KALORIMETRICKÝ PRŮTOKOMĚR FLEX-F

Flow Transmitter / Switch FLEX-F

- **Compact robust flow switch / transmitter**
- **Combination with temperature switch or transmitter possible**
- **No moving parts in the medium being monitored**
- **Only one medium-contact material**
- **Simple to use**
- **Very low pressure loss**
- **Various sensor lengths and models**
- **Short response times for a calorimetric sensor**
- **Cable outlet infinitely rotatable**
- **Small installation width allows very narrow pipework**

Characteristics

The calorimetric sensor measures the flow velocity in aqueous liquids.The standard measuring range is 150 cm/s. An extended measuring range of 300 cm/s is optionally available. In principle, the measurement is carried out as a point measurement in a pipe cross section, from which the flow in the entire pipe cross section is deduced. In addition, the installation situation and the resulting change in the flow profile have an influence on the measurement result. The measurement uncertainty is therefore ±10%. This can be increased to ±5% by ordering the sensors with a measuring section in which the adjustment is made in the factory.

The measured value is output as an analogue value (0/4..20 mA or 0/2..10 V).

An electronic switching output (push-pull) is also available, which can be designed as a limit switch, frequency output or quantity pulse output.

A supplied magnet allows a parameter (e.g. limit value) to be set during operation. In addition, numerous parameters can be changed using an optionally available PC interface (ECI-3).

The evaluation electronics record two process parameters: the flow rate of the medium and its temperature. Both parameters can be assigned to the analog output or the switching output. The following output combinations are available:

Flow		Temperature	
Analog output	Switching output	Analog output	Switching output
●			
	●		
●	●		
●			●
	●	●	

The switching output can be ordered as a minimum or a maximum switch.

Technical data

Sensor	calorimetric measurement principle	
Process connection	screw-in thread G $^1/_4$ A..G $^1/_2$ A, Push-in sensor Ø12 mm	
Metering range	water 2..150 cm/s or 3..300 cm/s oil available on request	
Measurement accuracy	depending on the installation location and flow conditions typically ±10 % of full scale value or min. ± 2 cm/s, measured in the GHM measuring tube ±5 % of full scale value (only for 12 mm version)	
Repeatability	±1 %	
Operating pressure	PN 100 bar, 200 bar available on request	
Metering range Temperature	0..+70 °C (high temperature model 0..+120 °C with gooseneck)	
Operating temperature	0..+70 °C	
Storage temperature	-20..+80 °C	
Temperature gradient	4 Kelvin/s	
Materials medium-contact	Sensor	1.4571
Materials, non-medium-contact	Housing Plug Clip	1.4305 PA6.6 PA6.6
Adjustment	by means of magnet	
Supply voltage	24 V DC ±10 %	
Current requirement	max. 100 mA	
Switching output	transistor output "push-pull" (resistant to short circuits and polarity reversal) I_{out} = 100 mA max.	
Switching hysteresis	flow 4 % of full scale value, temp.: approx. 2 °C	
Display	yellow LED (On = Normal / Off = Alarm / rapid flashing = Programming)	
Analog output	4..20 mA / Load 500 Ohm max. or 0..10 V	
Electrical connection	for round plug connector M12x1, 4-pole	
Weight	approx. 0.2 kos (standard version)	
Ingress protection	IP 67	
Conformity	CE	

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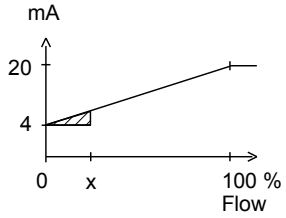
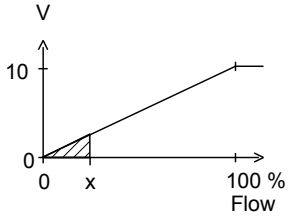
Signal output curves

Value x = Begin of the specified range
= not specified range

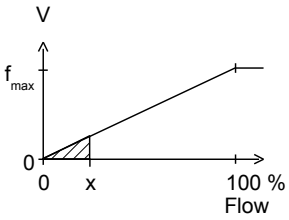
Current output



Voltage output



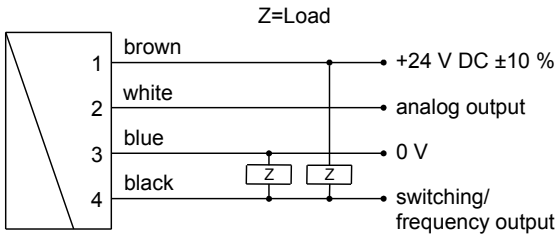
Frequency output



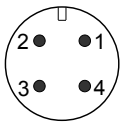
f_{max} selectable in the range of up to 2000 Hz

Other characters on request.

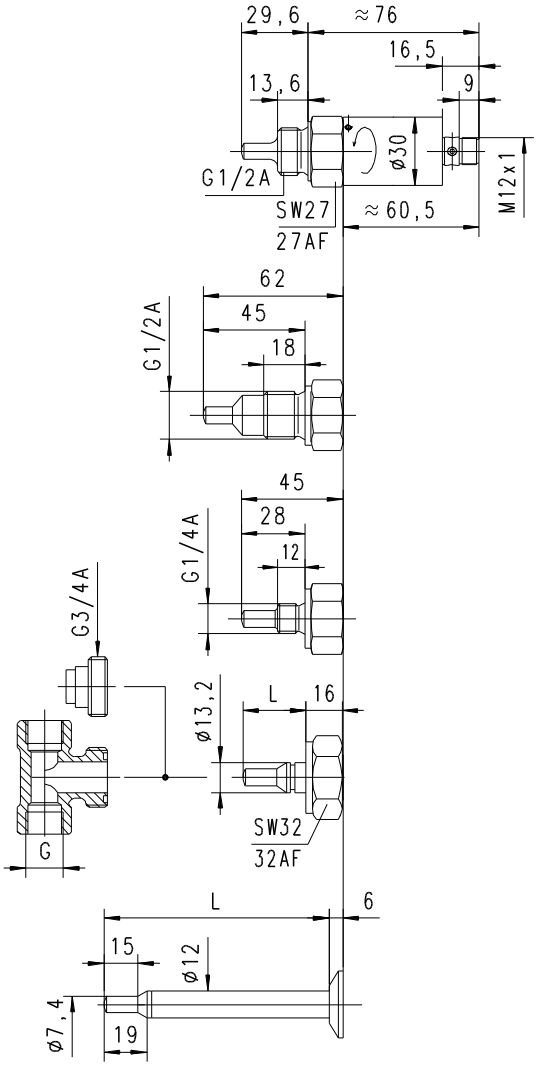
Wiring



Connection example: PNP NPC



Dimensions



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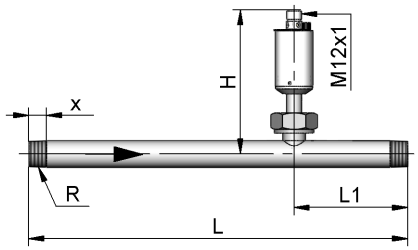
Gooseneck option

A gooseneck (optional) between the electronics head and the primary sensor provides complete freedom in the orientation and reading direction of the sensor.

FLEX-F-012WK050... with measuring tube



DN	15	25	40	50
Process connection R	1/2"	1"	1 1/2"	2"
X	14	18	22	24
L	300	475	475	475
L1	90	100	200	200
H	114	116	119	121

Handling and operation

Installation

All sensors must always be mounted in such a way that the side marked with an X receives the flow.
In general, the immersion depth should be chosen so that the sensitive point of the sensor (approx. 5 mm from the sensor tip) is at a depth of about 1/3.. ½ of the pipe diameter.

The mounting method differs for the different types of sensors.

Screw-in sensors (...008HK028..., ...015HK029..., ...015HK045…)
Screw-in sensors must be sealed with Teflon tape or a suitable sealing paste. Sealing with a flat gasket is generally not possible, since the orientation of the X marking must also be observed with screw-in sensors.
The sensor should be selected so that the medium flows well around the sensor tip.
The measurement result depends on the screw-in depth. Since this cannot be chosen arbitrarily due to the necessary alignment of the X marking, corresponding tolerances must be expected.

System fastening 13.2 mm (...013TK031..., ...013TK037…)
For the 13.2 mm system fastening, T-pieces of different nominal widths (DN10..DN50) and materials (brass, stainless steel) or alternatively welded or soldered sockets are available as accessories.
The sensor, which has a double O-ring seal, is inserted into a hole (Ø 13.2 mm) and fixed with a union nut. The alignment can be done by the free rotation without changing the immersion depth. The immersion depth is fixed.

Two different sensor lengths are available for different pipe diameters:
31 mm DN 10 .. DN 15
37 mm DN 20 .. DN 50
When the line is depressurised, the sensor can easily be disassembled and reassembled. A minimum tightening torque of the union nut is not required due to the radial seal.

Plug-in sensors 12 mm with variable immersion depth (...012VK…)
There are two different options for mounting the 12 mm plug-in sensors:
- Stainless steel compression fitting
- Plastic compression fitting

The stainless steel compression fitting is screwed into a G 1/2 threaded hole in the pipeline. A G 1/2 welded socket is also available for this purpose. If a suitable seal is used between the screw connection and the threaded hole, this arrangement can withstand pressures of up to 40 bar.
The immersion depth is determined by the user. For information on the immersion depth, see above.
The stainless steel screw connection is first tightened by hand and then further tightened 1/4 turn with the help of a wrench. The clamping ring of the screw connection can no longer be removed from the sensor after installation, so the immersion depth can no longer be changed. The alignment of the X marking can be corrected after loosening the clamping screw (only in the depressurized state!).

For the plastic compression fitting type of installation, T-pieces of various nominal widths (DN10..DN50) and materials (brass, stainless steel) or alternatively welded or soldered sockets are available as accessories. They contain a plastic cone with a 12 mm sensor hole, which is squeezed with the supplied union nut. The union nut must be tightened with 20 Nm. This arrangement is suitable for pressures up to 10 bar.
The immersion depth is determined by the user. For information on the immersion depth, see above.
The connection can be released again so that the immersion depth can be changed later.
The use of a safety chain (see accessories) is recommended to protect against being pulled out during operation.

Plug-in sensors 12 mm with measuring tube (...012WK…)
The sensors are delivered mounted in a measuring section. Since the adjustment was made in the factory in this measuring section, this version offers the lowest measurement uncertainty (typically±5%).
The measuring sections are available in different nominal widths (DN15..DN50). They have an external thread on both sides for mounting in the application.
The sensor and the measuring section can be separated from each other, e.g. for cleaning. To do this, the union nut is loosened (only if the pipeline is pressure-free!) and the sensor is pulled out of the hole. The sensor has a permanently attached cone with an O-ring and a groove into which a pin engages on the opposite side. This prevents twisting and the sensor can only be inserted in one position in the measuring section.

Programming

The electronics contain a magnetic contact, with the aid of which different parameters can be programmed. Programming takes place when a magnet clip is applied for a period between 0.5 and 2 seconds to the marking located on the label. If the contact time is longer or shorter than this, no programming takes place (protection against external magnetic fields).

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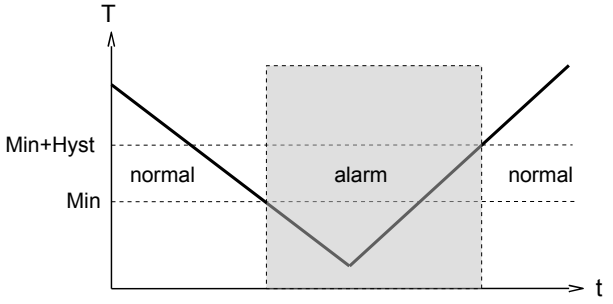
After the programming ("teaching"), the clip can either be left on the device, or removed to protect data.
The device has a yellow LED which flashes during the programming pulse. During operation, the LED serves as a status display for the switching output.
In order to avoid the need to transit to an undesired operating status during "teaching", the device can be provided ex-works with a "teach-offset". The "teach-offset" value is added to the currently measured value before saving (or is subtracted if a negative value is entered).

Example: The switching value is to be set to 70 % of the metering range, because at this flow rate a critical process status is to be notified. However, only 50% can be achieved without danger. In this case, the device would be ordered with a "teach-offset" of +20 %. At 50 % in the process, a switching value of 70 % would then be stored during "teaching".

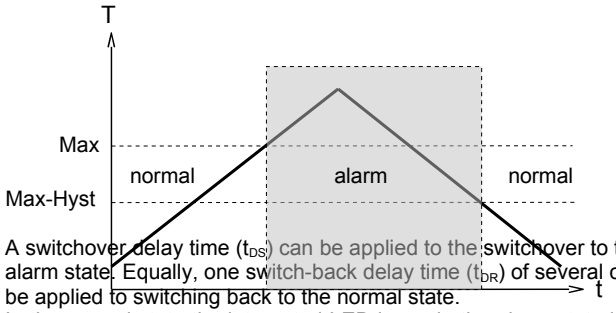
Normally, programming is used to set the limit switch. However, if desired, other parameters such as the end value of the analog or frequency output may also be set.

The limit switch can be used to monitor minimal or maximal.

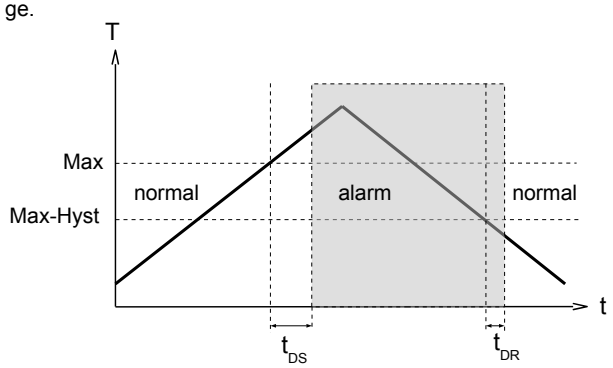
With a minimum-switch, falling below the limit value causes a switchover to the alarm state. Return to the normal state occurs when the limit value plus the set hysteresis is again exceeded.



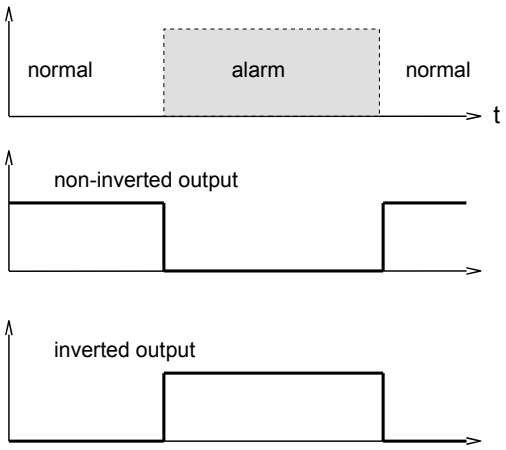
With a maximum-switch, exceeding the limit value causes a switchover to the alarm state. Return to the normal state occurs when the measured value once more falls below the limit value minus the set hysteresis.



A switchover delay time (t_{DS}) can be applied to the switchover to the alarm state. Equally, one switch-back delay time (t_{DR}) of several can be applied to switching back to the normal state.
In the normal state the integrated LED is on, in the alarm state it is off, and this corresponds to its status when there is no supply voltage.



In the non-inverted (standard) model, while in the normal state the switching output is at the level of the supply voltage; in the alarm state it is at 0 V, so that a wire break would also display as an alarm state at the signal receiver. Optionally, an inverted switching output can also be provided, i.e. in the normal state the output is at 0 V, and in the alarm state it is at the level of the supply voltage.



A Power-On delay function (ordered as a separate option) makes it possible to maintain the switching output in the normal state for a defined period after application of the supply voltage.

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Ordering code

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
FLEX-F -			**K**							

❍=Option

1.	**Connection size**						
	008	connection G 1/4 A					
	015	connection G 1/2 A					
	013	system fastener Ø13.2					
	012	push-in sensor Ø12					
2.	**Process connection**						
	H	male thread			●	●	
	T	for insertion into the system T-piece		●			
	V	push-in sensor with variable insertion depth	●				
3.	**Connection material**						
	K	stainless steel 1.4571	●	●	●	●	
4.	**Sensor**						
	028	sensor length	28.0 mm				●
	029		29.6 mm			●	
	045 ❍		45.0 mm			●	
	031	sensor for T-piece	G 3/8..G 1/2		●		
	037		G 3/4..G 2		●		
	050	insertion sensor	50 mm	●			
	070		70 mm	●			
	100		100 mm	●			
	150		150 mm	●			
	200		200 mm	●			
5.	**Analog output**						
	I	current output 4..20 mA					
	U ❍	Voltage output 0..10 V					
	K	without analog output					
6.	**Unit for analog output**						
	F	flow rate to analog output					
	T ❍	temperature to analog output					
	K	without analog output					
7.	**Switching output**						
	T	switching output push-pull					
	M ❍	switching output NPN (open collector)					
	K	without switching output					
8.	**Measurement parameter to switching output**						
	F	flow to switching output					
	T ❍	temperature to switching output					
	K	without switching output					
9.	**Function for switching output**						
	L	minimum switch					
	H	maximum switch					
	R ❍	frequency output					
10.	**Switching output level**						
	O	standard output					
	I ❍	inverted output					

Options

Special measuring range for flow: ☐☐☐ cm/s
Max. 300 cm/s (standard = 150 cm/s)

Special measuring range for temperature: ☐☐☐ °C
Maximum 120 °C (standard = 70 °C)

Minimum -20 °C (standard = 0 °C) ☐☐☐ °C

Special range for analog output: ☐☐☐ cm/s °C
<= Metering range (standard = metering range)

Special range for frequency output: ☐☐☐ cm/s °C
<= Metering range (Standard = Metering range)

End frequency (max. 2000 Hz) ☐☐☐☐ Hz

Switching delay ☐☐.☐ s
(from Normal to Alarm)

Switchback delay ☐☐.☐ s
(from Alarm to Normal)

Power-On delay (0..99 s) ☐☐ s
(time after power on, during which the outputs are not actuated)

Switching output fixed ☐☐☐ cm/s °C

Special hysteresis (standard = 4 % EW) ☐☐ %

Gooseneck ☐
(recommended at operating temperatures above 70 °C)

If the field is not completed, the standard setting is selected automatically.

Accessories

- Device configurator ECI-3
- T-piece TS-2 for system connection Ø13.2
- T-piece TS-3 for insertion sensor Ø12 with plastic compression fitting
- Weld-on adapter for insertion sensor Ø12 with plactic compression fitting
- stainless steel compression fitting
- Cable/round plug connector (KB...)
  see additional information “Accessories”
- Measuring tubes (DN15...DN50)
- safety chain kit