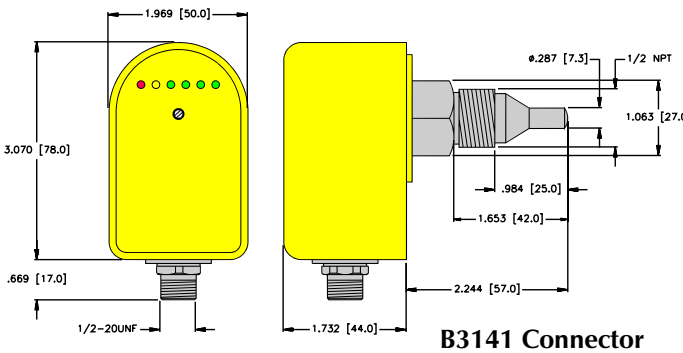
When the red LED illuminates, the relay output is de-energized; when the yellow LED illuminates, the relay output is energized.

Flow Monitors
AC Self Contained with Relay Output
FCS-N1/2 A4P-ARX-B3141
FCS-N1/2 A4P-ARX-B1151

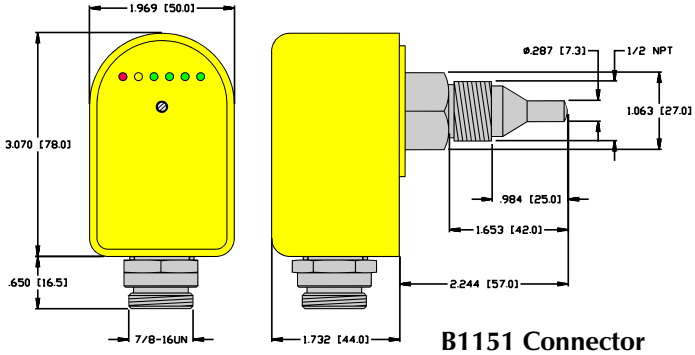
Type	FCS-N1/2 A4P-ARX-B3141	FCS-N1/2 A4P-ARX-B1151
ID Number	M6871037	M6871025
Operating Voltage	115 VAC ±15%	115 VAC ±15%
Power / Current consumption	≤40 mA	≤40 mA
Output	relay output, N.O.	relay output, N.O.
Switching current	≤4 A	≤4 A
Switching voltage	≤250 VAC / 60 VDC	≤250 VAC / 60 VDC
Switching capacity	≤1000 VA / 60 W	≤1000 VA / 60 W
Temperature Range (flow)	-20° to +80°C (-4° to +176°F) cont.	-20° to +80°C (-4° to +176°F) cont.
Operating Range (flow rate)		
Water	1-150 cm/s (2-295 ft/min)	1-150 cm/s (2-295 ft/min)
Oil	3-300 cm/s (6-590 ft/min)	3-300 cm/s (6-590 ft/min)
Repeatability	±5% of full range	±5% of full range
Time Delay Before Availability	2-15 s (8 s typical)	2-15 s (8 s typical)
Switch ON time (above setpoint)	1-13 s (2 s typical)	1-13 s (2 s typical)
Switch OFF time (below setpoint)	1-15 s (2 s typical)	1-15 s (2 s typical)
Temperature gradient	max. 250°C/min. (450°F/min.)	max. 250°C/min. (450°F/min.)
Pressure Rating	1450 psi (100 bar)	1450 psi (100 bar)
LED Indications		
Below setpoint, output de-energized	red	red
At setpoint, output energized	yellow	yellow
Above setpoint, output energized	green (4), in addition to yellow LED	green (4), in addition to yellow LED
Probe Material (DIN 2 462/17 440)	316TI stainless steel (1.4571)	316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,4x,12,13	IP 67, NEMA 1,3,4,4x,12,13
Temperature rating	-25° to +80°C (-13° to +176°F)	-25° to +80°C (-13° to +176°F)
Torque	100 Nm (73.7 ft-lb)	100 Nm (73.7 ft-lb)
Housing Material	PBT	PBT
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,4x,12,13	IP 67, NEMA 1,3,4,4x,12,13
Operating temperature	-25° to +60°C (-13° to +140°F)	-25° to +60°C (-13° to +140°F)
Connection	4-wire ***microfast*** quick disconnects KB 4T-*/S727 or WKB 4T-*/S727 (Page 67) * = Length in meters	5-wire ***minifast*** quick disconnects RKM 50-* or WKM 50-* (Page 69) * = length in meters







B3141 Connector



B1151 Connector

FCS-N1/2 A4-AP8X-H1141
FCS-G1/2 A4-AP8X-H1141

- **All stainless steel housing**
- **DC PNP/NPN transistor output, short-circuit protected**
- **Flow monitor and signal processor in one compact housing**
- **Dynamic pressure resistance up to 870 psi**
- **Simple adjustment by means of potentiometer**

This DC self-contained flow device has a flow monitor and signal processor incorporated into one compact housing. It is ideal for monitoring liquid flow speeds in the 2 to 295 ft/min range.

The flow monitor is designed for installation directly into the pipeline by means of a pipe-tee or welded pipe socket. It is suitable for use in a 1/2 inch pipe diameter or larger.

The flow monitor housing is made of 316TI stainless steel, and is rated for dynamic pressures up to 870 psi. The output features a short-circuit protected PNP transistor.

Setpoint adjustments, in reference to flow speed, are achieved by means of an adjuster located under the protective screw cap on the front of the device.

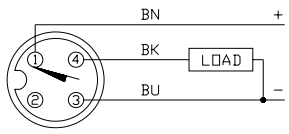
The output is de-energized when the flow speed is below the setpoint; the output is energized when flow speed is above the setpoint. Six LEDs display the flow speed in comparison to the flow speed that the setpoint is adjusted to. The LEDs operate as follows:

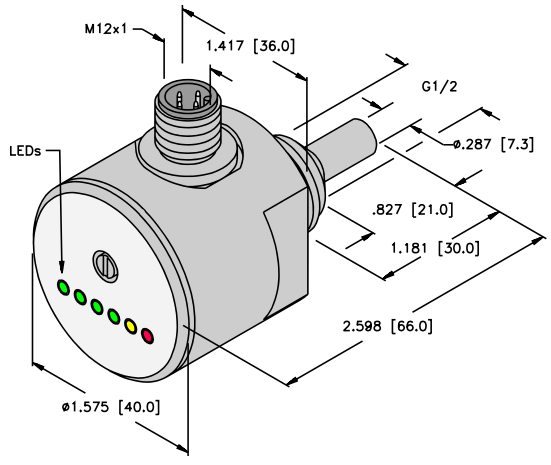
Red LED: flow is below setpoint
Yellow LED: flow is at or above setpoint
Green LEDs: each LED indicates a percentage of flow above the setpoint

Notes: Also available in PVDF (Dyflor) housing material.
Available with NPN transistor output or relay output.
Consult factory.

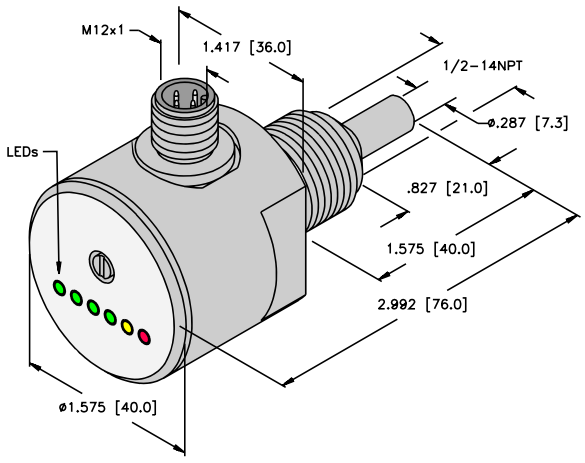
Flow Monitors
DC Self Contained
FCS-N1/2 A4-AP8X-H1141
FCS-G1/2 A4-AP8X-H1141

Type	FCS-N1/2 A4-AP8X-H1141	FCS-G1/2 A4-AP8X-H1141
ID Number	M6871004	M6870004
Operating Voltage	19.2 - 28.8 VDC (including ripple)	19.2 - 28.8 VDC (including ripple)
Power / Current consumption	≤70 mA	≤70 mA
Output	PNP transistor, short-circuit and reverse polarity protected	PNP transistor, short-circuit and reverse polarity protected
Switching current	≤400 mA	≤400 mA
Voltage drop	≤1.5 V at 400 mA	≤1.5 V at 400 mA
Temperature Range (fluid)	-25° to +80°C (-13° to +176°F) cont. up to 100°C (212°F) for approx. 10 min.	-25° to +80°C (-13° to +176°F) cont. up to 100°C (212°F) for approx. 10 min.
Operating Range (flow rate)		
Water	1-150 cm/s (2-295 ft/min)	1-150 cm/s (2-295 ft/min)
Oil	3-300 cm/s (6-590 ft/min)	3-300 cm/s (6-590 ft/min)
Repeatability	±5% of full range	±5% of full range
Time Delay Before Availability	2-15 s (8 s typical)	2-15 s (8 s typical)
Switch ON time (above setpoint)	1-13 s (2 s typical)	1-13 s (2 s typical)
Switch OFF time (below setpoint)	1-15 s (2 s typical)	1-15 s (2 s typical)
Temperature gradient	max. 250°C/min. (450°F/min.)	max. 250°C/min. (450°F/min.)
Pressure Rating	1450 psi (100 bar)	1450 psi (100 bar)
LED Indications		
Below setpoint, output de-energized	red	red
At setpoint, output energized	yellow	yellow
Above setpoint, output energized	green (4)	green (4)
Housing Material (DIN 2 462/17 440)	316TI stainless steel (1.4571)	316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,4x,12,13	IP 67, NEMA 1,3,4,4x,12,13
Operating temperature (ambient)	-25° to +80°C (-13° to +176°F)	-25° to +80°C (-13° to +176°F)
Torque	100 Nm (73.7 ft-lb)	100 Nm (73.7 ft-lb)
Connection	3-wire ***eurofast*** quick disconnect 150 m max. cable length (22 AWG) RK 4T-* or WK 4T-* (Page 65) * = length in meters	3-wire ***eurofast*** quick disconnect 150 m max. cable length (22 AWG) RK 4T-* or WK 4T-* (Page 65) * = length in meters





FCS-G1/2 A4-AP8X-H1141



FCS-N1/2 A4-AP8X-H1141

FCS-N1/2 A4P-AP8X-H1141

- **DC PNP/NPN transistor output, short-circuit protected**
- **Flow monitor and signal processor in one compact housing**
- **Dynamic pressure resistance up to 870 psi**
- **Simple adjustment by means of potentiometer**

This DC self-contained flow device has a flow monitor and signal processor incorporated into one compact housing. It is ideal for monitoring liquid flow speeds in the 2 to 295 ft/min range.

The flow monitor is designed for installation directly into the pipeline by means of a pipe-tee or welded pipe socket. It is suitable for use in a 1/2 inch pipe diameter or larger.

The flow monitor probe is made of 316TI stainless steel and the housing is made of plastic. The flow monitor is rated for dynamic pressures up to 870 psi. The outputs of the monitors feature a short-circuit protected PNP transistor.

Setpoint adjustments, in reference to flow speed, are achieved by means of an adjuster located under the protective screw cap on the front of the device.

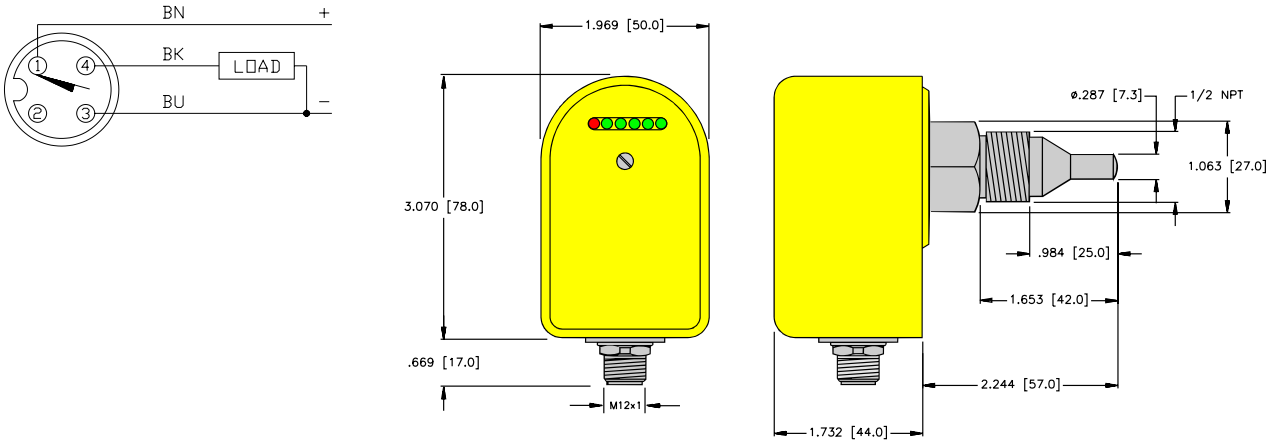
The output is de-energized when the flow speed is below the setpoint; the output is energized when flow speed is above the setpoint. Each of the six LEDs display the difference the actual flow speed in comparison to the flow speed that the setpoint is adjusted to. The LEDs operate as follows:

Red LED: flow is below set point
Yellow LED: flow is at or above set point
Green LEDs: each LED indicates a percentage of flow above the setpoint

Notes: Available with relay output. Consult factory.

Flow Monitors
DC Self Contained
FCS-N1/2 A4P-AP8X-H1141

Type	FCS-N1/2 A4P-AP8X-H1141
ID Number	M6871032
Operating Voltage	19.2 - 28.8 VDC (including ripple)
Power / Current consumption	≤65 mA
Output	PNP transistor, short-circuit and reverse polarity protected
Switching current	≤400 mA
Voltage drop	≤1.5 V at 400 mA
Temperature Range (flow)	-25° to +80°C (-13° to +176°F) cont. up to +100°C (+212° F) for approx.10 min.
Operating Range (flow rate)	
Water	1-150 cm/s (2-295 ft/min)
Oil	3-300 cm/s (6-590 ft/min)
Repeatability	±5% of full range
Time Delay Before Availability	2-15 s (8 s typical)
Switch ON time (above setpoint)	1-13 s (2 s typical)
Switch OFF time (below setpoint)	1-15 s (2 s typical)
Temperature gradient	max. 250°C/min. (450°F/min.)
Pressure Rating	1450 psi (100 bar)
LED Indications	
Below setpoint, output de-energized	red
At setpoint, output energized	yellow
Above setpoint, output energized	green (4), in addition to yellow LED)
Probe Material (DIN 2 462/17 440)	316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,4x,12,13
Temperature rating	-25° to +80°C (-13° to +176°F)
Torque	100 Nm (73.7 ft-lb)
Housing Material	PBT
Enclosure (DIN 40 050)	IP 67, NEMA 1, 3, 4, 4x, 12, 13
Operating temperature	-25° to +80°C (-13° to +176°F)
Connection	3-wire ***eurofast*** quick disconnects RK 4T-* or WK 4T-* (Page 65) * = Length in meters



FCS-N1/2 A4P-AP8X-H1141

FCS-G1/4 A4-ARX-H1140

- **All stainless steel housing**
- **Flow monitor and signal processor in one compact housing**
- **Dynamic pressure resistance up to 870 psi**
- **Simple adjustment by means of potentiometer**
- **Relay output for 60 VDC/1 A, N.O.**

This DC self-contained flow device has a flow monitor and signal processor incorporated into one compact housing. It is ideal for monitoring liquid flow speeds in the 2 to 295 ft/min range.

The flow monitor is designed for installation directly into the pipeline by means of a pipe-tee or welded pipe socket. It is suitable for use in a 1/2 inch pipe diameter or larger.

The flow monitor housing is made of 316TI stainless steel, and is rated for dynamic pressures up to 870 psi.

Setpoint adjustments, in reference to flow speed, are achieved by means of an adjuster located under the protective screw cap on the front of the device.

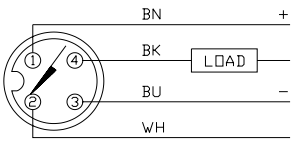
The output is de-energized when the flow speed is below the setpoint; the output is energized when flow speed is above the setpoint. Six LEDs display the flow speed in comparison to the flow speed that the setpoint is adjusted to. The LEDs operate as follows:

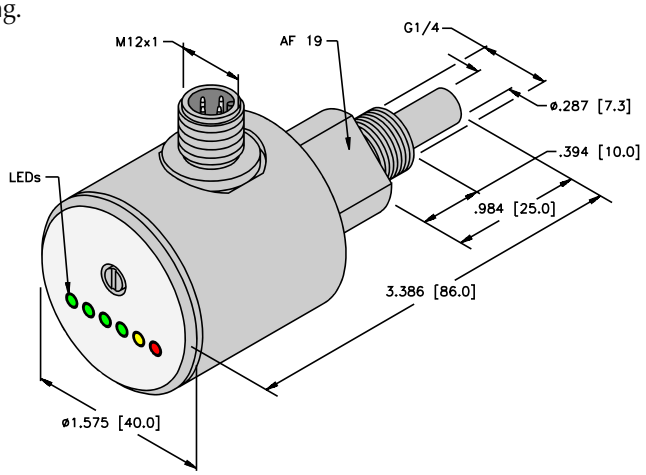
Red LED:	flow is below set point
Yellow LED:	flow is at or above set point
Green LEDs:	each LED indicates a percentage of flow above the setpoint

Flow Monitors
DC Self Contained
with Relay Output
FCS-G1/4 A4-ARX-H1140

Type	FCS-G1/4 A4-ARX-H1140
ID Number	M6870102
Operating Voltage	24 VDC ±20%
Power / Current consumption	≤70 mA
Output	
Switching current	≤1 A
Switching Voltage	≤60 VDC
Switching Capacity	≤60 W
Temperature Range (fluid)	-25° to +80°C (-13° to +176°F) cont.
Operating Range (flow rate)	
Water	1-150 cm/s (2-295 ft/min)
Oil	3-300 cm/s (6-590 ft/min)
Repeatability	±5% of full range
Time Delay Before Availability	2-15 s (8 s typical)
Switch ON time (above setpoint)	1-13 s (2 s typical)
Switch OFF time (below setpoint)	1-15 s (2 s typical)
Temperature gradient	max. 250°C/min. (450°F/min.)
Pressure Rating	1450 psi (100 bar)
LED Indications	
Below setpoint, output de-energized	red
At setpoint, output energized	yellow
Above setpoint, output energized	green (4)
Housing Material (DIN 2 462/17 440)	316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,4x,12,13
Operating temperature	-25° to +80°C (-13° to +176°F)
Torque	100 Nm (73.7 ft-lb)
Connection	4-wire ***eurofast*** quick disconnect 150 m max. cable length (22 AWG) RK 4.4T-* or WK 4.4T-* (page 65) * = length in meters

Note: G threading refers to British parallel pipe (BSPP) threading.





FCS-G1/4 A4-ARX-H1140

FCS-N1/2 A4P-LIX-H1141

- **Flow monitor and signal processor in one compact unit**
- **Housing made of Crastin**
- **Pressure resistant up to 435 psi**
- **Current output from 4 to 20 mA**
- **Enclosure meets IP 67**
- **Simple adjustment by means of potentiometer**

The FCS-N1/2 A4P-LIX-H1141 series incorporates the flow monitor and signal processor into one compact housing. These devices are ideal for monitoring liquid flow speeds in the 5 to 150 cm/s range.

The flow monitor is designed for installation into the pipeline by means of a pipe tee or welded pipe socket. It is suitable for a wide variety of pipe diameters.

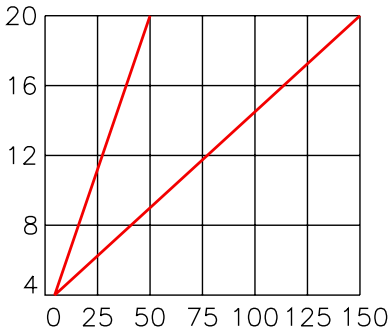
The 1/2 NPT thread mounting is pressure resistant up to 435 psi. A V/I signal converter converts the internal analog voltage signal into a standard 4 to 20 mA analog current signal.

A potentiometer serves for Analog adjustments in reference to the flow speed. At maximum flow speed, the output of the monitor is 20 mA. The output signal is factory preset for 20 mA at 150 cm/s (water). The 20 mA output is adjustable from 50 cm/s to 150 cm/s.

Six LEDs display the output signal based on the flow velocity.

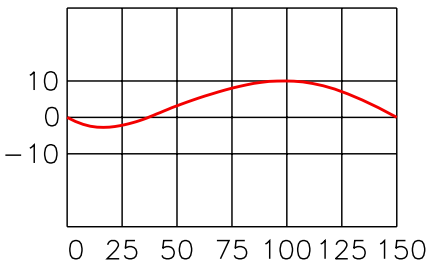
Note: Flow settings are factory calibrated for water at 20°C. The settings are 4 mA at approx. 5 cm/s and 20 mA at approx. 150 cm/s.

Output Current [mA]



Flow Rate [cm/s]

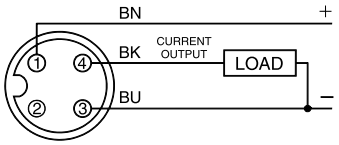
Linearity Deviation [%]

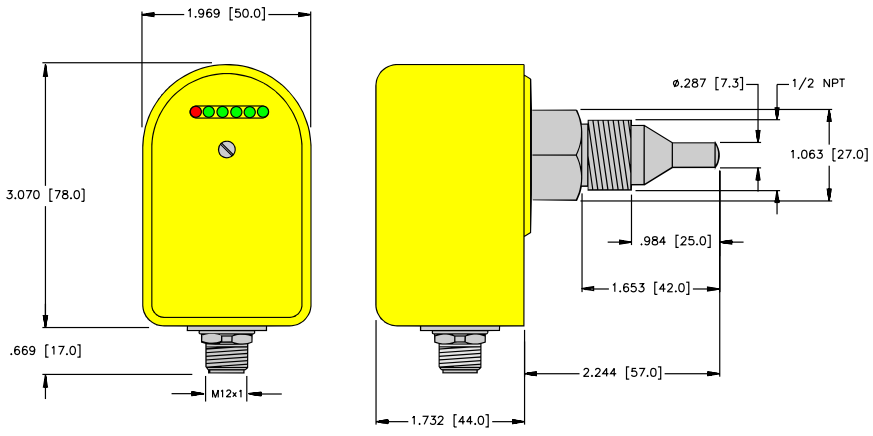


Flow Rate [cm/s]

Flow Monitors
DC Self Contained
Linear Analog Output
FCS-N1/2 A4P-LIX-H1141

Type	FCS-N1/2 A4P-LIX-H1141
ID Number	M6871041
Operating Voltage	21.6 to 26.4 VDC (includes ripple)
Power / Current consumption	≤100 mA
Output	current output
Load	≤500 Ω
Output current	4 to 20 mA (25 mA max.)
Linearity Deviation	≤10%
Temperature Range (flow)	-25° to 75°C (-13° to 167°F)
Operating Range (flow rate)	
Water	5-150 cm/s
Time Delay Before Availability	2-15 s (8 s typical)
Response time	1-15 s
Pressure Rating	435 psi (30 bar)
LED Indications	
Output status	5 green, 1 red
1 to 6 illuminate:	
- LED 6	≥20 mA
- LED 5	>16 mA
- LED 4	>12 mA
- LED 3	> 8 mA
- LED 2	> 4 mA
- LED 1 (red)	= 4 mA
Probe Material (DIN 2 462/17 440)	316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,4x,12,13
Torque	100 Nm (73.7 ft-lb)
Housing Material	PBT
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,4x,12,13
Operating temperature	-25° to 80°C (-13° to 176°F)
Connection	3-wire ***eurofast***® quick disconnects
Mating cordset	RK 4T-* or WK 4T-* (page 65)
	* = Length in meters
Accessories	2 sealing rings
	1 screwdriver for span adjustment





FCS-N1/2 A4-NA-H1141
FCS-N3/4 A4-NA-H1141
FCS-G1/4 A4-NA-H1141
FCS-GL1/2 A4-NA-H1141/D500
FCS-G1/2 TN-NA-H1141
FCS-G1/2 HC22-NA
FCS-G1/4 A4-NA/D100
FCS-N1/2 A4-NA/D100
FCS-N1/2 T-NA
FCS-N3/4 T-NA

- **Remote switch to be used with separate signal processor**
- **Dynamic pressure resistance:**
  - Standard: up to 1450 psi
  - Extended: up to 7250 psi
- **Temperature range:**
  - Standard: 13° to 176°F
  - Extended: 32° to 212°F
- **Housing material:**
  316TI stainless steel and Teflon

The insertion style flow monitors are used in applications where it is necessary to monitor liquid flows.

These devices are designed for direct installation into the pipeline by means of a pipe-tee or a welded pipe socket. The flow monitors are suitable for use in a 1/2 inch pipe diameter or larger.

The insertion style flow monitors are manufactured in 316TI stainless steel and Teflon. Models with extended temperature ranges are also available (denoted by the /D100 in part number.)

Insertion flow monitors are to be used in conjunction with a **TURCK** signal processor. All necessary settings for the correct function of the flow monitor are programmed at the signal processor.

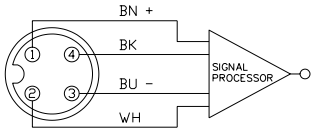
MK96... ***multimodul*** style (see pages 53-58)
MS96... ***multisafe*** style (see pages 59-62)

Additional functions such as fluid temperature monitoring and off delay are provided when the flow monitor is used with a MS96-12R signal processor. Refer to pages 53-62 to select the appropriate processor for specific applications.

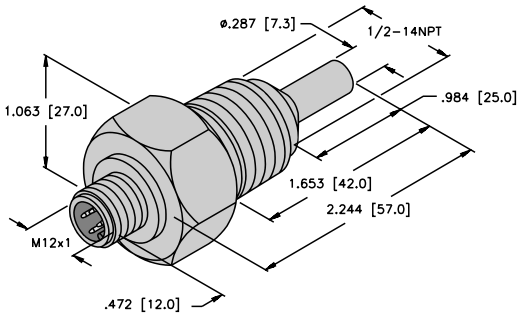
Notes: Ring gasket provided with G style flow monitors.
Ring gasket available for G1/4 style flow monitors. Consult factory.
Consult factory for other housing materials.

Insertion Flow Monitors
316TI Stainless Steel
FCS-N1/2 A4-NA-H1141
FCS-N3/4 A4-NA-H1141

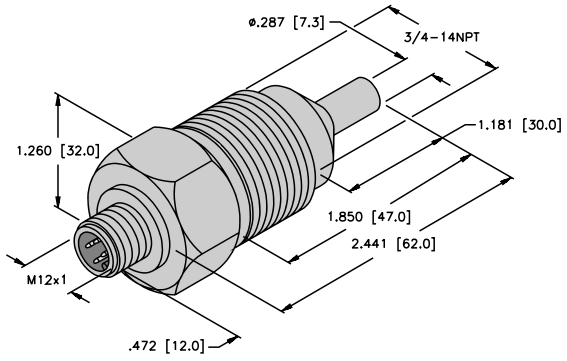
Type	FCS-N1/2 A4-NA-H1141	FCS-N3/4 A4-NA-H1141
ID Number	M6871303	M6871304
Temperature Range (fluid)	-25° to +80°C (-13° to +176°F) cont. up to 100°C (212°F) for approx. 10 min.	-25° to +80°C (-13° to +176°F) cont. up to 100°C (212°F) for approx. 10 min.
Operating Range (flow rate)		
Water	1-150 cm/s (2-295 ft./min.)	1-150 cm/s (2-295 ft./min.)
Oil	3-300 cm/s (6-590 ft./min.)	3-300 cm/s (6-590 ft./min.)
Repeatability	±5% of full range	±5% of full range
Time Delay Before Availability	2-15 s (8 s typical)	2-15 s (8 s typical)
Switch ON time (above setpoint)	1-13 s (2 s typical)	1-13 s (2 s typical)
Switch OFF time (below setpoint)	1-15 s (2 s typical)	1-15 s (2 s typical)
Temperature gradient	max. 250°C/min. (450°F/min.)	max. 250°C/min. (450°F/min.)
Pressure Rating	1450 psi (100 bar)	1450 psi (100 bar)
Housing Material (DIN 2 462/17 440)	316TI stainless steel (1.4571)	316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67, IP 65, NEMA 1,3,4,4x,12,13	IP 67, IP 65, NEMA 1,3,4,4x,12,13
Operating temperature	-25° to +80°C (-13° to +176°F)	-25° to +80°C (-13° to +176°F)
Torque	100 Nm (73.7 ft-lb)	100 Nm (73.7 ft-lb)
Connection	4-wire ***eurofast*** quick disconnect 150 m max. cable length (22 AWG) RK 4.4T-* or WK 4.4T-* (Page 65) * = length in meters	4-wire ***eurofast*** quick disconnect 150 m max. cable length (22 AWG) RK 4.4T-* or WK 4.4T-* (Page 65) * = length in meters



See pages 53-62 for signal processor choices.



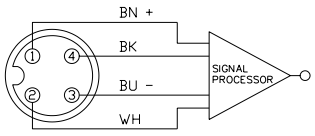
FCS-N1/2 A4-NA-H1141



FCS-N3/4 A4-NA-H1141

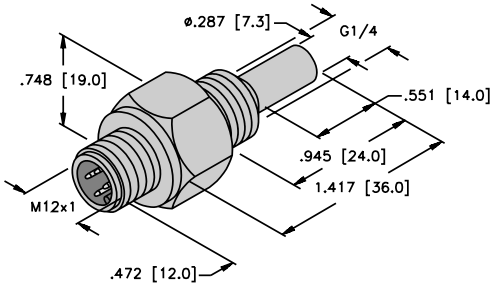
Insertion Flow Monitors
316TI Stainless Steel
FCS-G1/4 A4-NA-H1141
FCS-GL1/2 A4-NA-H1141/D500

Type	FCS-G1/4 A4-NA-H1411	FCS-GL1/2 A4-NA-H1141/D500
ID Number	M6870304	M6870425
Temperature Range (fluid)	-25° to +80°C (-13° to +176°F) continue. up to 100°C (212°F) for approx. 10 min.	-25° to +80°C (-13° to +176°F) cont. up to 100°C (212°F) for approx. 10 min.
Operating Range (flow rate)		
Water	1-150 cm/s (2-295 ft/min)	1-150 cm/s (2-295 ft./min.)
Oil	3-300 cm/s (6-590 ft/min)	3-300 cm/s (6-590 ft./min.)
Repeatability	±5% of full range	±5% of full range
Time Delay Before Availability	2-15 s (8 s typical)	2-15 s (8 s typical)
Switch ON time (above setpoint)	1-13 s (2 s typical)	1-13 s (2 s typical)
Switch OFF time (below setpoint)	1-15 s (2 s typical)	1-15 s (2 s typical)
Temperature gradient	max. 250°C/min. (450°F/min)	**max. 250°C/min. (450°F/min.)**
Pressure Rating	1450 psi (100 bar)	7250 psi (500 bar)
Housing Material (DIN 2 462/17 440)	316TI stainless steel (1.4571)	316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67, IP 65, NEMA 1,3,4,4x,12,13	IP 67, IP 65, NEMA 1,3,4,4x,12,13
Operating temperature	-25° to +80°C (-13° to +176°F)	-25° to +80°C (-13° to +176°F)
Torque	100 Nm (73.74 ft-lb)	100 Nm (73.7 ft-lb)
Connection	4-wire ***eurofast*** quick disconnect 150 m max. cable length (22 AWG) RK 4.4T -* or WK 4.4T -* (Page 65) * = length in meters	

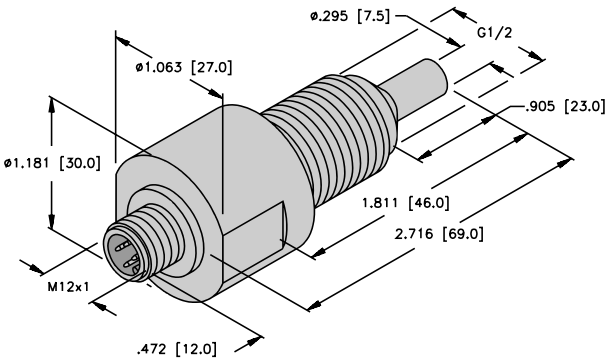


See pages 53-62 for signal processor choices.

NOTE: G threading refers to British parallel pipe (BSPP) threading.



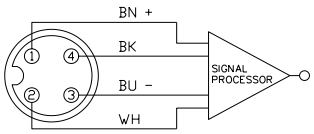
FCS-G1/4 A4-NA-H1141

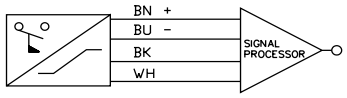


FCS-GL1/2 A4-NA-H1141/D500

Insertion Flow Monitors
For Corrosive Environments
FCS-G1/2TN-NA-H1141
FCS-G1/2HC22-NA

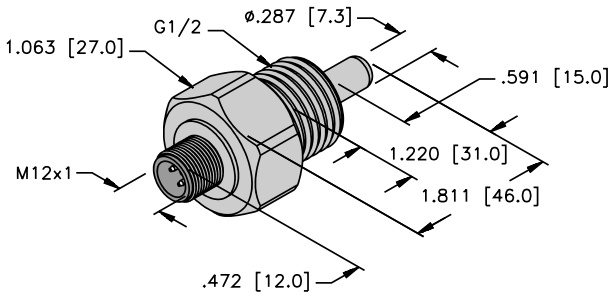
Type	FCS-G1/2TN-NA-H1411	FCS-G1/2HC22-NA
ID Number	M6870311	M6870366
Temperature Range (fluid)	-25° to +80°C (-13° to +176°F) continue. up to 100°C (212°F) for approx. 10 min.	-25° to +80°C (-13° to +176°F) cont. up to 100°C (212°F) for approx. 10 min.
Operating Range (flow rate)		
Water	1-150 cm/s (2-295 ft/min)	1-150 cm/s (2-295 ft./min.)
Oil	3-300 cm/s (6-590 ft/min)	3-300 cm/s (6-590 ft./min.)
Repeatability	±5% of full range	±5% of full range
Time Delay Before Availability	2-15 s (8 s typical)	2-15 s (8 s typical)
Switch ON time (above setpoint)	1-13 s (2 s typical)	1-13 s (2 s typical)
Switch OFF time (below setpoint)	1-15 s (2 s typical)	1-15 s (2 s typical)
Temperature gradient	max. 250°C/min. (450°F/min)	max. 250°C/min. (450°F/min.)
Pressure Rating	1450 psi (100 bar)	1450 psi (100 bar)
Housing Material (DIN 2 462/17 440)	Titanium, B3 (3.7035) with ceramic coating	Hastelloy C22 (2.4602)
Enclosure (DIN 40 050)	IP 67, IP 65, NEMA 1,3,4,4x,12,13	IP 68, IP 65, NEMA 1,3,4,4x,12,13
Operating temperature	-25° to +80°C (-13° to +176°F)	-25° to +80°C (-13° to +176°F)
Torque	100 Nm (73.74 ft-lb)	100 Nm (73.7 ft-lb)
Connection	4-wire ***eurofast*** quick disconnect 150 m max. cable length (22 AWG) RK 4.4T -* or WK 4.4T -* (Page 65) * = length in meters	Teflon cable, 4-wire 2 m standard length (24 AWG)



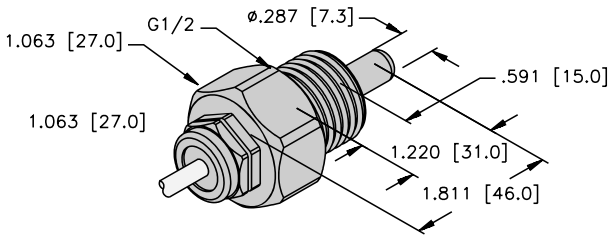


See pages 53-62 for signal processor choices.

NOTE: G threading refers to British parallel pipe (BSPP) threading.



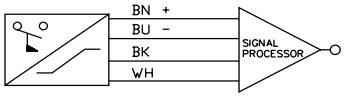
FCS-G1/2TN-NA-H1141



FCS-G1/2HC22-NA

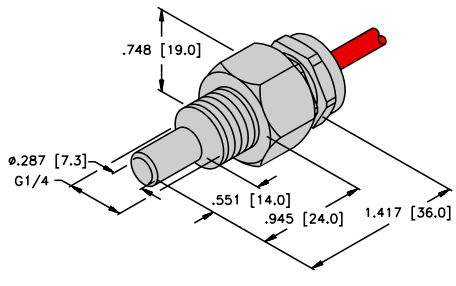
Insertion Flow Monitors
316 Stainless Steel
with Extended Temperature Range
FCS-G1/4 A4-NA/D100
FCS-N1/2 A4-NA/D100

Type	FCS-G1/4 A4-NA/D100	FCS-N1/2 A4-NA/D100
ID Number	M6870411	M6871412
Temperature Range (fluid)	0° to +120°C (32° to +248°F) cont.	0° to +120°C (32° to +248°F) cont.
Operating Range (flow rate)		
Water	1-150 cm/s (2-295 ft/min)	1-150 cm/s (2-295 ft/min)
Oil	3-300 cm/s (6-590 ft/min)	3-300 cm/s (6-590 ft/min)
Repeatability	±5% of full range	±5% of full range
Time Delay Before Availability	2-15 s (8 s typical)	2-15 s (8 s typical)
Switch ON time (above setpoint)	1-13 s (2 s typical)	1-13 s (2 s typical)
Switch OFF time (below setpoint)	1-15 s (2 s typical)	1-15 s (2 s typical)
Temperature gradient	max. 250°C/min. (450°F/min)	max. 250°C/min. (450°F/min)
Pressure Rating	1450 psi (100 bar)	1450 psi (100 bar)
Housing Material (DIN 2 462/17 440)	316TI stainless steel (1.4571)	316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67, IP 65, NEMA 1,3,4,4x,12,13	IP 67, IP 65, NEMA 1,3,4,4x,12,13
Operating temperature	-25° to +100°C (-13° to +212°F)	-25° to +100°C (-13° to +212°F)
Torque	100 Nm (73.7 ft-lb)	100 Nm (73.7 ft-lb)
Connection	Teflon® cable, 4-wire 2 m standard length (24 AWG)	Teflon cable, 4-wire 2 m standard length (24 AWG)

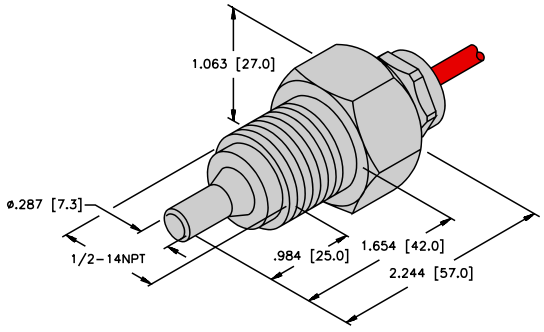


See pages 53-62 for signal processor choices.

Note: G threading refers to British parallel pipe (BSPP) threading.



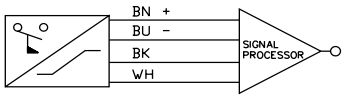
FCS-G1/4 A4-NA/D100



FCS-N1/2 A4-NA/D100

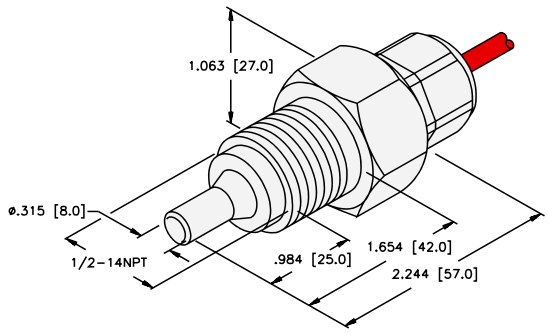
Insertion Flow Monitors
Teflon® Housing
FCS-N1/2 T-NA
FCS-N3/4 T-NA

Type	FCS-N1/2 T-NA	FCS-N3/4 T-NA
ID Number	M6871422	M6871312
Temperature Range (fluid)	-10° to +70°C (14° to +158°F)	-10° to +70°C (14° to +158°F)
Operating Range (flow rate)		
Water	1-70 cm/s (2-138 ft/min)	1-70 cm/s (2-138 ft/min)
Oil	2-100 cm/s (4-197 ft/min)	2-100 cm/s (4-197 ft/min)
Repeatability	±5% of full range	±5% of full range
Time Delay Before Availability[1)]	40-100 s (60 s typical)	40-100 s (60 s typical)
Switch ON time (above setpoint)[1)]	20-50 s (30 s typical)	20-50 s (30 s typical)
Switch OFF time (below setpoint)[1)]	4-15 s (6 s typical)	4-15 s (6 s typical)
Temperature gradient	30°C/min. typical (54°F/min)	30°C/min. typical (54°F/min)
Pressure Rating	72 psi (5 bar)	72 psi (5 bar)
Housing Material	PTFE (Teflon)	PTFE (Teflon)
Enclosure (DIN 40 050)	IP 67, IP 65, NEMA 1,3,4,4x,12,13	IP 67, IP 65, NEMA 1,3,4,4x,12,13
Operating temperature	-10° to +70°C (14° to +158°F)	-10° to +70°C (14° to +158°F)
Torque	5 Nm (3.7 ft-lb)	5 Nm (3.7 ft-lb)
Connection	Teflon cable, 4-wire 2 m standard length (24 AWG)	Teflon cable, 4-wire 2 m standard length (24 AWG)

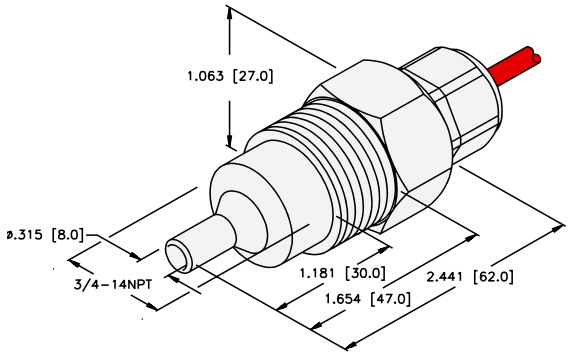


See pages 53-62 for signal processor choices.

1) Medium: water; flow rate 20 cm/s



FCS-N1/2 T-NA



FCS-N3/4 T-NA

FCS-G1/4 A4-NAEx
FCS-GL1/2 A4-NAEx/D500

- **Intrinsically safe insertion flow sensors with approval for zone 1, EEx ib IIC T6**
- **Switch-point accuracy during changes in flow temperature**
- **Enclosure meets IP 67**
- **Connection to intrinsically safe signal processors only**
- **316TI stainless steel housing**
- **Temperature range -20 to +70 C**
- **Pressure resistant up to 870 psi**

The FCS B series insertion flow sensor is used to monitor liquid flow speeds in hazardous areas. (The term “FCS B” is used to class all insertion-style sensors approved for use in zone 1 hazardous areas).

The device installs directly into the flow stream via a pipe tee or welded pipe socket, with the sensing probe positioned into the flow, which makes it ideal for a wide variety of pipe diameters.

This monitor requires an intrinsically safe signal processor to operate. The following signal processors are available:

MS96-11Ex-R: 50 mm wide modular housing (see page 59)

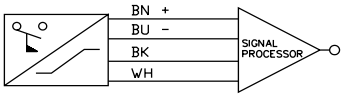
MC96...Ex: 19” Eurocard

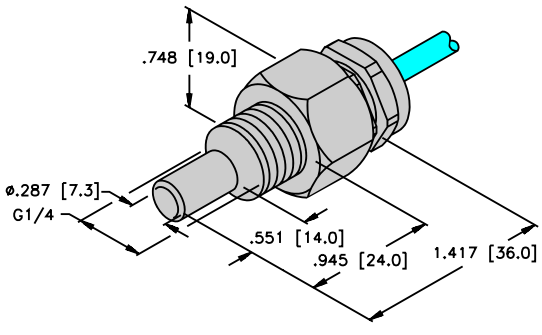
All necessary settings for the correct function of the sensor are programmed on the signal processor.

Insertion Flow Monitors
Intrinsically Safe
FCS-G1/4 A4-NAEx
FCS-GL1/2 A4-NAEx/D500

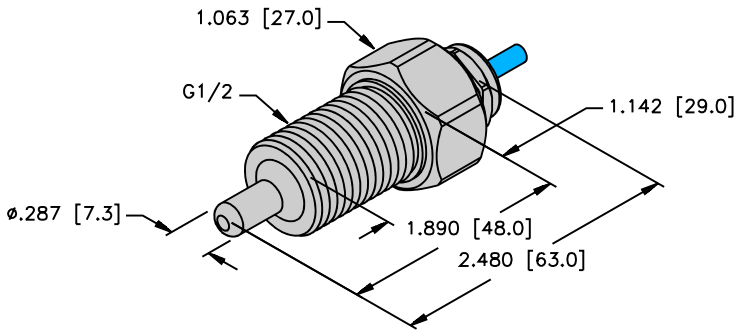
Type	FCS-G1/4 A4-NAEx	FCS-GL1/2 A4-NAEx/D500
ID Number	M6870315	M6870431
Hazardous Area Approvals	PTB No Ex-94.C.4013 ASEV 94.1 00369X	
Protection class	intrinsically safe, EEx ib IIC T6	
Maximum nominal values		
- Power P	0.69 W	
- External inductances / capacitances	negligible	
Temperature class (depending on medium temperature T_m)	T6: $T_m \leq 50°$ C T5: $T_m \leq 65°$ C T4: $T_m \leq 70°$ C	
Temperature Range (flow)	-20° to +85°C (-4° to +185°F)	
Operating Range (flow rate)		
Water	1-100 cm/s	
Oil	3-200 cm/s	
Repeatability	±5% of full range	
Time Delay Before Availability	2-15 (8 s typical)	
Switch ON time	1-13 (2 s typical)	
Switch OFF time	1-15 (2 s typical)	
Response time to change in temperature	≤12 s	
Temperature gradient	max. 250 K/min	
Pressure Rating	870 psi (60 bar)	7250 psi (500 bar)
Housing Material (DIN 2 462/ 17440)	316TI stainless steel (1.4571)	
Protection type (IEC 60529/EN 60529)	IP 67, NEMA 1,3,4,4x,12,13	
Ambient temperature rating	-20° to +70°C (-4° to +158°F)	
Torque	100 Nm	
Accessories	2 sealing rings	
Connection	PUR cable, 4/24 AWG 2 m standard length (other lengths upon request) See pages 55-64 for signal processor choices.	

Note: G threading refers to British parallel pipe (BSPP) threading.





FCS-G1/4 A4-NAEx



FCS-GL1/2 A4-NAEx/D500

Tri-clamp fitting

FCS-50A4-NA/D014

FCS-50A4-AP8X-H1141/D014

- **Flow monitors for dairy applications in the food and beverage industry**
- **Dynamic pressure resistance up to 145 psi**
- **316L stainless steel housing**

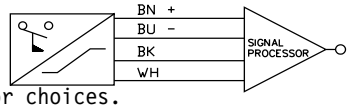
The sanitary style flow monitors are well suited for the dairy, food and beverage industries. The non-contaminating and non-corrosive design is in accordance with the ASME Food, Drug & Beverage Equipment Sanitary Standard #ANSI/ASME F2.1-1982.

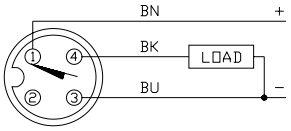
These flow monitors are designed for direct installation into the pipeline by means of Tri-clamp fittings manufactured by Tri-Clover, Inc. of Kenosha, WI.

The AP8X version is completely self-contained. The NA style flow monitor is to be used in conjunction with a **TURCK** signal processor. All necessary settings for the correct function of the flow monitors are programmed at the signal processor. Refer to Pages 53-62 to select the appropriate signal processor for specific applications.

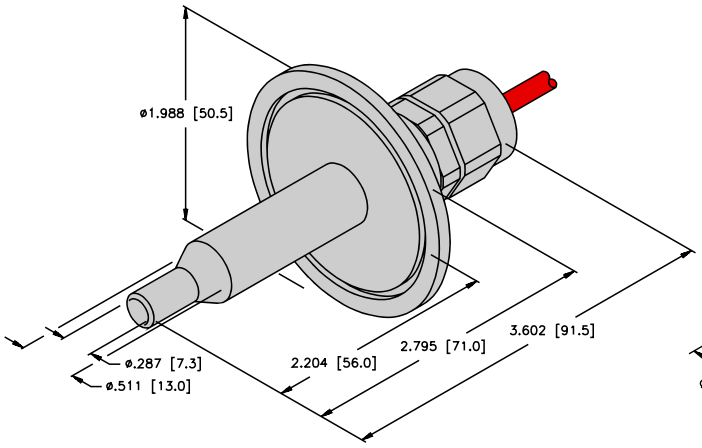
Sanitary Flow Monitors
316L Stainless Steel
FCS-50A4-NA/D014
FCS-50A4-AP8X-H1141/D014

Type	FCS-50A4-NA/D014	FCS-50A4-AP8X-H1141/D014
ID Number	M6872009	M6872025
Temperature Range (flow)	10° to 120°C (50° to 248°F)	
Operating Range (flow rate)		
Water	1-150 cm/s (2-295 ft/min)	
Oil	3-300 cm/s (6-590 ft/min)	
Repeatability	±5% of full range	
Time Delay Before Availability	2-15 s (8 s typical)	
Switch ON time (above setpoint)	1-13 s (2 s typical)	
Switch OFF time (below setpoint)	1-15 s (2 s typical)	
Temperature gradient	max. 250°C/min. (450°F/min)	
Pressure Rating	145 psi (10 bar)	
Approvals, Listings or Certifications		
3-A	Certificate No. 803	
Housing Material (DIN 2 462/17 440)	316L stainless steel (1.4435)	
Surface smoothness	≤1.6 µm	
Enclosure (DIN 40 050)	IP 68, NEMA 1,3,4,4x,6,12,13	
Operating temperature	-25° to +85°C (-13° to +185°F)	
Connection	Teflon cable, 4-wire 2 m standard length (24 AWG) (8 m length available upon request)	3-wire ***eurofast*** quick disconnect 150 m max. cable length (22 AWG) RK 4T-* or WK 4T-* (Page 65) * = length in meters

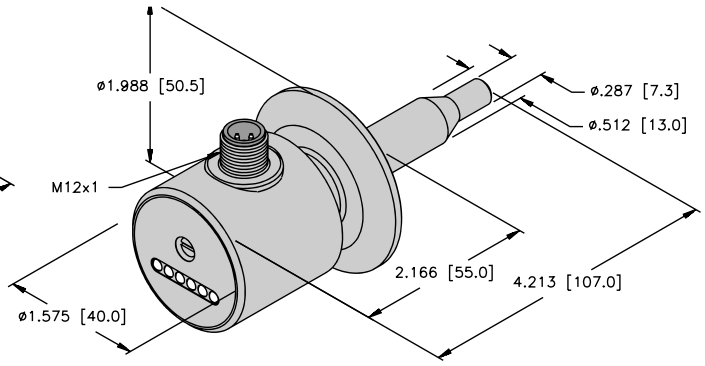




See pages 53-62 for signal processor choices.



FCS-50A4-NA/D014



FCS-50A4-AP8X-H1141/D014

FCI-D04A4P-AP8X-H1141 (M6870640)
FCI-D04A4P-LIX-H1141 (M6870641)
FCI-D10A4P-AP8X-H1141 (M6870642)
FCI-D10A4P-LIX-H1141 (M6870643)
FCI-D10A4P-ARX-H1140 (M6870644)

- **Ideal for very low flow rates**
- **For use with liquids or gases**
- **Stainless steel wetted parts**
- **Connects directly into the pipeline with a ¼" thread**
- **4 mm or 10 mm diameter available**
- **Pressure resistance up to 290 psi**
- **IP 67 rating**
- **Switch-point accuracy during changes in flow temperature**
- **Fast response time**

These flow monitors are ideal for applications involving very low flow rates of liquids or gasses. The fast response time allows these flow monitors to be used in applications where other flow switches can't perform. They can maintain their switchpoint accuracy over the full temperature range and are pressure resistant up to 290 psi.

This series of flow monitors are designed for mounting directly into the pipeline with no probe to protrude into the flow. The G1/4 outer threads can be used together with the tube fitting adapters located on page 38 or with other suitable connection hardware.

This series of flow monitor is completely self-contained and requires no separate amplifier for operation. Versions are available with discrete or analog output, both adjustable with a potentiometer located on the top of the sensor just under the output display.

The housings are made from PBT plastic with the wetted parts comprised of 316 stainless steel

Conversion Table for Liquids

To Convert	Into	Multiply by:
ml / min	in^3 / min	0.0610
	gal / hr	0.0159
	gal / day	0.3804
	l / min	0.0010
	l / hr	0.0600

Conversion Table for Gases

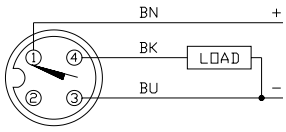
To Convert	Into	Multiply by:
l / min	in^3 / min	60.9984
	ft^3 / min	0.0353

In-line Flow Monitors
316TI Stainless Steel

FCI-D04A4P-AP8X-H1141 (Discrete PNP Transistor Output)
FCI-D10A4P-AP8X-H1141 (Discrete PNP Transistor Output)

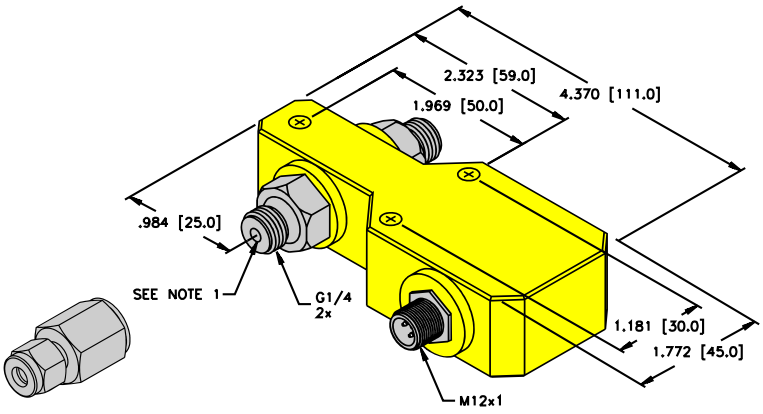
Type	FCI-D04A4P-AP8X-H1141	FCI-D10A4P-AP8X-H1141
Operating Range (flow rate)		
Water	0.05-1 L/min (.001-.53 GPM)	0.2-6 L/min (.26-3.17 GPM)
Oil	0.05-2 L/min (.001-.53 GPM)	0.2-6 L/min (.001-.53 GPM)
Rated Operational Voltage (DC) UB	21 to 26 VDC	
Current Consumption	≤ 50 mA	
Output Function	Normally Open, PNP	
Short-circuit Protection	Yes	
Reverse Polarity Protection	Yes	
Max. Voltage Drop at IB	≤1.5 V	
Switching Current	0.4 mA	
Temperature Range		
Ambient Temperature	0° to +60°C (32° to +140°F).	
Medium Temperature	-20° to +80°C (-20° to +176°F).	
Time Delay Before Availability	2-15 s (1 s typical)	
Temperature gradient (°C/S)	6.7°C/S	
Pressure Rating	290 psi	
Repeatability	≤3% of full range	
Housing Material (DIN 2 462/17 440)	PBT Plastic with 316TI stainless steel (1.4571)	
Enclosure (DIN 40 050)	IP 67	
Max. Fixing Torque of Coupling Nut	Max. 100 Nm	
Connection	4-wire ***eurofast*** quick disconnects RK 4.4T-* or WK 4.4T-* (Page 65) * = Length in meters	

AP8X Wiring Diagram



BSPP to standard tube fitting adapters.
(must be ordered separately)

Tube Size	Type	ID Number
1/8″	FSV-SS 1/8 x 1/4	A2535
1/4″	FSV-SS 1/4 x 1/4	A2534
3/8″	FSV-SS 3/8 x 1/4	A2533
1/2″	FSV-SS 1/2 x 1/4	A2536



Note: 1. Dimension of hole size for the different units is as follows:
FCI-D04... = Ø.118 [3.0]
FCI-D10... = Ø.354 [9.0]

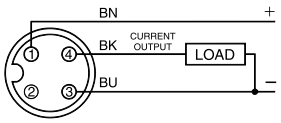
FCI-D*A4P-*-H1141**

In-line Flow Monitors
316TI Stainless Steel

FCI-D04A4P-LIX-H1141 (4 -20 mA Current Analog Output)
FCI-D10A4P-LIX-H1141 (4 -20 mA Current Analog Output)

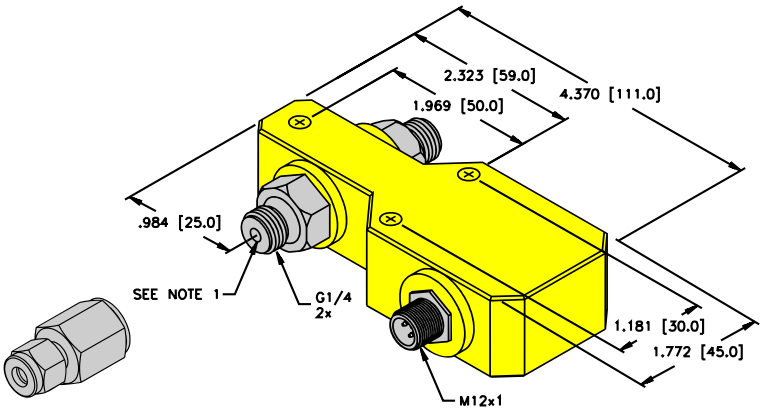
Type	FCI-D04A4P-LIX-H1141	FCI-D10A4P-LIX-H1141
Operating Range (flow rate)		
Water	0.05-1 L/min (.001-.53 GPM)	0.2-6 L/min (.26-3.17 GPM)
Oil	0.05-2 L/min (.001-.53 GPM)	0.2-6 L/min (.001-.53 GPM)
Rated Operational Voltage (DC) UB	21 to 26 VDC	
Current Consumption	≤ 50 mA	
Output Function	Current 4-20 mA	
Short-circuit Protection	Yes	
Reverse Polarity Protection	Yes	
Max. Voltage Drop at IB	≤1.5 V	
Switching Current	0.4 mA	
Temperature Range		
Ambient Temperature	0° to +60°C (32° to +140°F).	
Medium Temperature	-20° to +80°C (-20° to +176°F).	
Time Delay Before Availability	2-15 s (1 s typical)	
Temperature gradient (°C/S)	6.7°C/S	
Pressure Rating	290 psi	
Repeatability	≤3% of full range	
Housing Material (DIN 2 462/17 440)	PBT Plastic with 316TI stainless steel (1.4571)	
Enclosure (DIN 40 050)	IP 67	
Max. Fixing Torque of Coupling Nut	Max. 100 Nm	
Connection	4-wire ***eurofast*** quick disconnects RK 4.4T-* or WK 4.4T-* (Page 65) * = Length in meters	

LIX Wiring Diagram



BSPP to standard tube fitting adapters.
(must be ordered separately)

Tube Size	Type	ID Number
1/8″	FSV-SS 1/8 x 1/4	A2535
1/4″	FSV-SS 1/4 x 1/4	A2534
3/8″	FSV-SS 3/8 x 1/4	A2533
1/2″	FSV-SS 1/2 x 1/4	A2536



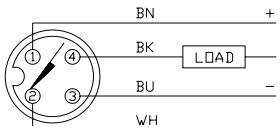
Note: 1. Dimension of hole size for the different units is as follows:
FCI-D04... = Ø.118 [3.0]
FCI-D10... = Ø.354 [9.0]

FCI-D*A4P-LIX-H1141

In-line Flow Monitors
316TI Stainless Steel
FCI-D10A4P-ARX-H1141 (Relay Output)

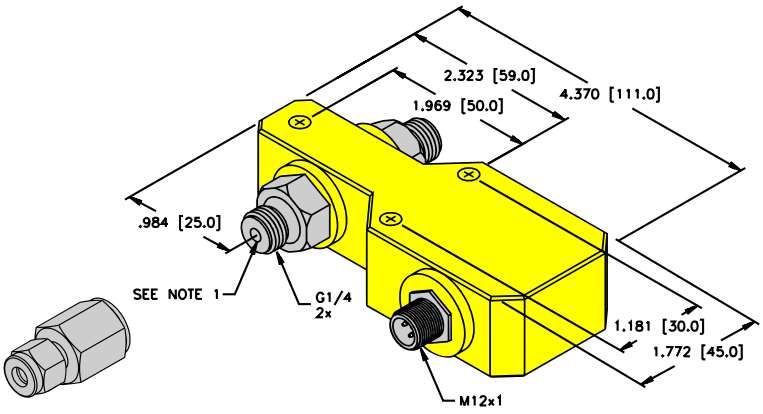
Type	FCI-D10A4P-ARX-H1141
Operating Range (flow rate)	
Water	0.2-6 L/min (.26-3.17 GPM)
Oil	0.2-6 L/min (.001-.53 GPM)
Rated Operational Voltage (DC) UB	21 to 26 VDC
Current Consumption	≤ 50 mA
Output Function	Relay Output
Short-circuit Protection	Yes
Reverse Polarity Protection	Yes
Max. Voltage Drop at IB	≤1.5 V
Switching Current	0.4 mA
Temperature Range	
Ambient Temperature	0° to +60°C (32° to +140°F).
Medium Temperature	-20° to +80°C (-20° to +176°F).
Time Delay Before Availability	2-15 s (1 s typical)
Temperature gradient (°C/S)	6.7°C/S
Pressure Rating	290 psi
Repeatability	≤3% of full range
Housing Material (DIN 2 462/17 440)	PBT Plastic with 316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67
Max. Fixing Torque of Coupling Nut	Max. 100 Nm
Connection	4-wire ***eurofast*** quick disconnects RK 4.4T-* or WK 4.4T-* (Page 65) * = Length in meters

ARX Wiring Diagram



BSPP to standard tube fitting adapters.
(must be ordered separately)

Tube Size	Type	ID Number
1/8″	FSV-SS 1/8 x 1/4	A2535
1/4″	FSV-SS 1/4 x 1/4	A2534
3/8″	FSV-SS 3/8 x 1/4	A2533
1/2″	FSV-SS 1/2 x 1/4	A2536



Note: 1. Dimension of hole size for the different units is as follows:
FCI-D04... = Ø.118 [3.0]
FCI-D10... = Ø.354 [9.0]

FCI-D*A4P-ARX-H1141

FCI-D03A4-NA-H1141/M16

- **Ideal for very low flow rates**
- **Stainless steel housing**
- **Connects directly into the pipeline**
- **Self-tapping screw connection according to DIN 2353 (Must be ordered separately)**
- **3/8" or 10 mm outside pipe diameter**
- **Pressure resistance up to 72 psi**
- **Enclosure meets IP 67**
- **Switch-point accuracy during changes in flow temperature**
- **3.5 mm inside diameter standard 9.3 mm also available (Consult Factory)**

This series of flow monitors are designed to be mounted directly into pipelines so the probe does not protrude into the flow. The compression fitting provides a hermetical and pressure resistant connection.

These flow monitors are offered with an inner diameter of 3.5 mm which can monitor fluids in the 5 to 300 ml/min range. A 9.3 mm i.d version monitors fluid flow between 30-1800 ml/min (consult factory).

The flow monitor housings are made of 316TI stainless steel and are pressure resistant up to 72 psi.

These flow monitors require a remote signal processor for operation.
The following signal processor models are available:

MK96... ***multimodul*** style (see pages 53-58)
MS96... ***multisafe*** style (see page 59-62)

All necessary setting for the correct function of the monitor are programmed on the signal processor.

Additional functions such as fluid temperature monitoring and switch. Off delay functions are provided if the monitor is used with a MS96-12-R signal processor.

Conversion Table for Liquids

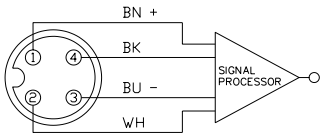
To Convert	Into	Multiply by:
ml / min	in^3 / min	0.0610
	gal / hr	0.0159
	gal / day	0.3804
	l / min	0.0010
	l / hr	0.0600

Conversion Table for Gases

To Convert	Into	Multiply by:
l / min	in^3 / min	60.9984
	ft^3 / min	0.0353

In-line Flow Monitors
316TI Stainless Steel
FCI-D03A4-NA-H1141/M16

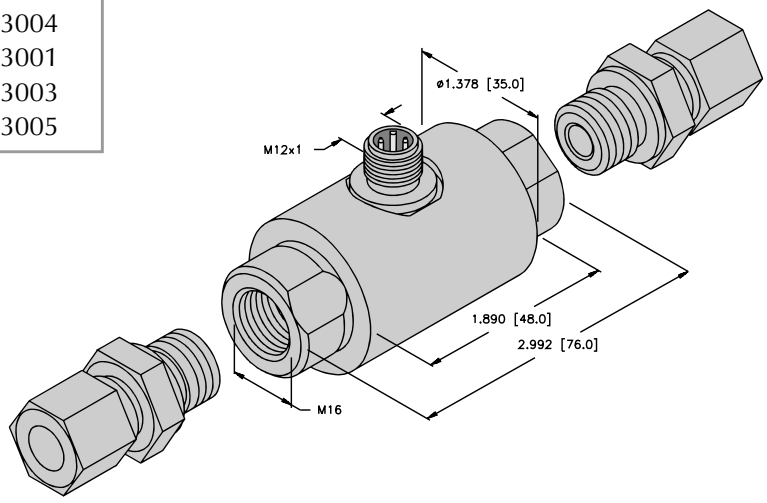
Type	FCI-D03A4-NA-H1141/M16
ID Number	M6870633
Temperature Range (fluid)	-20° to +80°C (-4° to +176°F) cont.
Operating Range (flow rate)	
Water	5-150 ml/min
Oil	15-300 ml/min
Repeatability	±5% of full range
Time Delay Before Availability	2-15 s (8 s typical)
Switch ON time (above setpoint)	1-15 s (2 s typical)
Switch OFF time (below setpoint)	1-15 s (2 s typical)
Temperature gradient	max. 250°C/min. (450°F/min)
Pressure Rating	145 psi (10 bar)
Maximum flow	300 (1800) l/h
Housing Material (DIN 2 462/17 440)	316TI stainless steel (1.4571)
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,12,13
Operating temperature	-25° to +80°C (-13° to +176°F)
Connection	4-wire ***eurofast*** quick disconnects RK 4.4T-* or WK 4.4T-* (Page 65) * = Length in meters



See pages 53-62 for signal processor choices.

Self tapping screw coupling according to DIN 2353
(must be ordered separately)

Size	Type	ID Number
6 mm	FSV-D06/M12	M6873002
8 mm	FSV-D08/M12	M6873004
10 mm	FSV-D10/M16	M6873001
12 mm	FSV-D12/M16	M6873003
3/8"	FSV-D3/8-M16	M6873005



FCI-D03A4-NA-H1141/M16

FCS-GL1/2 A2P-LIX-H1141/A

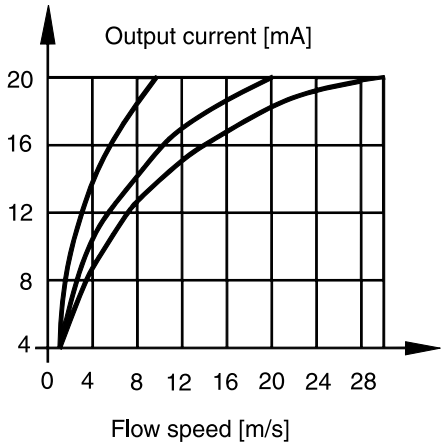
- **Monitor and signal processor in one compact housing**
- **Analog output, 4 - 20 mA**
- **Current output indication via six LEDs**
- **Protection class IP 67**
- **Simple adjustment by means of potentiometer**

The FCS-GL1/2A2P-LIX flow monitors are self-contained devices. Monitor and signal processor are incorporated in one compact housing. They monitor nonexplosive gaseous media in a flow speed range from 0.5 to 30 m/s.

The flow monitors are designed to be installed directly into the flow stream by means of a GL1/2 thread with the sensing probe protruding into the flow. The probes are made of 303 stainless steel.

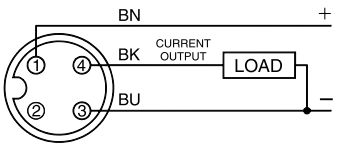
The monitors must be mounted at a specific orientation with respect to flow (see diagram on page 12). They feature a 4 - 20 mA current output. A potentiometer serves for adjusting the sensor to the flow range. 20 mA should correspond to the maximum flow rate.

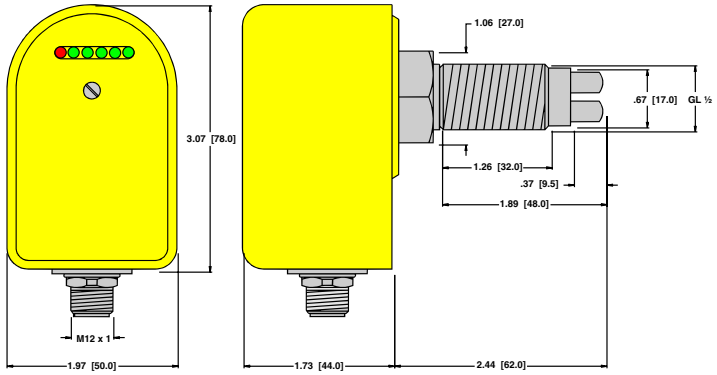
The output curve indicates the typical correlation between the output signal and flow rate.



Flow Monitors for Air and Gaseous Media Analog Output FCS-GL1/2 A2P-LIX-H1141/A

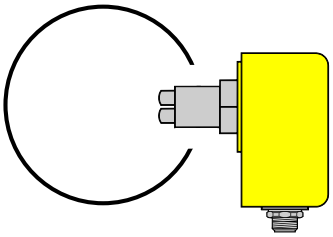
Type	FCS-GL1/2A2P-LiX-H1141/A
ID Number	M6870455
Output	current output
Load	≤500 Ω
Output current	4 - 20 mA
Linearity deviation	≤10%
Temperature Range (flow)	-20° to +80°C (-4° to +176°F) continuous
Operating Range (flow rate)	
Air	0.5 - 30 m/s (98.5 - 5906 ft/min)
Availability	20 - 90 s
Response time to changes in flow rate	4 - 30 s
Response time to changes in temperature	≤100 s
Temperature gradient	max. 20 K/min.
Pressure Rating	435 psi (30 bar)
LED Indications	
Output status	5 green , 1 red
1 to 6 illuminate:	
- LED 6	≥20 mA
- LED 5	>16 mA
- LED 4	>12 mA
- LED 3	> 8 mA
- LED 2	> 4 mA
- LED 1 (red)	= 4 mA
Sensor Housing Material	303 stainless steel (1.4305)
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,4x,12,13
Operating temperature	-20° to +80°C (-4° to +176°F)
Housing Material (DIN 2 462)	PBT
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,4X,12,13)
Operating temperature	-20° to +70°C (-4° to +158°F)
Connection	3-wire ***eurofast***® quick disconnects RK 4T-* or WK 4T-* (See page 65) * = length in meters
Accessories	1 screwdriver for span adjustment





FCS-GL1/2A2P-LiX-H1141/A

Mounting Position



Note: G threading refers to British parallel pipe (BSPP) threading.

FCS-K20-AP8X
FCS-M18-AP8X

- **Monitor and signal processor in one compact housing**
- **Protection class IP 67**
- **Maximum switch point accuracy during changes in flow temperature**
- **Simple adjustment by means of potentiometer**
- **Transistor output, PNP, short-circuit protected**

The FCS-K20-AP8X flow monitors are self-contained devices. Monitor and signal processor are incorporated in one compact housing. They monitor nonexplosive gaseous media in a flow speed range from 0.5 to 15 m/s.

The flow monitors are designed to be installed directly into the flow stream, by means of a plastic flange coupling or lock washers, with the sensing probe protruding in the flow. As a result, the flow monitors are suitable for use in various pipe diameters or ductwork.

These flow monitors feature a short-circuit protected PNP transistor output.
A potentiometer serves for setpoint adjustments in reference to the flow speed.

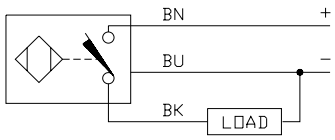
One two-color LED indicated the flow status in reference to the preset set point:

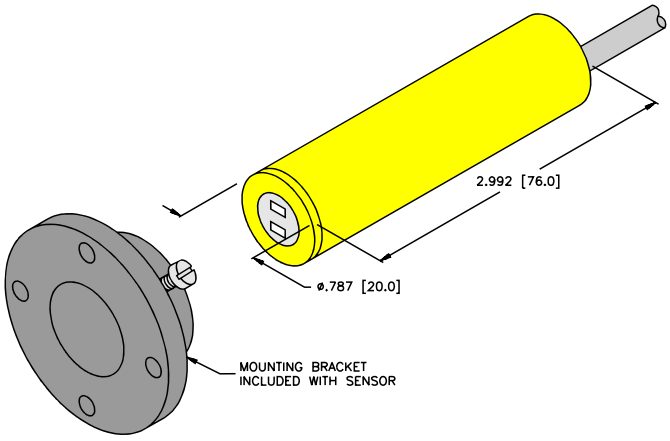
Red LED:	flow below setpoint
Green LED:	flow at or above set point

When the red LED illuminates, the out put is de-energized. The yellow LED is on when the output is energized.

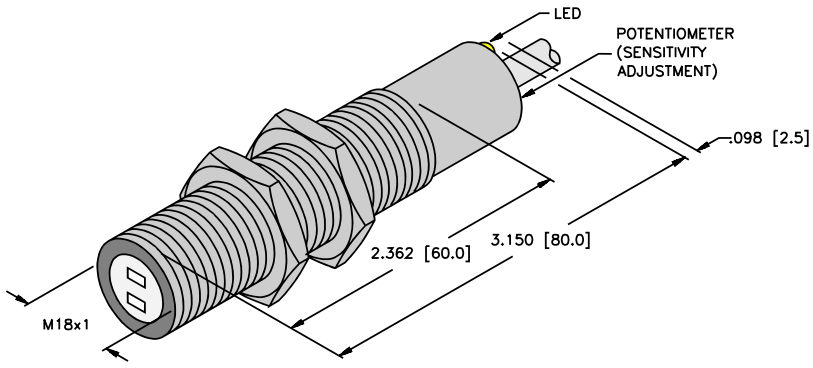
Flow Monitors for Air and Gaseous Media Discrete Output
FCS-K20-AP8X
FCS-M18-AP8X

Type	FCS-K20-AP8X	FCS-M18-AP8X
ID Number	M6870792	M6870704
Operating Voltage	19.2 - 28.8 VDC (including ripple)	19.2 - 28.8 VDC (including ripple)
Current consumption	≤70 mA	≤70 mA
Temperature Range (flow)	-20° to +70°C (-4° to +158°F) continuous	-20° to +70°C (-4° to +158°F) continuous
Operating Range (flow rate)		
Air	0.5-15 m/s (98.5-2952 ft/min)	0.5-15 m/s (98.5-2952 ft/min)
Repeatability	±5% of full range	±5% of full range
Time Delay Before Availability	20-40 s (25 s typical)	20-40 s (25 s typical)
Response Time	1-4 s (6 s typical)	1-4 s (6 s typical)
Pressure Rating	14.5 psi (1 bar)	145.0 psi (10 bar)
Housing Material (DIN 2 462)	PBT-GF30-V0	Chrome Plated Brass
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,12,13	IP 67, NEMA 1,3,4,12,13
Operating temperature	-30° to +60°C (-22° to +140°F) continuous	0° to +60°C (32° to +140°F) continuous
Connection	PVC cable, 3-wire 2 m standard length (21 AWG)	PVC cable, 3-wire 2 m standard length (21 AWG)





FCS-K20-AP8X



FCS-M18-AP8X

FCS-K20-LIX
FCS-M18-LIX

- **Monitor and signal processor in one compact housing**
- **Analog output, 4-20 mA**
- **Protection class IP 67**
- **Maximum switch point accuracy during changes in flow temperature**
- **Simple adjustment by means of potentiometer**

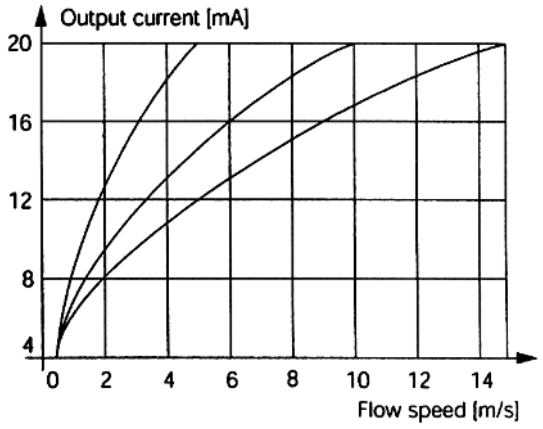
The FCS-K20-LiX flow monitors are self-contained devices. Monitor and signal processor are incorporated in one compact housing. They monitor nonexplosive gaseous media in a flow speed range from 0.5 to 15 m/s.

The flow monitors are designed to be installed directly into the flow stream, by means of a plastic flange coupling or lock washers, with the sensing probe protruding in the flow. As a result, the flow monitors are suitable for use in various pipe diameters or ductwork.

These flow monitors feature a 4-20 mA analog output. A potentiometer serves for adjusting the sensor to the flow range. 20 mA should correspond to the maximum flow rate. The factory setting of the output signal is 20 mA at a flow speed of 15 m/s (air).

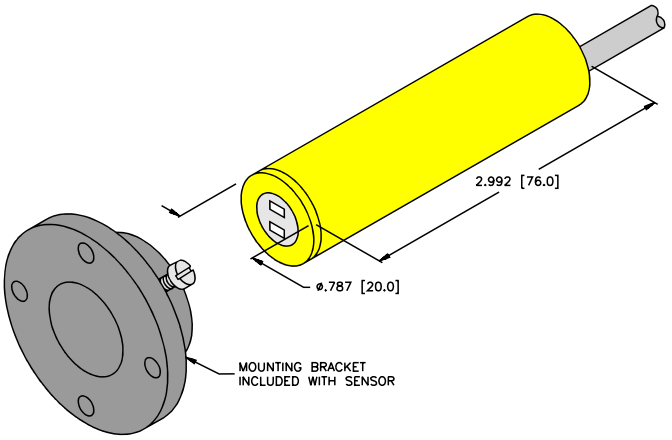
Operational readiness (power on) is indicated by a green LED.

The curve shows the typical correlation between the output signal and flow speed.

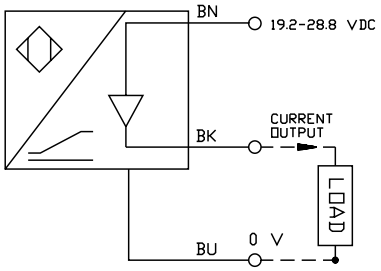


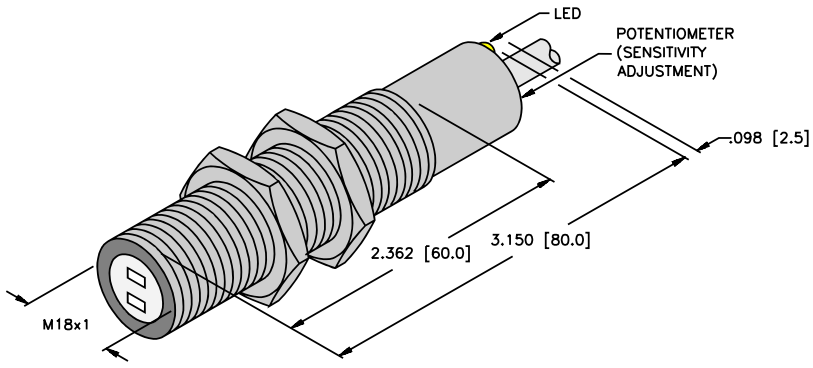
Flow Monitors for Air and Gaseous Media
Linear Analog Output
FCS-K20-LIX
FCS-M18-LIX

Type	FCS-K20-LIX	FCS-M18-LIX
ID Number	M6870791	M6870707
Operating Voltage	19.2-28.8 VDC (including ripple)	19.2-28.8 VDC (including ripple)
Current consumption	≤70 mA	≤70 mA
Output	4 - 20 mA current output	4 - 20 mA current output
Load	200-500 Ω	200-500 Ω
Linearity deviation	≤10%	≤10%
Temperature Range (flow)	-20° to +70°C (-4° to +158°F) continuous	-20° to +70°C (-4° to +158°F) continuous
Operating Range (flow rate)		
Air	0.5-15 m/s (1.6-49.2 ft/s)	0.5-15 m/s (1.6-49.2 ft/s)
Time Delay Before Availability	20-40 s (25 s typical)	20-40 s (25 s typical)
Response Time	1-20 s (6 s typical)	1-20 s (6 s typical)
LED Indication		
Power on	green	green
Pressure Rating	14.5 psi (1 bar)	145.0 psi (1 bar)
Housing Material (DIN 2 462)	PBT-GF30-V0	Chrome Plated Brass
Enclosure (DIN 40 050)	IP 67, NEMA 1,3,4,12,13	IP 67, NEMA 1,3,4,12,13
Operating temperature	-30° to +50°C (-22° to +122°F) continuous	0° to +60°C (+32° to +140°F) cont.
Connection	PVC cable, 3-wire 2 m standard length (21 AWG)	PVC cable, 3-wire 2 m standard length (21 AWG)



FCS-K20-LiX





FCS-M18-AP8X

TC01-G1/2 A4P-2AP8X-H1140
TC01-G1/2 A4P-LIAP8X-H1140

- **Indication of relative temperature via three-digit, seven-segment display**
- **Two independent switching points or single switch point with current analog output**
- **Hysteresis or window function**
- **On- and off-delay**
- **MIN/MAX memory function**

The self-contained temperature-monitoring device has two independently adjustable switching points or single switch point with separate analog output. These can be used for limit-value monitoring or window functions. The operating range is between -40° and +120°C when used in liquid or paste-like media.

The outputs can be programmed for either N.C. or N.O. operation. The switch on- and off-delays suppress output indications caused by short-term fluctuations in temperature.

The device features a volatile, resettable MIN/MAX memory. It is programmed via push buttons located on the front cover. Switching points and parameter settings can be called up and displayed while the unit is operating.

The device should be mounted in a standard tee or weld socket. The housing is rotatable for optimal viewing of the display.

Operating Modes

If an over-range of a certain temperature is to be monitored, select the **hysteresis-function**. In this mode, a limit value must be set. If the temperature exceeds this value, the output either activates or de-activates, depending on the selected output function.

A hysteresis value is assigned to the limit value, which determines the differential between the switch-on or switch-off value. It is also possible to delay the switch-on and switch-off times.

If the **window-function** is selected as the operating mode, the switching output activates when the adjusted limit temperature is reached (beginning of window range) and de-activates when the end value (defined by the window width value) is reached. The switch-on and switch-off delay may also be used in this operating mode.

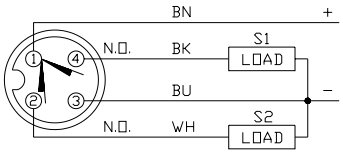
Discrete and Analog Temperature Controls, DC Self-Contained, Programmable
TC01-G1/2 A4P-2AP8X-H1140
TC01-G1/2 A4P-LIAP8X-H1140

Type	TC01-G1/2A4P-2AP8X-H1140	TC01-G1/2A4P-LIAP8X-H1140
ID number	M6877001	M6877002
Output	(2) PNP transistors, short-circuit and reverse-polarity protected, programmable N.C. or N.O.	(1) PNP transistor, short-circuit and reverse-polarity protected, programmable N.C. or N.O. And One 4-20 mA Analog output
Voltage drop at Imax	≤2.5 V	≤2.5 V
Operating Voltage	21.6 - 26.4 VDC (incl. ripple)	
Current consumption	≤ 70 mA	
Temperature Range	-20° to +60°C (-4° to +140°F)	
Medium temperature range	-40° to +120°C (-40° to +248°F)	
Adjustment Time (water, 10% - 90%)	typ. 10 s	
Measuring Range	-40° to +120°C (-40° to +248°F)	
Tolerance range	±2.5°C (0° to 80°C: ±1°C)	
Switch point accuracy	±3% of full scale	
Display resolution	1°C (-9.9° to +99.9°C: 0.1°C)	
Programmable Ranges	-39° to +120°C (-38° to +248°F), 0.5°C/step	
Hysteresis range	0.5° to +99.5°C (32.9° to +211.1°F), 0.5°C/step (0.9°F/step)	
Window range	0.5° to +99.5°C (32.9° to +211.1°F), 0.5°C/step (0.9°F/step)	
Switch-on and switch-off delay time	0 to 50 s (0.5 s/step)	
LED indications/ display	3-digit 7-segment display	
- at limit value S1/S2	yellow (2x)	
- display resolution (3-digit)	0.1°C	
Connection	4-wire ***eurofast*** ® quick disconnects, RK 4.4T-* or WK4.4T-* (See page 65), * = length in meters	
Materials		
Housing	PBT	
Sensor	316TI stainless steel (1.4571)	
Type of protection (IEN 529/ DIN 40050-9)	IP 65	
Pressure resistance	1450 psi (100 bar)	

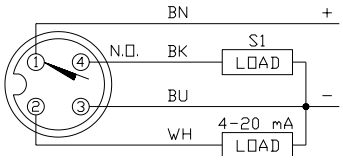
Note: G threading refers to British parallel pipe (BSPP) threading.

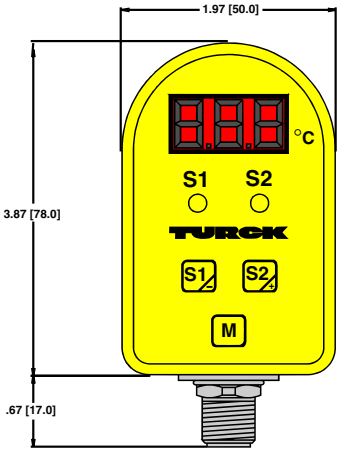
Wiring Diagrams

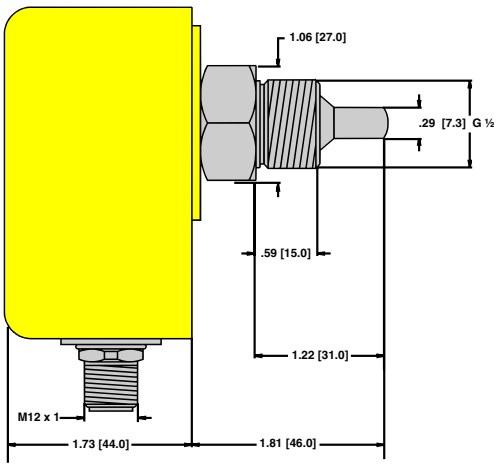
2AP8X



LIAP8X

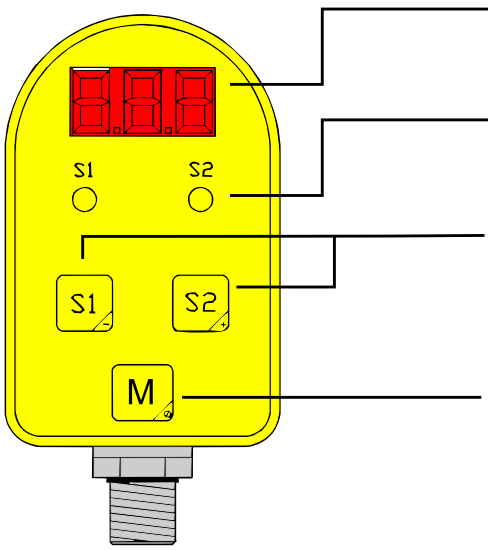






Operating and Display Elements

Operating and display elements for call-up of programmed parameters



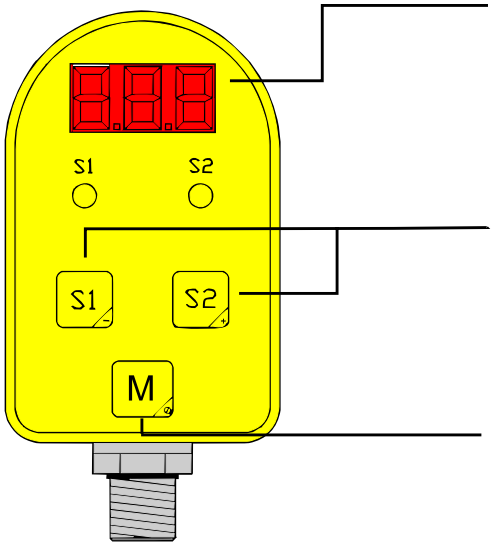
7-segment display, 3 digits.
Indicates relative temperature.

LED indications for switch points S1 and S2.
The LED illuminates yellow if output S1 or S2 are active.

Buttons S1/(-) and S2/mA/(+) set switch points S1 and S2/ the analog output. The display will return to the measuring-value monitoring mode in approximately 3 seconds.

Button M selects the required parameter.
After 2 s, the selected value displays for 2 s. Then the display returns to the measuring- value monitoring mode. If the window/hysteresis function is selected, first parameter Fu1/Fu, then Fu2 are displayed. After 2 s, the active function is indicated (window = *CO*;

Operating and display elements in the programming mode



7-segment display with 3 digits for monitoring of individual menu items, i.e. main and sub-menus and programming values.

Buttons S1/(-) and S2/mA/(+) switch between sub-menus and set the parameters. S1/(-) decreases the value, S2/mA/(+) increases the value. Programming is initiated by pressing both buttons simultaneously for 3 seconds at which time the display will start flashing. To reset the MIN or MAX memory in programming mode, use either button S1/(-) or S2/mA(+). If power is remover from the sensor, MIN and MAX will automatically be reset.

Button M selects the required parameter within the main menu. The parameter can be saved after each step by pressing the button for 3 seconds. At this time the display will stop flashing and the actual measuring value will be indicated.

Note: The analog version S2(+) push button is labeled mA(+).

Parameter Setting (displayed sequentially): Parameters and values are selected via the M and S buttons:

M: Use to select parameters in the main menu.

S1/- and S2/+: Use to select sub-menu parameters and values.

Sub-menu (hysteresis/window function)

The display of the sub-menu changes depending on whether the window or hysteresis function modes are selected. Use the S1/- and S2/+ buttons to choose the respective modes.

If the window function CO is selected for switching output 1 or 2, the display shows FR1 or FR2 a few steps later. The width of the window is determined by the value that was just set.

If the hysteresis function HYS is selected for output 1 or 2, HS1 or HS2 will be displayed. The adjusted values determine the differential between the switch-on and switch-off value.

START (press button S1/- and S2/+ simultaneously for 3 seconds). At this time the menu will begin flashing.

Menu item	Main menu	Sub-menu	Value range
Function 1	FU1		
window function 1		CO	
hysteresis 1		HYS	
Function 2	FU2		
window function 2		CO	
hysteresis 2		HYS	
Switch point 1	SP1		-39° - +120°C (-39° - +248°F)
Switch point 2	SP2		-39° - +120°C (-39° - +248°F)
Window 1	FR1		0.5° - +99.5°C (-1.0° - +179°F)
hysteresis 1	HS1		0.5° - +99.5°C (-1.0° - +179°F)
Window 2	FR2		0.5° - +99.5°C (-1.0° - +179°F)
hysteresis 2	HS2		0.5° - +99.5°C (-1.0° - +179°F)
Switch-on delay 1	DS1		0 - 50
Switch-on delay 2	DS2		0 - 50
Switch-off delay 1	DR1		0 - 50
Switch-off delay 2	DR2		0 - 50
Switching output 1	OU1		
PNP N.C.		NC	
PNP N.O.		NO	
Switching output 2	OU2		
PNP N.C.		NC	
PNP N.O.		NO	
MAX value (high)	HI		Reset MAX: [S1/-] / [S2/+]
MIN value (low)	LO		Reset MAX: [S1/-] / [S2/+]
Unit °F / C°	UNI		
		°C	
		°F	

Save (exit) Press button M for 3 seconds

TC01-G1/2 A4P-LIAP8X-H1140
Parameter Programming and Call-up

Parameter Setting (displayed sequentially): Parameters and values are selected via the M, S1 and mA buttons:

M: Use to select parameters in the main menu.

S1/- and mA/+: Use to select sub-menu parameters and values.

Sub-menu (hysteresis/window function)

The display of the sub-menu changes depending on whether the window or hysteresis function modes are selected. Use the S1/- and mA/+ buttons to choose the respective modes.

If the window function CO is selected, the display shows FR a few steps later. The width of the window is determined by the value that was just set.

If the hysteresis function HYS is selected, HS will be displayed. The adjusted value determines the differential between the switch-on and switch-off values.

START (press buttons S1/- and mA/+ simultaneously for 3 seconds). At this time the menu will begin flashing.

Menu item	Main menu	Sub-menu	Value range
Function	FU		
window function		CO	
hysteresis		HYS	
Switch point	SP		-39° - +120°C (-39° - +248°F)
Window	FR		0.5° - +99.5°C (-1.0° - +179°F)
hysteresis	HS		0.5° - +99.5°C (-1.0° - +179°F)
Switch-on delay	DS		0 - 50
Switch-off delay	DR		0 - 50
Switching output	OU		
PNP N.C.		NC	
PNP N.O.		NO	
Lower range value 4 mA	A4		-40 - 104 °C (-40° - +219°F)
Upper range value 20 mA	A20		-24 - 120 °C (-24° - +248°F)
MAX value (high)	HI		Reset MAX: [S1/-] / [mA/+]
MIN value (low)	LO		Reset MIN: [S1/-] / [mA/+]
Unit °C / °F	UNI		
		°C	
		°F	

SAVE / **EXIT** Press button M for 3 seconds

Notes:

The MK96-11-R/24VDC are single channel devices designed for use with insertion style and in-line flow monitors. All logic functions as well as the adjustments and display elements are combined in one 18 mm wide package. The devices mount on a 35 mm DIN track.

Flow setpoint adjustments are achieved by means of a coarse and a fine adjuster. The course adjuster tunes the flow setpoint to the different flow speed ranges of the remote flow monitor. The fine adjuster calibrates the flow setpoint to the exact desired flow speed.

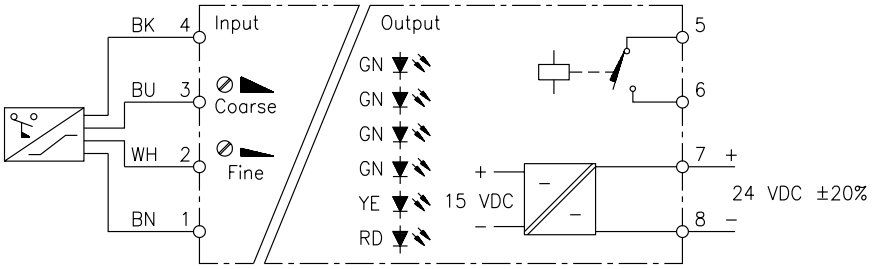
Each of the six LEDs display the difference between the actual flow speed in comparison to the flow speed that the setpoint is adjusted to.

Red LED: flow is below setpoint
Yellow LED: flow is at or above setpoint
Green LED: degree of setpoint over-range (1, 2, 3 or 4 green LEDs are lit.)

MK96-11-R/24 VDC

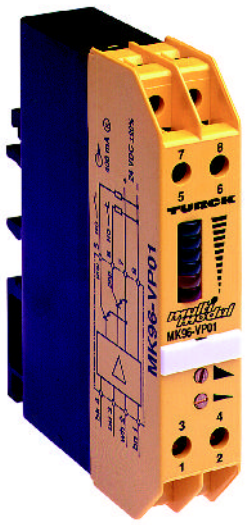
- **Signal processors for insertion style and in-line flow monitors**
- **One normally open dry contact**
- **18 mm wide terminal housing**
- **Finger protection according to VGB 4 and VDE 0470, Part 1**
- **Simple switching setpoint calibration with potentiometer**
- **Six LEDs to indicate flow conditions**

Block Diagram



Flow Monitors
Signal Processor
MK96-11-R/24VDC
1 channel

Type	MK96-11-R/24VDC
ID Number	M7525090
Supply Voltage	24 VDC ≤20%
Power / Current consumption	≤65 mA
Output Circuits	one normally open relay output (SPST)
Switching current	1 A AC/2 A DC
Voltage drop	≤1.5 V
Switching voltage	125 VAC/60 VDC
Switching capacity	125 VA/60 W
LED Indications	
Flow below setpoint, output de-energized	red
Flow at setpoint, output energized	yellow
Flow above setpoint, output energized	4 green LEDs (in addition to yellow LED)
Housing	8-pole terminal housing (H x W x D) 89 x 18 x 71 mm, page 11 PC/ABS, flammability class V-O per UL 94
Mounting	snap-on clamps for hat rail (DIN 50 022) or G-rail (DIN 50 035)
Connection	via flat terminals with self-lifting pressure plates
Connection profile	2 x 14 AWG conductors per terminal
Enclosure	IP 30
Operating temperature	-25° to +60°C (-13° to +140°F)



MK96-VP01
MK96-VN01

- **Remote signal processor for insertion and in-line style flow monitors**
- **Two complementary, short-circuit protected PNP/NPN transistor outputs**
- **18 mm wide terminal housing**
- **Simple switch set point calibration with potentiometers**
- **Six LEDs to indicate flow conditions**

The single channel MK96-VP01 and MK96-VN01 signal processors are designed for use with the insertion and in-line style flow monitors. These units feature a complementary PNP/NPN transistor output with short-circuit protection.

The flow setpoint adjustments are achieved by means of a coarse and a fine tune adjuster. The coarse adjuster tunes the flow setpoint to the different flow speed ranges of the remote flow monitors. The fine adjuster calibrates the flow setpoint to the exact desired flow speed.

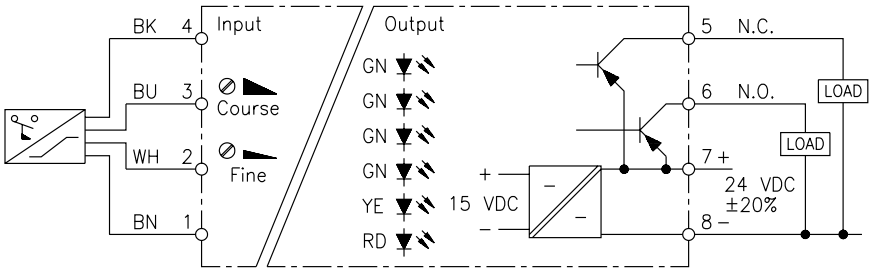
The output is de-engergized when the flow speed is below the setpoint; the output is energized when the flow speed is above the setpoint. Each of the six LEDs display the difference between the actual flow speed in comparison to the flow speed that the setpoint is adjusted to.

The LED indications are as follows:

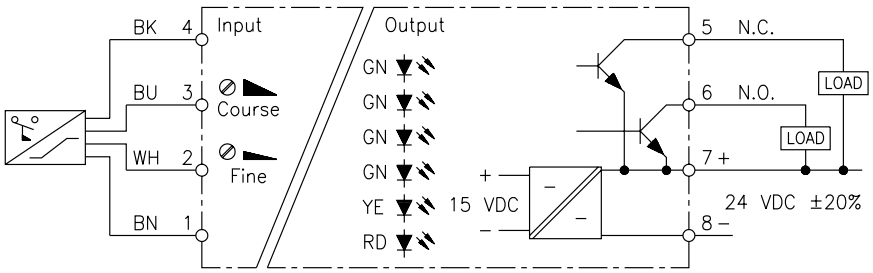
Red LED:	flow is below setpoint
Yellow LED:	flow is at or above setpoint
Green LEDs:	each LED indicates a percentage of flow above the setpoint.

Block Diagram

MK96-VP01



MK96-VN01



Flow Monitors
Signal Processor
MK96-VP01
MK96-VN01
1 channel

Type	MK96-VP01	MK96-VN01
ID Number	M7525002	M7525003
Supply Voltage	24 VDC ±20%	24 VDC ±20%
Power / Current consumption	≤65 mA	≤65 mA
Output Circuits	two complementary transistor outputs exclusive OR, PNP, short-circuit and reverse polarity protected	two complementary transistor outputs exclusive OR, NPN, short-circuit and reverse polarity protected
Switching current	≤400 mA	≤400 mA
Voltage drop	≤1.5 V at 400 mA	≤1.5 V at 400 mA
LED Indications		
Flow below setpoint, output de-energized	red	red
Flow at setpoint, output energized	yellow	yellow
Flow above setpoint, output energized	4 green	4 green
Housing	8-pole terminal housing (H x W x D) 89 x 18 x 71 mm, page 11 PC/ABS, flammability class V-O per UL 94	8-pole terminal housing (H x W x D) 89 x 18 x 71 mm, page 11 PC/ABS, flammability class V-O per UL 94
Mounting	snap-on clamps for hat rail (DIN 50 022) or G-rail (DIN 50 035)	snap-on clamps for hat rail (DIN 50 022) or G-rail (DIN 50 035)
Connection	flat terminals with self-lifting pressure plates	flat terminals with self-lifting pressure plates
Connection profile	2 x 14 AWG conductors per terminal	2 x 14 AWG conductors per terminal
Enclosure	IP 30	IP 30
Operating temperature	-25° to +60°C (-13° to +140°F)	-25° to +60°C (-13° to +140°F)

The single channel MK96-LI01 is designed for use with insertion and in-line style flow monitors. All logic functions as well as the adjustment and display elements are combined in one 18 mm wide compact package.

The voltage analog input signal is transferred to an U/A converter where it is converted into a 4 to 20 mA analog output.

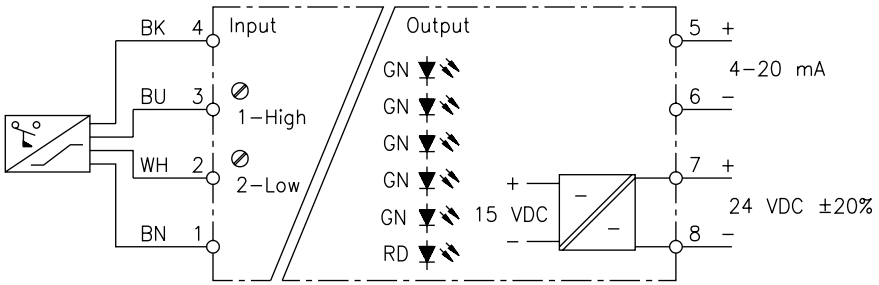
The operating range, over which switch actuation is desired, is adjusted by means of two potentiometers. Potentiometer 2 is used to set the 4 mA output at minimum flow speed. The high level setting is achieved with potentiometer 1 by adjusting the output to 20 mA when flow is at maximum speed.

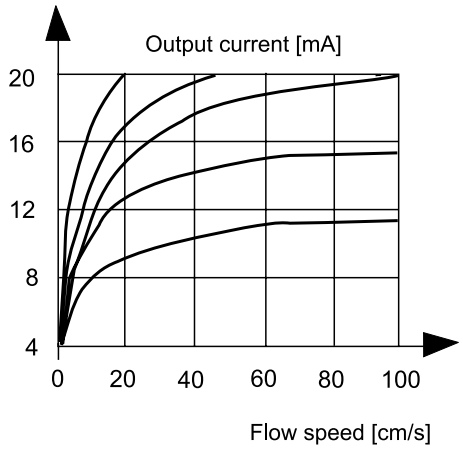
Each of the six LEDs displays the difference between the actual flow speed and the flow speed to which the unit was calibrated.

MK96-LI01

- **Signal processor for insertion and in-line style flow monitors**
- **Current output from 4 to 20 mA**
- **18 mm wide terminal housing**
- **Finger protection according to VGB 4 and VDE 0470, Part 1**
- **Simple zero and span calibration with two potentiometers**
- **Six LEDs to indicate output status**

Block Diagram





Flow Monitors
Signal Processor
with Current Output
MK96-LI01
1 channel

Type	MK96-LI01
ID Number	M7525004
Supply Voltage	24 VDC ±10% including ripple
Power / Current consumption	≤100 mA
Output Circuit	current output
Load	≤500 Ω
Current	≤4 -20 mA (max 25 mA)
LED Indications	
Output status	5 green, 1 red
- LED 6	≥ 20 mA
- LED 5	>16 mA
- LED 4	>12 mA
- LED 3	> 8 mA
- LED 2	> 4 mA
- LED 1	= 4 mA
Housing	8-pole terminal housing (H x W x D) 89 x 18 x 71 mm, page 11 PC/ABS, flammability class V-O per UL 94
Mounting	snap-on clamps for hat rail (DIN 50 022) or G-rail (DIN 50 035)
Connection	flat terminals with self-lifting pressure plates
Connection profile	2 x 14 AWG conductors per terminal
Enclosure	IP 30
Operating temperature	-25° to +60°C (-13° to +140°F)

MS96-11Ex-R...

- **Remote signal processor for Ex insertion-style flow monitors**
- **Intrinsically safe input circuit for Zone 1 [EEx ib] II C**
- **One SPDT relay output for flow control**
- **Six LEDs for flow indication**
- **Wire-break monitoring**
- **Built-in switch OFF delay, from 0 to 25 seconds**

The single channel MS96-11Ex-R signal processor is designed for use with intrinsically safe insertion-style flow monitors.

Flow set point adjustments are achieved by means of a coarse and a fine potentiometer. The coarse adjustment tunes the flow set point to the different flow speed ranges of the remote flow monitor. The fine adjustment calibrates the flow set point to the exact desired flow speed.

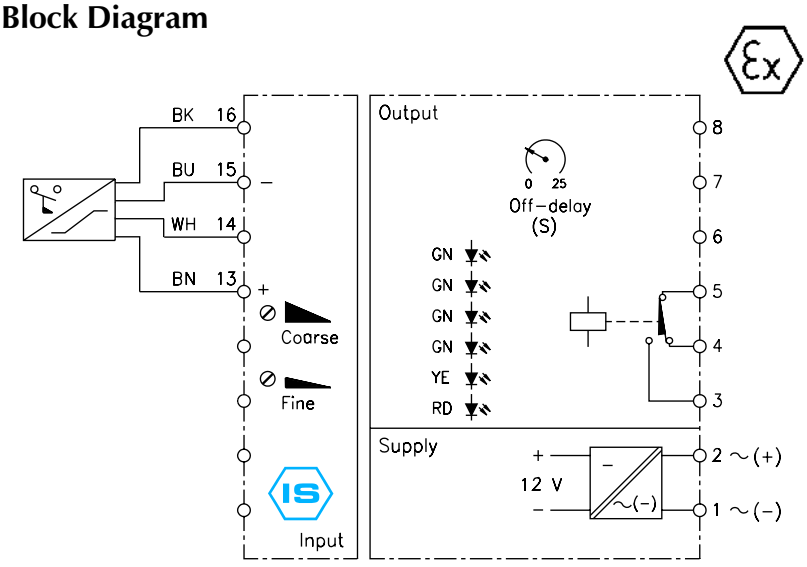
The output is de-energized when the flow speed is below the set point; it is energized when the flow speed is above the set point.

Six LEDs indicate the actual flow conditions relative to setpoint (preset range).

Red LED: flow is below set point (output de-energized)
Yellow LED: flow is at or above set point (output energized)
Green LEDs: each LED indicates a percentage of flow above the set point

The switch OFF time-delay feature is used to override the output during short-duration underflow conditions. The timer can be set for 0 to 25 seconds and is set by means of the OFF-delay potentiometer. When the switch OFF delay feature is activated, both the red and the yellow LED will illuminate at the same time.

Block Diagram



Flow Monitors
Signal Processor for Hazardous Areas
MS96-11Ex-R...
1 Channel

Type	MS96-11Ex-R/115VAC	MS96-11Ex-R/24VDC
ID Number	M5231202	M5231207
Supply Voltage	115 VAC ±10%	24 VDC ±10%
Power / Current consumption	≤75 mA	≤75 mA
Output Circuits	1 SPDT relay output	1 SPDT relay output
Switching voltage	≤250 VAC/60 VDC	≤250 VAC/60 VDC
Switching current	≤4 A/0.5 A	≤4 A/0.5 A
Hazardous Area Approvals, Listings or Certifications		
PTB No.	Ex-93.C.2039	Ex-93.C.2039
Maximum nominal values		
- No-load voltage V_O	≤12.6 V	≤12.6 V
- Short-circuit current I_K	≤200 mA	≤200 mA
Maximum external inductances/capacitances		
- [EEx ib] II C	L_A ≤0.5 mH; C_A ≤1200 nF	L_A ≤0.5 mH; C_A ≤1200 nF
Operating Range	Depends on remote flow monitor type.	Depends on remote flow monitor type.
Additional Logic Functions		
Switch OFF delay	0 to 25 s (adjustable by potentiometer)	0 to 25 s (adjustable by potentiometer)
LED Indications		
Flow below setpoint, output de-energized	red	red
Flow at setpoint, output energized	yellow	yellow
Flow above setpoint, output energized	4 green	4 green
Housing	Polycarbonate ABS (H x W x D) 75 x 50 x 110, page 11	Polycarbonate ABS (H x W x D) 75 x 50 x 110, page 11
Mounting	snap-on clamps for hat rail (DIN 50 022)	snap-on clamps for hat rail (DIN 50 022)
Connection	2 x 8 self-lifting pressure plates	2 x 8 self-lifting pressure plates
Connection profile	2 x 14 AWG conductors per terminal	2 x 14 AWG conductors per terminal
Enclosure	IP 30	IP 30
Operating temperature	-25° to +40°C (-13° to +104°F)	-25° to +40°C (-13° to +104°F)

MS96-12R...

- **Remote signal processor for use with insertion and in-line style flow monitors**
- **Units available for 115 VAC or 24 VDC**
- **Two SPDT relay outputs for flow and temperature control**
- **Six LEDs for flow indication**
- **Wire-break monitoring**
- **Adjustable temperature control over -20° to +100°C (-4° to +212°F) range**
- **Built-in switch OFF delay, from 0 to 25 seconds**

The single channel MS96-12R signal processor is designed for use with insertion and in-line style flow monitors. In addition to monitoring flow speed, the unit will also monitor flow temperature.

Flow setpoint adjustments are achieved by means of a coarse and a fine potentiometer. The coarse adjustment tunes the flow setpoint to the different flow speed ranges of the remote flow monitor. The fine adjustment calibrates the flow setpoint to the exact desired flow speed.

The output is de-energized when the flow speed is below the setpoint; the output is energized when the flow speed is above the setpoint.

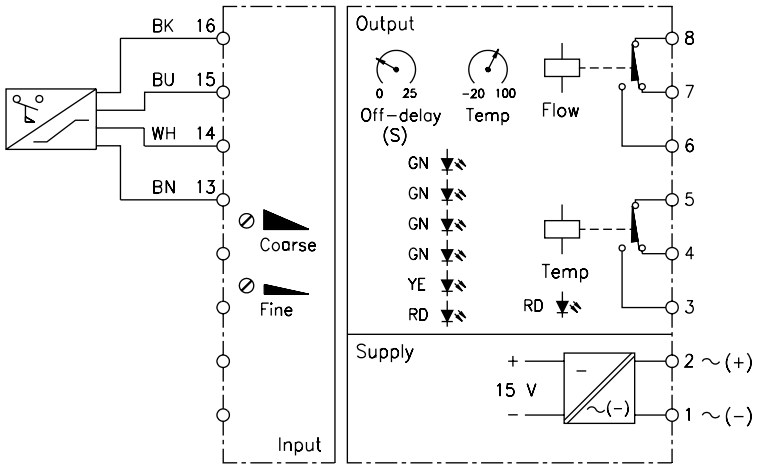
Six LEDs indicate the actual flow conditions relative to setpoint (preset range).

Red LED:	flow is below setpoint (output de-energized)
Yellow LED:	flow is at or above setpoint (output energized)
Green LEDs:	each LED indicates a percentage of flow above the setpoint

The switch OFF delay feature is used to override the output during short-duration underflow conditions. The timer can be set for 0 to 25 seconds and is set by means of the OFF delay potentiometer. When the switch OFF delay feature is activated, both the red and the yellow LED will illuminate at the same time.

Fluid temperature monitoring from -20° to +100°C (-4° to +212°F) is available and set by means of a potentiometer. When the temperature is above the temperature setpoint, the relay de-energizes and the red LED is on.

Block Diagram



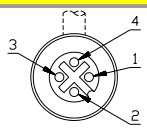
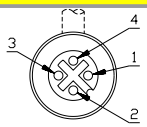
Flow Monitors
Signal Processor
MS96-12R...
1 channel

Type	MS96-12R/115VAC	MS96-12R/24VDC
ID Number	M5231000	M5231007
Supply Voltage	115 VAC +10%/-20%	24 VDC ±20%
Power / Current consumption	≤75 mA	≤125 mA
Output Circuits	2 SPDT relay outputs	2 SPDT relay outputs
Switching voltage	≤250 VAC	≤250 VAC
Switching current	≤2 A	≤2 A
Switching capacity	≤500 VA/60 W	≤500 VA/60 W
Additional Logic Functions		
Temperature control	-20° to +100°C (-4° to +212°F) adjustable by potentiometer	-20° to +100°C (-4° to +212°F) adjustable by potentiometer
Repeat accuracy	≤ ±2°C (±3.6°F)	≤ ±2°C (±3.6°F)
Setting tolerance	≤ ±10°C (±18°F)	≤ ±10°C (±18°F)
LED indication	red (1)	red (1)
Switch OFF delay	0 to 25 s (adjustable by potentiometer)	0 to 25 s (adjustable by potentiometer)
LED Indications		
Flow below setpoint, output de-energized	red	red
Flow at setpoint, output energized	yellow	yellow
Flow above setpoint, output energized	4 green	4 green
Temperature control	red	red
Housing	Polycarbonate ABS (H x W x D) 75 x 50 x 110, page 11	Polycarbonate ABS (H x W x D) 75 x 50 x 110, page 11
Mounting	snap-on clamps for hat rail (DIN 50 022)	snap-on clamps for hat rail (DIN 50 022)
Connection	2 x 8 self-lifting pressure plates	2 x 8 self-lifting pressure plates
Connection profile	2 x 14 AWG conductors per terminal	2 x 14 AWG conductors per terminal
Enclosure	IP 30	IP 30
Operating temperature	-25° to +60°C (-13° to +140°F)	-25° to +60°C (-13° to +140°F)

eurofast ® Standard Duty Cordsets

High Grade Oil and UV Resistant Gray PVC
Standard Plug Body
Unshielded
20 and 22 AWG, 105°C

Selection Guide

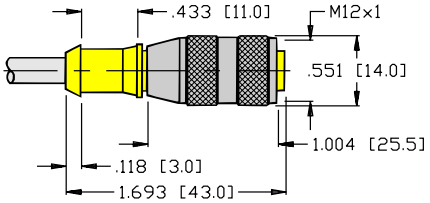
Female Pinout		
Conductor Colors	1. Bn 2. N/C 3. Bu 4. Bk	1. Bn 2. Wh 3. Bl 4. Bk
Rating	250 V, 4.0 A	250 V, 4.0 A
Conductors	3/20 AWG	4/22 AWG
Application	3-wire DC	4-wire DC
Female	**Part Number - *Length in Meters**	
- Straight - metal coupling nut	RK 4T-*	RK 4.4T-*
- Right Angle - metal coupling nut	WK 4T-*	WK 4.4T-*
Mating Receptacle	FS 4.4-0.5	FS 4.4-0.5

Specifications

Connector:	Oil resistant polyurethane body material, Nylon or PUR contact carrier, spacings to VDE 0110 Group C.
Contacts:	Gold plated brass, machined from solid stock.
Coupling Nuts:	Available in nickel plated brass, PA 6.6-GF (Nylon) or stainless steel.
Cable:	Oil resistant grey PVC jacket, 300 V 105°C. UL recognized, CSA certified.
Conductors:	High flex stranding, PVC insulation.
Protection:	NEMA 1,3,4,6P and IEC IP 68.

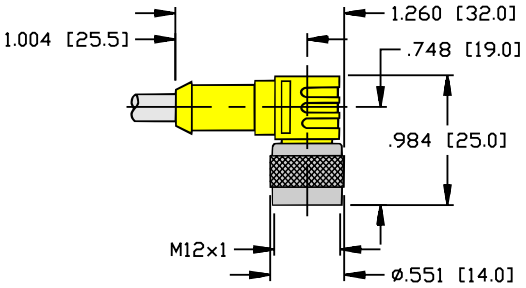
Dimensions

RK ..



Female plug, Female coupling nut

WK ..



Female plug, Female coupling nut

Cable Length

- Standard cable lengths are nominal 2,4 and 6 meters.
- Other cable lengths available. Please consult factory.

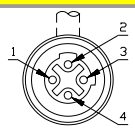
Options

- Stainless steel coupling nut. Change part # (RK .. to RKV ..).
- Nylon coupling nut. Female cordsets only. Change part # (WK .. to WKK ..).
- Other lengths and configurations available. Please consult factory.

microfast ® Standard Duty Cordsets

High Grade Oil and UV Resistant Yellow PVC
Standard Plug Body
Unshielded
22 AWG, 105°C

Selection Guide

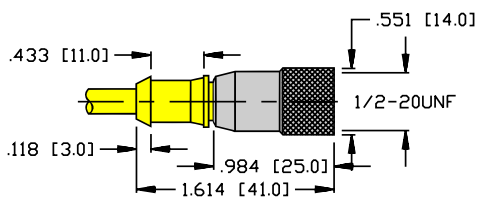
Female Pinout	
Conductor Colors	1. Bn 2. Bu 3. Bk 4. Wh
Rating	250 V, 4.0 A
Conductors	4/22 AWG
Female	**Part Number - *Length in Meters**
- Straight - metal coupling nut	KB 4T-*/S727
- Right Angle - metal coupling nut	WKB 4T-*/S727
Mating Receptacle	FSB 4-0.5/18.25

Specifications

Connector:	Oil resistant polyurethane body material, Nylon contact carrier
Contacts:	Gold plated brass, machined from solid stock.
Coupling Nuts:	Nickel plated brass.
Cable:	Oil resistant yellow PVC jacket, 105°C.
Protection:	NEMA 1,3,4,6P and IEC IP 67.

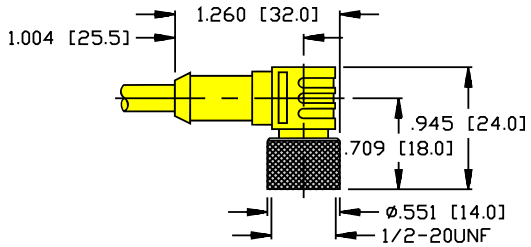
Dimensions

KB ..



Female plug, Female coupling nut

WKB ..



Female plug, Female coupling nut

Cable Length

- Standard cable lengths are nominal 2,4 and 6 meters.
- Other cable lengths available. Please consult factory.

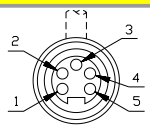
Options

- Stainless steel coupling nut.
  Change part # (KB .. to KBV ..).
- Other lengths and configurations available. Please consult factory.

minifast ® Standard Duty Cordsets

High Grade Oil and UV Resistant PVC
Standard Duty Connector
Unshielded
18 AWG, 105°C

Selection Guide

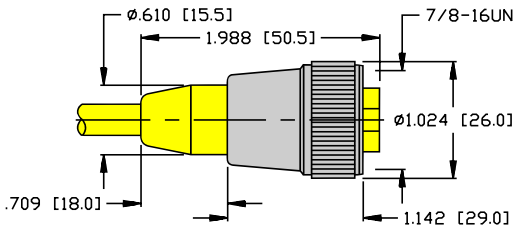
Female Pinout	
Conductor Colors	1. Bk 2. Bu 3. Gn / Ye 4. Bn 5. Wh
Rating	300 V, 9.0 A
Conductors	5/18 AWG
Female	**Part Number - *Length in Meters**
- Straight - metal coupling nut	RKM 50-*M
- Right Angle - metal coupling nut	WKM 50-*M
Mating Receptacle	RSF 50

Specifications

Connector:	Oil resistant polyurethane body material and contact carrier, 300 V rating,
Contacts:	Gold plated brass, machined from solid stock.
Coupling Nuts:	Available in nickel plated brass, PA 6.6-GF (Nylon) or stainless steel.
Cable:	Oil resistant yellow PVC jacket, 300 V 105°C AWM style. UL recognized, CSA certified.
Conductors:	18 AWG high flex stranding, PVC insulation.
Protection:	NEMA 1,3,4,6P and IEC IP 67.

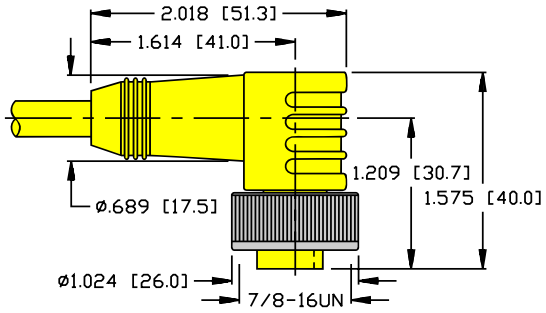
Dimensions

RKM ..



Female plug, Female coupling nut

WKM ..



Female plug, Female coupling nut

Cable Length

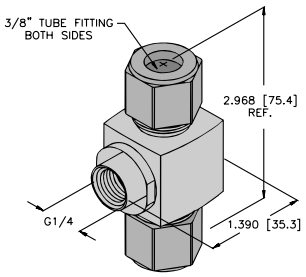
- Standard cable lengths are nominal 2,4 and 6 meters.
- Other cable lengths available. Please consult factory.

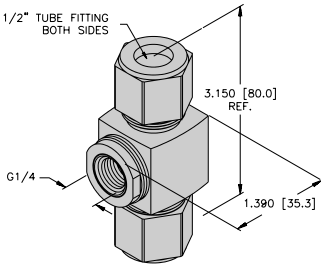
Options

- Stainless steel or nylon coupling nuts. Change part #
  (RKM .. to RKV ..) - Stainless steel
  (RKM .. to RK ..) - Nylon

Pipe Tees

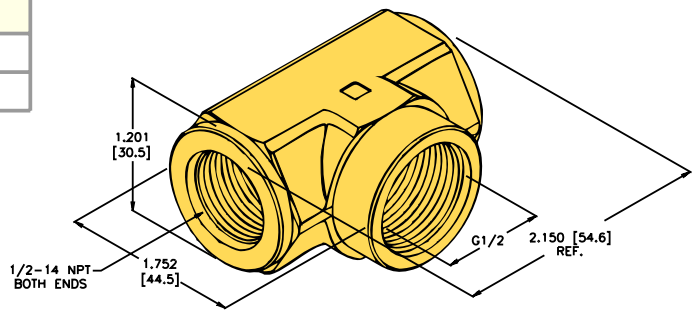
Part Number	ID Number	Material
3/8 A4-AK	A6000	316 Stainless Steel
1/2 A4-AK	A3420	316 Stainless Steel



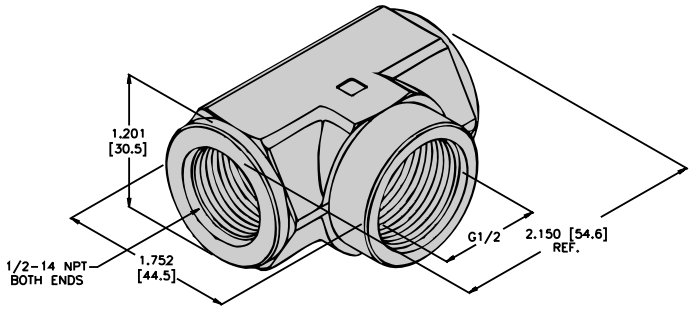


For use with G1/4 style sensors and 3/8" tubing.

Part Number	ID Number	Material
N1/2-G1/2-SST	A6060	Stainless Steel
N1/2-G1/2-BT	A6050	Brass



N1/2-G1/2-BT



N1/2-G1/2-SST

For use with G1/2 style sensors and 1/2-14 NPT pipe threads.

Notes:

- G threading refers to British parallel pipe (BSPP) threading.
- Other tee pieces available upon request.

Part Number Index

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For Application Assistance or for the location of your nearest **TURCK** distributor, call:

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Specifications in this manual are subject to change without notice. **TURCK** also reserves the right to make modifications and makes no guarantee of the accuracy of the information contained herein.

Literature and Media questions or concerns? Contact *media@turck.com*

Notes:

New Literature from TURCK

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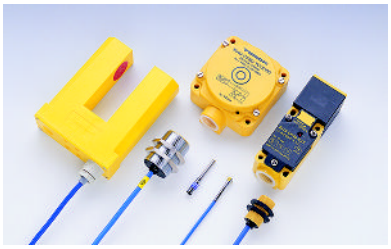

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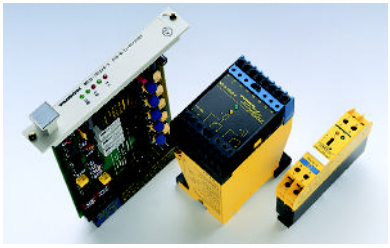

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