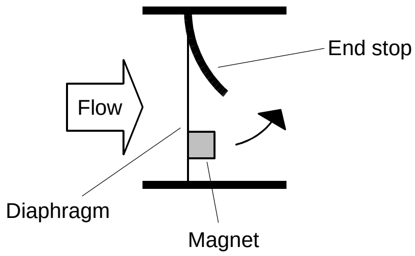
Flow Transmitter / Switch FLEX-XF

- **Universal flow sensor with rapid dynamic diaphragm**
- **Switching output and/or analog output (4..20 mA or 0..10 V)**
- **Wide measuring range**
- **Ingress protection IP 67**
- **Cable outlet infinitely rotatable**
- **Robust stainless steel housing**

Characteristics

A thin elastic diaphragm made of stainless steel, which covers the entire flow cross-section, is deflected by the flowing fluid, and thereby pushes against an arched end stop.



There is a plastic-coated magnet on the diaphragm. When there is a deflection, its magnetic field changes, and this is detected by a sensor outside the area of flow.

Flexible diaphragm made of stainless steel, with plastic-coated magnet.

Because the diaphragm only bends, and functions without a bearing, there is almost no frictional effect. The movement therefore occurs practically free of hysteresis, and the test results have very good reproducibility. The diaphragm's low bulk results in a rapid response time.

The almost complete covering of the flow cross-section in the neutral position allows very high initial sensitivity. As soon as the slightest flow exists, the diaphragm is of necessity deflected. The evaluation of the entire flow cross-section means that there are no problems when routing pipes. Run-in and run-out sections are not necessary.

The shaped end stop and the elastic properties of the diaphragm mean that even severe water hammer causes no damage.

The low number of media contact parts guarantees reliable operation and a low tendency to contamination.

The connection pieces for both sides can be freely selected, and are flanged on. Various nominal widths and materials are available. By removing the four bolts of the flange connection, it is simple to remove the measurement unit for servicing, while the connections remain in the pipework.

The integrated FLEX-XF converter / counter have an analog output (4..20 mA or 0..10 V) and a transistor output (push-pull). The transistor output can be used as a limit switch for monitoring of minimal or maximal, but also as a frequency output.

Technical data

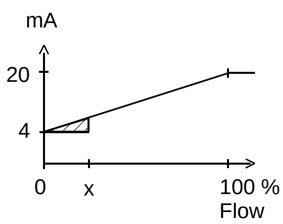
Sensor	dynamic diaphragm
nominal width	DN 8..25
Process connection	female thread G $^{1}/_{4}$..G 1, optionally male thread or hose nozzle, NPT threads and custom specific connectors on request
Metering ranges	1..100 l/min (water) for standard ranges, see table "Ranges", minimum value range 0.4..6 l/min optionally available
Accuracy	standard ranges: ±3 % of the measured value, minimum 0.25 l/min minimum value range: ±3 % of the measured value, minimum 0.1 l/min
Pressure loss	max. 0.5 bar at the end of the metering range
Pressure resistance	plastic construction: PN 16 bar full metal construction: PN 100 bar
Media temperature	0..+70 °C with high temperature option 0..+150 °C
Ambient temperature	0..+70 °C
Storage temperature	-20..+80 °C
Materials medium-contact	Body: PPS, CW614N nickelled or stainless steel 1.4404 Connections: POM, CW614N nickelled or stainless steel 1.4404 Seals: FKM Diaphragm: stainless steel 1.4031k Magnet holder: PPS Adhesive: epoxy resin
Materials, non-medium-contact	Electronic housing: 1.4305 / CW614N nickelled Plug: PA6.6 Clip: PA6.6 Flange bolts: stainless steel, full metal construction: steel
Supply voltage	18..30 V DC
Power consumption	< 1 W (for no-load outputs)
Analog output	4..20 mA / load 500 Ohm max. or 0..10 V / load min. 1 kOhm

Switching output	transistor output "push-pull" (resistant to short circuits and polarity reversal) I_{out} = 100 mA max.
Hysteresis	2 % F.S., for min.-switch, position of the hysteresis above the limit value, and for max.-switch, below the limit value
Display	yellow LED (On = Normal / Off = Alarm / rapid flashing = Programming)
Electrical connection	for round plug connector M12x1, 4-pole
Ingress protection	IP 67
Weight	see table "Dimensions and weights"
Conformity	CE

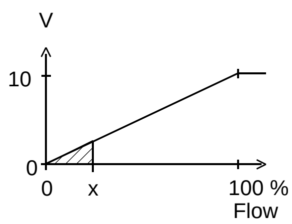
Signal output curves

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

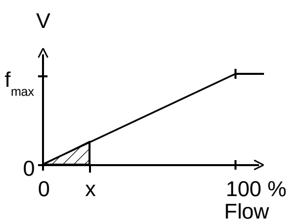
Current output



Voltage output



Frequency output



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

Other characters on request.

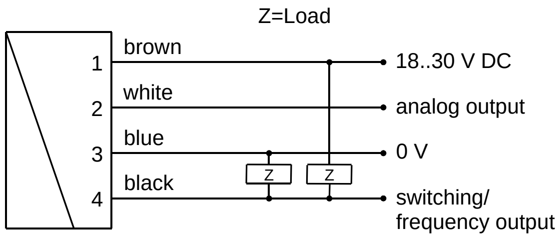
Ranges

Nominal width		Switching range l/min H_2O	Q_{max} recommended
DN 8..25	❍	0.4.. 6.0	120
DN 8..25	●	1.0.. 15.0	
DN 10..25	●	1.0.. 25.0	
DN 15..25	●	1.0.. 50.0	
DN 20..25	●	1.0.. 80.0	
DN 25 *	❍	1.0..100.0	

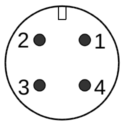
* Inner pipe diameter ≥ Ø22.5

Special ranges are available.

Wiring



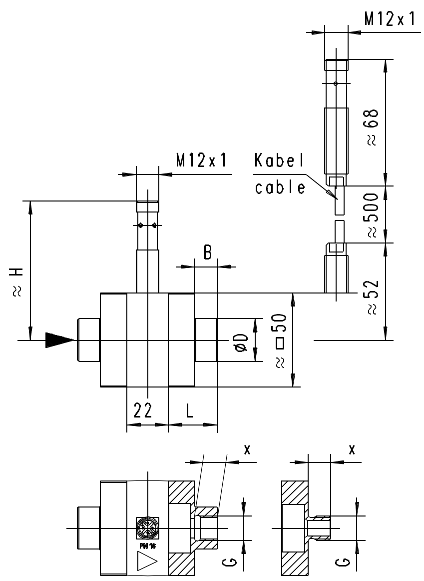
Connection example: PNP NPN



Before the electrical installation, it must be ensured that the supply voltage corresponds with the data sheet.

It is recommended to use shielded wiring.

Dimensions and weights



For high temperatures with extended electronic

Connection pieces

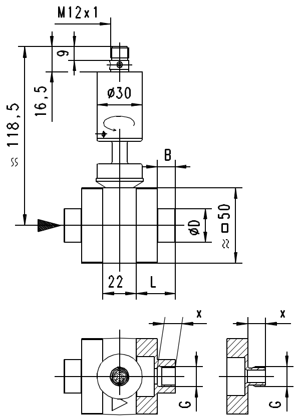
G	DN	L	B	X	ØD Metal / Plastic	Weight* kg Metal / plastic
G $^1/_4$	DN 8	26	12	12	22.5 / 33	0.245 / 0.055
G $^3/_8$	DN 10					0.240 / 0.050
G $^1/_2$	DN 15	28	14	14	28.0 / 37	0.250 / 0.055
G $^3/_4$	DN 20	30	16	16	35.0 / 42	0.270 / 0.060
G 1	DN 25		-	18	-	0.400 / 0.085
G $^1/_4$ A	DN 8	26	-	12	-	0.230 / 0.045
G $^3/_8$ A	DN 10		-		-	0.230 / 0.045
G $^1/_2$ A	DN 15	28	-	14	-	0.240 / 0.050
G $^3/_4$ A	DN 20	30	-	16	-	0.235 / 0.050
G 1 A	DN 25	32	-	18	-	0.235 / 0.050

* weights per connection, excluding bolts
Other interfaces on request
NPT threads and custom specific connectors on request

Body

Construction	Weight* kg
Plastic	ca. 0.210
Metal	ca. 0.490
Metal (with spacer)	ca. 0.560

*Weights incl. internal parts, sensor and bolts for connection pieces



Options

Through a range of options, the XF system is flexibly adaptable to very varied requirements:

Full metal construction
The standard version has a plastic body with a pressure resistance of 16 bar. A metalled body (nickelled brass) with a pressure resistance of 100 bar is optionally available. The higher operating pressure requires a combination with metal connection pieces. Measurements and switching value settings in the range 1..80 l/min are possible.

High temperature
If the full metal model is fitted with high temperature sensors and a gooseneck, operation at media temperatures up to 150 °C is possible.
Note: Operation using the plastic body is also possible at temperatures greater than 70 °C. However, it should be noted that this reduces the stability to pressure .

Resistance to backflows
With forward flows, the diaphragm pushes against an arched end stop, and is undamaged by flow rates which are significantly higher than the intended metering range, or by water hammer. For flows or pressure surges in the reverse direction, in the standard version the diaphragm pushes against a circumferential support ring made of plastic or stainless steel , and almost completely closes the flow cross-section. This causes pressure to build up which can damage the diaphragm. In applications where such conditions can arise (e.g. from elastic hoses to the rear of the measuring equipment) the use of the "resistance to backflows" option is recommended.

Here, the support ring is replaced by another arched end stop made of stainless steel, so that the diaphragm is provided with the same overload and pressure surge resistance in the reverse direction as in the forward direction. However, a measurement or setting of switching value in the reverse direction is not possible.

Minimum value measurement
For metering ranges up to 6 l/min, the sensitivity of the measuring system can be increased, and so measurements even less than 1 l/min, i.e. from 0.4 l/min become possible. For this, the sensor is installed on the opposite side of the housing. This option is not available for metal housings and models with resistance to backflows.

Handling and operation

Installation

The device is supplied with connection pieces mounted. These may be removed for the installation in the pipework.
The sensor can be operated in any location. However, the lowest tendency to contamination occurs when the diaphragm swings from bottom to top (see "Principles Drawing"). If possible. installation should therefore be made either with flow from bottom to top, or horizontal. Factory adjustment is made with flow horizontal.

It should be ensured that the sensor is installed in the direction of the flow arrow. In spite of its low bulk, the diaphragm is very robust; nevertheless it should not be buckled or compressed through force during installation or removal.

The bolts in the housing pass all the way through it, and must be completely removed if the sensor body is replaced. Afterwards, as normal with a flanged part, the body can be pulled out without loosening the screw connections.

The electronics housing is connected to the primary sensor, and cannot be removed by the user. After installation, the electronic head can be turned to align the cable outlet.

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).

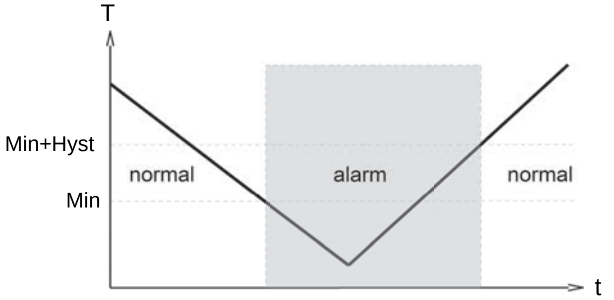

After the programming ("teaching"), the clip can either be left on the device, or removed to protect data.
The device has a yellow LED which flashes during the programming pulse. During operation, the LED serves as a status display for the switching output.
In order to avoid the need to transit to an 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".

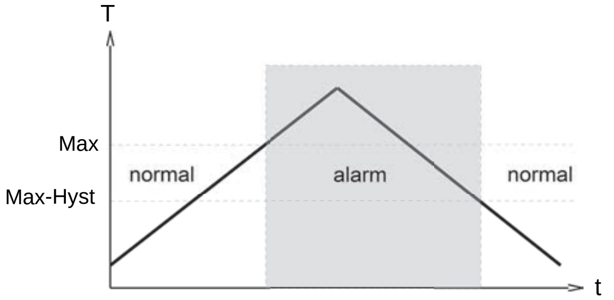
Normally, programming is used to set the limit switch. However, if desired, other parameters such as the end value of the analog or frequency output may also be set.

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

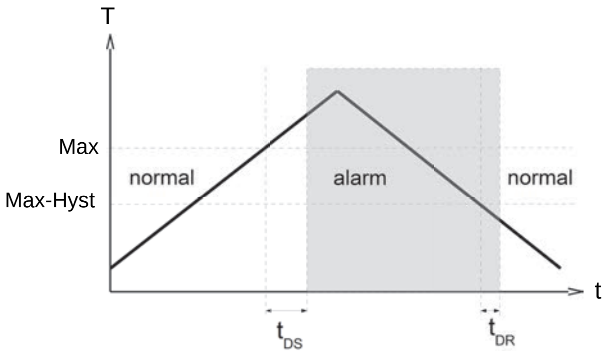
With a minimum-switch, falling below the limit value causes a switchover to the alarm state. Return to the normal state occurs when the limit value plus the set hysteresis is again exceeded.



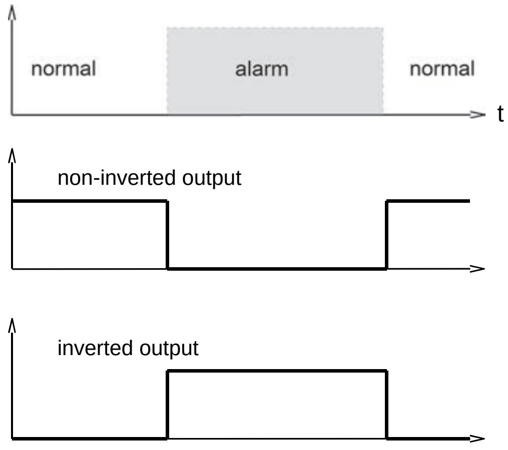
With a maximum-switch, exceeding the limit value causes a switchover to the alarm state. Return to the normal state occurs when the measured value once more falls below the limit value minus the set hysteresis.



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.

Ordering code

FLEX - XF- 1. [ ] 2. [ ] 3. [ ] 4. [ ] 5. [ ] 6. [ ] 7. [ ] 8. [ ]
9. [ ] 10. [ ] 11. [ ]

❍ = Option

1.	**Nominal width**									
	008	DN 8 - G $^1/_4$								
	010	DN 10 - G $^3/_8$								
	015	DN 15 - G $^1/_2$								
	020	DN 20 - G $^3/_4$								
	025	DN 25 - G 1								
2.	**Process connection**									
	G	female thread								
	A ❍	male thread								
	T ❍	hose nozzle								
3.	**Connection material**									
	M	CW614N nickelled								
	P ❍	POM								
	K ❍	stainless steel								
4.	**Body material**									
	Q	PPS								
	M ❍	CW614N nickelled								
	K ❍	stainless steel								
5.	**Metering range**									
	006 ❍	minimum value 0.4.. 6.0 l/min	●	●	●	●	●			●
	015	1.0.. 15.0 l/min	●	●	●	●	●	●	●	●
	025	1.0.. 25.0 l/min	●	●	●	●		●	●	●
	050	1.0.. 50.0 l/min	●	●	●			●	●	●
	080	1.0.. 80.0 l/min	●	●				●	●	●
	100 ❍	1.0..100.0 l/min	●					●	●	●
6.	**Seal material**									
	V	FKM								
	E ❍	EPDM								
	N ❍	NBR								
7.	**Resistance to backflows**									
	O	without resistance to backflows								●
	R ❍	with resistance to backflows						●	●	●
8.	**Analog output**									
	I	current output 0/4..20 mA								
	U ❍	voltage output 0/2..10 V								
9.	**Switching function**									
	L	minimum-switch								
	H	maximum-switch								
	R	frequency output								
10.	**Switching signal**									
	O	standard								
	I ❍	inverted								
11.	**Optional**									
	D ❍	150 °C version (with spacer, only for metal housing)						●	●	

Options

Special range for analog output: [ ] l/min
<= Metering range
(Standard = Metering range)

Special range for frequency output: [ ] l/min
<= 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 period (0..99 s) [ ] s
(time after power on, during which the outputs are not actuated)

Switching output fixed [ ] l/min

Special hysteresis [ ] %
(standard = 2 % of end value)

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

Accessories

- Cable/round plug connector (KB...)
  see additional information “Accessories”
- Device configurator ECI-1