



Type 406090

Fittings for flow rate sensors



Operating instructions

V1.00/EN/00570362

Fittings for flow rate sensors type 406090

Table of contents:

1. OPERATING INSTRUCTIONS	5
1.1. Method of presentation	5
2. INTENDED USE	6
2.1. Restrictions	6
2.2. Foreseeable misuse.....	6
2.3. Warranty	6
3. SAFETY INSTRUCTIONS	7
4. TECHNICAL DATA.....	8
4.1. Operating principles	8
4.2. Available certificates	8
4.3. General technical data	8
4.3.1. Available diameters.....	8
4.3.2. Materials.....	8
4.3.3. Dimensions of T fittings.....	9
4.3.4. dimensions of the adapters	11
4.3.5. Dimensions of connecting clamps.....	12
4.4. K factors.....	12

4.4.1. Reference conditions	12
4.4.2. Calculation of K factors (in pulse/l) of the connection clamps or weld ends	12
4.4.3. K factors (in pulse/l) of the T fittings	13
4.4.4. K factors (in pulse/l) of the connection clamps.....	14
4.4.5. K factors (in pulse/l) of the weld ends	15
5. INSTALLATION	17
5.1. Safety instructions.....	17
5.2. Connection to the pipe	19
5.2.1. Recommendations for installing the fitting on the pipe	19
5.2.2. Installation of a T fitting	21
5.2.3. Installation of fittings.....	21
5.2.4. Installation of a stainless steel weld end	22
5.2.5. Installation of a PE weld end.....	22
5.2.6. Calculator for DN of the pipe - flow velocity - flow rate.....	23
6. MAINTENANCE.....	24
6.1. Safety instructions.....	24

6.2. Maintenance and cleaning	24
7. SPARE PARTS AND ACCESSORIES	25
8. PACKAGING AND TRANSPORT	26
9. DISPOSAL	26

1. OPERATING INSTRUCTIONS

Keep these instructions so they are accessible for every user.

The operating instructions contain important information about safety!

Failure to comply with these instructions may lead to dangerous situations.

- These operating instructions must be read and understood.

1.1. Method of presentation



DANGER!

Warns of an imminent danger!

- Failure to comply will result in death or severe injuries.



WARNING!

Warns or a possibly hazardous situation!

- Failure to comply may result in severe injuries or even death.



CAUTION!

Warns of a possible hazard!

- Failure to comply may result in moderate or minor injuries.

NOTE!

Warns of physical damage!

- Failure to comply may result in damage to the fitting or system.



Identifies important additional information, tips and recommendations that are important for your safety and proper functionality of the fitting.



Refers to information in these operating instructions or in other documentation.

→ Marks a step you must perform in a work sequence.

2. INTENDED USE

Use of the fitting not in conformity with its intended purpose may result in hazards for persons, systems in the vicinity and the environment.

- The fitting is designed for installation of a flow rate sensor or transmitter to be inserted in a pipe.
- When using the instrument, comply with the permissible data, operating and usage conditions in the contract documents and these operating instructions and in the operating instructions for the instrument that is inserted.
- To ensure reliable and problem-free use of the fitting, transport, storage and installation must be properly performed. Careful operation and maintenance are also required.
- Always make certain to use this fitting properly.

- Do not use this fitting in an area that is incompatible with the materials of which the fitting is made.
- Do not load the fitting mechanically (for example by placing objects on it or using it as a stepping stool).
- Do not make any external changes to fitting. Do not paint the fitting anywhere.

2.3. Warranty

The warranty requires use of the instrument in conformity with its intended purpose, taking into consideration the usage conditions specified in this manual.

2.1. Restrictions

When exporting the fitting, observe any restrictions that may be in effect.

2.2. Foreseeable misuse

- Do not use this fitting in a potentially explosive atmosphere.
- Do not use any liquids that are not compatible with the materials of which the fitting is made.

3. SAFETY INSTRUCTIONS

These safety instructions do not cover the following conditions:

- Random events and events that could occur during installation, operation and maintenance of the instruments.
- Local safety requirements; the operator is responsible for complying with local safety requirements, also as they relate to installation and maintenance personnel.



Danger due to high pressure in the system!

Danger due to high liquid temperatures!

Danger due to the nature of the liquid!



Various hazardous situations!

To avoid any injury, ensure that:

- the system cannot be activated unintentionally.
- installation and maintenance work is performed by qualified and approved personnel using suitable tools.
- after an interruption in the electrical power supply, a controlled restart of processes is guaranteed.



Various hazardous situations!

To avoid any injury, ensure that:

- you operate the fitting only in flawless condition and in compliance with the operating instructions.
- state-of-the-art rules apply when planning for use and operation of the fitting!

NOTE!

Chemical compatibility of materials that come in contact with the liquid.

- Check systematically to ensure chemical compatibility of the materials of which the fitting is made and the products with which it could come in contact (for example alcohols, strong or concentrated acids, aldehydes, bases, esters, aliphatic compounds, ketones, aromatic or halogenated hydrocarbons, oxidation agents and agents containing chlorine).



The type 406090 fitting was developed in accordance with the state of the art and recognized safety rules.

Failure to comply with these instructions or unauthorized manual changes to the fitting will release the manufacturer from any liability. The warranty of the fitting and accessory parts will also be voided!

4. TECHNICAL DATA

4.1. Operating principles

Liquid temperature	Depends on the material of the fitting and instrument inserted in it. Refer to the instrument manual and the temperature/pressure curve of the liquid in Figure 3. If the ranges differ, use the most restrictive range.
Ambient temperature	Depends on the instrument inserted in the fitting. Refer to the relevant manual.
Pressure class	Depends on the material of the fitting and instrument inserted in it. Refer to the instrument manual and the temperature/pressure curve of the liquid in Figure 3. If the pressure classes differ, do not exceed the lowest maximum pressure.

4.2. Available certificates

- Certificate 3.1, stainless steel fitting only
- Certificate 2.2
- Certificate regarding roughness
- Certificate regarding calibration
- FDA approval (with EPDM seal), stainless steel fitting only.

4.3. General technical data

4.3.1. Available diameters

The available diameters depend on the design of the fitting.



See data sheets for the fitting type 406090 and the instrument inserted in the fitting to determine the appropriate DN.

Table 1 : Available diameters depend on the design of the fitting

4.3.2. Materials

Design of the fitting	Material		
	Enclosure	Upper part	Seal
T fitting	Stainless steel (316L - 1.4435)		FKM or EPDM
	PVC		
Weld ends	Stainless steel (316L - 1.4435)	-	-
	PE	-	-
Connecting clamps	PP and PVC	-	EPDM

Table 2 : Materials depends on the design of the 406090 fitting

4.3.3. Dimensions of T fittings

DN [mm]	P [mm]	A [mm]	D [inch]	L [mm]
15	80.3	84.0	G 1/2	16.0
20	77.8	94.0	G 3/4	17.0
25	78.0	104.0	G 1	23.5
32	81.6	119.0	G 1 1/4	23.5
40	85.4	129.0	G 1 1/2	23.5
50	91.5	148.5	G 2	27.5

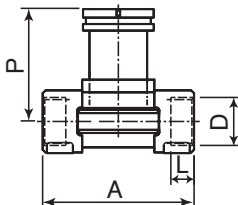


Table 3 : Dimensions of T fittings with stainless steel inner thread connection

DN [mm]	P [mm]	A [mm]	D [inch]	L [mm]
15	80.3	84.0	G 3/4	11.5
20	77.8	94.0	G 1	13.5
25	78.0	104.0	G 1 1/4	14.0
32	81.6	119.0	G 1 1/2	18.0
40	85.4	129.0	M55 x 2	19.0
50	91.5	148.5	M64 x 2	20.0

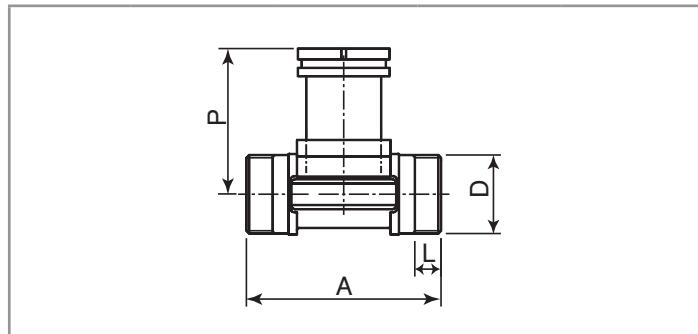


Table 4 : Dimensions of T fittings with stainless steel outer thread connection

DN [mm]	P [mm]	D [mm]	A [mm]	D1 [mm]	A2 [mm]	A1 [mm]
15	80.4	43	128	20	90	96
20	77.8	53	144	25	100	106
25	78.0	60	160	32	110	116
32	81.4	74	168	40	110	116
40	85.2	83	188	50	120	127
50	91.5	103	212	63	130	136

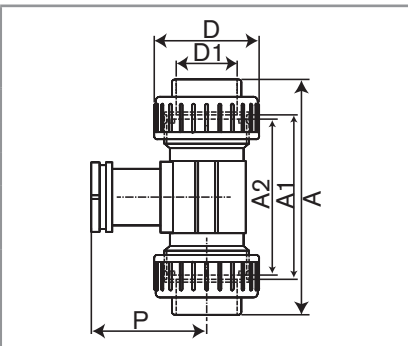


Table 5 : Dimensions of PVC T fittings per DIN 8063

4.3.4. Dimensions of the adapters

DN [mm]	A [mm]	B [mm]	R [mm]
50	56.6	61.6	30.2
65	54.5	58.6	36.7
80	53.1	56.4	44.5
100	50.7	53.2	57.2
125	48.2	50.3	70.7
150	45.7	47.4	84.2
200	41.0	42.3	109.6
250	73.6	74.7	136.6
300	67.8	68.7	162.0
350	63.9	64.7	177.8

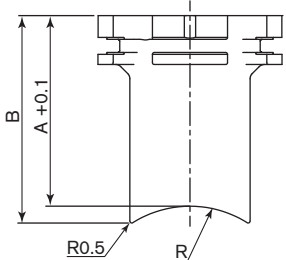


Table 6 : Dimensions of the stainless steel weld ends with radius

DN [mm]	H [mm]	PE		PP		PVDF	
		H1 [mm]	H2 [mm]	H1 [mm]	H2 [mm]	H1 [mm]	H2 [mm]
65	72.5	13	-	13	-	10.4	-
80	72.5	15.6	-	15.6	-	12.5	-
100	72.5	19	5	19	5	15.2	6
125	102	24.2	8	-	-	-	-
150	102	27.7	10	27.7	10	-	-
200	102	38.9	16	38.9	16	-	-
250	102	48.4	21	48.4	21	-	-
300	102	54.5	24	54.5	24	-	-

350	102	61.3	28	61.3	28	-	-
400	102	69.1	31.5	-	-	-	-

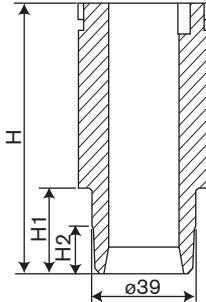


Table 7 : Dimensions of PE weld ends

4.3.5. Dimensions of connecting clamps

DN	D	P	D1	H
[mm]	[mm]	[mm]	[mm]	[mm]
50	116	116.0	63	155.0
65	129	115.0	75	160.0
80	144	119.0	90	171.0
100	166	124.0	110	187.0
110	181	120.0	125	191.0
125	196	127.0	140	205.0
150	216	137.0	160	225.0
180	266	161.0	200	271.0
200	290	173.0	225	297.0

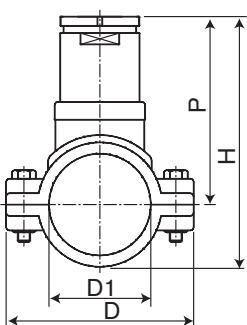


Table 8 : Dimensions of PP/PVC connection clamps

4.4. K factors

4.4.1. Reference conditions

All K factors were determined using the following reference conditions: Liquid = water, water and ambient temperature of 20°C, consideration of minimum intake and outlet distances, adjusted tubing dimensions.

4.4.2. Calculation of K factors (in pulse/l) of the connection clamps or weld ends



This calculation does not apply to T fittings.

Other than the reference conditions mentioned above, the K factors for the connection clamps and weld ends were determined using the external pipe diameters (D_{material}) and wall thicknesses (s_{material}) specified in the tables.

If the dimensions of the pipe that is used differ from dimensions D or s as specified in the tables, the K factor must be recalculated using one of the following formulas:



These formulas can only be used with pipes having a diameter that differs no more than +/- 5% from the specified theoretical values.

$$K_n = K_t \times \frac{d_t^2}{d_n^2}$$

Figure 1: If the fitting is used with an impeller flow rate sensor

$$K_n = K_t \times \frac{d_n^2}{d_t^2}$$

Figure 2: If the fitting is used with an electromagnetic flow rate sensor

K_n = recalculated K factor

K_t = K factor specified in the table

$d_t = D_{\text{material}} - 2 s_{\text{material}}$ = theoretical internal diameter of the pipe, calculated using the values specified in the tables for each fitting material: D_{material} and s_{material} (D_{material} = external diameter of the pipe and s_{material} = thickness of the pipe wall)

d_n = Internal diameter of the pipe that is used

4.4.3. K factors (in pulse/l) of the T fittings



If the measuring instrument does not automatically convert K factors, they can be converted with one of the following formulas:

K factor in pulse/US gallon = K factor in pulse/l x 3.785 to convert the flow rate into US gallons/time unit

K factor in pulse/UK gallon = K factor in pulse/l x 4.546 to convert the flow rate into UK gallons/time unit

Measuring instrument inserted	406020		406010	
Material of the T fitting	Stainless steel	PVC	Stainless steel	PVC
DN				
15	110	120	1.69	1.33
20	64.0	81.1	1.98	1.45
25	48.3	56.6	2.85	2.26
32	30.9	29.9	4.32	4.29
40	19.5	18.6	6.68	7.30
50	11.2	10.7	11.3	12.5

Table 9 : K factors of the T fittings

4.4.4. K factors (in pulse/l) of the connection clamps



If the dimensions of the pipe that is used differ slightly from dimensions D or s as specified in the tables, the K factor must be recalculated using one of the formulas in section 4.4.2.



If the measuring instrument does not automatically convert K factors, they can be converted with one of the following formulas:
K factor in pulse/US gallon = K factor in pulse/l x 3.785 to convert the flow rate into US gallons/time unit
K factor in pulse/UK gallon = K factor in pulse/l x 4.546 to convert the flow rate into UK gallons/time unit

Measuring instrument inserted	406020		406010		External diameters and theoretical cross-sections			
Pipe material	PVC	PE / PP	PVC	PE / PP	D _{PVC} [mm]	s _{PVC} [mm]	D _{PP} [mm]	s _{PP} [mm]
DN								
50	14.2 (L)	15.6 (L)	10.4 (L)	9.28 (L)	63	4.7	63	5.8
65	11.2 (L)	12.3 (L)	14.5 (L)	12.9 (L)	75	5.5	75	6.9
80	7.37 (L)	7.80 (L)	21.3 (L)	20.4 (L)	90	6.6	90	8.2
100	4.83 (L)	5.29 (L)	33.0 (L)	30.4 (L)	110	8.1	110	10
110	3.45 (L)	-	44.7 (L)	-	125	9.2	-	-
125	2.55 (L)	3.10 (L)	63.7 (L)	52.1 (L)	140	10.3	140	12.8
150	1.67 (L)	2.03 (L)	137 (L)	78.8 (L)	160	6.2	160	14.6
180	1.08 (L)	1.37 (L)	197 (L)	116 (L)	200	9.6	200	18.2
200	0.80 (L)	1.07 (L)	290 (L)	147 (L)	225	8.6	225	20.5

Table 10 : K factors, external diameters and theoretical cross-sections of the connection clamp

(L): Long version of the sensor

4.4.5. K factors (in pulse/l) of the weld ends



If the dimensions of the pipe that is used differ slightly from dimensions D or s as specified in the tables, the K factor must be recalculated using one of the formulas in section 4.4.2.



If the measuring instrument does not automatically convert K factors, they can be converted with one of the following formulas:

K factor in pulse/US gallon = K factor in pulse/l x 3.785 to convert the flow rate into US gallons/time unit

K factor in pulse/UK gallon = K factor in pulse/l x 4.546 to convert the flow rate into UK gallons/time unit

Measuring instrument inserted	406020			External diameters and theoretical cross-sections					
Pipe material	Stainless steel	PE / PP	PVDF	D _{Steel} [mm]	s _{steel} [mm]	D _{PE/PP} [mm]	s _{PE/PP} [mm]	D _{PVDF} [mm]	s _{PVDF} [mm]
DN									
50	13.0 (C)	-	-	60.3	2.0	-	-	-	-
65	7.86 (C)	8.32 (C)	5.53 (C)	76.1	2.9	75	6.9	75	2.5
80	5.52 (C)	5.49 (C)	3.65 (C)	88.9	3.2	90	8.2	90	2.8
100	3.20 (C)	3.51 (C)	2.34 (C)	114.3	3.6	110	10	110	3.5
110	-	-	-	-	-	-	-	-	-
125	2.00 (C)	2.66 (L)	-	139.7	4	140	12.8	-	-
150	1.32 (C)	2.12 (L)	-	168.3	4.5	160	14.6	-	-
180	-	-	-	-	-	200	18.2	-	-
200	0.72 (C)	0.98 (L)	-	219.1	6.3	225	20.5	-	-
250	0.50 (L)	0.63 (L)	-	273	7.7	280	25.5	-	-
300	0.35 (L)	0.42 (L)	-	323.9	9.5	315	28.7	-	-
350	0.26 (L)	0.30 (L)	-	355.6	10.1	355	32.3	-	-
400	-	0.23 (L)	-	-	-	400	36.4	-	-

Table 11 : K factors, external diameters and theoretical cross-sections of the weld ends

(C): Short version of the sensor; (L): Long version of the sensor

Measuring instrument inserted	406010			External diameters and theoretical cross-sections					
Pipe material	Stainless steel	PE / PP	PVDF	D _{steel} [mm]	s _{steel} [mm]	D _{PE/PP} [mm]	s _{PE/PP} [mm]	D _{PVDF} [mm]	s _{PVDF} [mm]
DN									
50	11.6 (C)	-	-	60.3	2.0	-	-	-	-
65	20.0 (C)	17.8 (C)	24.1 (C)	76.1	2.9	75	6.9	75	2.5
80	28.5 (C)	25.6 (C)	40.8 (C)	88.9	3.2	90	8.2	90	2.8
100	49.2 (C)	38.1 (C)	70.5 (C)	114.3	3.6	110	10	110	3.5
110	-	-	-	-	-	-	-	-	-
125	78.0 (C)	81.7 (L)	-	139.7	4	140	12.8	-	-
150	98.4 (C)	103 (L)	-	168.3	4.5	160	14.6	-	-
180	-	-	-	-	-	200	18.2	-	-
200	210 (C)	224 (L)	-	219.1	6.3	225	20.5	-	-
250	311 (L)	347 (L)	-	273	7.7	280	25.5	-	-
300	447 (L)	510 (L)	-	323.9	9.5	315	28.7	-	-
350	609 (L)	705 (L)	-	355.6	10.1	355	32.3	-	-
400	-	931 (L)	-	-	-	400	36.4	-	-

Table 12 : K factors, external diameters and theoretical cross-sections of the weld ends

(C): Short version of the sensor

(L): Long version of the sensor

5. INSTALLATION

5.1. Safety instructions



DANGER!

Danger of injury due to high pressure in the system!

- Before loosening the process connections, stop liquid circulation and release the pressure.

Danger of injury due to high liquid temperatures!

- Wear protective gloves when you touch the fitting.
- Before loosening the process connections, stop liquid circulation and empty the pipe.

Danger of injury due to the nature of the liquid!

- Observe the rules in force in the area of accident protection and safety related to the use of hazardous products.



WARNING!

Danger of injury due to improper Installation!

- Liquid systems must only be installed by authorized and qualified specialists with suitable tools!
- Follow the installation instructions for the measuring instrument that is inserted in the fitting.

Danger of injury through uncontrolled restarting!

- Ensure that the system is restarted in a controlled manner every time after manual changes.



WARNING!

Danger of injury through failure to observe the temperature/pressure dependency of the liquid.

- Observe the temperature/pressure dependency of the liquid, depending on the type of materials the fitting is made of (see Figure 3)) and the measuring instrument that is used (see the corresponding operating instructions).
- Observe the Pressure Equipment Directive 97/23/EC.



WARNING!

Danger of injury due to improper commissioning!

Improper operation may result in injuries as well as damage to the fitting and the surrounding area.

- You must ensure before commissioning that the machine operators are familiar with the content of the operating instructions and understand it completely.
- Take special care to ensure compliance with the safety instructions and intended use.
- The system must only be placed in operation by sufficiently trained personnel.

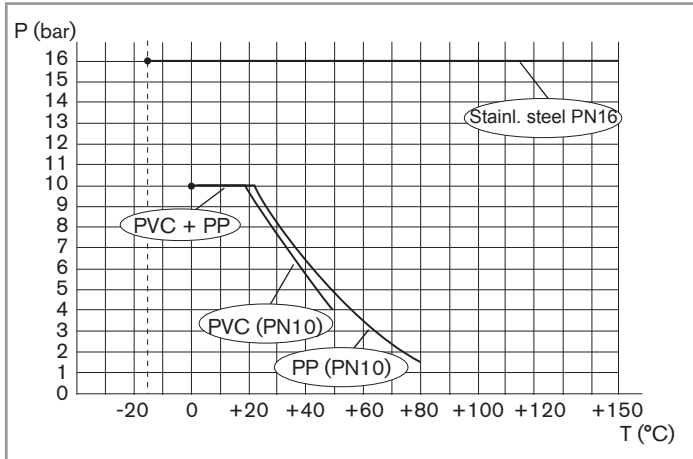


Figure 3: Temperature/pressure dependency curve of the liquid when T fittings are used alone

5.2. Connection to the pipe



DANGER!

Danger of injury due to high pressure in the system!

- Before loosening the process connections, stop liquid circulation and release the pressure.

Danger of injury due to high liquid temperatures!

- Wear protective gloves when you touch the fitting.
- Before loosening the process connections, stop liquid circulation and empty the pipe.

Danger of injury due to the nature of the liquid!

- Observe the rules in force in the area of accident protection and safety related to the use of hazardous products.

5.2.1. Recommendations for installing the fitting on the pipe

- Install the fitting in the pipe to ensure compliance with the minimum intake and outlet distances defined by standard EN ISO 5167-1 (see Figure 4).

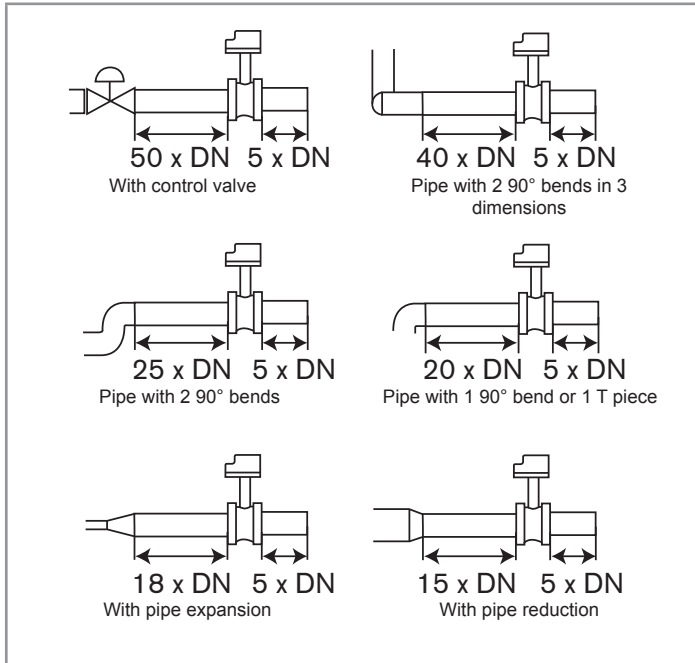


Figure 4: Minimum intake and outlet distances depending on the layout of the pipes.

- If necessary, use a flow conditioner to improve measuring accuracy for the flow rate measurement.
- Observe the following additional installation conditions to ensure correct function of the measuring instrument (Figure

5 and Figure 6), to prevent air bubbles from forming in the pipe and to ensure correct filling of the pipe on the measuring instrument.

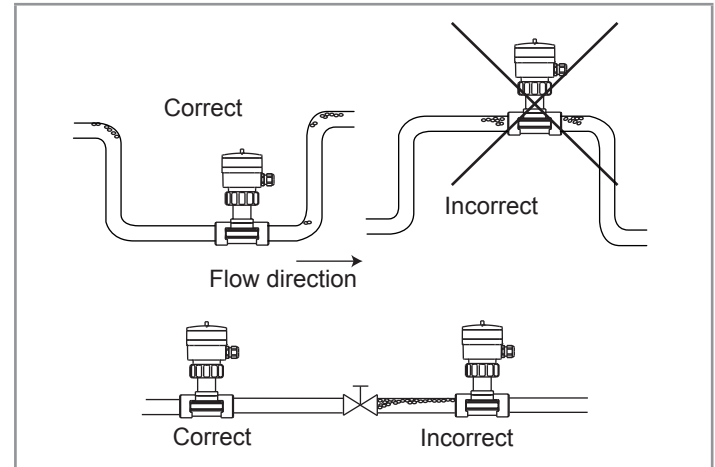


Figure 5: Additional recommendations for installation

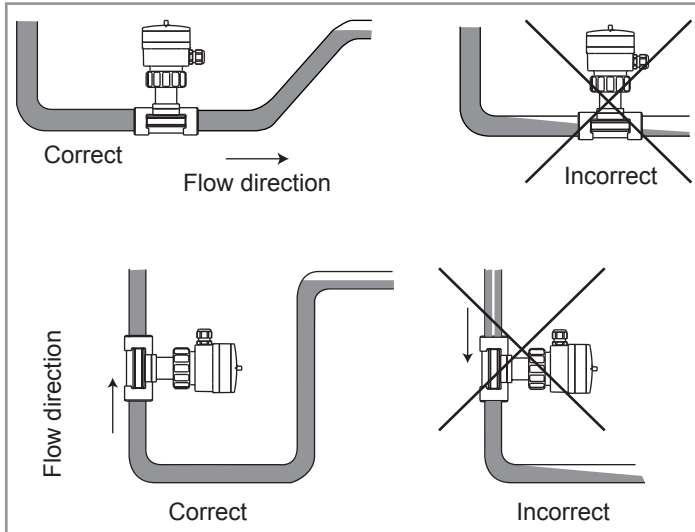


Figure 6: Additional recommendations for installation

5.2.2. Installation of a T fitting



Comply with the recommendations for installation described in section 5.2.1.

→ Install the fitting so that one of the non-interchangeability elements is pointing in the direction opposite of flow.

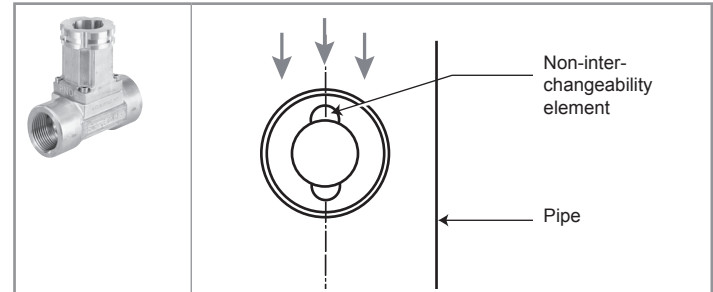


Figure 7: Installation of a T fitting

5.2.3. Installation of fittings



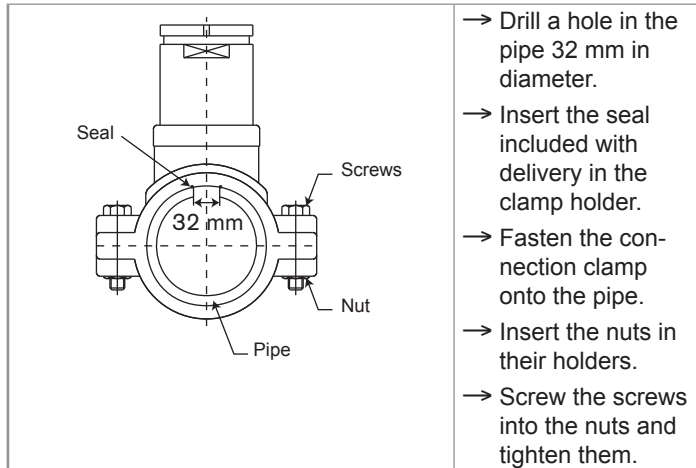


Figure 8: Installation of fittings

5.2.4. Installation of a stainless steel weld end

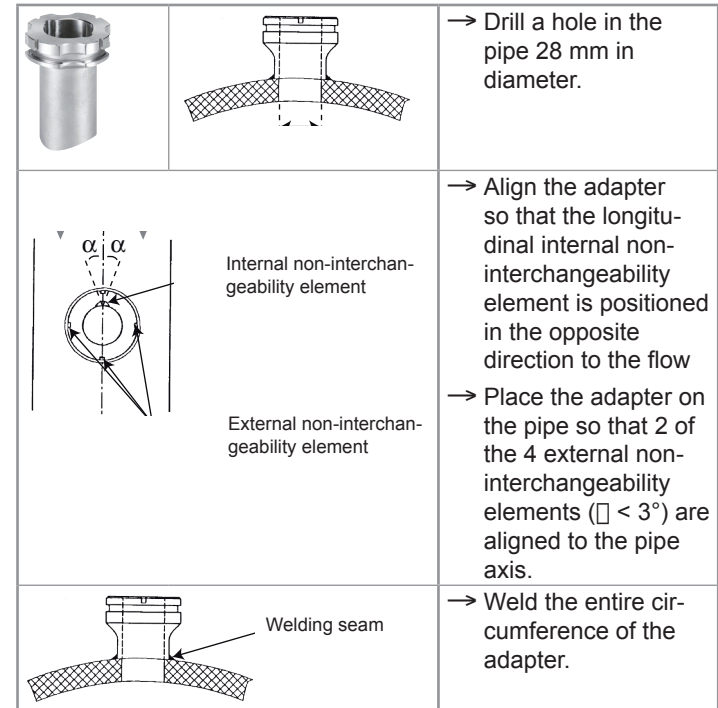


Figure 9: Installation of a stainless steel weld end

5.2.5. Installation of a PE weld end

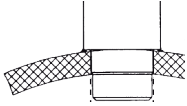
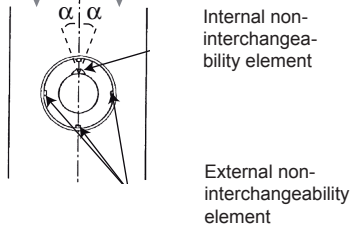
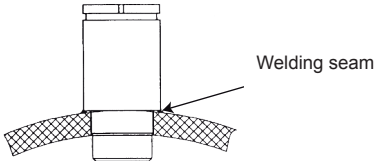
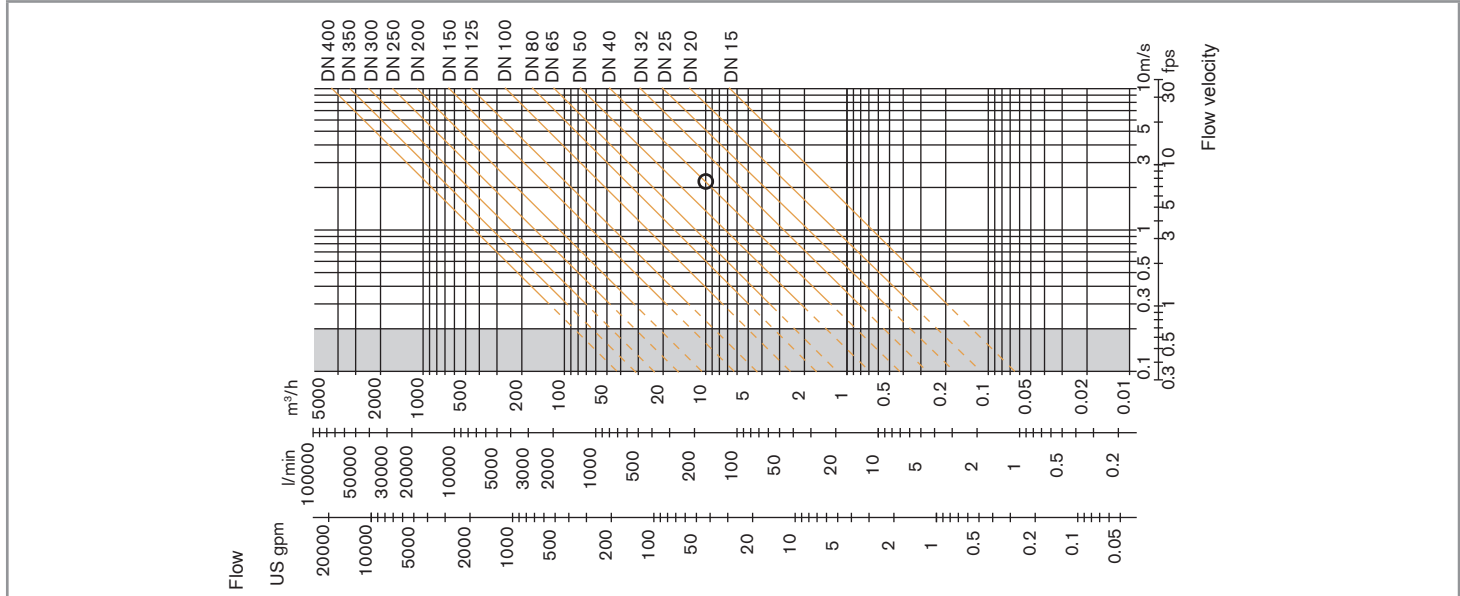
	<p>→ Drill a hole in the pipe 40 mm in diameter.</p>
 <p>Internal non-interchangeability element</p> <p>External non-interchangeability element</p>	<p>→ Align the adapter so that the longitudinal internal non-interchangeability element is positioned in the opposite direction to the flow</p> <p>→ Place the adapter on the pipe so that 2 of the 4 external non-interchangeability elements ($\alpha < 3^\circ$) are aligned to the pipe axis.</p>
 <p>Welding seam</p>	<p>→ Weld the entire circumference of the adapter.</p>

Figure 10: Installation of a PP weld end

5.2.6. Calculator for DN of the pipe - flow velocity - flow rate

This calculator is used to determine the suitable DN for the pipe and fitting depending on the flow velocity and flow rate.



6. MAINTENANCE

6.1. Safety instructions



DANGER!

Danger of injury due to high pressure in the system!

- Before loosening the process connections, stop liquid circulation and release the pressure.

Danger of injury due to high liquid temperatures!

- Wear protective gloves when you touch the fitting.
- Before loosening the process connections, stop liquid circulation and empty the pipe.
- Keep readily flammable materials and media well away from the fitting.

Danger of injury due to the nature of the liquid!

- Observe the rules in force in the area of accident protection and safety related to the use of hazardous products.



WARNING!

Danger due to improper maintenance work!

- Maintenance work must only be performed by authorized and qualified specialists with suitable tools!
- Ensure that the system is restarted in a controlled manner every time after manual changes.

6.2. Maintenance and cleaning

NOTE

The fitting can be damaged by cleaning agents.

- The fitting must only be cleaned with water or a product that is compatible with the materials of which the fitting is made.

7. SPARE PARTS AND ACCESSORIES



CAUTION!

Danger of injury and physical damage due to unsuitable parts!

Wrong accessories and unsuitable replacement parts can cause injuries and damage to the fitting and its environment.

- Use only original Jumo accessories and replacement parts.

→ If replacement parts or accessories are needed, please contact the supplier.

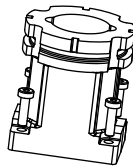


Figure 11: Intermediate support with 4 screws

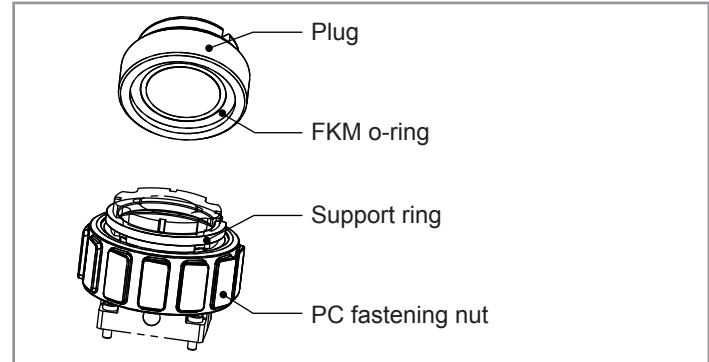


Figure 12: Plug with o-ring, fastening nut and support ring

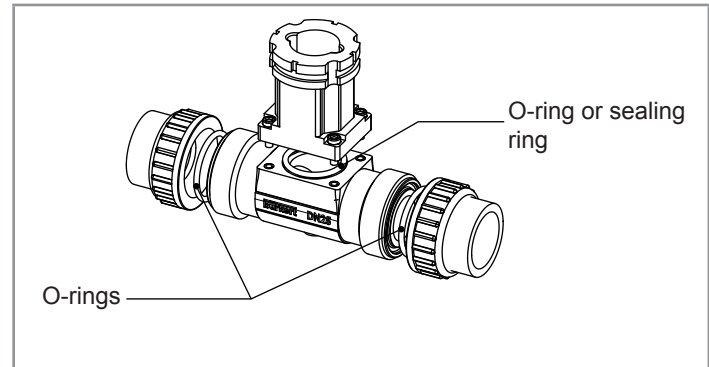


Figure 13: Seals for a PVC T fitting

8. PACKAGING AND TRANSPORT

CAUTION!

Transport damage!

If the fitting is insufficiently protected, it can be damaged by transport.

- The fitting must be packaged in a shockproof package and protected against moisture and dirt for transport.
- Do not expose the fitting to any temperatures outside the permissible temperature range for storage.

9. STORAGE

CAUTION!

Improper storage can cause damage to the fitting!

- The fitting must be stored in a dry and dust-free room!
- Storage temperature: -15 to +60°C.

10. DISPOSAL

→ Dispose of the fitting and packaging in an environmentally responsible way.

CAUTION!

Parts that are contaminated by liquids can damage the environment!

- Comply with applicable disposal regulations and environmental requirements!



Note:

Comply with national waste disposal regulations.



JUMO GmbH & Co. KG

Street address:

Moritz-Juchheim-Straße 1
36039 Fulda, Germany

Delivery address:

Mackenrodtstraße 14
36039 Fulda, Germany

Postal address:

36035 Fulda, Germany
Phone: +49 661 6003-0
Fax: +49 661 6003-607
E-mail: mail@jumo.net
Internet: www.jumo.net

JUMO Instrument Co. Ltd.

JUMO House

Temple Bank, Riverway
Harlow - Essex CM20 2DY, UK

Phone: +44 1279 63 55 33

Fax: +44 1279 63 52 62

E-mail: sales@jumo.co.uk

Internet: www.jumo.co.uk

JUMO Process Control, Inc.

6733 Myers Road

East Syracuse, NY 13057, USA

Phone: 315-437-5866

1-800-554-5866

Fax: 315-437-5860

E-mail: info.us@jumo.net

Internet: www.jumousa.com