

Product information

Flow Hygienic design

Mag Flowmeter MFI447



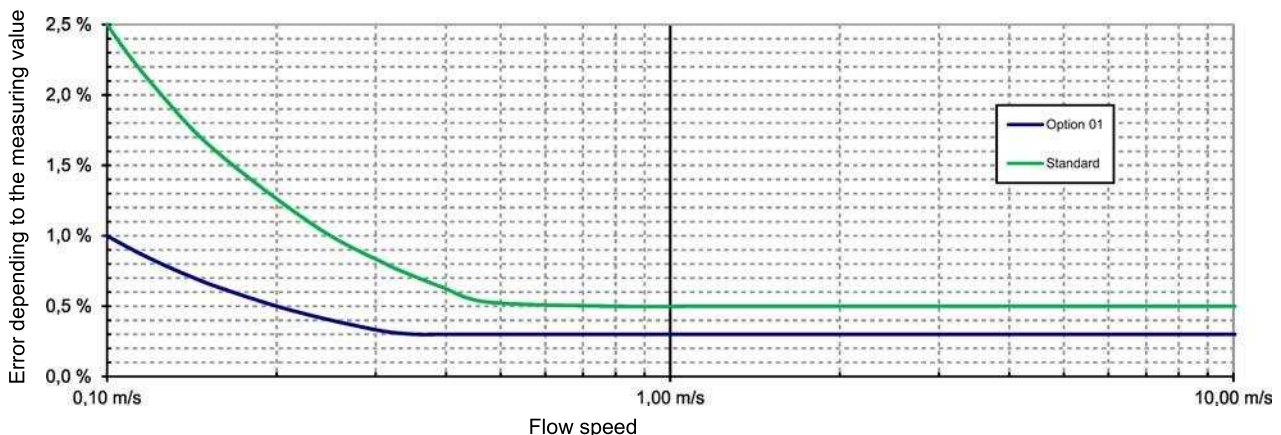
- Ultra compact design
- High accuracy ($\pm 0.5\%$) of flow speed > 0.5 m/s (1.6 f/s) (optional $\pm 0.3\%$ for tube diameter < 20 mm)
- No moving parts in the process
- Measurement of fluid, pasty and slurry media
- Turnable transmitter housing ($\pm 170^\circ$)
- Programming with touch screen
- EHEDG certified
- CIP-/SIP-capable
- Integrated batch controller (optional)

Characteristics

In the basic principle an electromagnetic flow meter consists of a measuring pipe, a magnetic circle and two electrodes. The measuring pipe will be flown through a medium with a minimum of electrical conductivity. From outside a magnetic field vertically oriented to the flow direction is raised. The induced voltage in the medium will be measured with two opposite installed electrodes. The induced voltage is proportional to the flow velocity of the liquid. With knowledge of the pipe geometry the transmitter calculates the actual flow volume. From this value the data will be derived for the outputs and the integrated totalizer.

The MFI447 is designed for measurement of liquids, pasty or slurry media with a minimum of conductivity from $> 5 \mu\text{S}$.

Error table accuracy 0.5 % (standard) and option 01 (0.3 %)



Technical data

- Power supply**
 Supply voltage : 18..32 V DC
 Power consumption : max. 5 W
 Electrical connection : M12 plug, 5 pole
 Isolation : Sensor / supply, output / housing
 CE- conformity : EN 61326:05/2007
- Ambient condition**
 Ambient temperature : -20..+60 °C
 Climate class : EN 60068-2-38
 Vibrations : EN 60068-2-6, GL test2
- Approval**
 EHEDG : Evaluation Report No. 148/18.10.2007
- Measuring range**
 Accuracy : 0..12 m/s (0..33 feet/s)
 Accuracy : $\pm 0.5\%$, optional $\pm 0.3\%$
 Min. conductivity : $> 5 \mu\text{S}$,
 $> 20 \mu\text{S}$ for water
- Process temperature : -20..+130 °C, 150 °C < 60 min
 CIP-/SIP-cleaning, ($T_{\text{Umg.}}$ 25°C)
- Process pressure : DN3..DN40 ≤ 40 bar
 DN50, DN80 ≤ 16 bar
 DN65, DN100 ≤ 10 bar
- Process material : coating PFA (FDA conform),
 1.4539 electrodes, tube connection
 1.4435, seal EPDM (FDA conform)
 hygienic design acc. to EHEDG
- Process connection : TriClamp, SMS, DIN11851 milk pipe,
 DIN11864 Südmo Aseptic connection,
 Tuchenhagen flange, APV flange

Material

Tube standard	Material	3.1 certificate
DIN 11850 range 1 and 2	1.4404	-
DIN 11866 range A	1.4435	✓
DIN 11866 range B (DIN EN ISO 1127)	1.4435	✓
DIN 11866 range C (ASME)	1.4435	✓
OD-Tube (ASME)	1.4404	-
ISO 2037	1.4404	-

Outputs

- Analog : 0/4..20 mA
 Switching outputs : 2 x Transistor PNP / NPN programmable
 max. 32 V DC, 100 mA
 programmable as:
 - impulse output (max. 10 kHz)
 - switching output
 - control input

Housing

- : electronic housing $\varnothing 79$ mm
 Material : 1.4305
 Protection class : IP67 / IP69K

Display

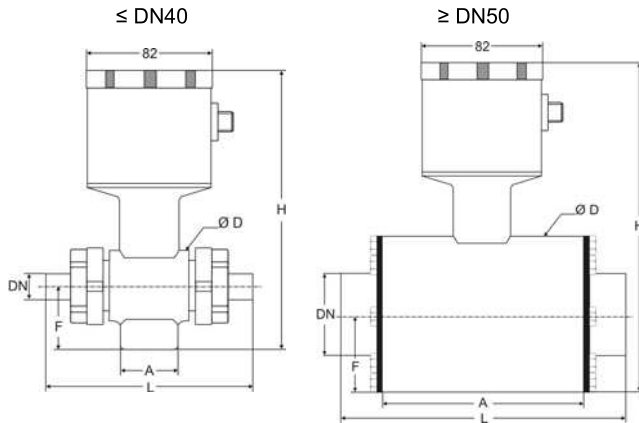
- : Graphic-LCD background illuminated
 Operation : 4 capacitive buttons

Mistakes reserved, technical specifications subject to change without notice..

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Dimensions / process connection



Standard dimensions for welding connection

(Dimensions in mm)

Ø MFI DN	Connection DN	D	H	A	F	L
3	10	44	175	37	38.5	127
4	10	44	175	37	38.5	127
6	10	44	175	37	38.5	127
8	10	44	175	37	38.5	127
10	10	44	175	37	38.5	127
15	15	44	175	37	38.5	127
20	20	63	185	42	43	132
25	25	63	194	54	48	149
32	32	78	203	62	53	166
40	40	78	212	67	57	171
50	50	100	208	128	50	173
65	65	116	230	114	58	165
80	80	133	247	114	67	169
100	100	160	275	114	81	199

Valid for DIN 11850 range 1, DIN 11850 range 2 and DIN 11866 range A.

Dimensions of additional process connections

(Length over all L [mm])

DIN 11850 range 2 / DIN 11866 range A

DN	TriClamp DIN32676	Milk pipe DIN11851*	Aseptic flange DIN11864-1/ Form A	APV Flange with slot
3..10	163	169	165	--
15	163	169	165	--
20	168	180	174	--
25	192	207	201	197
32	209	230	226	--
40	214	237	233	219
50	216	243	235	221
65	221	245	237	213
80	225	259	253	217
100	255	307	299	247

only for DIN 11850 range 2

OD Tube / DIN 11866 range C

DN	TriClamp inch	Milk pipe DIN11851*	Aseptic flange DIN11864-1/ Form A
1/4"	--	--	--
3/8"	--	--	--
1/2"	143.6	--	200.2
3/4"	143.6	--	200.2
1"	175.6	191.0	184.6
1 1/2"	267.0	290.0	286.0
2"	267.0	294.0	286.0
2 1/2"	280.0	304.0	296.0
3"	225.0	249.0	253.0
4"	255.0	307.0	299.0

* only for OD Tube

DIN 11866 range B (ISO 1127)

DN	TriClamp ISO	Aseptic flange DIN11864-1/ Form A
3..10		168.6
15	162.6	
20		178.6
25		284.0
32	267.0	
40		286.0
50	280.0	
65		253.0
80	225.0	
		269.0
100	--	--

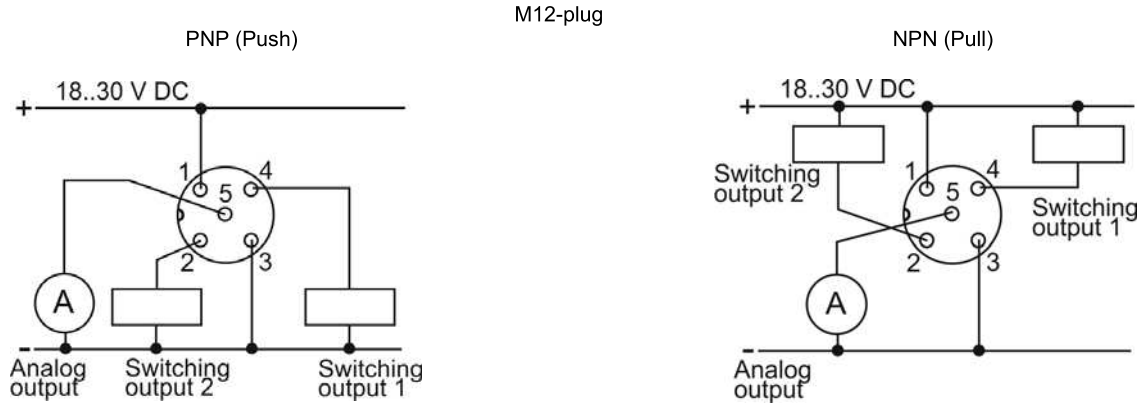
ISO 2037

DN	SMS threaded nozzle
3..10	
15	--
20	
25	179
32	200
40	211
50	
65	213
80	217
100	269

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Connection diagram



Cable colors: 1 = brown, 2 = white, 3 = blue, 4 = black, 5 = grey

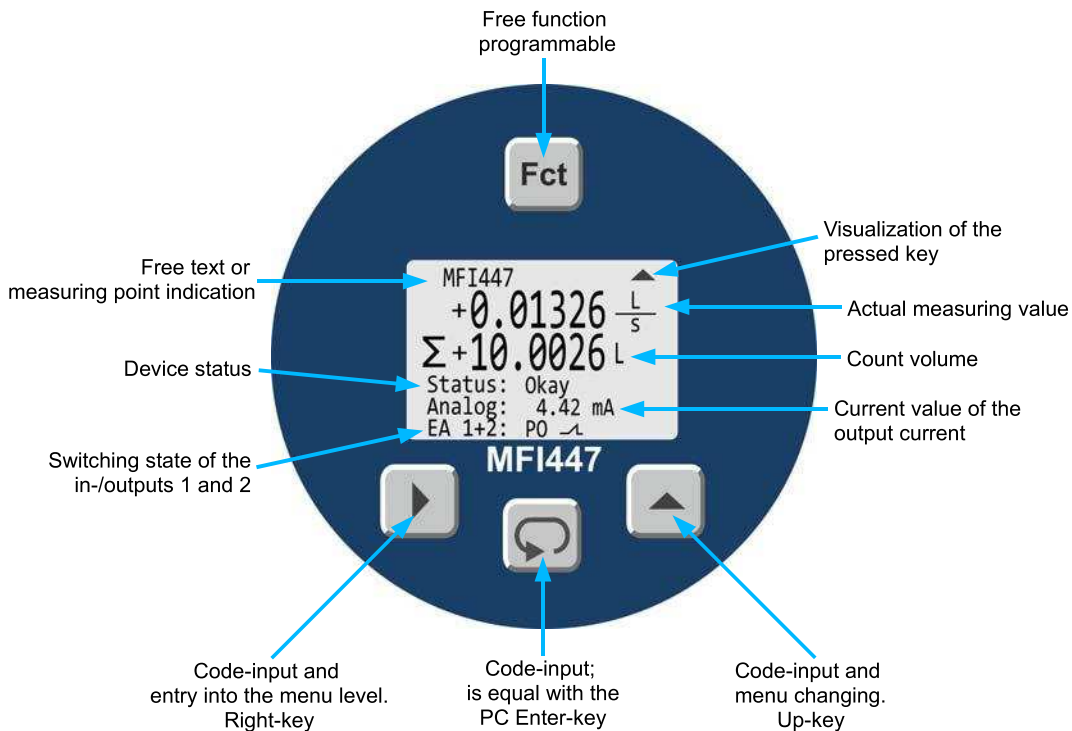
Display and control

A total of four capacitive keys are available. The functions of the respective keys depends on the MFI447 operating state.

NOTE: Capacitive keys react to a change of capacity caused by an approaching finger. They have no moving parts and are therefore rugged. However, gloves, contamination, and humidity may lead to malfunctions.

During measuring operations, the LC display shows measured values and status information. The displayed values change according to parametrization and device state.

The display is generally partitioned as followed:



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Installation conditions

Potential equalization

The metallic connection via welding nozzles or other process connection and the tubing guaranties that the MFI447 depends on the same electrical potential like the tubing. Additional potential cables are necessary at plastic tubing.

Installation

Please observe the following notes

- The measuring tube must be completely filled at all times.
- The flow-direction marking on the sensor must be the same as in the tube
- During installation, no mechanical forces (torsion, bending) should be exerted on the process adaptation of the measuring feeder.
- The gaskets may not extend into the tube diameter since this will affect the accuracy of the measurement of the device.
- The measuring converter must not be exposed to solar radiation.

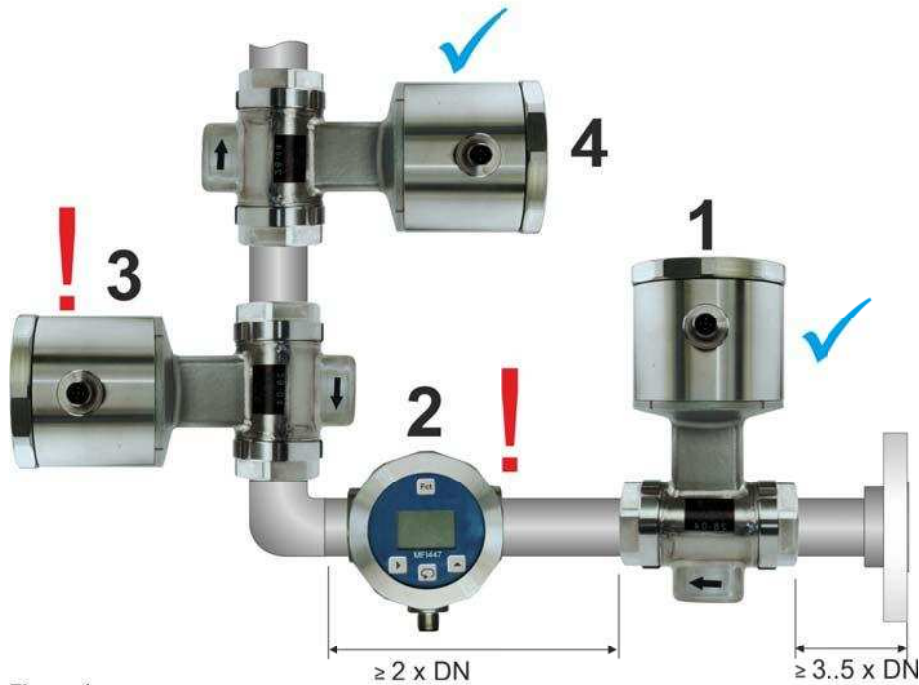


Figure 1

Position	Characteristics
1	<i>Ideal:</i> Good measuring result, if no air bubbles form. Minimum distance to tube angle 3...5 x DN in the inlet and 2 x DN in the outlet. (DN=nominal diameter)
2	<i>Not recommended:</i> The configuration of measuring electrodes may lead to measuring errors (when air is trapped), making it impossible to ensure flawless functionality.
3	<i>Questionable (only with free outlet):</i> A falling flow direction may lead to measuring errors.
4	<i>Ideal:</i> Good measuring result, if no air bubbles form. Minimum distance to tube angle same as 1.

Table 1

Continued next page

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Inlet and outlet path (Figure 1)

A straight and undisturbed path of $\geq 3 \dots 5 \times DN$ on the inlet side and $\geq 2 \times DN$ on the outlet side must be observed in order to avoid measuring errors.

Valves and other actuators should be mounted after the MFI447 and behind the outlet path.

Electrode axis, horizontal installation position (Table 1, Position 1, 2)

The electrode axis should be horizontal. If this is not possible, the electrode axis should touch the highest point of the tubing (installation 12:00 o'clock) and is set to 2:00 o'clock.

Free outlet path, down tube (Table 1, Position 3)

In order to avoid trapped gas and air, don't install the measuring device at the highest point (risk of trapped air), immediately before a free outlet, or in a down tube. A siphon or a venting valve must be installed in down tubes whose distance to the upper point of the measuring tube is $> 5 \text{ m}$ (approx. 16 ft.). This avoids an interruption of the liquid stream and subsequent trapped air.

Installation near pumps

In order to avoid under-pressure and damage to the inner tube coating, don't install the device on the suction side of a pump. In order to avoid the transfer of vibrations onto the measuring device, it is recommended to use pulsation dampers or vibration compensators. This will help compensate pulsations that occur during pumping.

Vertical installation (Table 1, Position 4)

In vertical installations, the measuring device is ideally installed in a rising tube. This is the only way to ensure that the measuring tube is always completely filled, and gas bubbles can escape.

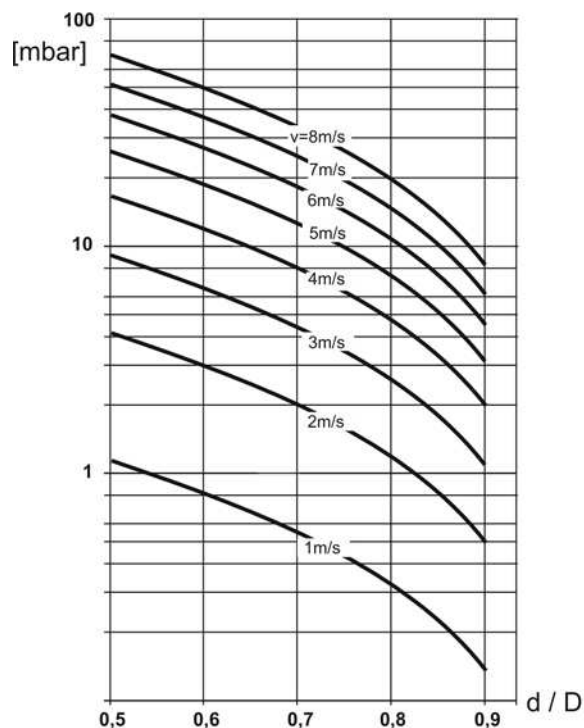
Partially filled tubing

For partially filled tubes, a design including a device similar to an inverse siphon is necessary. In order to avoid disturbing accumulations of solid matter, the MFI447 must not be installed at the lowest point of the inverse siphon.

Increase of flow rate, installation in tubing with larger nominal diameters

The measuring feeder may also be installed in tubing with larger nominal diameters if suitable adapters are used. This permits higher flow rates and increased measuring accuracy. When using reducing adapters, the loss of pressure can be determined as follows:

1. Determine the pressure measurement ratio d/D (d = Nominal diameter of the MFI447, D = Interior tubing diameter).
2. Determine the flow rate from the flow diagram.
3. Read the pressure loss on the y-axis in the diagram.



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Notes to interpretation of the mag flow

Abrasive media

... existing of a mixture of water and a portion of float elements or solid particles of different grain size, e.g. loam, sand, cement, concrete etc., which can be very sharp edged according to the processing process.

In dependence of the flow speed this can lead to a clearing away of the inner tube coating and a strong reduction of the product life span.

To avoid this, the following points are to be considered for abrasive media to the applications of magmeters:

- Speak about the case of applications with the manufacturer at first.
- If the device fulfills the standard, select a flow speed (< 1 m/s). This can be reached by the selection of a bigger measuring sensor diameter.
- The ideal installation is to be intended in a vertical mounting.

High adhering media

Sediments and adherents can be avoid by a higher flow speed. This can be reached by the selection of a smaller measuring sensor diameter.

Filmogenic and fatty-media

For this type of media (e.g. cream) peak electrodes will be preferred to use (on request). They reject the isolation of the electrodes (self-cleaning effect). This avoids the error of the measuring signal.

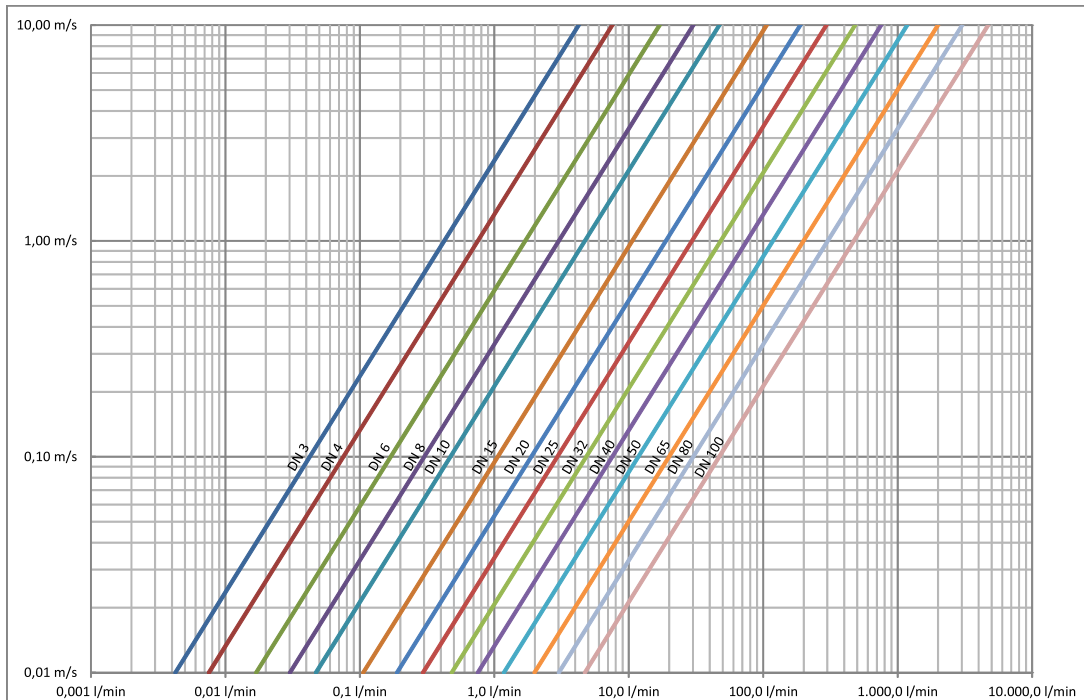
Vacuum stability

The measuring sensor fulfills by his high-quality, vacuum-stability and therefore form-stable smooth lining PFA the highest demands. He is resistant against high fluctuation in temperature (hot cold changing in CIP processes) or vacuum suction which occurs by emptying the tubes.

Dimensioning

At tube diameter < DN10, the measuring pipe has to be reduced to a smaller DN.

Conversion table l/min ↔ m/s



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Note:

The MFI will be delivered with a basic device and its process connection. Please state both by order.

Ordering code of the basic device MFI447

MFI447 - 1. - 2. - 3. - 4.

1. Nominal diameter [mm]	003, 004, 006, 008, 010, 015, 020, 025, 032, 040, 050, 065, 080, 100
2. Electrode material	0 stainless steel 1.4539 (standard)
3. Mounted Electrodes	0 Flush mounted
4. Options	00 without option 01 accuracy ± 0.3 % for DN < 20mm 02 batch controlling

* At tube diameter < DN10 the measuring pipe will be also reduced to a smaller DN.

Ordering code process connection

APF 1. 2. 3. - 4.

DIN 11850 range 1 (applications: food & beverage)

1. Connection standard [mm]	1 DIN 11850 range 1
2. Type	1 welded nozzle
3. 0	
4. Tube diameter DN [mm]*	010, 015, 020, 025, 032, 040, 050

DIN 11850 range 2 (applications: food & beverage)

1. Connection standard [mm]	2 DIN 11850 range 2
2. Type	1 welded nozzle 2 TriClamp 3 milk pipe DIN 11851 threaded nozzle 4 aseptic gland DIN 11864
3. 0	
4. Tube diameter DN [mm]*	010, 015, 020, 025, 032, 040, 050, 065, 080, 100

DIN 11866 range A (applications: pharmacy)

1. Connection standard [mm]	3 DIN 11866 range A
2. Type	1 welded nozzle 2 TriClamp 4 aseptic-gland DIN 11864
3. 0	
4. Tube diameter DN [mm]*	006, 008, 010, 015, 020, 025, 032, 040, 050, 065, 080, 100

DIN 11866 range B (applications: pharmacy)

1. Connection standard [mm]	4 DIN 11866 range B
2. Type	1 welding nozzle 2 TriClamp 4 aseptic-gland DIN 11864
3. 0	
4. Tube diameter DN [mm]*	006, 008, 010, 015, 020, 025, 032, 040, 050, 065, 080, 100

DIN 11866 range C (applications: pharmacy)

1. Connection standard [mm]	5 DIN 11866 range C
2. Type	1 welding nozzle 2 TriClamp (> ½) 4 aseptic gland DIN 11864 (> ½)
3. 0	
4. Tube diameter DN [mm ("*)]	006 (¼), 008 (3/8), 015 (½), 020 (¾), 025 (1), 040 (1 ½), 050 (2), 065 (2 ½), 080 (3), 100 (4)

OD-Tube (applications: food & beverage)

1. Connection standard [mm]	6 OD-Tube
2. Type	1 welding nozzle 2 TriClamp (> ½) 4 aseptic gland DIN 11864 (> ½)
3. 0	
4. Tube diameter DN [mm ("*)]	006 (¼), 008 (3/8), 015 (½), 020 (¾), 025 (1), 040 (1 ½), 050 (2), 065 (2 ½), 080 (3), 100 (4)

ISO 2037 (applications: food & beverage)

1. Connection standard [mm]	7 ISO 3037
2. Type	1 welding nozzle 2 TriClamp (> ½) 4 aseptic gland DIN 11864 (> ½)
3. 0	
4. Tube diameter DN [mm]	025, 032, 040, 050, 065, 080, 100

Sensor thread (applications: food & beverage) 1.4404

1. Connection standard	8 Process thread Sensor MFI
2. Type	6 hose connection
3. 0	
4. Tube diameter DN	015
5. Hose inner diameter [mm]	19 XX (on request)