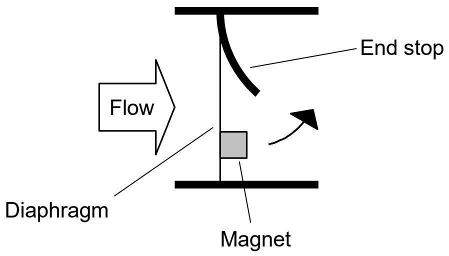
Flow Switch LABO-XF-S

- **Very short response time**
- **High overload protection**
- **Metering range 1:80**
- **Low pressure loss**
- **Compact design**

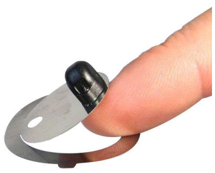
Characteristics

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.



The integrated converter / counter make available an electronic switching output (push-pull) with adjustable characteristics (minimum/maximum) and hysteresis, which responds when an adjustable limit is fallen short of or exceeded. If desired, the switching value can be set to the currently existing flow using "teaching".
Models with analog or pulse output are also available (see separate data sheets). Because the diaphragm only bends, and functions without a bearing, there is almost no friction effect. The movement therefore occurs practically free of hysteresis, and the switching point has very good reproducibility.

The diaphragm's low bulk results in a short response time. The almost complete covering of the flow cross-section in the neutral position enables a very low response threshold. 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.

There are flanged connection pieces on the inlet and outlet; these are available in various nominal widths and materials. 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.

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
Switching ranges	1...100 l/min (water) for standard range see table "Ranges", minimum value range 0.4..6 l/min optionally available
Measurement 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 end of range
Pressure resistance	Plastic construction: PN 16 Full metal construction: PN 100
Media temperature	0...+70 °C with high temperature option 0...110 °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 Back-up ring: PVDF Adhesive: epoxy resin
Materials, non-medium-contact	Sensor tube: CW614N nickelled Adhesive: epoxy resin Flange bolts stainless steel Full metal construction: steel
Supply voltage	10...30 V DC
Power consumption	< 1 W (for no-load outputs)
Switching output	transistor output "push-pull" (resistant to short circuits and polarity reversal) I_{out} = 100 mA max.
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

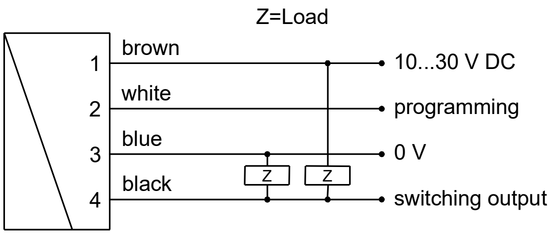
Ranges

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	

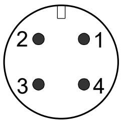
* Inner pipe diameter ≥ Ø22.5

Special ranges are available.

Wiring



Connection example: PNP NPN

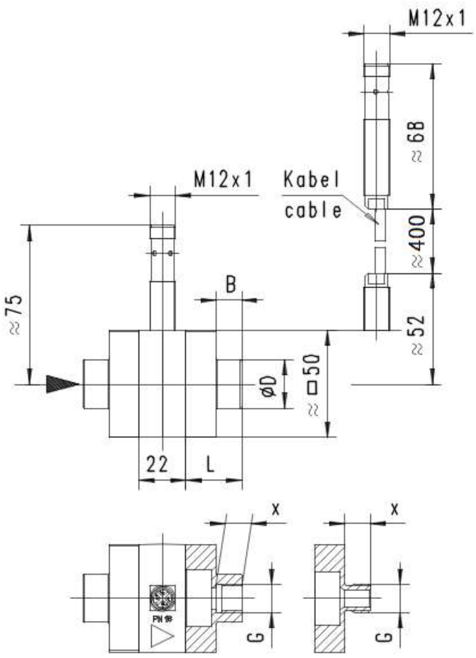


Before the electrical installation, it must be ensured that the supply voltage corresponds to the data sheet.

It is recommended to use shielded wiring.

The push-pull output) can as desired be switched as a PNP or an NPN output.

Dimensions and weights



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
NPT threads and custom specific connectors on request

Body

Construction	Weight* kg
Plastic	ca. 0.100
Metal	ca. 0.400

*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 or stainless steel) with a pressure resistance of 100 bar is optionally available. The higher operating pressure requires a combination with metal connection pieces. Switching value settings in the range of 1...100 l/min are possible.

High temperature
If the full metal model with high temperature sensors is fitted, operation at media temperatures up to 110 °C is possible. Here, the primary sensor element is located in the housing of the measurement unit, while the converter / counter are located away from housing via a 40 cm long heat-resistant cable.

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, 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 in the reverse direction is not possible.

Low value measurement
For switching 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

Inlet and outlet sections are not to be taken into account when mounting the measuring instrument.
However, care must be taken to ensure that the free cross-section of the inflow is not reduced by the assembled pipeline in a way that a nozzle effect leads to unequal distribution of the flow in the inside of the measuring instrument.
This could cause measurement errors.
The device is supplied with connection pieces mounted. These may be removed for the installation in the pipework.
For this purpose, the four screws in the front side of one of the connections are loosened and completely removed.
The fittings are then mounted in the pipeline. The connections of the inlet and outlet side may be swapped with each other if necessary, e.g. to change the mounting direction of the four threaded screws.
Subsequently, the body of the instrument is pushed between the connectors and fastened with the help of the four threaded screws.
It must be ensured that the O-rings are in the intended position.
This fastening method allows easy disassembly for cleaning and maintenance or replacement of the instrument while retaining the existing connectors.
The diaphragm is very robust despite its low mass. Nevertheless, it should not be forcibly bent or compressed during assembly.

The measuring instrument is intended for operation with water or non-aggressive media of the same viscosity.
Operation with air or other gases can lead to a flutter of the diaphragm, which can destroy the diaphragm within a short time.
It is therefore particularly important during commissioning that the system is slowly filled with the liquid medium and only then operating states with a higher flow rate are started.
It should be ensured by suitable piping that the measuring instrument cannot run empty during breaks in operation.

The sensor can be operated in any direction. However, the lowest tendency to contamination occurs when the diaphragm swings from bottom to top. If possible. installation should therefore be made either with flow from bottom to top, or horizontal. (see principle sketch p. 1 Characteristics). For this purpose, the installation must be carried out in a horizontally guided pipeline.
When installed horizontally, the electronics should point downwards in the low value range model (max. 6 l/min, see options), for other versions upwards.

The adjustment in the factory takes place with flow in a horizontal direction. Important: Regardless of the mounting direction, the prerequisite for trouble-free operation is that the medium does not contain any ferritic particles that can attach to the magnet on the orifice.

These can lead to measurement errors. In addition, it must be ensured that no particles with grain sizes > 100 µm are present in the medium. These can get stuck in the gap of the aperture and possibly inhibit the orifice plate from returning to zero, so that a flow rate is displayed even without a flowing medium.
If necessary, a filter with mesh size is located in front of the measuring system < 100 µm.

The flow direction must be observed. This is marked on the housing with an arrow. If there is a risk of rear flows (e.g. due to elastic hoses present in the pipeline), a version with the option "backflow resistance" should be selected.

The electronic housing is connected to the primary sensor and cannot be disassembled by the user.

Note

The switching value can be programmed by the user via "teaching". If desired, programmability can be blocked by the manufacturer.

The ECI-1 device configurator with associated software is available as a convenient option for programming all parameters by PC, and for adjustment.

Operation and programming

The switching value is set as follows:

- Apply the flow rate to be set to the device.
- Apply an impulse of at least 0.5 seconds and max. 2 seconds duration to pin 2 (e.g. via a bridge to the supply voltage or a pulse from the PLC), in order to accept the measured value.
- When the teaching is complete, pin 2 should be connected to 0 V, so as to prevent unintended programming.

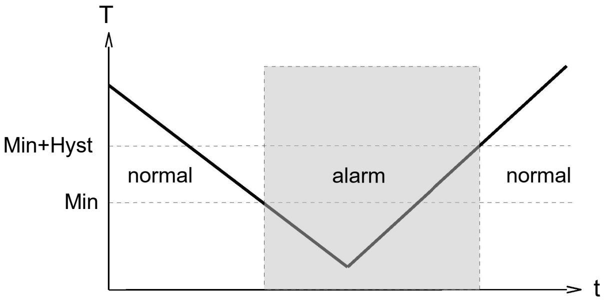
The device has a yellow LED which flashes during the programming pulse. During operation, the LED serves as a status display for the switching output.

In order to avoid the need to transit to an undesired operating status during the teach-in, the device can be provided ex-works with a teach-offset. The teach-offset point is added to the currently measured value before saving. The offset point can be positive or negative.

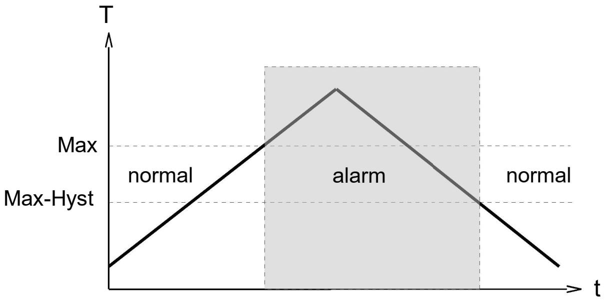
Example: The switching value should be set to 80 l/min. However, it is possible only to reach 60 l/min without problems. In this case, the device would be set using a teach-offset of +20 l/min. At a flow rate of 60 l/min in the process, teaching would then store a value of 80 l/min.

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

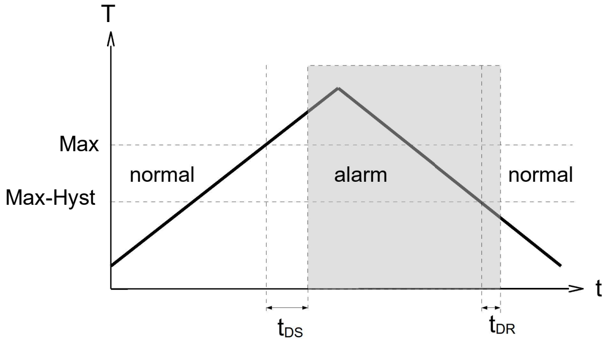
With a minimum-switch, falling below the limit value causes a switchover to the alarm state. Return to the normal state occurs when the limit value plus the set hysteresis is once more exceeded.



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.

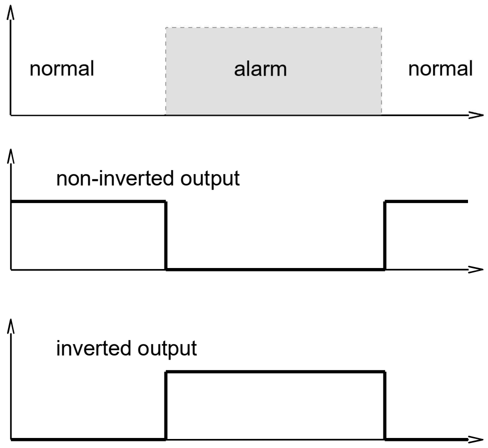


A switchover delay time (t_{DS}) can be applied to the switchover to the alarm state. Equally, one switch-back delay time (t_{DR}) of several can be applied to switching back to the normal state.



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

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
LABO-XF-		S											S	

❍ = Option

No.	Code	Opt.	Description	DN 25 (025)	DN 20 (020)	DN 15 (015)	DN 10 (010)	DN 8 (008)	K	M	Q
1.	**Switching output (Limit switch)**										
	S		push-pull (compatible with PNP and NPN)								
2.	**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								
3.	**Process connection**										
	G		female thread								
	A	❍	male thread								
	T	❍	hose nozzle								
4.	**Connection material**										
	M		CW614N nickelled								
	P	❍	POM								
	K	❍	stainless steel								
5.	**Body material**										
	Q		PPS								
	M	❍	CW614N nickelled								
	K	❍	stainless steel								
6.	**Switching range**										
	006	❍	low 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	●					●	●	●
7.	**Seal material**										
	V		FKM								
	E	❍	EPDM								
	N	❍	NBR								
8.	**Resistance to backflows**										
	O		without resistance to backflows								●
	R	❍	with resistance to backflows						●	●	●
9.	**Programming**										
	N		cannot be programmed (no teaching)								
	P	❍	programmable (teaching possible)								
10.	**Switching function**										
	L		minimum switch								
	H		maximum switch								
11.	**Switching signal**										
	O		standard								
	I	❍	inverted								
12.	**Electrical connection**										
	S		for round plug connector M12x1, 4-pole								
13.	**Optional**										
	H	❍	110 °C version (with 400 mm cable, only for metal housing)						●	●	

Options

Switching delay period (0.0 … 99.9 s) [_ _ . _] s
(from Normal to Alarm)

Switch-back delay period (0.0 … 99.9 s) [_ _ . _] s
(from Alarm to Normal)

Power-On-Delay period (0 … 99 s) [_ _] s
(after connecting the supply, time during which the switching output is not activated)

Switching output fixed at [_ _ _] l/min

Switching hysteresis [_ _] %
Standard = 2 % of the metering range

Teach-offset [_ _ _ _] %
(in percent of the metering range)
Standard = 0 %

Further options available on request.

Accessories

- Cable with connector (K04PU...)
- Device configurator ECI-3