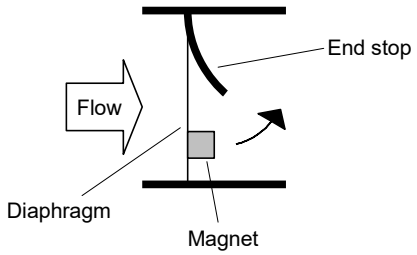
Flow Transmitter LABO-XF-I / U / F / C

- **Very short response time**
- **High overload protection**
- **Metering range 1:100**
- **Low pressure loss**
- **Compact design**
- **0...10 V, 4...20 mA, frequency/pulse output, completely configurable**

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 measurements have 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 produces very high start-up 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.

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.

The LABO-XF electronics make various output signals available:

- Analog signal 0/4..20 mA (LABO-XF-I)
- Analog signal 0/2..10 V (LABO-XF-U)
- Frequency signal (LABO-XF-F) or
- Value signal pulse / x Litres (LABO-XF-C)

A model with switching output is also available.

If desired, the range end value can be set to the currently existing flow using "teaching".

Technical data

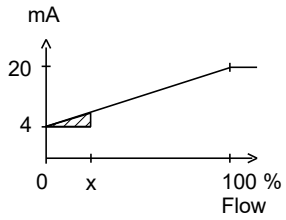
Sensor	dynamic diaphragm	
nominal width	DN 8...25	
Process connection	female thread G $^1/_4$...G 1, optionally male thread or hose nozzle, NPT threads and custom specific connectors on request	
Metering ranges	1...100 l/min (water) for standard ranges, see table "Ranges", minimum value range 0.4...6 l/min optionally available	
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	
Pressure resistance	Plastic construction: Full metal construction:	PN 16 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: Connections: Seals: Diaphragm: Magnet holder: Back-up ring: Adhesive:	PPS, CW614N nickelled or stainless steel 1.4404 POM, CW614N nickelled or stainless steel 1.4404 FKM stainless steel 1.4031k PPS PVDF epoxy resin
Materials, non-medium-contact	Sensor tube: Adhesive: Flange bolts:	CW614N nickelled epoxy resin stainless steel full metal construction: steel
Supply voltage	10...30 V DC or 15...30 V DC (for voltage output 10 V)	

Power consumption	< 1 W (for no-load outputs)
Output data:	all outputs are resistant to short circuits and reversal polarity protected
Current output:	4...20 mA (0...20 mA available on request)
Voltage output:	0...10 V (2...10 V available on request) output current max. 20 mA
Frequency output:	transistor output "push-pull" I_{out} = 100 mA max. output frequency depends on metering range, standard is 500 Imp/l (corresponds to 833.3 Hz at 100 l/min) minimum value range: 5000 Imp/l (corresponds to 500 Hz at 6 l/min) (other frequencies available on request)
Pulse output:	transistor output "push-pull" I_{out} = 100 mA max. pulse width 50 ms pulse per volume is to be stated
Display	yellow LCD shows operating voltage (LABO-XF-I / U) or output status (LABO-XF-F / C) or (rapid flashing = programming)
Electrical connection	for round plug connector M12x1, 4-pole
Ingress protection	IP 67
Weight	see table "Dimensions and weights"
Conformity	CE

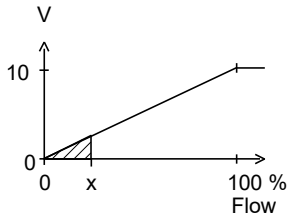
Signal output curves

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

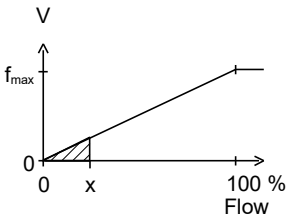
Current output



Voltage output



Frequency output



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

Other characters on request.

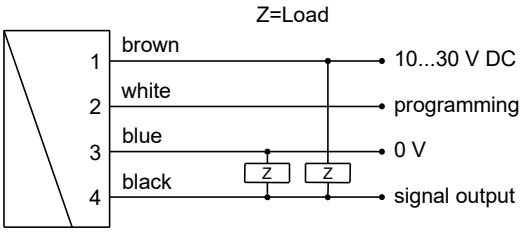
Ranges

Nominal width		Measurement 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	

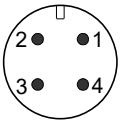
* Inner pipe diameter ≥ Ø22.5

Special ranges are available.

Wiring



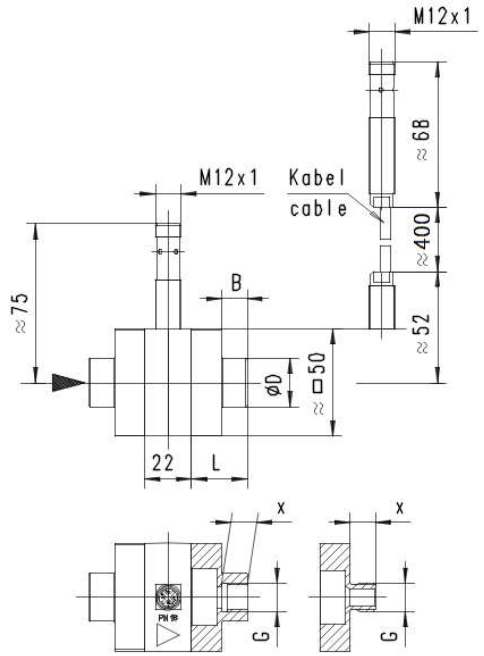
Connection example: PNP NPN



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 of the frequency output version can as desired be connected 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.

Measurements 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 is 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 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

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 metering range end value can be programmed by the user via "teaching". Requirement for programmability must be stated when ordering, otherwise the device cannot be programmed. The ECI-3 device configurator with associated software is available as a convenient option for programming all parameters by PC, and for adjustment. The teaching option is not available for the pulse output version.

Operation and programming

The teaching process can be carried out by the user as follows:

- The flow rate to be set is applied 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 devices have a yellow LED which flashes during the programming pulse. During operation, the LED serves as an indicator of operating voltage (for analog output) or of switching status (for frequency or pulse output).

To avoid the need to transit to an undesired operating status for the purpose of teaching, 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 end of the metering range 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.

Ordering code

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

❍ = Option

1.	**Signal output**										
	I	current output 4...20 mA									
	U	voltage output 0...10 V									
	F	frequency output (see "Ordering information")									
	C	pulse output (see "Ordering information")									
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.	**Metering 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.	**Electrical connection**										
	S	for round plug connector M12x1, 4-pole									
11.	**Optional**										
	H ❍	110 °C Version (with 400 mm cable, only for metal housing)						●	●		

Required ordering information

For LABO-XF-F:
Output frequency at full scale ☐☐☐☐ Hz
Maximum value: 2,000 Hz

For LABO-XF-C:
For the pulse output version, the volume (with numerical value and unit) which will correspond to one pulse must be stated.

Volume per pulse (numerical value) ☐☐☐☐

Volume per pulse (unit) ☐☐☐☐

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)

Further options available on request.

Accessories

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