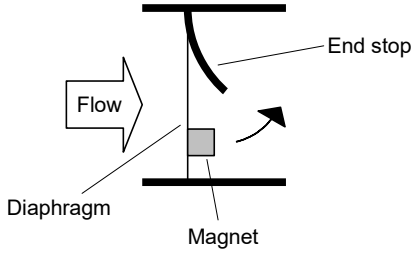
Flow transmitter/switch OMNI-XF

- **Universal flow rate sensor with dynamic diaphragm**
- **Analog output, two switching outputs**
- **Clear, easily legible, illuminated LCD display**
- **Modifiable units in the display**
- **Designed for industrial use**
- **Small, compact construction**
- **Simple installation**

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 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 medium 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 OMNI transducer located on the sensor has a backlit graphics LCD display which is very easy to read, both in the dark and in bright sunlight. The graphics display allows the presentation of measured values and parameters in a clearly understandable form.

The measured values are displayed to 4 places, together with their physical unit, which may also be modified by the user. The electronics have an analog output (4..20 mA or 0..10 V) and two switching outputs, which can be used as limit switches for monitoring minimal or maximal, or as two-point controllers. The switching outputs are designed as push-pull drivers, and can therefore be used both as PNP and NPN outputs. Exceeding limit values is signalled by a red LED which is visible over a long distance, and by a cleartext in the display.

The stainless steel case has a hardened non-scratch mineral glass pane. It is operated by a programming ring fitted with a magnet, so there is no need to open the operating controls housing, and its leakproofness is permanently ensured.

By turning the ring to right or left, it is simple to modify the parameters (e.g. switching point, hysteresis...). To protect from unintended programming, it can be removed, turned through 180 ° and replaced, or completely removed, thus acting as a key.

OPTION C:
Preset Counter with external reset option, complementary switching outputs and actual value display.

OPTION C1:
Instantaneous value display with analog output, pulse-volume output and totalizer

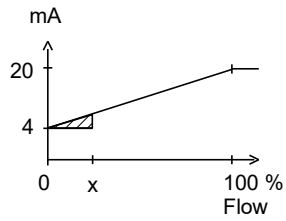
Technical data

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 Full metal construction: PN 100
Media temperature	Plastic construction: 0… +70 °C Full metal construction: 0...+100 °C
Ambient temp.	0...+70 °C
Storage temp.	-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	Housing: stainless steel 1.4305 Glass: mineral glass, hardened Magnet: Samarium-Cobalt Ring: POM Flange bolts: stainless steel Full metal construction: steel
Supply voltage	18...30 V DC
Power consumption	< 1 W
Signal output	4/0...20 mA / max. load 500 Ohm (0/2...10 V available on request)
Switching output	transistor output "push-pull" (short circuit protected and polarity proof) I_{out} = 100 mA max.
Hysteresis	adjustable, position of the hysteresis depends on minimum or maximum
Display	backlit graphical LCD-Display (transreflective), extended temperature range -20...+70 °C, 32 x 16 pixels, background illumination, displays value and unit, flashing LED signal lamp with simultaneous message on the display.
Electrical connection	for round plug connector M12x1, 5-pole
Ingress protection	IP 67 / (IP 68 if oil-filled)
Weight	see table "Dimensions and weights"
Conformity	CE

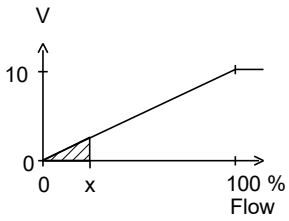
Signal output curves

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

Current output



Voltage output



Other characters on request

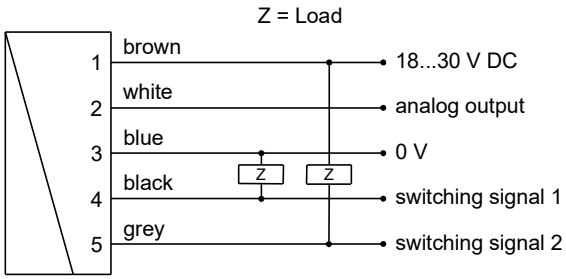
Ranges

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	

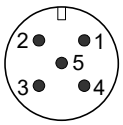
* Inner pipe diameter ≥ Ø22.5

Special ranges are available.

Wiring



Connection example: PNP NPN

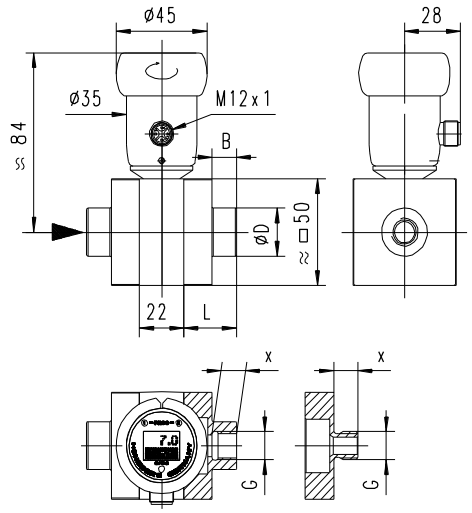


connector M12x1

See separate wiring at C and C1 option in the separate descriptions.

Before the electrical installation, it must be ensured that the supply voltage corresponds to the data sheet.
The use of shielded cabling is recommended.

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				22.5 / 33	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. 0.265
Metal	ca. 0.550

*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 of 1...100 l/min are possible.

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 or setting of switching value 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 orifi-

ce.

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.

After installation, the electronic head can be rotated to align the cable outlet.

Programming

The annular gap of the programming ring can be turned to positions 1 and 2. The following actions are possible:

Set to 1 = continue (STEP)
Set to 2 = modify (PROG)

Neutral position between 1 and 2

The ring can be removed to act as a key, or turned through 180 ° and replaced to create a programming protector.
Operation is by dialog with the display messages, which makes its use very simple.
Starting from the normal display (present value and unit), if 1 (STEP) is repeatedly selected, then the display shows the following information in this order:

Display of parameters, using position 1

- Switching value S1 (switching point 1 in the selected unit)
- Switching characteristic of S1
  MIN = Monitoring of minimum value
  MAX = Monitoring of maximum value
- Hysteresis 1 (hysteresis value of S1 in the set unit)
- Switching value S2
- Switching characteristic of S2
- Hysteresis 2
- Code
  After entering the **code 111**, further parameters can be defined:
- Filter (settling time of the display and output)
- Physical unit (Units)
- Output: 0...20 mA or 4...20 mA
- 0/4 mA (measured value corresponding to 0/4 mA)
- 20 mA (measured value corresponding to 20 mA)

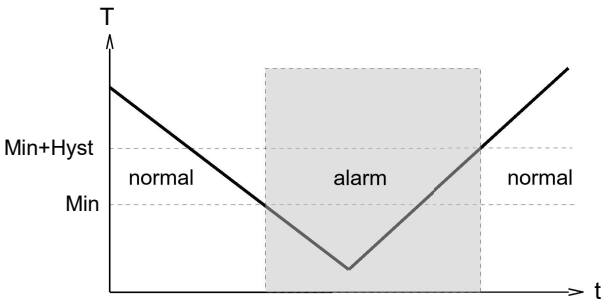
For models with a voltage output, replace 20 mA accordingly with 10 V.

Edit, using position 2

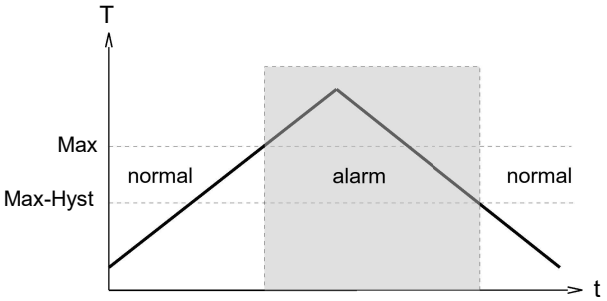
If the currently visible parameter is to be modified:
- Turn the annular gap to position 2, so that a flashing cursor appears which displays the position which can be modified.
- By repeatedly turning to position 2, values are increased; by turning to position 1, the cursor moves to the next digit.
- Leave the parameter by turning to position 1 (until the cursor leaves the row); this accepts the modification.
- If there is no action within 30 seconds, the device returns to the normal display range without accepting the modification.

The limit switches S1 and S2 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.



The change to the alarm state is indicated by the integrated red LED and a cleartext in the display.
While in the normal state the switching outputs are at the level of the supply voltage; in the alarm state they are at 0 V, so that a wire break would also display an alarm state at the signal receiver.

Overload display
Overload of a switching output is detected and indicated on the display ("Check S 1 / S 2"), and the switching output is switched off.

Simulation mode
To simplify commissioning, the sensor provides a simulation mode for the analog output. It is possible to create a programmable value in the range 0...26.0 mA at the output (without modifying the process variable). This allows the wiring run between the sensor and the downstream electronics to be tested during commissioning. This mode is accessed by means of code **311**.

Factory settings
After modifying the configuration parameters, it is possible to reset them to the factory settings at any time using **code 989**.

Options

- Counter C (hardware and software option):
  Preset Counter with external reset option, complementary switching outputs and actual value display
  (modified wiring diagram!)

- Counter C1 (software option):
  Instantaneous value display with analogue output, pulse-volume output and totalizer

Accessories

- Cable with circular connector M12x1(K05PU...)

Order code

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
OMNI - XF-										

❍ = 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 ❍	low value measurement 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								●
	K ❍	without							●	
9.	**Option 1**									
	O ❍	tropical model oil-filled version for heavy duty or external use								
10.	**Option 2**									
	C ❍	Counter C								
	C1 ❍	Counter C1								