MECON

FLOW-CONTROL-SYSTEMS

Flow sensors and Level sensors

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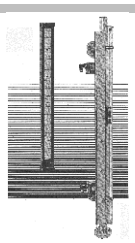
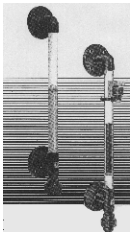




Variable area meter
F VA Trogflux

Fig. 1 F VA Trogflux variable area meter

Application

The F VA Trogflux variable area meters are used measure the volume of transparent liquids and gases passing through closed piping. The variable area meters can also be used for flow monitoring if they are equipped with one or more switching contacts. Standard scales are available for liquids with a density of 1 kg/l (62.43 lb/cu.ft). The scales must be recalculated for all other media depending on the physical characteristics.

Design and operation

The main components of the F VA Trogflux variable area meters are the plastic variable-area flow tube with float and the connection parts. The flow is displayed directly on the scale present on the flow tube (e.g. in l/h) and is read at the position of the float's widest diameter.

Special features

- Product scales for liquids and gases
- Simple assembly and handling
- Low-price plastic design
- Short delivery times for standard versions.

Connection and mode of operation

For certain variable area meter sizes, the float is packed in a plastic net for transport purposes. Prior to fitting, this must be removed out of the variable area meter from the top. Free movement of the float in the flow tube should then be rechecked.

The variable area meter must be fitted vertically and without tension. Control elements or reductions/extensions in the pipe diameter upstream or downstream of the variable area meter have no influence on the accuracy when measuring liquids. However, when measuring gases, the variable area meter should be installed upstream of valves to prevent pulsations resulting from compression. Since variable area meter respond extremely sensitively to changes in flow, control elements should always be adjusted slowly.

The calibration has been carried out for defined media conditions. Deviations in the density, pressure or temperature of gases, or in the density or viscosity of liquids, result in measurement errors. It is essential to observe the calibration conditions.

When ordering, it is therefore essential to provide data on the medium, density and viscosity at the operating temperature and pressure. With gases, it is additionally necessary to specify the exact reference point for the pressure (pressure above atmospheric, or absolute pressure).

Retrofitting of switching contacts is only possible if variable area meters with magnets are used. When using for the first time, move the float completely past the contact to permit polarization.

Technical specifications

Application	See left
Mode of operation	See left
Measuring principle	Float
Input	
Flow	Vertically upwards
Pressure limit	Max. 10 bar (145 psi) see page 3
Rated operating conditions	
Ambient conditions	
Temperature limits	
• For Trogamid flow tube	Max. 60°C (140°F) (with water 50°C (122 °F))
• For Polysulfone flow tube	Max. 90°C (194F)
Pressure & temperature limits	See table on page 3
Medium conditions	
• Accuracy	Class 2,5 (according to VDE/VDI 3513, sheet 2)
• Measuring range	
- For liquids	12,5 l/h to 25 m³/h / 0,055 to 110 USgpm
- For gases	200 l/h to 430 m³/h / 0,118 to 253 scfm A special scale must be provided for liquids with a density other than 1 kg/l (62,43 lb/cu.ft) and all gases
• Dim. for measured variable	l/h (up to flow tube D2500) m³/h (flow tube E4000 and above)
Design	
Connections	PVC-adhesive bushing, female thread, cast iron
Material	
• Flow tube	Trogamid, Polysulfone
• Connection	
- Union nut	PVC, cast iron
- Insert	PVC, cast iron, steel, stainless steel
• Float	Stainl. steel mat.No. 1.4305 / 303, mat.No. 1.4571 / 316 Ti, PVC, aluminium
• Float guide rod	Stainl. steel mat.No. 1.4571 / 316 Ti (option with flow tubes C 125 to D 2.500)
• Gasket	Buna N (with Trogamid flow tube), Viton (with polysulfone flow tube), EPDM (for potable water plants)
• Limit	Polysulfone
Certificates and approvals	
Classification according to PED 97/23/EC	For gases of fluid group 2 and liquids of fluid group 1; complies with requirements of article 3, paragraph 3 (sound engineering practice SEP)

Technical specification of contacts

Designation	K18 A, K18 B
Housing/plug	PP/PA 6
Contact material	Rhodium
Degree of protection	IP65
Ambient temperature	-20 to +80 °C (-4 to 176 °F)
Max. switching frequency	5/min
Max. rating (rating data apply to resistive loads; a suppressor circuit is required for inductive loads)	AC 250 V/0,5 A/10 VA DC 250 V/0,5 A/5 W

Measuring ranges for liquids

Standard measuring range for liquid: ρ= 1 kg/l (62,43 lb/cu.ft), viscosity 1 mPa·s (1 cp)

Connection		Flow tube	Dynamics	max. measuring range for the selected floats									
				Stainless steel mat.No.		Stainless steel with magnet, mat.No.		PVC weighted		PVC with magnet weighted		Viscosity-compensated stainless steel mat.No.	
PVC adhesive bushing [mm]	Female thread			1.4305	1.4303	1.4571	316Ti					1.4571	316Ti
				l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)
20	(G1/4) (G3/8),G1/2	C 125	1:10	125	(0,55)	120	(0,53)	65	(0,29)	65	(0,29)	100*	(0,44)*
		C 315	1:10	315	(1,39)	300	(1,32)	175	(0,77)	175	(0,77)	240*	(1,06)*
32	(G1/2), (G3/4), G1	D 650 [1]	1:10	TS 650	TS (2,86)	TS 600	(TS 2,64)	TS 500	(TS 2,20)	TS 450	(TS 1,98)	TS 400*	(TS 1,76)*
		D 650 [2]	1:10	PS 600	PS (2,64)	PS 550	(PS 2,42)	PS 450	(PS 1,98)	PS 400	(PS 1,76)	PS 350*	(PS 1,54)*
		D 1000	1:10	1.000	(4,4)	950	(4,18)	750	(3,30)	700	(3,08)	600*	(2,64)*
		D 1600	1:10	1.600	(7,04)	1.500	(6,6)	1.250	(5,50)	1.100	(4,84)	1.000*	(4,4)*
		D 2500	1:10	2.500	(11,0)	2.400	(10,6)	2.000	(8,81)	1.750	(7,7)	1.400*	(6,16)*
63	(G1 1/4), (G1 1/2), G2	E 4000	1:10	4.000*	(17,6)*	3.800*	(16,7)*	3.200	(14,1)	3.200	(14,1)	2.500*	(11,0)*
		E 6500	1:10	6.500*	(28,6)*	6.400*	(28,2)*	5.000	(22,0)	5.000	(22,0)	4.000*	(17,6)*
		F 10000	1:10	10.000*	(44,0)*	9.500*	(41,8)*	7.500	(33,0)	7.500	(33,0)	5.500*	(24,2)*
		G 16000	1:4	16.000 [3]*	(70,4)[3]*	16.000*	(70,4)*	12.500	(55,0)	12.500	(55,0)	-	-
		H 20000	1:3	20.000 [3]*	(88,0) [3]*	19.000*	(83,6)*	-	-	-	-	-	-
		J 25000	1:3	25.000 [3]*	(110,0) [3]*	24000*	(106,0)*	-	-	-	-	-	-

(connections in brackets are non-standard)

* Guided float.
[1] With Trogamid flow tube
[2] With polysulfone flow tube
[3] Float, flow tube G, H and J: mat.No.. 1.4571/316Ti

Measuring ranges for air

Standard measuring range for air: p_{abs} = 1,013 bar (14,69 psi), at T=20°C (68°F) , ρ= 1,293 kg/m³, v= 0,0181 mPa.s

Connection		Flow tube	Dynamics	Max. measuring range for the selected floats							
				Aluminium mat.No. 3.1645		Aluminium with magnet mat.No. 3.1645		PVC non-weighted		PVC with magnet weighted	
PVC adhesive bushing [mm]	Female thread			l/h	(scfm)	l/h	(scfm)	l/h	(scfm)	l/h	(scfm)
20	(G1/4) (G3/8),G1/2	C 125	1:10	2.000	(1.18)	2.500	(1.47)	1.400	(0.82)	2.200	(1.29)
		C 315	1:10	5.000	(2.94)	6.400	(3.77)	3.400	(2.00)	6.000	(3.53)
32	(G1/2), (G3/4), G1	D 650 [1]	1:10	TS 10.000	TS (5.89)	TS 12.000	TS (7.06)	TS 7000	TS (4.12)	TS 10.000	TS (5.89)
		D 650 [2]	1:10	PS 9000	PS (5.3)	PS 10.500	PS (6.18)	PS 6.500	PS (3.83)	PS 9.000	PS (5.30)
		D 1000	1:10	16.000	(9.42)	20.000	(11.77)	11.000	(6.47)	16.000	(9.42)
		D 1600	1:10	28.000	(16.48)	32.000	(18.83)	18.000	(10.59)	25.000	(14.71)
		D 2500	1:10	40.000	(23.54)	50.000	(29.43)	28.000	(16.48)	40.000	(23.54)
63	(G1 1/4), (G1 1/2), G2	E 4000	1:10	64.000*	(37.67)*	75.000*	(44.14)*	45.000	(26.49)*	60.000	(35.51)*
		E 6500	1:10	100.000*	(58.86)*	125.000*	(73.57)*	75.000	(44.14)*	100.000	(58.86)*
		F 10000	1:10	160.000*	(94.17)*	180.000*	(105.9)*	120.000	(70.63)*	160.000	(94.17)*
		G 16000	1:4	280.000*	(164.8)*	300.000*	(176.6)*	190.000*	(111.8)*	-	-
		H 20000	1:3	350.000*	(206.0)*	400.000*	(235.4)*	240.000*	(141.3)*	-	-
		J 25000	1:3	430.000*	(253.1)*	480.000*	(282.5)*	300.000*	(176.6)*	-	-

(connections in brackets are non-standard)

Pressure losses

Pressure loss				
	Liquid		Air	
Flow tube	Float Mat.No. 1.4305	Mat.No 303	Aluminium float Mat.No.3.1645	
	mbar	(psi)	mbar	(psi)
C 125	11	(0,16)	4	(0,058)
C 315	13	(0,189)	5	(0,073)
D 650	17	(0,247)	7	(0,102)
D 1000	17	(0,247)	7	(0,102)
D 1600	20	(0,291)	7	(0,102)
D 2500	24	(0,349)	8	(0,116)
E 4000	25	(0,364)	9	(0,131)
E 6500	27	(0,393)	10	(0,145)
F 10000	32	(0,465)	13	(0,189)
G 16000	51	(0,740)	23	(0,334)
H 20000	65	(0,943)	31	(0,451)
J 25000	91	(1,320)	43	(0,625)

Pressure losses of variable area meters

Contact assembly

The bistable contact assembly K18 consists of a contact spring set sealed in a glass tube filled with protective gas. The contact springs are polarized by a fixed magnet such that they exhibit a bistable response.

Two contacts can be selected:

- K 18 A: contact closes when the limit is fallen below
- K 18 B: contact closes when the limit is exceeded.

Dimensions

Connection		Dimensions of inserts			Weight
PVC adhe-sive bushing mm (inch)	Bushing female thread	with female thread	With PVC adhesive bushing		
d		A±4 mm (A±0,16inch)	A±4[mm] (A±0,16inch)	B±4[mm] (B±0,16inch)	approx. kg (lb)
20 (0,79)	G1/2	344 (13,54)	340 (13,39)	306 (12,05)	0,4 (0,88)
32 (1,26)	G1	353 (13,90)	352 (13,86)	306 (12,05)	0,7 (1,54)
63 (2,49)	G2	372 (14,65)	382 (15,04)	306 (12,05)	2,2 (4,85)

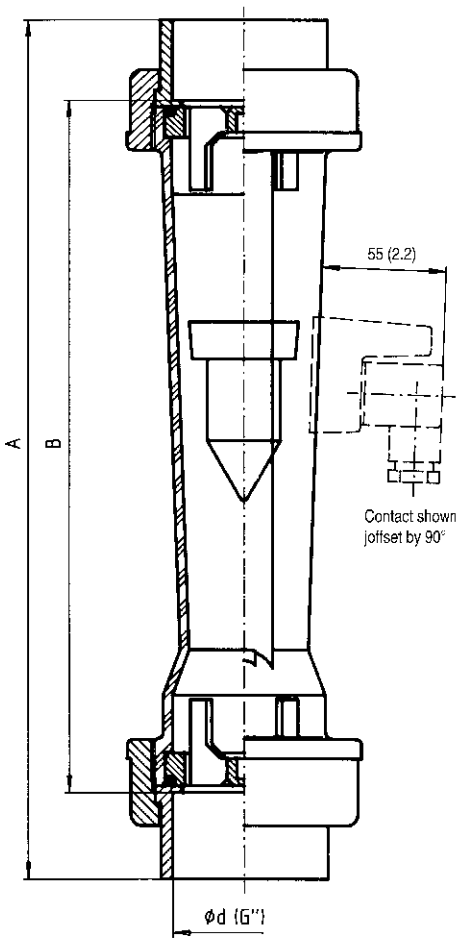


Fig. 2 F VA Trogflux, dimensions in mm (inch)

Selection of float

There are three versions of floats:

- Non-guided float
- Guided float
- Viscosity-compensated float.

Use of the viscosity-compensated float is necessary above the following viscosities:

Flow tube	mPa·s (cp)
C 125 to 315	≥ 3
D 650 to D 2500	≥ 5
E 4000 to F 10000	≥ 8

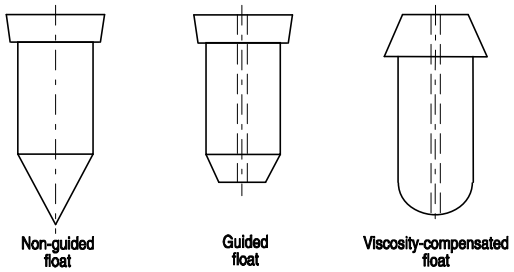


Fig. 3 Float versions

Pressure and temperature limits

Trogamid		Polysulfone
t[°C (°F)]	P_e [bar (psi)]	P_e [bar (psi)]
-10 to +60 (14 to 140)*	10,0 (145)	10,0 (145)
80 (176)	-	10,0 (145)
90 (194)	-	8,5 (123)

* Only up to 50 °C(122°F) with water

Connection parts PVC DIN 8062		
Media	t[°C(°F)]	P_e [bar (psi)]
With water and non-corrosive liquids	20 (68) 40 (104) 60 (140)	10,0 (145) 10,0 (145) 2,5 (36)
With corrosive liquids	20 (68) 40 (104) 60 (140)	10,0 (145) 4,0 (58) 1,0 (15)

P_e = effective pressure = pressure above atmospheric

Note of application

The operator of these measuring instruments is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the meter parts in contact with the medium are suitable for the used process media. The meter may only be used within the pressure and voltage limits specified in the operating instructions. Provide a touch guard for surface temperatures of > 70°C. This touch guard must be designed in a way that the max. allowable ambient temperature on the unit is not exceeded. Before replacing the measuring tubes, check that the unit is free of hazardous media and pressures. The flowmeter meets the requirements of the PED 97/23/EC, article 3, paragraph 3. The most hazardous allowable media are gases of fluid group 2.

Ordering data (C125-C315)
Connection G ¼-G ½ / DN 20 / NPT ¼"- ½"

F VA Trogflux **7ME580** - ☐☐☐☐☐ - ☐☐☐☐ - Z
Variable area meter, Plastic flow tube

see right

Flow tube material	
Trogamid	1
Polysulfone	6
Gasket material	
Buna N	1
Viton	4
EPDM	8

for liquids (ρ= 1 kg/l, v= 1 mPa.s)

measuring range Q_v l/h

Size flow tube		Float material							
C	125	mat.No. 1.4305/303	12,5 - 125	A	C	1			0
		mat.No. 1.4571/316Ti	12,5 - 125	A	C	2			0
		mat.No. 1.4571/316Ti, guided	12,5 - 125	A	C	2			2
		mat.No. 1.4571/316Ti, with magnet	12,0 - 120	A	C	2			1
		PVC, weighted	6,5 - 65	A	C	3			0
		PVC, weighted, with magnet	6,5 - 65	A	C	3			1
		mat.No. 1.4571/SV/316Ti, guided	10,0 - 100	A	C	4			2
C	315	mat.No. 1.4305/303	31,5 - 315	B	C	1			0
		mat.No. 1.4571/316Ti	31,5 - 315	B	C	2			0
		mat.No. 1.4571/316Ti, with magnet	30,0 - 300	B	C	2			1
		mat.No. 1.4571/316Ti, guided	31,5 - 315	B	C	2			2
		PVC, weighted	17,5 - 175	B	C	3			0
		PVC, weighted, with magnet	17,5 - 175	B	C	3			1
		mat.No. 1.4571/SV/316Ti, guided	24,0 - 240	B	C	4			2

for air (pabs=1,013 bar, T=20°C, ρ= 1,293 kg/m³, v= 0,0181 mPa.s)

measuring range Q_n l/h

Size flow tube		Float material							
C	125	Aluminium 3.1645	200 - 2000	A	C	5			0
		Aluminium 3.1645, with magnet	250 - 2500	A	C	5			1
		PVC, non weighted	140 - 1400	A	C	6			0
		PVC, non weighted, with magnet	220 - 2200	A	C	6			1
C	315	Aluminium 3.1645	500 - 5000	B	C	5			0
		Aluminium 3.1645, with magnet	640 - 6400	B	C	5			1
		PVC, non weighted	340 - 3400	B	C	6			0
		PVC, non weighted, with magnet	600 - 6000	B	C	6			1

Ordering data (C125-C315)

F VA Trogflux **7ME580** - ☐☐☐☐☐ - ☐☐☐☐ - Z
Variable area meter, Plastic flow tube

see left see left

Connection	Material	Type	Size				
Float							
C - C	PVC	adhesive	20 (DN 15)	1	1	A	
C - C	PVC	female thread DIN ISO 228	G 1/4	1	2	B	
			G 3/8	1	2	C	
			G 1/2	1	2	D	
C - C	PVC	female thread NPT	1/4"	1	3	B	
			3/8"	1	3	C	
			1/2"	1	3	D	
C - C	cast iron	DIN ISO 228	G 1/2	2	2	D	
C - C	steel mat.No. 1.0254	female thread DIN ISO 228	G 1/4	3	2	B	
			G 3/8	3	2	C	
C - C	steel mat.No. 1.0254	female thread NPT	1/4"	3	3	B	
			3/8"	3	3	C	
			1/2"	3	3	D	
C - C	stainless steel mat.No. 1.4571	female thread DIN ISO 228	G 1/4	4	2	B	
			G 3/8	4	2	C	
			G 1/2	4	2	D	
C - C	stainless steel mat.No. 1.4571	female thread NPT	1/4"	4	3	B	
			3/8"	4	3	C	
			1/2"	4	3	D	

Contacts (only with magnetic float)	
• without contact	A
• contact K18/A (closes when limit is fallen below)	C
• contact K18/B (closes when limit is exceeded)	D
• 2 contacts K18/A	E
• 2 contacts K18/B	F
• 1 per contact K18/A and K18/B	G

Further designs

Please add "**-Z**" to Order No. and specify Order codes

B06 with calibration certificate
Y01 measured medium: specify in plain text: medium, always required, measuring range with dimension, density with dimension, viscosity with dimension operating temperature, operating pressure
Y04 Silicone-free version
Y99 Specify special version in plain text

Ordering data (D650-D2500)

Connection G ½ -G 1 / DN 32 / NPT ½"-1"

F VA Trogflux **7ME580** - - Z
Variable area meter, Plastic flow tube

see right

Flow tube material	
Trogamid	1
Polysulfone	6
Gasket material	
Buna N	1
Viton	4
EPDM	8

for liquids (ρ= 1 kg/l, v= 1 mPa.s);

measuring range Q_v l/h

Size flow tube		Float material						
D	650	mat.No. 1.4305/303	TS 65 - 650 PS 60 - 600	C D 1				0
		mat.No. 1.4571/316Ti	TS 65 - 650 PS 60 - 600	C D 2				0
		mat.No. 1.4571/316Ti, guided	TS 60 - 600 PS 55 - 550	C D 2				2
		mat.No. 1.4571/316Ti, with magnet	TS 60 - 600 PS 55 - 550	C D 2				1
		PVC, weighted	TS 50 - 500 PS 45 - 450	C D 3				0
		PVC, weighted, with magnet	TS 45 - 450 PS 40 - 400	C D 3				1
		mat.No. 1.4571/SV/316Ti, guided	TS 40 - 400 PS 35 - 350	C D 4				2
D	1000	mat.No. 1.4305/303	100 - 1000	D D 1				0
		mat.No. 1.4571/316Ti	100 - 1000	D D 2				0
		mat.No. 1.4571/316Ti, with magnet	95 - 950	D D 2				1
		mat.No. 1.4571/316Ti, guided	100 - 1000	D D 2				2
		PVC, weighted	75 - 750	D D 3				0
		PVC, weighted, with magnet	70 - 700	D D 3				1
		mat.No. 1.4571/SV/316Ti, guided	60 - 600	D D 4				2
D	1600	mat.No. 1.4305/303	160 - 1600	E D 1				0
		mat.No. 1.4571/316Ti	160 - 1600	E D 2				0
		mat.No. 1.4571/316Ti, with magnet	150 - 1500	E D 2				1
		mat.No. 1.4571/316Ti, guided	160 - 1600	E D 2				2
		PVC, weighted	125 - 1250	E D 3				0
		PVC, weighted, with magnet	110 - 1100	E D 3				1
		mat.No. 1.4571/SV/316Ti, guided	100 - 1000	E D 4				2
D	2500	mat.No. 1.4305/303	250 - 2500	F D 1				0
		mat.No. 1.4571/316Ti	250 - 2500	F D 2				0
		mat.No. 1.4571/316Ti, with magnet	240 - 2400	F D 2				1
		mat.No. 1.4571/316Ti, guided	250 - 2500	F D 2				2
		PVC, weighted	200 - 2000	F D 3				0
		PVC, weighted, with magnet	175 - 1750	F D 3				1
		mat.No. 1.4571/SV/316Ti, guided	140 - 1400	F D 4				2

for air (pabs=1,013 bar, T=20°C, ρ= 1,293 kg/m³, v= 0,0181 mPa.s)

measuring range Q_n m³/h

Size flow tube		Float material						
D	650	Aluminium 3.1645	TS 1,0 - 10,0 PS 0,9 - 9,0	C D 5				0
		Aluminium 3.1645, with magnet	TS 1,2 - 12,0 PS 1,05 - 10,5	C D 5				1
		PVC, non weighted	TS 0,7 - 7,0 PS 0,65 - 6,5	C D 6				0
		PVC, non weighted, with magnet	TS 1,0 - 10,0 PS 0,9 - 9,0	C D 6				1
D	1000	Aluminium 3.1645	1,6 - 16,0	D D 5				0
		Aluminium 3.1645, with magnet	2,0 - 20,0	D D 5				1
		PVC, non weighted	1,1 - 11,0	D D 6				0
		PVC, non weighted	1,6 - 16,0	D D 6				1
D	1600	Aluminium 3.1645	2,8 - 28,0	E D 5				0
		Aluminium 3.1645, with magnet	3,2 - 32,0	E D 5				1
		PVC, non weighted	1,8 - 18,0	E D 6				0
		PVC, non weighted	2,5 - 25,0	E D 6				1
D	2500	Aluminium 3.1645	4,0 - 40,0	F D 5				0
		Aluminium 3.1645, with magnet	5,0 - 50,0	F D 5				1
		PVC, non weighted	2,8 - 28,0	F D 6				0
		PVC, non weighted, with magnet	4,0 - 40,0	F D 6				1

Ordering data (D650-D2500)

F VA Trogflux **7ME580** - - Z
Variable area meter, Plastic flow tube

see left see left

Connection Float	Material	Type	Size			
D - D	PVC	adhesive bushing	32 (DN 25)	1	1	A
D - D	PVC	female thread DIN ISO 228	G 1/2	1	2	D
			G 3/4	1	2	E
			G 1	1	2	F
D - D	PVC	female thread NPT	1/2"	1	3	D
			3/4"	1	3	E
			1"	1	3	F
D - D	cast iron	DIN ISO 228	G 1	2	2	F
D - D	steel mat.No. 1.0254	female thread	G 1/2	3	2	D
			G 3/4	3	2	E
D - D	steel mat.No. 1.0254	female thread NPT	1/2"	3	3	D
			3/4"	3	3	E
			1"	3	3	F
D - D	stainless steel mat.No. 1.4571	female thread DIN ISO 228	G 1/2	4	2	D
			G 3/4	4	2	E
			G 1	4	2	F
D - D	stainless steel mat.No. 1.4571	female thread NPT	1/2"	4	3	D
			3/4"	4	3	E
			1"	4	3	F

Contacts (only with magnetic float)	
• without contact	A
• contact K18/A (closes when limit is fallen below)	C
• contact K18/B (closes when limit is exceeded)	D
• 2 contacts K18/A	E
• 2 contacts K18/B	F
• 1 per contact K18/A and K18/B	G

Further designs

Please add "**-Z**" to Order No. and specify Order codes

B06 with calibration certificate
Y01 measured medium: specify in plain text: medium, always required, measuring range with dimension, density with dimension, viscosity with dimension operating temperature, operating pressure
Y04 Silicone-free version
Y99 Specify special version in plain text

Ordering data (E4000-J25000)
Connection G 1-G 2 / DN 63 / NPT 1"- 2"

F VA Trogflux **7ME580** - [ ][ ][ ][ ][ ] - [ ][ ][ ][ ][ ] - Z
Variable area meter, Plastic flow tube
see right

Flow tube material	
Trogamid	**1**
Polysulfone	**6**
Gasket material	
Buna N	**1**
Viton	**4**
EPDM	**8**

for liquids (ρ= 1 kg/l, v= 1 mPa.s)

measuring range Q_v m³/h

Size flow tube		Float material			
E	4000	mat.No. 1.4305/303, guided	0,4 - 4,0	**GE1**	**0**
		mat.No. 1.4571/316Ti, guided	0,4 - 4,0	**GE2**	**0**
		mat.No. 1.4571/316Ti, guided+magnet	0,38 - 3,8	**GE2**	**1**
		PVC, weighted	0,32 - 3,2	**GE3**	**0**
		PVC, weighted, with magnet	0,32 - 3,2	**GE3**	**1**
		mat.No. 1.4571/SV/316Ti, guided	0,25 - 2,5	**GE4**	**0**
E	6500	mat.No. 1.4305/303, guided	0,65 - 6,5	**HE1**	**0**
		mat.No. 1.4571/316Ti, guided	0,65 - 6,5	**HE2**	**0**
		mat.No. 1.4571/316Ti, guided+magnet	0,64 - 6,4	**HE2**	**1**
		PVC, weighted	0,5 - 5,0	**HE3**	**0**
		PVC, weighted, with magnet	0,5 - 5,0	**HE3**	**1**
		mat.No. 1.4571/SV/316Ti, guided	0,4 - 4,0	**HE4**	**0**
F	10000	mat.No. 1.4305/303, guided	1,0 - 10,0	**JE1**	**0**
		mat.No. 1.4571/316Ti, guided	1,0 - 10,0	**JE2**	**0**
		mat.No. 1.4571/316Ti, guided+magnet	0,95 - 9,5	**JE2**	**1**
		PVC, weighted	0,755 - 7,5	**JE3**	**0**
		PVC, weighted, with magnet	0,75 - 7,5	**JE3**	**1**
		mat.No. 1.4571/SV/316Ti, guided	0,55 - 5,5	**JE4**	**0**
G	16000	mat.No. 1.4571/316Ti, guided	4,0 - 16,0	**KE2**	**0**
		mat.No. 1.4571/316Ti, guided+magnet	5,0 - 19,0	**KE2**	**1**
		PVC, weighted	3,1 - 12,5	**KE3**	**0**
		PVC, weigthed, with magnet	3,1 - 12,5	**KE3**	**1**
H	20000	mat.No. 1.4571/316Ti, guided	6,0 - 20,0	**LE2**	**0**
		mat.No. 1.4571/316Ti, guided+magnet	6,0 - 19,0	**LE2**	**1**
J	25000	mat.No. 1.4571/316Ti, guided	8,0 - 25,0	**ME2**	**0**
		mat.No. 1.4571/316Ti, guided+magnet	8,0 - 24,0	**ME2**	**1**

for air (pabs=1.013 bar, T=20°C, ρ= 1,293 kg/m³, v= 0,0181 mPa.s)

measuring range Q_n m³/h

Size flow tube		Float material			
E	4000	Aluminium 3.1645, guided	6,4 - 64,0	**GE5**	**0**
		Aluminium 3.1645, guided+magnet	7,5 - 75,0	**GE5**	**1**
		PVC, non weighted	4,5 - 45,0	**GE6**	**0**
		PVC, non weighted, with magnet	6,0 - 60,0	**GE6**	**1**
E	6500	Aluminium 3.1645, guided	10,0 - 100,0	**HE5**	**0**
		Aluminium 3.1645, guided+magnet	12,5 - 125,0	**HE5**	**1**
		PVC, non weighted	7,5 - 75,0	**HE6**	**0**
		PVC, non weighted, with magnet	10,0 - 100,0	**HE6**	**1**
F	10000	Aluminium 3.1645, guided	16,0 - 160,0	**JE5**	**0**
		Aluminium 3.1645, guided+magnet	18,0 - 180,0	**JE5**	**1**
		PVC, non weighted	12,0 - 120,0	**JE6**	**0**
		PVC, non weighted, with magnet	16,0 - 160,0	**JE6**	**1**
G	16000	Aluminium 3.1645, guided	70,0 - 280,0	**KE5**	**0**
		Aluminium 3.1645, guided+magnet	75,0 - 300,0	**KE5**	**1**
		PVC, non weighted, guided	47,5 - 190,0	**KE7**	**0**
H	20000	Aluminium 3.1645, guided	117,0 - 350,0	**LE5**	**0**
		Aluminium 3.1645, guided+magnet	134,0 - 400,0	**LE5**	**1**
		PVC, not weigthed, guided	80,0 - 240,0	**LE7**	**0**
J	25000	Aluminium 3.1645, guided	143,0 - 430,0	**ME5**	**0**
		Aluminium 3.1645, guided+magnet	160,0 - 480,0	**ME5**	**1**
		PVC, non weighted, guided	100,0 - 300,0	**ME7**	**0**

Ordering data (E4000-J25000)

F VA Trogflux **7ME580** - [ ][ ][ ][ ][ ] - [ ][ ][ ][ ][ ] - Z
Variable area meter, Plastic flow tube
see left / see left

Connection Float	Material	Type	Size		
E - J	PVC	adhesive bushing	63 (DN 50)	**1**	**1 A**
E - J	PVC	female thread DIN ISO 228	G 1	**1**	**2 F**
			G 1 1/4	**1**	**2 G**
			G 1 1/2	**1**	**2 H**
			G 2	**1**	**2 J**
E - J	PVC	female thread NPT	1"	**1**	**3 F**
			1 1/4"	**1**	**3 G**
			1 1/2"	**1**	**3 H**
			2"	**1**	**3 J**
E - J	cast iron	DIN ISO 228	G 2	**2**	**2 J**
E - J	steel mat.No. 1.0254	female thread DIN ISO 228	G 1	**3**	**2 F**
			G 1 1/4	**3**	**2 G**
			G 1 1/2	**3**	**2 H**
E - J	steel mat.No. 1.0254	female thread NPT	1"	**3**	**3 F**
			1 1/4"	**3**	**3 G**
			1 1/2"	**3**	**3 H**
			2"	**3**	**3 J**
E - J	stainless steel mat.No. 1.4571	female thread DIN ISO 228	G 1	**4**	**2 F**
			G 1 1/4	**4**	**2 G**
			G 1 1/2	**4**	**2 H**
			G 2	**4**	**2 J**
E - J	stainless steel mat.No. 1.4571	female thread NPT	1"	**4**	**3 F**
			1 1/4"	**4**	**3 G**
			1 1/2"	**4**	**3 H**
			2"	**4**	**3 J**

Contacts (only with magnetic float)	
• without contact	**A**
• contact K18/A (closes when limit is fallen below)	**C**
• contact K18/B (closes when limit is exceeded)	**D**
• 2 contacts K18/A	**E**
• 2 contacts K18/B	**F**
• 1 per contact K18/A and K18/B	**G**

Further designs

Please add "**-Z**" to Order No. and specify Order codes

B06 with calibration certificate
Y01 measured medium: specify in plain text: medium, always required, measuring range with dimension, density with dimension, viscosity with dimension operating temperature, operating pressure
Y04 Silicone-free version
Y99 Specify special version in plain text

Variable area meter
F VA Trogflux - short version

Fig. 1 F VA Trogflux variable area meter – short-version

Application

The F VA Trogflux variable area meters in short-version are used to measure transparent liquids and gases passing through closed piping. The variable area meters can also be used for flow monitoring if they are equipped with one or more switching contacts. Standard scales are available for liquids with a density of 1 kg/l (62.43 lb/cu.ft). The scales must be recalculated for all other media depending on the physical characteristics.

Design and operation

The main components of the F VA Trogflux in short-version are the plastic variable-are flow tube with float and the connection parts. The flow is displayed directly on the scale present on the flow tube (e.g. in l/h) and is read at the position of the float´s widest diameter.

Special features

- Product scales for liquids and gases
- Simple assembling and handling
- Low-price plastic design
- Short delivery times for standard versions

Connection and mode of operation

For certain variable area meter sizes, the float is packed in a plastic net for transport purposes. Prior to fitting, this must be removed out of the variable area meter from the top. Free movement of the float in the flow tube should then be rechecked.

The variable area meter must be fitted vertically and without tension. Control elements or reductions/extensions in the pipe diameter upstream or downstream of the variable area meter have no influence on the accuracy when measuring liquids. However, when measuring gases, the variable area meter should be installed upstream of valves to prevent pulsations resulting from compression. Since variable area meter respond extremely sensitively to changes in flow, control elements should always be adjusted slowly.

The calibration has been carried out for the defined medium conditions. Deviation in the density pressure or temperature of gases, or in the density or viscosity of liquids, result in measurement errors. It is essential to observe the calibration conditions.

When ordering, it is therefore essential to provide data on the medium, density and viscosity at the operating temperature and pressure. With gases, it is additionally necessary to specify the exact reference point for the pressure (pressure above atmospheric, or absolut pressure).

Retrofitting of switching contacts is only possible if variable area meters with magnets are used. When using for the first time, move the float completely past the contact to permit polarization.

Technical specifications

Application	See left
Mode of operation	See left
Measuring principle	Float
Input	
Flow	Vertically upwards
Pressure limit	Max. 10 bar (145 psi) see page 8
Rated operating conditions	
Ambient conditions	
Temperature limits	
• for Trogamid-flow tube	Max. 60°C (140°F) (with Water 50°C (122 °F)
Medium conditions	
• Accuracy	Class 4 (according to VDE/VDI 3513, sheet 2)
• Measuring range	
- for liquids	4 l/h to 1600 l/h / 0,0176 to 7,0433 USgpm
- for gases	70 l/h to 25 m³/h / 0,0412 to 14,712 scfm
	A special scale must be provided for liquids with a density other than 1 kg/l (62,43 lb/cu.ft and all gases
• Dim. for measured variable	L/h
Design	
Connections	PVC-adhesive bushing, female thread, cast iron
Material	
• Flow tube	Trogamid
• Connection	
- Union nut	PVC, cast iron
- Insert	PVC, cast iron, stainless steel
• Float	Stainl. steel mat.No. 1.4571 / 316 Ti, PVC, aluminium
• Float guide rod	Stainl. steel mat.No. 1.4571 / 316
• Gasket	Buna N Viton EPDM
• Limit	Polysulfone
Certificates and approvals	
Classification according to (DGRL 97/23/EG)	For gases of fluid group 2 and liquids of fluid group 1; complies with requirements of article 3, paragraph 3 (sound engineering practice SEP)

Contact assembly

The bistable contact assembly K18 consists of a contact spring set sealed in a glass tube filled with protective gas. The contact is polarized by a fixed magnet such that they exhibit a bistable response.

Two contacts can be selected:

- K 18 A: contact closes when the limit is fallen below
- K 18 B: contact closes when the limit is exceeded

Technical specification of contacts

Designation	K18 A, K18 B
Housing/plug	PP/PA 6
Contact material	Rhodium
Degree of protection	IP65
Ambient temperature	-20 to 80 °C / (-4 to 176 °F)
Max. switching frequency	5/min
Max. rating (rating data apply to resistive loads; a suppressor circuit is required for inductive loads)	AC 250 V/0,5 A/10 VA DC 250 V/0,5 A/5 W

Measuring ranges for liquids and gases

Standard measuring range for liquid (ρ= 1 kg/l (62,43 lb/cu.ft), Viscosity 1 mPa·s (1 cp)

For air p_{abs} = 1,013 bar (14,69 psi), at T=20°C (68°F), ρ=1,293 kg/m³, v=0,0181 mPa.s

Connection		Flow Tube	Dynamics	max. Measuring range for the selected floats for liquids								max. Measuring rang for the selected floats for gases					
PVC adhe-sive [mm]	female thread			Stainless steel mat.No. 1. 4305	303	Stainl. steel with magnet, mat.No. 1.4571	316Ti	PVC weighted		PVC with magnet weighted		Aluminium mat.No.3.1645		PVC non-weighted		PVC with magnet non-weighted	
				l/h	Usgpm	l/h	Usgpm	l/h	Usgpm	l/h	Usgpm	l/h	scfm	l/h	scfm	l/h	scfm
20	(G1/4) (G3/8) G 1/2	C 40	1:10	40	0,176	40	0,176	20	0,088	20	0,088	700	0,412	450	0,265	800	0,471
		C 65	1:10	65	0,286	60	0,264	35	0,154	35	0,154	1200	0,706	700	0,412	1300	0,765
		C 100	1:10	100	0,44	90	0,396	55	0,242	55	0,242	1800	1,059	1000	0,588	2000	1,177
		C 160	1:10	160	0,704	160	0,704	100	0,396	90	0,396	2800	1,648	1800	1,059	3200	1,883
		C 250	1:10	250	1,101	240	1,057	140	0,616	140	0,616	4000	2,354	3000	1,765	5000	2,942
32	(G1/2), (G3/4), G1	D 400	1:10	400	1,761	400	1,761	300	1,101	250	1,101	7000	4,119	5000	2,942	6300	3,707
		D 650	1:10	650	2,861	650	2,861	500	1,981	450	1,981	12000	7,062	8000	4,708	10000	5,885
		D 1000	1:10	1.000	4,402	1000	4,402	750	2,861	650	2,861	17.000	10,00	12000	7,062	16000	9,416
		D 1600	1:10	1.600	7,043	1.600	7,043	1.200	4,402	1.000	4,402	25.000	14,71	20.000	11,77	25.000	14,71

(connections in brackets are non-standard)

Pressure losses

Pressure loss				
Flow tube	Liquid Float mat.No. 1.4305	mat.No. 303	Air Aluminium float mat.No. 3.1645	
	mbar	psi	mbar	psi
C 40	10	0,145	4	0,058
C 65	10	0,145	4	0,058
C 100	10	0,145	4	0,058
C 160	12	0,174	5	0,073
C 250	12	0,174	5	0,073
D 400	17	0,247	7	0,102
D 650	17	0,247	7	0,102
D 1000	17	0,247	7	0,102
D 1600	20	0,29	7	0,102

Pressure losses of variable area meters

Pressure and temperature limits

Connection parts PVC DIN 8062		
Media	t[°C(°F)]	P_e [bar (psi)]
With water and non-corrosive liquids	20 (68) 40 (104) 60 (140)	10,0 (145) 10,0 (145) 2,5 (36)
With corrosive liquids	20 (68) 40 (104) 60 (140)	10,0 (145) 4,0 (58) 1,0 (15)

P_e = effective pressure = pressure above atmospheric

Note of application

The operator of these instruments is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the meter parts in contact with the medium are suitable for the used process media. The meter may only be used within the pressure and voltage limits specified in the operating instructions. Provide a touch guard for surface temperatures of > 55°C (158 °F). This touch guard must be designed in a way that the max. allowable ambient temperature on the unit is not exceeded. Before replacing the measuring tubes, check that the unit is free of hazardous media and pressures. The flowmeter meets the requirements of the PED 97/23/EG, article 3, paragraph 3. The most hazardous allowable media are gases of fluid group 2.

Dimensions

Connection		Dimension of inserts			Weight
PVC-adhesive bushing] (inch) D	Bushing female thread	with female thread	With PVC adhesive bushing		
		A±4[mm] (A±0,16in)	A±4[mm] (A±0,16in)	B±4[mm] (B±0,16in)	aprox. kg (lb)
20 (0,79)	G1/2	207 (8,15)	203 (7,99)	171 (6,73)	0,15 (0,33)
32 (1,26)	G1	252 (9,92)	250 (9,84)	206 (8,11)	0,35 (0,77)

Fig. 2 Trogflux TS-K, dimensions in mm (inch)

F VA Trogflux TSK

Ordering data (C40-C250)
Connection G ¼-G ½ / DN 20 / NPT ¼"-½"

F VA Trogflux **7ME5892 -** _ _ _ _ _ - _ _ _ _

Variable area meter - short version
Trogamid flow tube

Gasket material	
Buna N	1
Viton	4
EPDM	8

Size flow tube		Float material	Measuring range Q_v l/h for liquids (ρ=1 kg/l, v=1mPa.s)						
C	40	mat.No. 1.4305/303	4,0 - 40,0	A	C	1			0
		mat.No. 1.4571/316Ti	4,0 - 40,0	A	C	2			0
		mat.No. 1.4571/316Ti, with magnet	4,0 - 40,0	A	C	2			1
		PVC, weighted	2,0 - 20,0	A	C	3			0
		PVC, weighted, with magnet	2,0 - 20,0	A	C	3			1
C	65	mat.No. 1.4305/303	6,5 - 65,0	B	C	1			0
		mat.No. 1.4571/316Ti	6,5 - 65,0	B	C	2			0
		mat.No. 1.4571/316Ti, with magnet	6,0 - 60,0	B	C	2			1
		PVC, weighted	3,5 - 35,0	B	C	3			0
		PVC, weighted, with magnet	3,5 - 35,0	B	C	3			1
C	100	mat.No. 1.4305/303	10,0 - 100,0	C	C	1			0
		mat.No. 1.4571/316Ti	10,0 - 100,0	C	C	2			0
		mat.No. 1.4571/316Ti, with magnet	9,5 - 90,0	C	C	2			1
		PVC, weighted	5,5 - 55,0	C	C	3			0
		PVC, weighted, with magnet	5,5 - 55,0	C	C	3			1
C	160	mat.No. 1.4305/303	16,0 - 160,0	D	C	1			0
		mat.No. 1.4571/316Ti	16,0 - 160,0	D	C	2			0
		mat.No. 1.4571/316Ti, with magnet	16,0 - 160,0	D	C	2			1
		PVC, weighted	10,0 - 100,0	D	C	3			0
		PVC, weighted, with magnet	9,0 - 90,0	D	C	3			1
C	250	mat.No. 1.4305/303	25,0 - 250,0	E	C	1			0
		mat.No. 1.4571/316Ti	25,0 - 250,0	E	C	2			0
		mat.No. 1.4571/316Ti, with magnet	24,0 - 240,0	E	C	2			1
		PVC, weighted	14,0 - 140,0	E	C	3			0
		PVC, weighted, with magnet	14,0 - 140,0	E	C	3			1

Size flow tube		Float Material	Measuring range Q_n l/h for air (pabs=1,013 bar, T=20°C, ρ=1,293 kg/m³, v=0,0181 mPa.s)						
C	40	Aluminium	70,0 - 700,0	A	C	5			0
		PVC, non-weighted	45,0 - 450,0	A	C	6			0
		PVC, non-weighted, with magnet	80,0 - 800,0	A	C	6			1
C	65	Aluminium	120,0 - 1200,0	B	C	5			0
		PVC, non-weighted	70,0 - 700,0	B	C	6			0
		PVC, non-weighted, with magnet	130,0 - 1300,0	B	C	6			1
C	100	Aluminium	180,0 - 1800,0	C	C	5			0
		PVC, non-weighted	100,0 - 1000,0	C	C	6			0
		PVC, non-weighted, with magnet	200,0 - 2000,0	C	C	6			1
C	160	Aluminium	280,0 - 2800,0	D	C	5			0
		PVC, non-weighted	180,0 - 1800,0	D	C	6			0
		PVC, non-weighted, with magnet	320,0 - 3200,0	D	C	6			1
C	250	Aluminium	400,0 - 4000,0	E	C	5			0
		PVC, non-weighted	300,0 - 3000,0	E	C	6			0
		PVC, non-weighted, with magnet	500,0 - 5000,0	E	C	6			1

Connection Float	Material	Type	Size			
C - C	PVC	adhesive bushing	20 (DN 15)	1	1	A
C - C	PVC	female thread DIN ISO 228	G 1/4	1	2	B
			G 3/8	1	2	C
			G 1/2	1	2	D
C - C	PVC	female thread NPT	1/4"	1	3	B
			3/8"	1	3	C
			1/2"	1	3	D
C - C	cast iron	DIN ISO 228	G 1/2	2	2	D
C - C	steel mat.No. 1.0254	female thread DIN ISO 228	G 1/4	3	2	B
			G 3/8	3	2	C
C - C	steel mat.No. 1.0254	female thread NPT	1/4"	3	3	B
			3/8"	3	3	C
			1/2"	3	3	D
C - C	stainless steel mat.No. 1.4571	female thread DIN ISO 228	G 1/4	4	2	B
			G 3/8	4	2	C
			G 1/2	4	2	C
C - C	stainless steel mat.No. 1.4571	female thread NPT	1/4"	4	3	B
			3/8"	4	3	C
			1/2"	4	3	D

see right

Ordering data (C40-C250)

F VA Trogflux **7ME5892 -** _ _ _ _ _ - _ _ _ _
Variable area meter - short version
Trogamid flow tube — see left — see left

Contacts (only with magnetic float)	
• Without contact	A
• Contact K18/A (closes when limit is fallen below)	C
• Contact K18/B (closes when limit is exceeded)	D

Further designs

Please add "**-Z**" to Order No. and specify Order codes

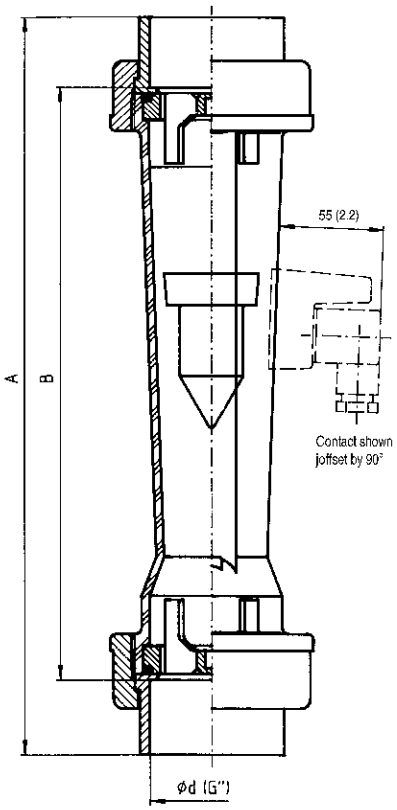
B06 with calibration certificate

Y01 measured medium: specify in plain text: medium, always required, measuring range with dimension, density with dimension, viscosity with dimension, operating temperature, operating pressure

Y04 Silicone-free version

Y05 Water as measured medium
Viscosity: 1mPas (cp); Density: 1 kg/l (62,43 lbs/cu.ft)

Y99 Specify special version in plain text



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Ordering data (D400-D1600)
Connection G ½-G1 / DN 32 / NPT ½"-1"

F VA Trogflux **7ME5892 -** _ _ _ _ _ - _ _ _ _
Variable area meter, short version
Trogamid flow tube

Gasket material									
Buna N						1			
Viton						4			
EPDM						8			
Measuring range Q_v l/h for liquids (ρ=1 kg/l, v=1mPa.s)									
Size flow tube		Float material							
D	400	mat.No. 1.4305/303	40 - 400	F	D	1			0
		mat.No. 1.4571/316Ti	40 - 400	F	D	2			0
		mat.No. 1.4571/316Ti, with magnet	40 - 400	F	D	2			1
		PVC, weighted	30 - 300	F	D	3			0
		PVC, weighted, with magnet	25 - 250	F	D	3			1
D	650	mat.No. 1.4305/303	65 - 650	G	D	1			0
		mat.No. 1.4571/316Ti	65 - 650	G	D	2			0
		mat.No. 1.4571/316Ti, with magnet	65 - 650	G	D	2			1
		PVC, weighted	50 - 500	G	D	3			0
		PVC, weighted, with magnet	45 - 450	G	D	3			1
D	1000	mat.No. 1.4305/303	100 - 1000	H	D	1			0
		mat.No. 1.4571/316Ti	100 - 1000	H	D	2			0
		mat.No. 1.4571/316Ti, with magnet	100 - 1000	H	D	2			1
		PVC, weighted	75 - 750	H	D	3			0
		PVC, weighted, with magnet	65 - 650	H	D	3			1
D	1600	mat.No. 1.4305/303	160 - 1600	J	D	1			0
		mat.No. 1.4571/316Ti	160 - 1600	J	D	2			0
		mat.No. 1.4571/316Ti, with magnet	160 - 1600	J	D	2			1
		PVC, weighted	120 - 1200	J	D	3			0
		PVC, weighted, with magnet	100 - 1000	J	D	3			1
Measuring range Q_n l/h for air (pabs=1,013 bar, T=20°C, ρ=1,293 kg/m³, v=0,0181 mPa.s)									
Size flow tube		Float Material							
D	400	Aluminium	700 - 7000	F	D	5			0
		PVC, non-weighted	500 - 5000	F	D	6			0
		PVC, non-weighted, with magnet	630 - 6300	F	D	6			1
D	650	Aluminium	1200 - 12000	G	D	5			0
		PVC, non-weighted	800 - 8000	G	D	6			0
		PVC, non-weighted, with magnet	1000 - 10000	G	D	6			1
D	1000	Aluminium	1700 - 17000	H	D	5			0
		PVC, non-weighted	1200 - 12000	H	D	6			0
		PVC, non-weighted, with magnet	1600 - 16000	H	D	6			1
D	1600	Aluminium	2500 - 25000	J	D	5			0
		PVC, non-weighted	2000 - 20000	J	D	6			0
		PVC, non-weighted, with magnet	2500 - 25000	J	D	6			1

see right

Ordering data (D400-D1600)

F VA Trogflux **7ME5892 -** _ _ _ _ _ - _ _ _
Variable area meter, short version
Trogamid flow tube

see left see left

Connection Float	Material	Type	Size			
D - D	PVC	adhesive bushing	32 (DN 25)	1	1	A
D - D	PVC	female thread DIN ISO 228	G 1/2	1	2	D
			G 3/4	1	2	E
			G 1	1	2	F
D - D	PVC	female thread NPT	1/2"	1	3	D
			3/4"	1	3	E
			1"	1	3	F
D - D	cast iron	DIN ISO 228	G 1	2	2	F
D - D	steel mat.No. 1.0254	female thread DIN ISO 228	G 1/2	3	2	D
			G 3/4	3	2	E
D - D	steel mat.No. 1.0254	female thread NPT	1/2"	3	3	D
			3/4"	3	3	E
			1"	3	3	F
D - D	stainless steel mat.No. 1.4571	female thread DIN ISO 228	G 1/2	4	2	D
			G 3/4	4	2	E
			G 1	4	2	F
D - D	stainless steel mat.No. 1.4571	female thread NPT	1/2"	4	3	D
			3/4"	4	3	E
			1"	4	3	F

Contacts (only with magnetic float)	
• Without contact	A
• Contact K18/A (closes when limit is fallen below)	C
• Contact K18/B (closes when limit is exceeded)	D

Further designs

Please add "**-Z**" to Order No. and specify Order codes

B06 with calibration certificate

Y01 measured medium: specify in plain text: medium,
always required, measuring range with dimension, density with dimension,
viscosity with dimension, operating temperature, operating pressure

Y04 Silicone-free version

Y05 Water as measured medium
Viscosity: 1mPas (cp); Density: 1 kg/l (62,43 lbs/cu.ft)

Y99 Specify special version in plain text

Variable area meter
F VA TUBUX M30

Fig. 1 variable area meter F VA Tubux M30

Application

The variable area meter F VA Tubux M30 are used to measure the volume of transparent liquids and gases passing through closed piping. The variable area meters can also be used for flow monitoring if they are equipped with one or more switching contacts. Standard scales are available for liquids with a density of 1 kg/l (62,43 lb/cu ft). The scales must be recalculated for all other media depending on the physical characteristics.
The flow tube is also optionally available with a percentage or 2-mm (0.078 inch) scale.

Design and operation

The main components of the F VA Tubux variable area meters are the glass variable-area flow tube with float, the fitting and the connection parts. The flow is displayed directly on the scale present on the flow tube (e.g. in l/h) and is read at the position of the float's widest diameter (see also page 14).

Benefits

- Scales for gases and fluids
- Rugged versions with various materials
- Can be used for high pressures and temperature
- Short delivery times for standard versions.

Connection and mode of operation

For certain variable area meter sizes, the float is packed in a plastic net for transport purposes. Prior to fitting, this must be removed out of the variable area meter from the top.

The locking rod must be pulled upwards out of the variable area meter.

The variable area meter must be fitted vertically and without tension. Control elements or reductions/extensions in the pipe diameter upstream or downstream of the variable area meter have no influence on the accuracy when measuring liquids. However, when measuring gases, the variable area meter should be installed upstream of valves to prevent pulsations resulting from compression. Since variable area meters respond extremely sensitively to changes in flow, control elements should always be adjusted slowly.

The calibration has been carried out for defined media conditions. Deviations in the density, pressure or temperature of gases, or in the density or viscosity of liquids, result in measurement errors. It is essential to observe the calibration conditions. When ordering, it is therefore essential to provide data on the medium, density and viscosity at the operating temperature and pressure. With gases, it is additionally necessary to specify the exact reference point for the pressure (pressure above atmospheric, or absolute pressure).

Retrofitting of switching contacts is only possible if variable area meters with magnets are used. When using for the first time, move the float completely past the contact to permit polarization.

Float guide rod

The float guide rod prevents the float from making contact with the glass flow tube.

The option is recommended to increase the operational safety and to protect against glass breakages in the case of operating conditions such as solenoid valve control. The option is not possible in conjunction with floats with magnets and weighted PVC/ PVDF floats.

Liquids: Standard: flow tube E 4000 to F 10000
Option: flow tube C 125 and upwards

Gases: Standard: flow tube E 4000 to F 10000
Option: flow tube C 125 and upwards

Note of application

The operator of these measuring instruments is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the flow meter parts in contact with the medium are suitable for the used process media. The flow meter may only be used within the pressure and voltage limits specified in the operating instructions. Before replacing the measuring tubes, check that the unit is free of hazardous media and pressures. Provide a touch guard for surface temperatures of > 70°C. This touch guard must be designed in a way that the max. allowable ambient temperature on the unit is not exceeded. The flow meter meets the requirements of the PED 97/23/EC as stated in the table as follows.

Classification according to PED 97/23/EC

	Permissible media	Category
≤DN25 (G1/4 to G1)	Gases of fluid group 1 and liquids of fluid group 1	Art. 3.3
>DN25 (G1 ¼ to G2)	Gases of fluid group 1 and liquids of fluid group 1	I

Technical specification Tubux M30

Application	see page 11
Mode of operation	see page 11
Measuring principle	Float
Input	
Flow	vertically upwards
Design	
Connections	screwed gland G¼ to G2 flange DN 15/ ½"– DN 80 / 3" hose nozzle 3/8" – 2" (LW 13 -50mm)
• Build in length	see page 13
• Flow tube length	300mm (11,8 inch)
Material	
• Flow tube	Borosilicate glass
• Connection	stainless steel W.-Nr. 1.4404 / 316L PVDF PVC (see page 13)
• Float	Stainless steel W.-Nr. 1.4571 /316Ti Aluminum PVDF
• Float guide rod	Stainless steel W.-Nr. 1.4571 / 316Ti
• Gasket	Viton® FKM EPDM FFKM
• Limit	PVDF Optional Stainless steel
• Fitting	Stainless steel
• optional	Shatter protection in Plexi glass up to max. 80°C Engraved scale (required for measured medium (temperature >90°C / 194 °F))
Weight	
• Tubux 45 screwed gland G½ flange DN 15	 approx. 0,65 kg (1,43 lb) approx. 1,91 kg (4,2 lb),
• Tubux 60 screwed gland G1 flange DN 25	 approx. 1,9 kg (4,19 lb) approx. 3,7 kg (8,04 lb),
• Tubux 90 screwed gland G2 flange DN 50	 approx. 3,8 kg (8,38 lb) approx. 8,7 kg (19,24 lb)

Rated operating conditions

Temperature Limits

• Flow tube	-10 to +150 °C (14 to 302 °F)
• Limit made of PVDF	-10 to +100 °C (14 to 212 °F)
• Limit made of Stainless steel	-10 to +150 °C (14 to 302 °F)
• Float material	
PVC	-10 to +50 °C (14 to 122 °F)
PVDF	-10 to +100 °C (14 to 212 °F)
Stainless steel	-10 to +150 °C (14 to 302 °F)
• Gasket	
Viton® FKM	max. 150 °C (302 °F)
EPDM	max. 150 °C (302 °F)
FFKM	max. 150 °C (302 °F)
• Connection material	
Stainless steel	-10 °C to +150 °C (14 to 122 °F)
PVC	see table below
PVDF	see table below
• Ambient temperature	-20 °C to +80 °C (-4 to 176 °F)
pressure limit for flow tube	Depending on temperature
• B 30 to B 100	max. 10 bar (145 psi) (at 20 °C)
• C 125 to D 3.000	max. 10 bar (145 psi) (at 20 °C)
• E 4.000 to F 10.000	max. 8 bar (116 psi) (at 20 °C)
• Accuracy	
liquids	G 1,6 qG 50%(acc. to VDE/VDI 3513, sheet 2)
gases	G 2,5 qG 50% (acc. to VDE/VDI 3513, sheet 2)
• Measuring range	Dependent on flow tube
- for liquids	1,1 l/h to 10.000 l/h (0,005 to 44,03 USgpm) Measuring range for water see tables on page 9 Special measuring range possible with specification of the media data and measuring range
- for gases	32 l/h to 180000 l/h (0,019 to 105,9 scfm) Measuring range for air see tables on page 9 Special measuring range possible with specification of the media data and measuring range
• Dimension for measured variable	l/h (to flow tube D2500) m^3/h (above flow tube D3000 % division markings on scale)

Connections PVC und PVDF		
Medium	T[°C(F)]	P_e[bar(psi)]
Water and not abrasive liquids	20 (68) 40 (104) 50 (122)	10,0 (145) 10,0 (145) 2,5 (36)
abrasive liquids	20 (68) 40 (104) 50 (122)	10,0 (145) 4,0 (58) 1,0 (15)

P_e= eff. pressure = overpressure

Dimensions

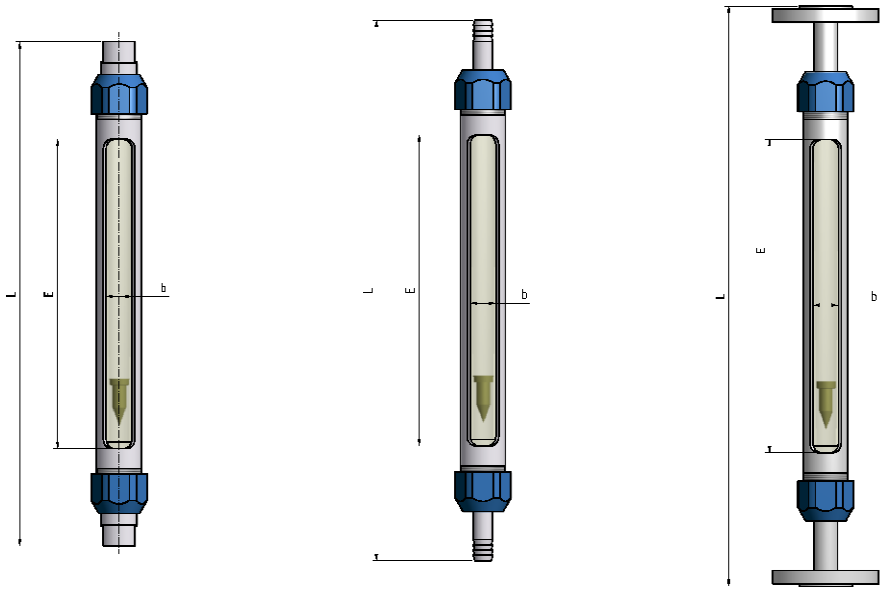


Fig. 2 F VA Tubux M30 Dimensions

Tubux M30	E in mm (inch)	b in mm (inch)	L in mm (inch)		
			screwed gland	hose nozzle	flange connection
45	235 (9,25)	19 (0,75)	375 (14,76)	400 (15,75)	425 (16,73), 500 (19,69)
60	235 (9,25)	38 (1,50)	375 (14,76)	400 (15,75)*	425 (16,73), 500 (19,69)
90	235 (9,25)	58 (2,28)	375 (14,76)	450 (17,72)	425 (16,73), 500 (19,69)

Special build in length on request
* Build in length for hose nozzle LW38 (1 ½") 450 mm (17,72)

Connection variants

Tubux M30	screwed gland DIN ISO 228	screwed gland NPT	hose nozzle	Flange EN 1092-1	ASME B16.5 150RF
45	G 1/4 G 3/8 **G 1/2**	NPT 1/4" NPT 3/8" **NPT 1/2"**	LW13 (3/8") **LW17 (1/2")**	DN 10 PN 40 **DN 15 PN 40** DN 20 PN 40 DN 25 PN 40	**1/2" 150RF** 3/4" 150RF 1" 150RF
60	G 1/2 G 3/4 **G 1**	NPT 1/2" NPT 3/4" **NPT 1"**	LW17 (1/2") LW19 (3/4") **LW25 (1")** LW32 (1 1/4") LW38 (1 1/2")	**DN 25 PN 40** DN 32 PN 40 DN 40 PN 40 DN 50 PN 40	**1" 150RF** 1 1 1/4" 1 1/2" 2"
90	G 1 G 1 ¼ **G 1 ½** **G 2**	NPT 1" NPT 1 1/4" NPT 1 1/2" **NPT 2"**	LW25 (1") LW32 (1 1/4") LW38 (1 1/2") **LW50 (2")**	DN 40 PN 40 **DN 50 PN 40** DN 65 PN 16 DN 80 PN 16	1 1/2" 150RF **2" 150RF** 2 1/2" 150RF 3" 150RF

Standard versions are bold printed

Parts list

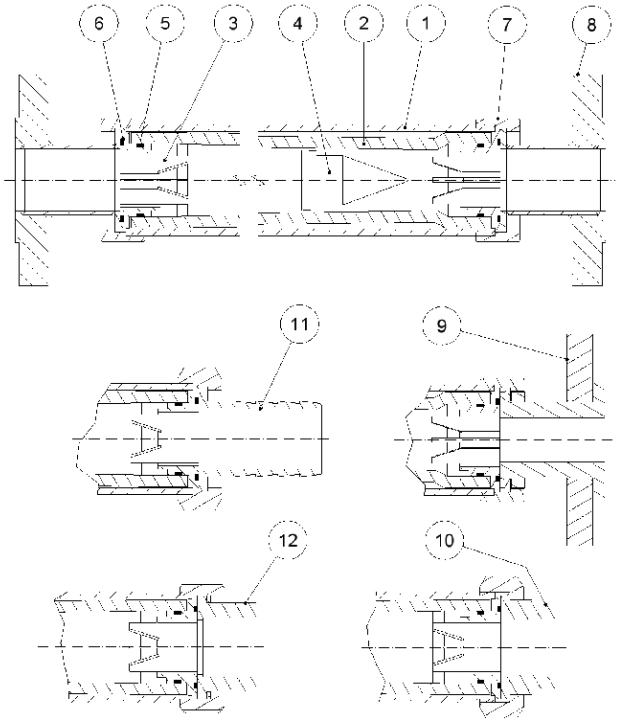


Fig. 3 Sectional drawing of FVA Tubux M30

1	fitting
2	Flow tube
3	limit
4	Float
5	O-Ring limit / glass
6	O-Ring limit / connection
7	Union nut
8	Flange connection
9	Flange connection in plastic
10	Female thread connection
11	Hose nozzle connection
12	Solvent-cemented connection

selection of float/ reading edge

There are three versions of floats:

- Non-guided float
- Guided float
- Viscosity-compensated float.

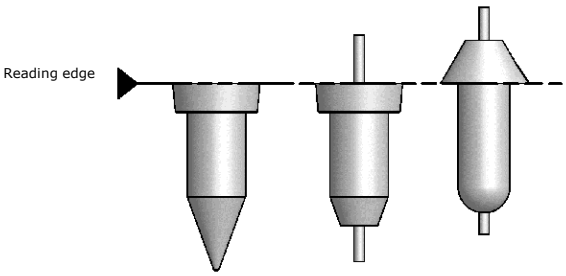


Fig. 4 Float version

Use of the viscosity-compensated float is necessary above the following viscosities:

Flow tube	mPa·s (cP)
C 125 to C 500	≥ 3
D 650 to D 3000	≥ 5
E 4000 to F 10000	≥ 8

Technical data contacts K17

The K17 bistable magnetic contact assemblies indicate the position of the float. In this way, measurement values are indicated without contact or feedback.

Special features:

- Bistable behavior
- High agitation resistance
- Switching without feedback
- No mutual influencing between the contacts
- Switching with almost no inertia
- Simple plug connection

The bistable contact assembly consists of a contact spring set sealed in a glass tube filled with protective gas.

Three contacts can be selected:

- K 17 A: contact closes when the limit is fallen below
- K 17 B: contact closes when the limit is exceeded

Switching principle	Magnetic contact unit, bistabile
housing/ plug	PP/PA 6
Contact material	Rhodium
Protection class	IP65
Ambient temperature	-20 to +80 °C / -4 to 176 °F
max. switching frequency	5/min
max. rating	AC 250 V/0,5 A/10 VA DC 250 V/0,5 A/5 W

Important: The maximum switching capacity and the maximum permissible peak activation current may not be exceeded; otherwise a welding effect arises at the contact studs causing them to bond together.

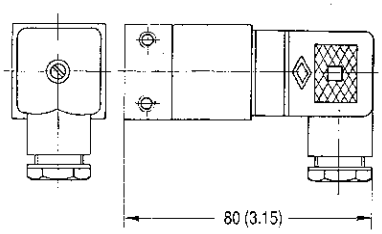


Fig. 5 Contact K17, Dimension in mm (inch)

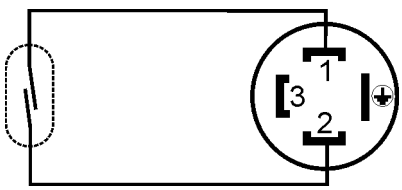


Fig. 6 electrical connection K17

Assembly of the connection cable onto the plug connection:

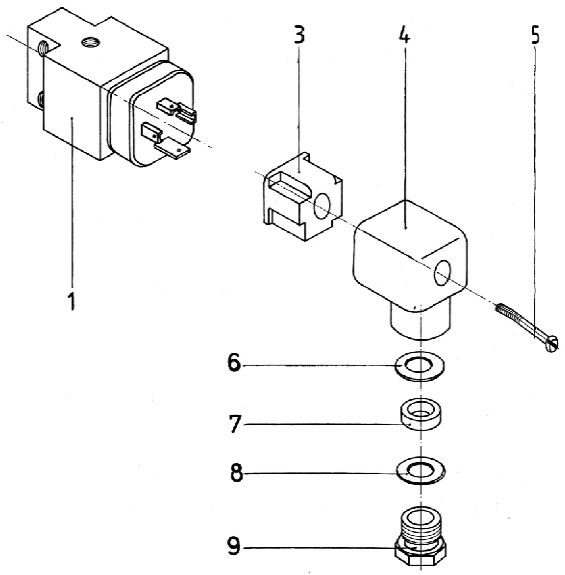


Fig. 7 Exploded view of contact K17

1. Loosen cable screw connection (9) and remove the seals (8, 7, 6)
2. Take out of the cover
3. Loosen the locking screw (5) and pull the cover (4) with element (3) off the contact housing (1).
4. Pull the screw (5) and insert element (3) out of the cover (4).
5. Feed the connection cable through the cable screw connection (9) and the seals (8, 7, 6) into the cover (4) and fasten to terminals 1 and 2 of the insert element.
6. Assembly of the plug connection takes place in the reverse order of the steps described under 1. to 3. The insert element can be rotated freely by 90° so that the cable runs down, up, right or left after connecting to the K17.

Commissioning:

During commissioning by the user, we recommend running the float of the device past the contact once or, similarly, the contact past the float. This will ensure the correct starting position of the contact.

Contact fastening K17:

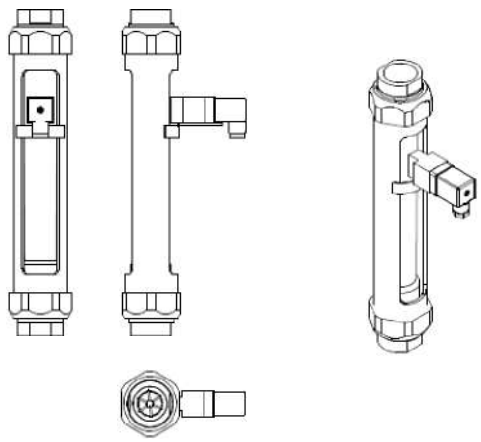


Fig. 8 Contact fastening of K17 to Tubux M30

Technical data contact K33

The magnetic protective gas contact is used in connection with measurement devices in situations where electrical circuits must be opened or closed at specific measurement values.

Housing	Alu
Contact material	AgPd
Protection class	IP54
Switching voltage	[V~] 220
	[V=] 250
Continuous current	[A] 1.5
Switching capacity	[V~] 220 max.150 VA
	[V=] 250 max.100W
Switching contact resistance	[Ω] 0.2 Ohm
Insulation resistance	[Ω] 50 M Ohm
Breakdown voltage	[V] 1150
Mech. service life	10^8 switch operations
Max. switching frequency	7200 /h
Electrical connection	Rectangular plug connector, type A (EN 175301-803)

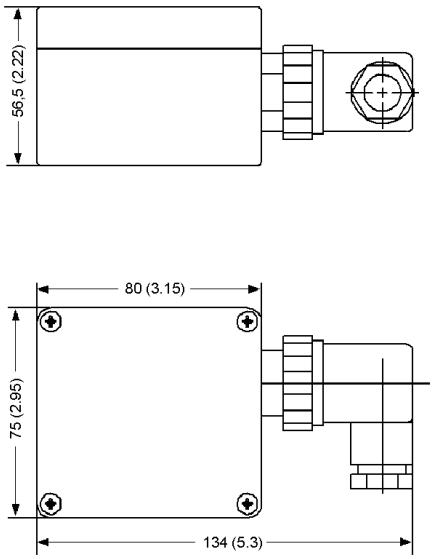


Fig. 9 Changer K33, Dimension in mm (inch)

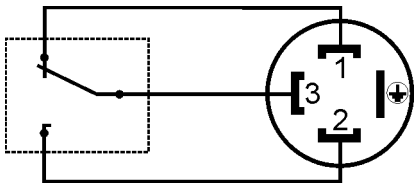
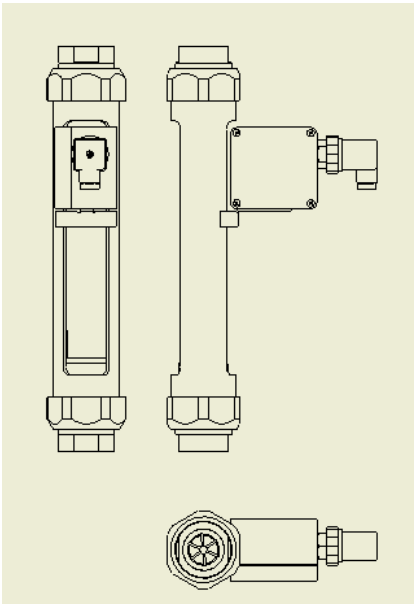


Fig. 10 electrical connection K33

Design and operating principle of protective gas contacts

Applications
The special advantage of this switch lies in the gas-tight encapsulation of the contacts, which prevents spark generation. This eliminates the risk of a gas explosion from switching sparks and in many cases makes expensive explosion protection measures unnecessary.

Operating principle
The contact springs of silver palladium are located within a glass tube filled with protective gas (fused in gas-tight). The middle, movable contact arm is pulled by a holding magnet affixed to the glass tube and held in the resting position. A tilting magnet on a toe bearing can be turned by an actuation magnet so that one of its poles is opposite the holding magnet. The stronger magnetic field of the tilting magnet pulls the contact arm, resulting in a switching operation. If the tilting magnet is turned back to its initial position by the actuation magnet, the contact arm returns to its original position due to the attractive force of the holding magnet. Since it is a changeover contact, it is possible to use both a circuit opening connection and a circuit closing connection.



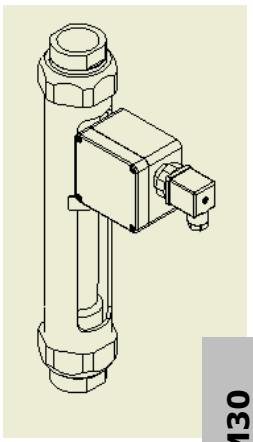


Fig. 11 Contact fastening of K33 to Tubux M30

Technical data contact K33i

The inductive switch contact K33i is used in particular when an electrical circuit must be opened or closed at specific measurement values in areas with gas, vapor or mist at risk to explosion.

Housing	Aluminum
Switching element function	Break contact
Output polarity	NAMUR (DIN EN 60947-5-6)
Protection class	IP54
Rated voltage U_0	[V] 8
Operating voltage U_B	[V] 5 … 25V
Max. switching frequency	3000 Hz
Electrical connection	Rectangular plug connector, type A (EN 175301-803)

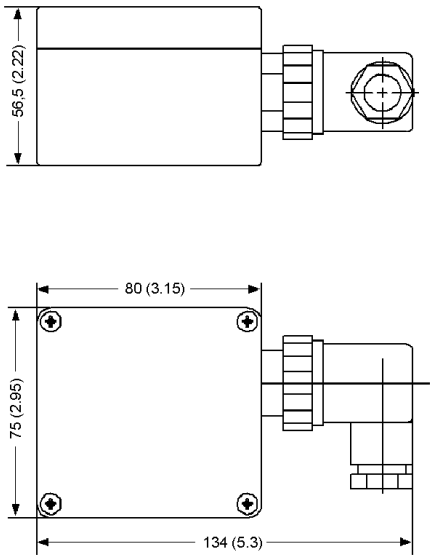


Fig. 12 Inductive contact K33i, dimension in mm (inch)

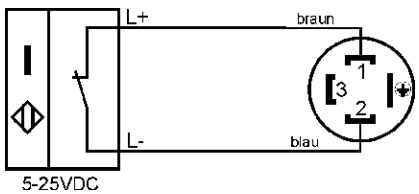


Fig. 13 electrical connection K33i

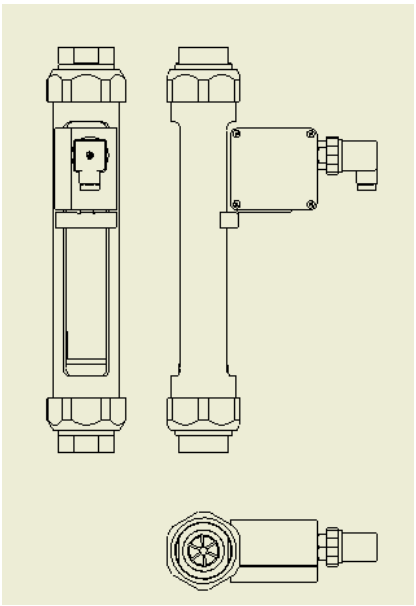
Design and operating principle of inductive slot proximity sensors

Application

The special advantage of the inductive slot proximity switch used lies in the sealed joint welding of the housing body and housing lid as well as the cavity-free casting of the sensors under a vacuum, which prevents the entrance of moisture. The protection class of the sensor is IP 68.
Thanks to the intrinsically safe design of the sensor, use in areas at risk to explosion is possible.

Operating principle

A control lug is fastened to the magnet mount of a tilting magnet on a toe bearing such that, depending on the position of the tilting magnet, the free end of the control lug either does or does not protrude into the slot of an inductive sensor.
The tilting magnet can be turned with an actuation magnet that brushes past the switch housing.
The dampening of the internal magnetic field of the sensor caused by the control lug protruding into the slot is detected by the sensor and converted into an output signal according to the NAMUR standard (DIN EN 60947-5-6).



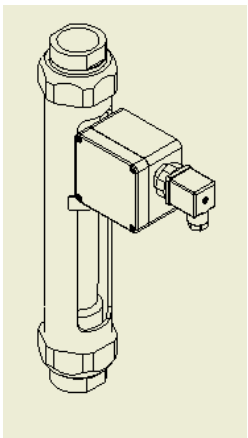


Fig. 14 Contact fastening of K33 i to Tubux M30

F VA Tubux M30

Measuring range for liquids

Standard-measuring range for liquids (ρ = 1kg/l (62,43) lb/cu.ft, viscosity 1 mPa.s (1cp)) (dynamic range 1:10)

Tubux fitting	flow tube	pressure loss		max. Measuring range for the selected float							
		mbar	psi	Standard float		with Magnet		viscosity – compensated		PVDF weighted	
				Material No. 1.4571	316Ti	Material No. 1.4571	316Ti	Material No. 1.4571	316Ti	PVDF weighted with magne	
				l/h	Usgpm	l/h	Usgpm	l/h	Usgpm	l/h	Usgpm
45	B 30	10	0,145	**30**	0,132	-	-	-	-	11	0,048
	B 40			**40**	0,176	-	-	-	-	15	0,066
	B 50			**50**	0,22	-	-	-	-	20	0,088
	B 65			**65**	0,29	-	-	-	-	25	0,11
	B 80			**80**	0,35	-	-	-	-	32	0,14
	B 100			**100**	0,44	-	-	-	-	40	0,18
	C 125	20	0,29	**125**	0,55	120	0,53	100*	0,44*	65	0,29
	C 160			**160**	0,70	150	0,66	125*	0,55*	90	0,40
	C 200			**200**	0,88	180	0,79	160*	0,70*	110	0,48
	C 250			**250**	1,10	240	1,06	200*	0,88*	140	0,62
	C 315	40	0,58	**315**	1,39	300	1,32	240*	1,06*	175	0,77
	C 400			**400**	1,76	360	1,59	300*	1,32*	220	0,97
	C 500			**500**	2,20	480	2,11	360*	1,59*	250	1,10
60	D 650	19	0,28	**650**	2,86	600	2,64	400*	1,76*	500	2,20
	D 800			**800**	3,52	750	3,30	500*	2,20*	600	2,64
	D 1000			**1000**	4,40	950	4,18	600*	2,64*	750	3,30
	D 1250			**1250**	5,50	1200	5,30	750*	3,30*	1000	4,40
	D 1600	24	0,35	**1600**	7,00	1500	6,60	1000*	4,40*	1250	5,50
	D 2000			**2000**	8,80	1800	7,90	1200*	5,30*	1600	7,00
	D 2500	33	0,48	**2500**	11,0	2400	10,6	1400*	6,20*	2000	8,80
	D 3000			**3000**	13,2	2800	12,3	1800*	7,90*	2400	10,6
90	E 4000	25	0,36	**4000***	17,6*	3800*	16,7*	2500*	11,1*	3200	14,0
	E 5000			**5000***	22,6*	4800*	21,1*	3000*	13,0*	3800	16,7
	E 6500			**6500***	28,6*	6400*	28,2*	4000*	17,6*	5000	22,0
	F 8000			**8000***	35,2*	7500*	33,0*	4500*	19,8*	6400	28,2
	F 10000			**10000***	44,0*	9500*	41,8*	5500*	24,2*	7500	33,0

Remarks: *Guided float
Standard versions are bold printed

Measuring range air

Standard measuring range for air (ρ_{abs} = 1.013 bar (14.69 psi) at T = 20°C (68°F), ρ=1.293 kg/m³, v=0.0181 mPa.s) (dynamic range 1:10)

Tubux fitting	Flow tube	pressure loss		max. measuring range for the select float							
		mbar	psi	Aluminium mat. No. 3.1645		Aluminium mat. No. 3.1645 with Magnet		PVDF		PVDF with Magnet	
				l/h	scfm	l/h	scfm	l/h	scfm	l/h	scfm
45	B 30	4	0,058	**500**	0,294	-	-	360	0,212	-	-
	B 40			**650**	0,383	-	-	500	0,294	-	-
	B50			**800**	0,471	-	-	650	0,383	-	-
	B 65			**1100**	0,647	-	-	800	0,471	-	-
	B 80			**1400**	0,824	-	-	1000	0,589	-	-
	B 100			**1600**	0,942	-	-	1250	0,736	-	-
	C 125	6,5	0,094	**2000**	1,18	2500	1,47	1500	0,88	2200	1,29
	C 160			**3000**	1,77	3200	1,88	2000	1,18	3000	1,77
	C 200			**3600**	2,12	4000	2,35	2500	1,47	3600	2,12
	C 250			**4000**	2,35	5000	2,94	3000	1,77	4500	2,65
	C 315	15	0,218	**5000**	2,94	6400	3,77	3600	2,12	6000	3,53
	C 400			**6400**	3,77	8000	4,71	5000	2,94	7000	4,12
	C 500			**8000**	4,71	10000	5,89	5500	3,24	9500	5,59
60	D 650	7	0,102	**10000**	5,89	12000	7,06	8000	4,71	10000	5,89
	D 800			**13000**	7,65	15000	8,83	9000	5,30	13000	7,65
	D 1000			**16000**	9,42	20000	11,77	12000	7,06	16000	9,42
	D 1250			**20000**	11,77	24000	14,13	15000	8,83	20000	11,77
	D 1600	9	0,131	**28000**	16,48	32000	18,83	20000	11,77	28000	16,48
	D 2000			**36000**	21,19	40000	23,54	25000	14,71	36000	21,18
	D 2500	12	0,174	**40000**	23,54	50000	29,43	30000	17,66	40000	23,54
	D 3000			**50000**	29,43	60000	35,31	36000	21,19	50000	29,43
90	E 4000	10	0,145	**64000***	37,67*	75000*	44,14*	50000	29,43	64000	37,67
	E 5000			**80000***	47,09*	100000*	58,86*	65000	38,26	80000	47,09
	E 6500			**100000***	58,86*	125000*	73,57*	80000	47,09	100000	58,86
	F 8000			**140000***	82,40*	150000*	88,29*	100000	58,86	140000	82,40
	F 10000			**160000***	94,17*	180000*	105,9*	125000	73,57	160000	94,17

Remarks: *Guided float
Standard versions are bold printed

Ordering data Tubux M30 - 45 for liquids – Measuring range from 3 to 500 l/h

7ME5812- □□□□□ - □□□□

Flow tube material	Float / Measuring range						
B 30	W. Nr. 1.4571 / Qv 3,0 - 30,0 l/h	2	D	B			0
	PVDF beschwert / Qv 1,1 - 11,0	2	D	E			0
B 40	W. Nr. 1.4571 / Qv 4,0 - 40,0 l/h	2	E	B			0
	PVDF beschwert / Qv 1,5 - 15,0	2	E	E			0
B 50	W. Nr. 1.4571 / Qv 5,0 - 50,0 l/h	2	F	B			0
	PVDF beschwert / Qv 2,0 - 20,0	2	F	E			0
B 65	W. Nr. 1.4571 / Qv 6,5 - 65,0 l/h	2	G	B			0
	PVDF beschwert / Qv 2,5 - 25,0	2	G	E			0
B 80	W. Nr. 1.4571 / Qv 8,0 - 80,0 l/h	2	H	B			0
	PVDF beschwert / Qv 3,2 - 32,0	2	H	E			0
B 100	W. Nr. 1.4571 / Qv 10,0 - 100,0 l/h	2	J	B			0
	PVDF beschwert / Qv 4,0 - 40,0	2	J	E			0
C 125	mat. No. 1.4571 / Qv 12,5 - 125 l/h	3	A	B			0
	mat. No. 1.4571/guided/Qv 12,5-125 l/h	3	A	B			2
	mat. No. 1.4571/with magnet/Qv12,0-120l	3	A	B			1
	PVDF, weighted / Qv 6,5 - 65 l/h	3	A	E			0
	PVDF, weighted/with magnet/Qv 6,5-65l/h	3	A	E			1
	mat. No. 1.4571/SV/guided/Qv 10,0-100l/h	3	A	C			2
C 160	mat. No. 1.4571 / Qv 16 - 160 l/h	3	B	B			0
	mat. No. 1.4571/guided/Qv 16-160l/h	3	B	B			2
	mat. No. 1.4571/with magnet/Qv 15,0-150	3	B	B			1
	PVDF, weighted / Qv 9,0 - 90 l/h	3	B	E			0
	PVDF, weighted/with magnet/Qv 9,0 - 90l/	3	B	E			1
	mat. No. 1.4571/SV/guided/Qv 12,5-125l/h	3	B	C			2
C 200	mat. No. 1.4571 / Qv 20 - 200 l/h	3	C	B			0
	mat. No. 1.4571/guided/Qv 20-200l/h	3	C	B			2
	mat. No. 1.4571/with magnet/Qv 18,0-180	3	C	B			1
	PVDF, weighted / Qv 11,0 - 110 l/h	3	C	E			0
	PVDF, weighted/with magnet/Qv 11,0-110	3	C	E			1
	mat. No. 1.4571/SV/guided/Qv 16,0-160l/h	3	C	C			2
C 250	mat. No. 1.4571 / Qv 25,0 - 250 l/h	3	D	B			0
	mat. No. 1.4571/guided/Qv 25,0-250l/h	3	D	B			2
	mat. No. 1.4571/with magnet/Qv 24,0-240	3	D	B			1
	PVDF, weighted / Qv 14,0 - 140 l/h	3	D	E			0
	PVDF, weighted/with magnet/Qv 14,0-140l	3	D	E			1
	mat. No. 1.4571/SV/guided/Qv 20,0 - 200l	3	D	C			2
C 315	mat. No. 1.4571 / Qv 31,5 - 315 l/h	3	E	B			0
	mat. No. 1.4571/guided/Qv 31,5 - 315l/h	3	E	B			2
	mat. No. 1.4571/with magnet/Qv 30,0 - 30	3	E	B			1
	PVDF, weighted / Qv 17,5 - 175 l/h	3	E	E			0
	PVDF, weighted/with magnet/Qv 17,5 - 17	3	E	E			1
	mat. No. 1.4571 /SV/guided/Qv 24,0-240l/	3	E	C			2
C 400	mat. No. 1.4571 / Qv 40,0 - 400 l/h	3	F	B			0
	mat. No. 1.4571/guided/Qv 40,0-400l/h	3	F	B			2
	mat. No. 1.4571/with magnet/Qv 36,0-360	3	F	B			1
	PVDF, weighted / Qv 22,0 - 220 l/h	3	F	E			0
	PVDF, weighted/with magnet/Qv 22,0-220l	3	F	E			1
	mat. No. 1.4571/SV/guided/Qv 30,0-300l/h	3	F	C			2
C 500	mat. No. 1.4571 / Qv 50,0 - 500 l/h	3	G	B			0
	mat. No. 1.4571/guided/Qv 50,0-500l/h	3	G	B			2
	mat. No. 1.4571/with magnet/Qv 48,0-480	3	G	B			1
	PVDF, weighted / Qv 25,0 - 250 l/h	3	G	E			0
	PVDF, weighted/with magnet/Qv 25,0-250l	3	G	E			1
	mat. No. 1.4571 / SV / guided / Qv 36,0 -	3	G	C			2
Design variant							
Fitting in stainless steel, union nut in aluminum					1		
Feeting in stainless steel, union nut in stainless steel					2		
Gasket							
Viton® FKM					4		
EPDM					5		
FFKM					8		

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Contacts			
without		0	
Contact K17/A (closes when value falls below limit)		1	
Contact K17/B (closes when value exceeds limit)		2	
two contacts K17/A		3	
two contacts K17/B		4	
contact K17/A and contact K17/B		6	
contact K 33 changer		5	
contact K 33i (inductive contact)		7	
Connection PVC adhesive bushing			
PVC adhesive bushing 20 (DN15)		A	A
Connection female thread DIN ISO 228			
PVDF		C	
stainless steel		D	
	G 1/4		B
	G 3/8		C
	G 1/2		D
Connection female thread NPT			
PVDF		F	
stainless steel		G	
	NPT 1/4"		B
	NPT 3/8"		C
	NPT 1/2"		D
Hose nozzle connection			
PVDF		H	
stainless steel		J	
	LW 10 (3/8")		B
	LW 13 (1/2")		C
connection flange EN 1092-1			
PVDF build in length 425 mm		K	
PVDF build in length 500 mm		L	
stainless steel build in length 425 mm		M	
stainless steel build in length 500 mm		N	
	DN 10 PN 40		A
	DN 15 PN 40		B
	DN 20 PN 40		C
	DN 25 PN 40		D
connection flange ANSI B16.5			
PVDF build in length 425 mm		P	
PVDF build in length 500 mm		Q	
stainless steel build in length 425 mm		R	
stainless steel build in length 500 mm		S	
	1/2" ANSI 150 RF		B
	3/4" ANSI 150 RF		C
	1" ANSI 150 RF		D

Further design

Please add "-Z" to order No. And specify order code

Y01	Measured medium, always required, enter in plain text: Medium, measuring range, unit, density, density unit, viscosity, viscosity unit, oper. temp., operating pressure
Y02	With engraved scale (>90°C /194°F)
Y04	Silicone-free design
Y03	Special scale markings (measuring precision 1%)
B06	With calibration certificate
B11	Labeling of the type plate in English
C15	ATEX certification
Y17	TAG plate
C05	Factory certification 2.1 as per EN10204
C07	Pressure test as per EN10204
C09	Leak test as per EN10204
C12	Material certificate for the stainless steel connection parts
Y07	Cleaning
S05	Shatter protection to max. 80 °C
S06	Stainless steel stop

Ordering data Tubux M30 - 60 for liquids – Measuring range from 50 to 3000 l/h

7ME5812- 4 [ ][ ][ ][ ] - [ ][ ][ ][ ]

Flow tube material Float / Measuring range			
D 650			
mat. No. 1.4571 / Qv 65 - 650 l/h	B	B	0
mat. No. 1.4571 / guided / Qv 65 - 650 l/h	B	B	2
mat. No. 1.4571 / with magnet / Qv 60,0 - 600 l/h	B	B	1
PVDF, weighted / Qv 50,0 - 500 l/h	B	E	0
PVDF, weighted / with magnet / Qv 50,0 - 500 l/h	B	E	1
mat. No. 1.4571 / SV / guided / Qv 40,0 - 400 l/h	B	C	2
D 800			
mat. No. 1.4571 / Qv 80 - 800 l/h	C	B	0
mat. No. 1.4571 / guided / Qv 80 - 800 l/h	C	B	2
mat. No. 1.4571 / with magnet / Qv 75,0 - 750 l/h	C	B	1
PVDF, weighted / Qv 60,0 - 600 l/h	C	E	0
PVDF, weighted / with magnet / Qv 60,0 - 600 l/h	C	E	1
mat. No. 1.4571 / SV / guided / Qv 50,0 - 500 l/h	C	C	2
D 1000			
mat. No. 1.4571 / Qv 100,0 - 1000 l/h	D	B	0
mat. No. 1.4571 / guided / Qv 100,0 - 1000 l/h	D	B	2
mat. No. 1.4571 / with magnet / Qv 95,0 - 950 l/h	D	B	1
PVDF, weighted / Qv 75,0 - 750 l/h	D	E	0
PVDF, weighted / with magnet / Qv 75,0 - 750 l/h	D	E	1
mat. No. 1.4571 / SV / guided / Qv 60,0 - 600 l/h	D	C	2
D 1250			
mat. No. 1.4571 / Qv 125,0 - 1250 l/h	E	B	0
mat. No. 1.4571 / guided / Qv 125,0 - 1250 l/h	E	B	2
mat. No. 1.4571 / with magnet / Qv 120,0 - 1200 l	E	B	1
PVDF, weighted / Qv 100,0 - 1000 l/h	E	E	0
PVDF, weighted / with magnet / Qv 100,0 - 1000 l/	E	E	1
mat. No. 1.4571 / SV / guided / Qv 7,5,0 - 750 l/h	E	C	2
D 1600			
mat. No. 1.4571 / Qv 160,0 - 1600 l/h	F	B	0
mat. No. 1.4571 / guided / Qv 160,0 - 1600 l/h	F	B	2
mat. No. 1.4571 / with magnet / Qv 150,0 - 1500 l	F	B	1
PVDF, weighted / Qv 125,0 - 1250 l/h	F	E	0
PVDF, weighted / with magnet / Qv 125,0 - 1250 l/	F	E	1
mat. No. 1.4571 / SV / guided / Qv 100,0 - 1000 l/	F	C	2
D 2000			
mat. No. 1.4571 / Qv 200,0 - 2000 l/h	G	B	0
mat. No. 1.4571 / guided / Qv 200,0 - 2000 l/h	G	B	2
mat. No. 1.4571 / with magnet / Qv 180,0 - 1800 l	G	B	1
PVDF, weighted / Qv 160,0 - 1600 l/h	G	E	0
PVDF, weighted / with magnet / Qv 160,0 - 1600 l/	G	E	1
mat. No. 1.4571 / SV / guided / Qv 120,0 - 1200 l/	G	C	2
D 2500			
mat. No. 1.4571 / Qv 250,0 - 2500 l/h	H	B	0
mat. No. 1.4571 / guided / Qv 250,0 - 2500 l/h	H	B	2
mat. No. 1.4571 / with magnet / Qv 240,0 - 2400 l	H	B	1
PVDF, weighted / Qv 200,0 - 2000 l/h	H	E	0
PVDF, weighted / with magnet / Qv 200,0 - 2000 l/	H	E	1
mat. No. 1.4571 / SV / guided / Qv 140,0 - 1400 l/	H	C	2
D 3000			
mat. No. 1.4571 / Qv 300,0 - 3000 l/h	J	B	0
mat. No. 1.4571 / guided / Qv 300,0 - 3000 l/h	J	B	2
mat. No. 1.4571 / with magnet / Qv 280,0 - 2800 l	J	B	1
PVDF, weighted / Qv 240,0 - 2400 l/h	J	E	0
PVDF, weighted / with magnet / Qv 240,0 - 2400 l/	J	E	1
mat. No. 1.4571 / SV / guided / Qv 180,0 - 1800 l/	J	C	2

Design variant	
Fitting in stainless steel, union nut in aluminum	1
Fitting in stainless steel, union nut in stainless steel	2

Gasket	
Viton® FKM	4
EPDM	5
FFKM	8

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Contacts	
without	0
Contact K17/A (closes when value falls below limit)	1
Contact K17/B (closes when value exceeds limit)	2
two contacts K17/A	3
two contacts K17/B	4
contact K17/A and contact K17/B	6
contact K 33 changer	5
contact K 33i (inductive contact)	7

Connection PVC adhesive bushing	
PVC adhesive bushing 32 (DN25)	A A

Connection female thread DIN ISO 228		
PVDF		C
stainless steel		D
	G 1/2	D
	G 3/4	E
	G 1	F

Connection female thread NPT		
PVDF		F
stainless steel		G
	NPT 1/2"	D
	NPT 3/4"	E
	NPT 1"	F

Hose nozzle connection		
PVDF		H
stainless steel		J
	LW 13 (1/2")	C
	LW 19 (3/4")	D
	LW 25 (1")	E
	LW 32 (1 1/4")	F
	LW 38 (1 1/2")	G

Connection flange EN 1092-1		
PVDF build in length 425 mm		K
PVDF build in length 500 mm		L
stainless steel build in length 425 mm		M
stainless steel build in length 500 mm		N
	DN 25 PN 40	D
	DN 32 PN 40	E
	DN 40 PN 40	F
	DN 50 PN 40	G

Connection flange ANSI B16.5		
PVDF build in length 425 mm		P
PVDF build in length 500 mm		Q
stainless steel build in length 425 mm		R
stainless steel build in length 500 mm		S
	1" ANSI 150 RF	D
	1 1/4" ANSI 150 RF	E
	1 1/2" ANSI 150 RF	F
	2" ANSI 150 RF	G

Further design

Please add "-Z" to order No. And specify order code

Y01	Measured medium, always required, enter in plain text: Medium, measuring range, unit, density, density unit, viscosity, viscosity unit, oper. temp., operating pressure
Y02	With engraved scale (>90°C /194°F)
Y04	Silicone-free design
Y03	Special scale markings (measuring precision 1%)
B06	With calibration certificate
B11	Labeling of the type plate in English
C15	ATEX certification
Y17	TAG plate
C05	Factory certification 2.1 as per EN10204
C07	Pressure test as per EN10204
C09	Leak test as per EN10204
C12	Material certificate for the stainless steel connection parts
Y07	Cleaning
S05	Shatter protection to max. 80 °C
S06	Stainless steel stop

Ordering data Tubux M30 - 90 for liquids – Measuring range from 250 to 10000 l/h

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Measuring cone / Float material / measuring range				
E 4000				
mat. No. 1.4571 / guided / Qv 400 - 4000 l/h	B	B		0
mat. No. 1.4571 / with magnet / Qv 380,0 - 3800 l/	B	B		1
PVDF, weighted / Qv 320,0 - 3200 l/h	B	E		0
PVDF, weighted / with magnet / Qv 320,0 - 3200 l/	B	E		1
mat. No. 1.4571 / SV / guided / Qv 250,0 - 2500 l/	B	C		2
E 5000				
mat. No. 1.4571 / guided / Qv 500 - 5000 l/h	C	B		0
mat. No. 1.4571 / with magnet / Qv 480,0 - 4800 l/	C	B		1
PVDF, weighted / Qv 380,0 - 3800 l/h	C	E		0
PVDF, weighted / with magnet / Qv 380,0 - 3800 l/	C	E		1
mat. No. 1.4571 / SV / guided / Qv 300,0 - 3000 l/	C	C		2
E 6500				
mat. No. 1.4571 / guided / Qv 650,0 - 6500 l/h	D	B		0
mat. No. 1.4571 / with magnet / Qv 640,0 - 6400 l/	D	B		1
PVDF, weighted / Qv 500 - 5000 l/h	D	E		0
PVDF, weighted / with magnet / Qv 500,0 - 5000 l/	D	E		1
mat. No. 1.4571 / SV / guided / Qv 400,0 - 4000 l/	D	C		2
E 8000				
mat. No. 1.4571 / guided / Qv 800,0 - 8000 l/h	E	B		0
mat. No. 1.4571 / with magnet / Qv 750,0 - 7500 l/	E	B		1
PVDF, weighted / Qv 640,0 - 6400 l/h	E	E		0
PVDF, weighted / with magnet / Qv 640,0 - 6400 l/	E	E		1
mat. No. 1.4571 / SV / guided / Qv 450,0 - 4500 l/	E	C		2
E 10000				
mat. No. 1.4571 / guided / Qv 1000,0 - 10000 l/h	F	B		0
mat. No. 1.4571 / with magnet / Qv 950,0 - 9500 l/	F	B		1
PVDF, weighted / Qv 750,0 - 7500 l/h	F	E		0
PVDF, weighted / with magnet / Qv 750,0 - 7500 l/	F	E		1
mat. No. 1.4571 / SV / guided / Qv 550,0 - 5500 l/	F	C		2
Design variant				
Fitting in stainless steel, union nut in aluminum			1	
Fitting in stainless steel, union nut in stainless steel			2	
Gasket				
Viton® FKM			4	
EPDM			5	
FFKM			8	

7ME5812- 5 □□□□ - □□□□

Contacts		
without		0
Contact K17/A (closes when value falls below limit)		1
Contact K17/B (closes when value exceeds limit)		2
two contacts K17/A		3
two contacts K17/B		4
contact K17/A and contact K17/B		6
contact K 33 changer		5
contact K 33i (inductive contact)		7
Connection PVC adhesive bushing		
PVC adhesive bushing 63 (DN50)	A	A
Connection female thread DIN ISO 228		
PVDF		C
Stainless steel		D
G 1		F
G 1 1/4		G
G 1 1/2		H
G 2		J
Connection female thread NPT		
PVDF		F
stainless steel		G
NPT 1"		F
NPT 1 1/4"		G
NPT 1 1/2"		H
NPT 2"		J
Hose nozzle connection		
PVDF		H
stainless steel		J
LW 25 (1")		E
LW 32 (1 1/4")		F
LW 38 (1 1/2")		G
LW 50 (2")		H
Connection flange EN 1092-1		
PVDF build in length 425 mm		K
PVDF build in length 500 mm		L
stainless steel build in length 425 mm		M
stain less steel build in length 500 mm		N
DN 40 PN 40		F
DN 50 PN 40		G
DN 65 PN 16		H
DN 80 PN 16		J
Connection flange ANSI B16.5		
PVDF build in length 425 mm		P
PVDF build in length 500 mm		Q
stainless steel build in length 425 mm		R
stainless steel build in length 500 mm		S
1 1/2" ANSI 150 RF		F
2" ANSI 150 RF		G
2 1/2" ANSI 150 RF		H
3" ANSI 150 RF		J

Further design

Please add "-Z" to order No. And specify order code

Y01	Measured medium, always required, enter in plain text: Medium, measuring range, unit, density, density unit, viscosity, viscosity unit, oper. temp., operating pressure
Y02	With engraved scale (>90°C /194°F)
Y04	Silicone-free design
Y03	Special scale markings (measuring precision 1%)
B06	With calibration certificate
B11	Labeling of the type plate in English
C15	ATEX certification
Y17	TAG plate
C05	Factory certification 2.1 as per EN10204
C07	Pressure test as per EN10204
C09	Leak test as per EN10204
C12	Material certificate for the stainless steel connection parts
Y07	Cleaning
S05	Shatter protection to max. 80 °C
S06	Stainless steel stop

Ordering data Tubux M30 - 45 for gases – Measuring range from 32 to 10000 l/h

7ME5812- ☐☐☐☐☐ - ☐☐☐☐

Measuring cone / Float material / measuring range			
B 30	Aluminium / Qn 50 - 500 l/h	2 D F	0
	PVC / Qn 32 - 320 l/h	2 D G	0
	PVDF / Qn 36 - 360 l/h	2 D H	0
B 40	Aluminium / Qn 65 - 650 l/h	2 E F	0
	PVC / Qn 45 - 450 l/h	2 E G	0
	PVDF / Qn 50 - 500 l/h	2 E H	0
B 50	Aluminium / Qn 80 - 800 l/h	2 F F	0
	PVC / Qn 55 - 550 l/h	2 F G	0
	PVDF / Qn 65 - 650 l/h	2 F H	0
B 65	Aluminium / Qn 110 - 1100 l/h	2 G F	0
	PVC / Qn 75 - 750 l/h	2 G G	0
	PVDF / Qn 80 - 800 l/h	2 G H	0
B 80	Aluminium / 140 - 1400 l/h	2 H F	0
	PVC / 90 - 900 l/h	2 H G	0
	PVDF / Qn 100 - 1000 l/h	2 H H	0
B 100	Aluminium / Qn 160 - 1600 l/h	2 J F	0
	PVC / Qn 110 - 1100 l/h	2 J G	0
	PVDF / Qn 125 - 1250 l/h	2 J H	0
C 125	Aluminium / Qn 200 - 2000 l/h	3 A F	0
	Aluminium/guided/Qn 200-2000l/h	3 A F	2
	Aluminium/with magnet/Qn 250-2500l/h	3 A F	1
	PVDF/ Qn 150 - 1500 l/h	3 A H	0
	PVDF/with magnet/Qn 220-2200l/h	3 A H	1
C 160	Aluminium / Qn 300 - 3000 l/h	3 B F	0
	Aluminium/guided/Qn 300-3000l/h	3 B F	2
	Aluminium/with magnet/Qn 320-3200l/h	3 B F	1
	PVDF/ Qn 200 - 2000 l/h	3 B H	0
	PVDF/with magnet/Qn 300-3000l/h	3 B H	1
C 200	Aluminium / Qn 360 - 3600 l/h	3 C F	0
	Aluminium/guided/Qn 360-3600 /h	3 C F	2
	Aluminium/with magnet/Qn 400-4000l/h	3 C F	1
	PVDF/ Qn 250 - 2500 l/h	3 C H	0
	PVDF/with magnet/Qn 360-3600l/h	3 C H	1
C 250	Aluminium / Qn 400 - 4000 l/h	3 D F	0
	Aluminium/guided/Qn 400-4000l/h	3 D F	2
	Aluminium/with magnet/Qn 500-5000l/h	3 D F	1
	PVDF/ Qn 300 - 3000 l/h	3 D H	0
	PVDF/with magnet/Qn 450-4500l/h	3 D H	1
C 315	Aluminium / Qn 500 - 5000 l/h	3 E F	0
	Aluminium / guided / Qn 500 - 5000 l/h	3 E F	2
	Aluminium/with magnet/Qn 640-6400l/h	3 E F	1
	PVDF/ Qn 360 - 3600 l/h	3 E H	0
	PVD/with magnet/Qn 600-6000l/h	3 E H	1
C 400	Aluminium / Qn 640 - 6400 l/h	3 F F	0
	Aluminium/guided/Qn 640-6400l/h	3 F F	2
	Aluminium/with magnet/Qn 800-8000l/h	3 F F	1
	PVDF/ Qn 500 - 5000 l/h	3 F H	0
	PVDF/ with magnet/Qn 700-7000l/h	3 F H	1
C 500	Aluminium / Qn 800 - 8000 l/h	3 G F	0
	Aluminium/guided/Qn 800-8000l/h	3 G F	2
	Aluminium/with magnet/Qn 1000-10000l/h	3 G F	1
	PVDF/ Qn 550 - 5500 l/h	3 G H	0
	PVDF/with magnet/ n 950-9500l/h	3 G H	1

Design variant	
Fitting in stainless steel, union nut in aluminum	1
Fitting in stainless steel, union nut in stainles steel	2

Gasket material	
Viton® FKM	4
EPDM	5
FFKM	8

7ME5812- ☐☐☐☐☐ - ☐☐☐☐

Contacts	
without	0
Contact K17/A (closes when value falls below limit)	1
Contact K17/B (closes when value exceeds limit)	2
two contacts K17/A	3
two contacts K17/B	4
contact K17/A and contact K17/B	6
contact K 33 changer	5
contact K 33i (inductive contact)	7

Connection PVC adhesive bushing		
PVC adhesive bushing 20 (DN15)		A A

Connection female thread DIN ISO 228		
	PVDF	C
	Stainless steel	D
	G 1/4	B
	G 3/8	C
	G 1/2	D

Connection female thread NPT		
	PVDF	F
	stainless steel	G
	NPT 1/4"	B
	NPT 3/8"	C
	NPT 1/2"	D

Hose nozzle connection		
	PVDF	H
	stainless steel	J
	LW 10 (3/8")	B
	LW 13 (1/2")	C

Connection flange connection EN 1092-1		
	PVDF build in length 425 mm	K
	PVDF build in length 500 mm	L
	Stainless steel build in length 425 mm	M
	Stainless steel build in length 500 mm	N
	DN 10 PN 40	A
	DN 15 PN 40	B
	DN 20 PN 40	C
	DN 25 PN 40	D

Connection flange ANSI B16.5		
	PVDF build in length 425 mm	P
	PVDF build in length 500 mm	Q
	stainless steel build in length 425 mm	R
	stainless steel build in length 500 mm	S
	1/2" ANSI 150 RF	B
	3/4" ANSI 150 RF	C
	1" ANSI 150 RF	D

Further design

Please add "-Z" to order No. And specify order code

Y01	Measured medium, always required, enter in plain text: Medium, measuring range, unit, density, density unit, viscosity, viscosity unit, oper. temp., operating pressure
Y02	With engraved scale (>90°C /194°F)
Y04	Silicone-free design
Y03	Special scale markings (measuring precision 1%)
B06	With calibration certificate
B11	Labeling of the type plate in English
C15	ATEX certification
Y17	TAG plate
C05	Factory certification 2.1 as per EN10204
C07	Pressure test as per EN10204
C09	Leak test as per EN10204
C12	Material certificate for the stainless steel connection parts
Y07	Cleaning
S05	Shatter protection to max. 80 °C
S06	Stainless steel stop

Ordering data Tubux M30 - 60 for gases – Measuring range from 800 to 60000 l/h

7ME5812- 4 □□□□ - □□□□

Measuring cone / Float material / measuring range						
D 650	Aluminium / Qn 1000 - 10000 l/h	B	F			0
	Aluminium/guided/Qn 1000-10000l/h	B	F			2
	Aluminium/with magnet/Qn 1200-12000l/h	B	F			1
	PVDF/ Qn 800 - 8000 l/h	B	H			0
	PVDF/with magnet/Qn 1000-10000l/h	B	H			1
D 800	Aluminium / Qn 1300 - 13000 l/h	C	F			0
	Aluminium/guided/Qn 1300-13000l/h	C	F			2
	Aluminium/with magnet/Qn 1500-15000l/h	C	F			1
	PVDF/ Qn 900 - 9000 l/h	C	H			0
	PVDF/with magnet/Qn 1300 - 13000l/h	C	H			1
D 1000	Aluminium / Qn 1600 - 16000 l/h	D	F			0
	Aluminium/guided/Qn 1600-16000l/h	D	F			2
	Aluminium / with magnet / Qn 2000 - 200	D	F			1
	PVDF/ Qn 1200 - 12000 l/h	D	H			0
	PVD/with magnet/Qn 1600-16000l/h	D	H			1
D 1250	Aluminium / Qn 2000 - 20000 l/h	E	F			0
	Aluminium/guided/Qn 2000-20000l/h	E	F			2
	Aluminium/with magnet/Qn 2400-24000l/h	E	F			1
	PVDF/ Qn 1500 - 15000 l/h	E	H			0
	PVDF/with magnet/Qn 2000-20000l/h	E	H			1
D 1600	Aluminium / Qn 2800 - 28000 l/h	F	F			0
	Aluminium/guided/Qn 2800-28000l/h	F	F			2
	Aluminium/with magnet/Qn 3200-32000l/h	F	F			1
	PVDF/ Qn 2000 - 20000 l/h	F	H			0
	PVDF/with magnet/Qn 2800-28000l/h	F	H			1
D 2000	Aluminium / Qn 3600 - 36000 l/h	G	F			0
	Aluminium/guided/Qn 3600-36000l/h	G	F			2
	Aluminium/with magnet/Qn 4000-40000l/h	G	F			1
	PVDF/ Qn 2500 - 25000 l/h	G	H			0
	PVDF/with magnet/Qn 3600-36000l/h	G	H			1
D 2500	Aluminium / Qn 4000 - 40000 l/h	H	F			0
	Aluminium/guided/Qn 4000-40000l/h	H	F			2
	Aluminium/with magnet/Qn 5000-50000l/h	H	F			1
	PVDF/ Qn 3000 - 30000 l/h	H	H			0
	PVDF/with magnet/Qn 4000-40000l/h	H	H			1
D 3000	Aluminium / Qn 5000 - 50000 l/h	J	F			0
	Aluminium/guided/Qn 5000-50000l/h	J	F			2
	Aluminium/with magnet/Qn 6000-60000l/h	J	F			1
	PVDF/ Qn 3600 - 36000 l/h	J	H			0
	PVDF/with magnet/Qn 5000-50000l/h	J	H			1
Design variant						
Fitting in stainless steel, union nut in aluminum				1		
Fitting in stainless steel, union nut in stainles steel				2		
Gasket material						
Viton® FKM					4	
EPDM					5	
FFKM					8	

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Contacts				
without				0
Contact K17/A (closes when value falls below limit)				1
Contact K17/B (closes when value exceeds limit)				2
two contacts K17/A				3
two contacts K17/B				4
contact K17/A and contact K17/B				6
contact K 33 changer				5
contact K 33i (inductive contact)				7
Connection PVC adhesive bushing				
PVC adhesive bushing 32 (DN25)			A	A
Connection female thread DIN ISO 228				
PVDF		C		
stainless steel		D		
G 1/2			D	
G 3/4			E	
G 1			F	
Connection female thread NPT				
PVDF		F		
stainless steel		G		
NPT 1/2"			D	
NPT 3/4"			E	
NPT 1"			F	
Hose nozzle connection				
PVDF		H		
stainless steel		J		
LW 13 (1/2")			C	
LW 19 (3/4")			D	
LW 25 (1")			E	
LW 32 (1 1/4")			F	
LW 38 (1 1/2")			G	
Connection flange EN 1092-1				
PVDF build in length 425 mm		K		
PVDF build in length 500 mm		L		
stainless steel build in length 425 mm		M		
stainless steel build in length 500 mm		N		
DN 25 PN 40			D	
DN 32 PN 40			E	
DN 40 PN 40			F	
DN 50 PN 40			G	
Connection flange ANSI B16.5				
PVDF build in length 425 mm		P		
PVDF build in length 500 mm		Q		
stainless steel build in length 425 mm		R		
stainless steel build in length 500 mm		S		
1" ANSI 150 RF			D	
1 1/4" ANSI 150 RF			E	
1 1/2" ANSI 150 RF			F	
2" ANSI 150 RF			G	

Further design

Please add "-Z" to order No. And specify order code

Y01	Measured medium, always required, enter in plain text: Medium, measuring range, unit, density, density unit, viscosity, viscosity unit, oper. temp., operating pressure
Y02	With engraved scale (>90°C /194°F)
Y04	Silicone-free design
Y03	Special scale markings (measuring precision 1%)
B06	With calibration certificate
B11	Labeling of the type plate in English
C15	ATEX certification
Y17	TAG plate
C05	Factory certification 2.1 as per EN10204
C07	Pressure test as per EN10204
C09	Leak test as per EN10204
C12	Material certificate for the stainless steel connection parts
Y07	Cleaning
S05	Shatter protection to max. 80 °C
S06	Stainless steel stop

Ordering data Tubux M30 - 90 for gases – Measuring range from 5000 to 180000 l/h

7ME5812- 5 □□□□ - □□□□

Measuring cone Float material / measuring range					
E 4000					
Aluminium / guided / Qn 6400 - 64000 l/h	**B**	**F**			**0**
Aluminium / with magnet / Qn 7500 - 75000 l/h	**B**	**F**			**1**
PVDF/ Qn 5000 - 50000 l/h	**B**	**H**			**0**
PVDF/ with magnet / Qn 6400 - 64000 l/h	**B**	**H**			**1**
E 5000					
Aluminium / guided / Qn 8000 - 80000 l/h	**C**	**F**			**0**
Aluminium / with magnet / Qn 10000 - 100000 l/h	**C**	**F**			**1**
PVDF/ Qn 6500 - 65000 l/h	**C**	**G**			**0**
PVDF/ with magnet / Qn 8000 - 80000 l/h	**C**	**H**			**1**
E 6500					
Aluminium / guided / Qn 10000 - 100000 l/h	**D**	**F**			**0**
Aluminium / with magnet / Qn 12500 - 125000 l/h	**D**	**F**			**1**
PVDF/ Qn 8000 - 80000 l/h	**D**	**G**			**0**
PVDF/ with magnet / Qn 10000 - 100000 l/h	**D**	**H**			**1**
E 8000					
Aluminium / guided / Qn 14000 - 140000 l/h	**E**	**F**			**0**
Aluminium / with magnet / Qn 15000 - 150000 l/h	**E**	**F**			**1**
PVDF/ Qn 10000 - 100000 l/h	**E**	**G**			**0**
PVDF/ with magnet / Qn 14000 - 140000 l/h	**E**	**H**			**1**
E 10000					
Aluminium / guided / Qn 16000 - 160000 l/h	**F**	**F**			**0**
Aluminium / with magnet / Qn 18000 - 180000 l/h	**F**	**F**			**1**
PVDF/ Qn 12500 - 125000 l/h	**F**	**G**			**0**
PVDF/ with magnet / Qn 16000 - 160000 l/h	**F**	**H**			**1**
Design variant					
Fitting in stainless steel, union nut in aluminum			**1**		
Fitting in stainless steel, union nut in stainles steel			**2**		
Gasket material					
Viton® FKM				**4**	
EPDM				**5**	
FFKM				**8**	

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Contacts		
without	**0**	
Contact K17/A (closes when value falls below limit)	**1**	
Contact K17/B (closes when value exceeds limit)	**2**	
two contacts K17/A	**3**	
two contacts K17/B	**4**	
contact K17/A and contact K17/B	**6**	
contact K 33 changer	**5**	
contact K 33i (inductive contact)	**7**	
Connection PVC adhesive bushing		
PVC adhesive bushing 63 (DN50)	**A**	**A**
Connection female thread DIN ISO 228		
PVDF	**C**	
stainless steel	**D**	
G 1		**F**
G 1 1/4		**G**
G 1 1/2		**H**
G 2		**J**
Connection female thread NPT		
PVDF	**F**	
stainless steel	**G**	
NPT 1"		**F**
NPT 1 1/4"		**G**
NPT 1 1/2"		**H**
NPT 2"		**J**
Hose nozzle connection		
PVDF	**H**	
stainless steel	**J**	
LW 25 (1")		**E**
LW 32 (1 1/4")		**F**
LW 38 (1 1/2")		**G**
LW 50 (2")		**H**
Connection flange EN 1092-1		
PVDF build in length 425 mm	**K**	
PVDF build in length 500 mm	**L**	
stainless steel build in length 425 mm	**M**	
stainless steel build in length 500 mm	**N**	
DN 40 PN 40		**F**
DN 50 PN 40		**G**
DN 65 PN 16		**H**
DN 80 PN 16		**J**
Connection flange ANSI B16.5		
PVDF build in length 425 mm	**P**	
PVDF build in length 500 mm	**Q**	
stainless steel build in length 425 mm	**R**	
stainless steel build in length 500 mm	**S**	
1 1/2" ANSI 150 RF		**F**
2" ANSI 150 RF		**G**
2 1/2" ANSI 150 RF		**H**
3" ANSI 150 RF		**J**

Further design

Please add "-Z" to order No. And specify order code

Y01	Measured medium, always required, enter in plain text: Medium, measuring range, unit, density, density unit, viscosity, viscosity unit, oper. temp., operating pressure
Y02	With engraved scale (>90°C /194°F)
Y04	Silicone-free design
Y03	Special scale markings (measuring precision 1%)
B06	With calibration certificate
B11	Labeling of the type plate in English
C15	ATEX certification
Y17	TAG plate
C05	Factory certification 2.1 as per EN10204
C07	Pressure test as per EN10204
C09	Leak test as per EN10204
C12	Material certificate for the stainless steel connection parts
Y07	Cleaning
S05	Shatter protection to max. 80 °C
S06	Stainless steel stop

Fig. 1 F VA Unox, variable area meter

Application

The F VA Unox variable area meters are used to measure the volume of transparent liquids and gases passing through closed piping. The variable area meters can also be used for flow monitoring if they are equipped with one or more switching contacts. Standard scales are available for liquids with a density of 1 kg/l (62.43 lb/cu.ft). The scales must be recalculated for all other media depending on the physical characteristics.

The measuring accuracy corresponds to class 1.6 according to VDE/VDI 3513, page 2.

Design and operation

The main components of the F VA Unox variable area meters are the glass variable-area flow tube with float and the connection parts. The flow is displayed directly on the scale present on the flow tube (e.g. in l/h). The flow tube is optionally available with a percentage or 2-mm (0.079 inch) scale.

The flow is read at the position of the float's widest diameter.

Benefits

- Product scales for liquids and gases
- Fast installation/removal of the flow tube possible without removal of the fitting
- Increased protection of users from glass breakages by additional cover with single-pane safety glass.

Note of application

The operator of these measuring instruments is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the flowmeter parts in contact with the medium are suitable for the used process media. The flowmeter may only be used within the pressure and voltage limits specified in the operating instructions. Before replacing the measuring tubes, check that the unit is free of hazardous media and pressures. Provide a touch guard for surface temperatures of > 70°C. This touch guard must be designed in a way that the max. allowable ambient temperature on the unit is not exceeded. The flowmeter meets the requirements of the PED 97/23/EC as stated in the table on page 2.

Connection and mode of operation

The variable area meter must be fitted vertically and without tension. Control elements or reductions/extensions in the pipe diameter upstream or downstream of the variable area meter have no influence on the accuracy when measuring liquids. However, when measuring gases, the variable area meter should be installed upstream of valves to prevent pulsations resulting from compression. Since variable area meters respond extremely sensitively to changes in flow, control elements should always be adjusted slowly.

The calibration has been carried out for defined media conditions. Deviations in the density, pressure or temperature of gases, or in the density or viscosity of liquids, result in measurement errors. It is essential to observe the calibration conditions. When ordering, it is therefore essential to provide data on the medium, density and viscosity at the operating temperature and pressure. With gases, it is additionally necessary to specify the exact reference point for the pressure (pressure above atmospheric, or absolute pressure).

Retrofitting of switching contacts is only possible if variable area meters with magnets are used. When using for the first time, move the float completely past the contact to permit polarization.

Classification according to PED 97/23/EC

	Order No. 7ME5815-	Permissible media	Category
DN 15 to DN 80 (G¼ to G2)	xxaxx-xxxx; a ≠ K, R	Gases of fluid group2 and liquids of fluid group1	Article 3.3
≤ DN 25 (G¼ to G1)	xxaxx-xxxx; a = K, R	Gases of fluid group1 and liquids of fluid group1	Article 3.3
> DN 25 (G1¼ to G2)	xxaxx-xxxx; a = K, R	Gases of fluid group1 and liquids of fluid group1	I

Selection of float

There are three versions of floats:
- Non-guided float
- Guided float
- Viscosity-compensated float.

Use of the viscosity-compensated float is necessary above the following viscosities:

Flow tube	mPa.s (cp)
C 125 to C 500	≥ 3
D 650 to D 3000	≥ 5
E 4000 to F 10000	≥ 8
G 12500 to H 25000	≥ 10

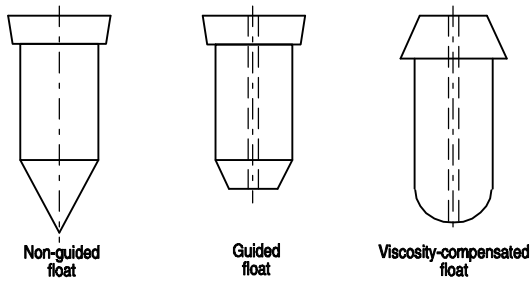


Fig. 2 Float versions

Float guide rod (see also Tables on page 31 and 32)

The float guide rod prevents the float from making contact with the glass flow tube.

The option is recommended to increase the operational safety and to protect against glass breakages in the case of operating conditions such as solenoid valve control. The option is not possible in conjunction with floats with magnets and weighted PVC/ PVDF floats.

Liquids

Standard: flow tubes E 4000 to H 25000

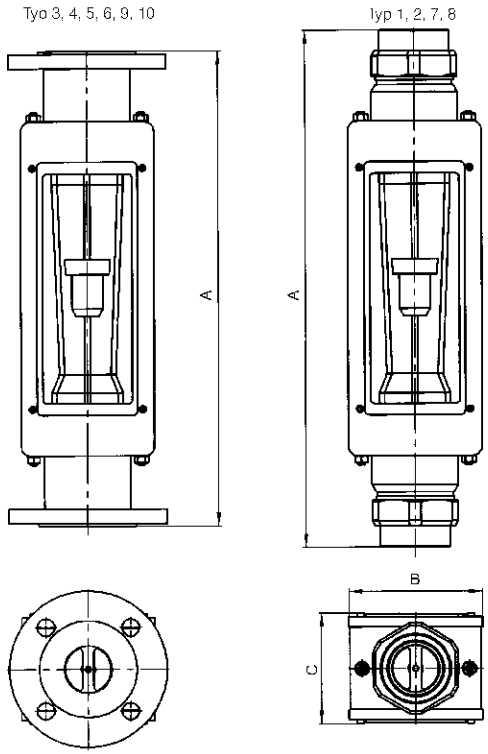
Option: flow tube C 125 and upwards

Gases

Standard: flow tubes D 2500 to H 25000

Option: flow tube C 125 and upwards

Dimensions



Connection		Flow tube	Dimensions in mm (inch)			
Thread	Flange		A±4 (0,16)		B	C
G	DN (ANSI)		Typ 1,2,7,8	Typ 3,4,5, 6,9,10		
½ (3/8, ¼)	15 (1/2 in)	A 1 to C 500	490 (19,29)	500 (19,68)	84 (3,31)	65 (2,56)
		D 650 to D 1000			100 (3,94)	80 (3,15)
1 (3/4, ½)	25 (1 in)	D 1250 to D 3000	500 (19,68)		118 (4,65)	100 (3,94)
1 ½ (1 ¼)	40 (1 ½ in)	E 4000 to E 6500	535 (21,06)		138 (5,43)	115 (4,53)
2 (1 ½,1 ¼)	50 (2 in)	F 8000 to F 10000	540 (21,26)		142 (5,59)	120 (4,72)
	65 (2 ½ in)	G 12500 to G 16000			168 (6,61)	150 (5,91)
	80 (3 in)	H 20000 to H 25000			185 (7,28)	170 (6,69)

Fig. 3 Unox, dimensions in mm (inch)

Dimensions: flange according to DIN is always drilled to PN 10

Technical specification

Application	See at page 27
Mode of operation	See at page 27
Measuring principle	Variable-area flowmeter
Input	
Flow	Vertically upwards
Rated operating conditions	
Temperature limits	
• With float made of stainless steel 1.4305 / 303 or 1.4571 / 316Ti or aluminium	Max. 150 °C / 302 °F
• With float made of PVDF	Max. 100 °C / 212 °F
• With float made of PVC	Max. 50 °C / 122 °F Engraved scale required with temp. of medium >90 °C / 194 °F
Medium conditions	
• Accuracy	Class 1,6 (according to VDE/VDI 3513, sheet 2)
• Measuring range	Dependent on flow tube, see Tables on pages 31 and 32
- for liquids	0,1 l/h to 25 m^3/h / 0,00044 to 110 USgpm
- for gases	1,6 l/h to 400 m^3/h / 0.009 to 235.4 scfm A special scale must be provided for liquids with a density other than 1 kg/l / 62,43 lb/cu.ft and all gases
• Dimensions for measured variable	l/h (up to flow tube D2500) m^3/h (flow tube D3000 and above)
Permissible operating pressure for flow tube:	
• A 1 to D 3.000	Max. 10 bar / 145 psi
• E 4.000 to F 10.000	Max. 8 bar / 116 psi
• G 12.500 to H 25.000	Max. 5 bar / 73 psi
Design	
Connections	Flanges DIN 15 to DN 80 (DIN 2501) / ½ to 3 inch, optional ANSI 16.5 B, screwed gland G ¼ to G2
Material	
• Flow tube	Borosilicate glass (lenght 300 mm (11,81 inch))
• Connection	EN-GJL-250 (GG25), optional: stainl. steel mat.No. 1.4571 / 316Ti or GG25, liner with hard rubber or PTFE
• Float	Stainl. steel mat.No. 1.4305 / 303, mat.No.1.4571 / 316Ti, PVC, PVDF, aluminium
• Float guide rod	Stainl. steel mat.No. 1.4571 / 316 Ti as standard for: • Flow tubes D 2.500 to H 25.000 for gases • Flow tubes E 4.000 to H 25.000 for liquids As option for flow tube C 125 and above (not together with contacts)
• Gasket	Buna N up to 90 °C/194 °F, Viton up to 150 °C/302 °F, PTFE up to 150 °C/ 302 °F, EPDM up to 150 °C/302 °F
• Limit	Springs made of stainl. steel up to flow tube D3.000, otherwise limit buffer from gasket material
Weight	
• DN 15 (G½)	6 kg (13,23 lb)
• DN 25 (G1)	10 kg (22,05 lb)
• DN 40 (G½)	14 kg (30,86 lb)
• DN 50 (G2)	14 kg (30,86 lb)
• DN 65	26 kg (57,32 lb)
• DN 80	27 kg (59,52 lb)

Technical specification of contacts

Switching principle	Magnet spring contact
Designation	
• Flow tube size C 125 bis H 25000	K 17
• Flow tube size D 650 bis H 25000	K 23
Housing/plug	PP/PA 6
Contact material	Rhodium
Degree of protection	IP65
Ambient temperature	-20 to +80 °C / -4 to +176 °F
Max. switching frequency	5/min
Max. rating	
• K 17	AC 250 V/0,5 A/10 VA DC 250 V/0,5 A/5 W
• K 23	AC 250 V/1 A/150 VA DC 250 V/1 A/100 W Rating data apply to resistive loads; a suppressor circuit is required for inductive loads

Contact assembly

The bistable contact assembly K17 consists of a contact spring set sealed in a glass tube filled with protective gas.

Three contacts can be selected:

- K 17 A: contact closes when the limit is fallen below
- K 17 B: contact closes when the limit is exceeded
- K 23: changeover contact.

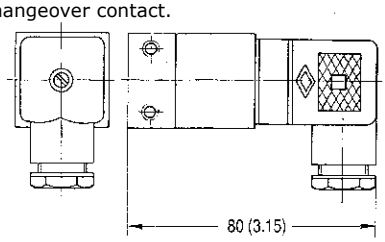


Fig. 4 Contact Kontakt K17, dimensions in mm (inches)

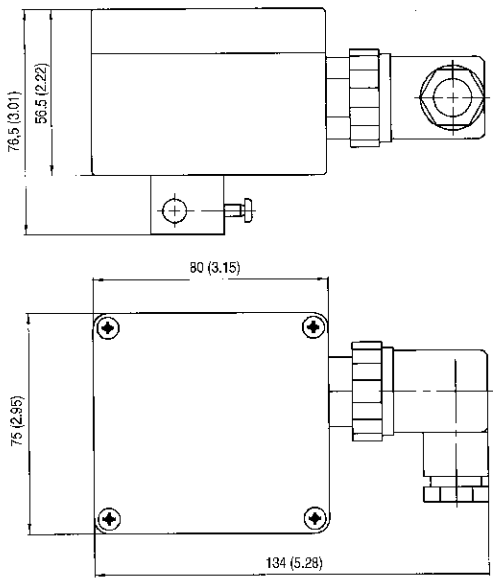


Fig. 5 Changeover contact K23, dimensions in mm (inches)

F VA Unox

Versions

Ten standard versions are defined in the price list using different combinations of fittings, connection materials and floats (the type numbers correspond to the 4th digit in the 2nd block of the Order No.)

Standard designs of the variable area meters (for liquids)

Version		Type 1 (J)	Type 2 (K)	Type 3 (L)	Type 4 (M)	Type 5 (N)	Type 6 (P)
Measured medium		**Liquids**					
Connection material		Steel	Mat.No. 1.4571/316 Ti	GG25	Mat.No. 1.4571/316Ti	GG25	GG25
Liner of fittings					Mat.No. 1.4571/316Ti above DN65	Hard rubber	PTFE
Connection type		Thread	Thread	Flange	Flange	Flange	Flange
Float	Standard	Mat.No. 1.4571/1.4305 316Ti/303	Mat.No. 1.4571/316Ti	Mat.No. 1.4571/1.4305316Ti/303	Mat.No. 1.4571/316Ti	Mat.No. 1.4571/316Ti	PVDF weighted [2]
	Options	SV, Mat.No. 1.4571/316Ti [1]	SV, Mat.No. 1.4571/316Ti [1]	SV, Mat.No. 1.4571/316Ti [1]	SV, Mat.No. 1.4571/316Ti [1]	PVC, PVDF weighted [2] and SV in Mat.No. 1.4517/316Ti [1]	-
Contact		As option with flow tube C 125 and above only with magnetic float					
Flow tube, size	A to F	X	X	X	X	X	X
	G and H	-	-	X	X	X	X

[1] Float SV only viscosity-compensated with flow tube C and above
[2] Float PVC and PVDF only weighted with flow tube B and above
[3] Float PVDF only delivered without contact.

Standard designs of the variable area meters (for gases)

Version		Type 7 (Q)	Type 8 (R)	Type 9 (S)	Type 10 (T)
Measured medium		**Gases**			
Connection material		Steel	Mat.No. 1.4571/316 Ti	GG25	GG25
Liner of fittings					PTFE
Connection type		Thread	Thread	Flange	Flange
Float	Standard	Aluminium	Aluminium	Aluminium	-
	Options	PVC or PVDF[3]	PVC or PVDF[3]	PVC or PVDF[3]	PVDF [3]
Contact		As option with flow tube C 125 and above only with magnetic float			-
Flow tube, size	A to F	X	X	X	X
	G and H	-	-	X	X

F VA Unox

Measuring ranges for liquids

Standard measuring range for liquid (ρ = 1kg/l (62,43) lb/cu.ft, viscosity 1 mPa.s (1cp)) (dynamic range 1:10)

Connection		Flow-tube	Pressure loss	Max. measuring range for the selected floats									
Female thread G	Flange DN (ANSI)			Up to flow tube B100 mat.No.		Viscosity-compen-sated, mat.No.		With magnet mat.No.		PVC/PVDF weighted		PVC/PVDF with magnet	
				1.4305, 1.4571	303/ 316Ti	1.4571	316Ti	1.4571	316Ti				
			mbar (psi)	l/h	(Usgpm)	l/h	(Usgpm)	l/h	(Usgpm)	l/h	(Usgpm)	l/h	(Usgpm)
(G1/4),	15	A 1	10 (0,145)	1	(0,0044)	-	-	-	-	-	-	-	-
(G3/8),	(1/2")	A 3		3	(0,013)	-	-	-	-	-	-	-	-
G1/2		A 5		5	(0,022)	-	-	-	-	-	-	-	-
		A 10		10	(0,044)	-	-	-	-	-	-	-	-
		A 25		25	(0,110)	-	-	-	-	-	-	-	-
		B 30		30	(0,132)	-	-	-	-	11	(0,048)	-	-
		B 40		40	(0,176)	-	-	-	-	15	(0,066)	-	-
		B 50		50	(0,22)	-	-	-	-	20	(0,088)	-	-
		B 65		65	(0,29)	-	-	-	-	25	(0,110)	-	-
		B 80		80	(0,35)	-	-	-	-	32	(0,141)	-	-
		B 100		100	(0,44)	-	-	-	-	40	(0,176)	-	-
		C 125	20 (0,290)	125	(0,55)	100*	(0,44)*	120	(0,53)	65	(0,29)	65	(0,29)
		C 160		160	(0,70)	125*	(0,55)*	150	(0,66)	90	(0,40)	90	(0,40)
		C 200		200	(0,88)	160*	(0,70)*	180	(0,79)	110	(0,48)	110	(0,48)
		C 250		250	(1,10)	200*	(0,88)*	240	(1,06)	140	(0,62)	140	(0,62)
		C 315	40 (0,58)	315	(1,39)	240*	(1,06)*	300	(1,32)	175	(0,77)	175	(0,77)
		C 400		400	(1,76)	300*	(1,32)*	360	(1,58)	220	(0,97)	220	(0,97)
		C 500		500	(2,20)	360*	(1,58)*	480	(2,11)	250	(1,10)	250	(1,10)
		D 650	19 (0,28)	650	(2,86)	400*	(1,76)*	600	(2,64)	500	(2,20)	450	(1,98)
		D 800		800	(3 ,52)	500*	(2,20)*	750	(3,30)	600	(2,64)	550	(2,4)
		D 1000		1000	(4,4)	600*	(2,64)*	950	(4,18)	750	(3,30)	700	(3,1)
(G1/2),	25	D 1250		1250	(5,5)	750*	(3,30)*	1200	(5,3)	1000	(4,40)	900	(4,0)
(G3/4),	(1")	D 1600	24 (0,35)	1600	(7,0)	1000*	(4,40)*	1500	(6,6)	1250	(5,50)	1100	(4,8)
G1		D 2000		2000	(8,8)	1200*	(5,28)*	1800	(7,9)	1600	(7,0)	1400	(6,2)
		D 2500	33 (0,48)	2500	(11,0)	1400*	(6,16)*	2400	(10,6)	2000	(8,8)	1750	(7,7)
		D 3000		3000	(13,2)	1800*	(7,9)*	2800	(12,3)	2400	(10,6)	2000	(8,8)
(G11/4),	40	E 4000	25 (0,36)	4000*	(17,6)*	2500*	(11,0)*	3800*	(16,7)*	3200	(14,1)	3200	(14,1)
G11/2,	(1 1/2")	E 5000		5000*	(22,0)*	3000*	(13,2)*	4800*	(21,1)*	3800	(16,7)	3800	(16,7)
		E 6500		6500*	(28,6)*	4000*	(17,6)*	6400*	(28,2)*	5000	(22,0)	5000	(22,0)
G2,	50	F 8000		8000*	(35,2)*	4500*	(19,8)*	7500*	(33,0)*	6400	(28,2)	6400	(28,2)
(G1 1/2),	(2")	F 10000		10000*	(44,0)*	5500*	(24,2)*	9500*	(41,8)*	7500	(33,0)	7500	(33,0)
only with flange connec-tion	65	G 12500	34 (0,49)	12500*	(55,0)*	7000*	(30,8)*	12000*	(52,8)*	10000	(44,0)	9000	(39,6)
	(2 1/2")	G 16000		16000*	(70,4)*	9000*	(39,6)*	16000*	(70,4)*	15000	(66,0)	12500	(55,0)
	80	H 20000	38 (0,55)	20000*	(88,0)*	11000*	(48,4)*	18000*	(79,2)*	18000	(79,2)	15000	(66,0)
	(3")	H 25000		25000*	(110,1)*	14000*	(61,6)*	24000*	(105,7)*	22000	(96,8)	18000	(79,2)

*Guided float
Non-standard sizes for the connections are listed in square brackets

Measuring ranges for air

Standard measuring range for air (ρ_{abs} = 1,013 bar (14,69 psi) at T = 20°C (68°F), ρ=1,293 kg/m³, v=0,181 mPa.s) (dynamic range 1:10)

Connection		Flow-tube	Pressure loss	Max measuring range for the selected floats									
Female thread G, NPT	Flange DN (ANSI) mm (inch)		mbar (psi)	Aluminium, mat. No. 3.1645		Aluminium, mat. No. 3.1645 with magnet		PVC		PVDF		PVC with magnet	
				(l/h)	(scfm)	(l/h)	(scfm)	(l/h)	(scfm)	(l/h)	(scfm)	(l/h)	(scfm)
(G ¼)	15	A 1	4 (0,058)	16	(0,009)	-	-	10	(0,006)	10	(0,006)	-	-
(G 3/8)	(1/2")	A 3		50	(0,029)	-	-	25	(0,015)	25	(0,015)	-	-
G ½		A 5		80	(0,047)	-	-	50	(0,029)	50	(0,029)	-	-
		A 10		160	(0,094)	-	-	80	(0,047)	80	(0,047)	-	-
		A 25		400	(0,235)	-	-	250	(0,147)	250	(0,147)	-	-
		B 30		500	(0,294)	-	-	320	(0,188)	360	(0,212)	-	-
		B 40		650	(0,383)	-	-	450	(0,265)	500	(0,294)	-	-
		B 50		800	(0,471)	-	-	550	(0,324)	650	(0,383)	-	-
		B 65		1100	(0,647)	-	-	750	(0,441)	800	(0,471)	-	-
		B 80		1400	(0,824)	-	-	900	(0,530)	1000	(0,589)	-	-
		B 100		1600	(0,942)	-	-	1100	(0,647)	1250	(0,736)	-	-
		C 125	6,5 (0,094)	2000	(1,18)	2500	(1,47)	1400	(0,824)	1500	(0,883)	2200	(1,29)
		C 160		3000	(1,77)	3200	(1,88)	1800	(1,06)	2000	(1,18)	3000	(1,77)
		C 200		3600	(2,12)	4000	(2,35)	2200	(1,29)	2500	(1,47)	3600	(2,12)
		C 250		4000	(2,35)	5000	(2,94)	2800	(1,65)	3000	(1,77)	4500	(2,65)
		C 315	15 (0,218)	5000	(2,94)	6400	(3,77)	3400	(2,00)	3600	(2,12)	6000	(3,53)
		C 400		6400	(3,77)	8000	(4,71)	4000	(2,35)	5000	(2,94)	7000	(4,12)
		C 500		8000*	(4,71)*	-	-	5000*	(2,94)*	5500*	(3,24)*	-	-
		D 650	7 (0,102)	10000	(5,89)	12000	(7,06)	7000	(4,12)	8000	(4,71)	10000	(5,89)
		D 800		13000	(7,65)	15000	(8,83)	9000	(5,30)	9000	(5,30)	12000	(7,06)
		D 1000		16000	(9,42)	20000	(11,77)	11000	(6,47)	12000	(7,06)	16000	(9,42)
(G ½)	25	D 1250	9 (0,131)	20000	(11,77)	24000	(14,13)	14000	(8,24)	15000	(8,83)	20000	(11,77)
(G ¾)	(1")	D 1600		28000	(16,48)	32000	(18,83)	18000	(10,59)	20000	(11,77)	25000	(14,71)
G1		D 2000		36000	(21,19)	40000	(23,54)	22000	(12,95)	25000	(14,71)	32000	(18,83)
		D 2500	12 (0,174)	40000*	(23,54)*	-	-	28000*	(16,48)*	30000	(17,66)*	-	-
		D 3000		50000*	(29,43)*	-	-	32000*	(18,83)*	36000	(21,19)*	-	-
(G1¼)	40	E 4000	10 (0,145)	64000*	(37,67)*	75000*	(44,14)*	45000	(26,49)	50000	(29,43)	60000	(35,31)
G1½	(1 1/2")	E 5000		80000*	(47,09)*	100000*	(58,86)*	55000	(32,37)	65000	(38,26)	80000	(47,09)
		E 6500		100000*	(58,86)*	125000*	(73,57)*	75000	(44,14)	80000	(47,09)	100000	(58,86)
(G 1½)	50	F 8000		140000*	(82,4)*	150000*	(88,29)*	90000	(52,97)	100000	(58,86)	125000	(73,57)
G2	(2")	F 10000		160000*	(94,17)*	180000*	(105,9)*	120000	(70,63)	125000	(73,57)	160000	(94,17)
only with flange connec-tion	65	G 12500	13 (0,189)	200000*	(117,7)*	220000*	(129,5)*	130000*	(76,52)*	150000*	(88,29)*	175000*	(103,0)*
	(2 1/2")	G 16000		280000*	(164,8)*	300000*	(176,6)*	180000*	(105,9)*	200000*	(117,7)*	240000*	(141,3)*
	80	H 20000	14 (0,203)	320000*	(188,3)*	360000*	(211,9)*	220000*	(129,5)*	250000*	(147,1)*	300000*	(176,6)*
	(3")	H 25000		400000*	(235,4)*	450000*	(264,9)*	280000*	(164,8)*	300000*	(176,6)*	360000*	(211,9)*

*Guided float
Non-standard sizes for the connections are listed in square brackets

Selection and ordering data

F VA Unox
variable area meter
glas flow tube

7ME5815- _ _ _ _ _ - _ _ _ _ (see right)

Flow tube size			
A	1	1A	1
A	3	2A	1
A	5	3A	1
A	10	4A	1
A	25	5A	1
B	30	1B	1
B	40	2B	1
B	50	3B	1
B	65	4B	1
B	80	5B	1
B	100	6B	1
C	125	1C	1
C	160	2C	1
C	200	3C	1
C	250	4C	1
C	315	5C	1
C	400	6C	1
C	500	7C	1
D	650	1D	2
D	800	2D	2
D	1000	3D	2
D	1250	4D	3
D	1600	5D	3
D	2000	6D	3
D	2500	7D	3
D	3000	8D	3
E	4000	1E	4
E	5000	2E	4
E	6500	3E	4
F	8000	1F	5
F	10000	2F	5
G	12500	1G	6
G	16000	2G	6
H	20000	1H	7
H	25000	2H	7

Standard versions acc. to table on page 20

Version

- Type 1 — **J**
  Threaded connection: steel (cast iron)
  Float: 1.4305/303, 1.4571/31
- Type 2 — **K**
  Threaded connection: steel (cast iron)
  Float: 1.4571, 316Ti
- Type 3 — **L**
  Flange connection: GG25
  Float: 1.4305/303, 1.4571,
- Type 4 — **M**
  Flange connection:1.4571/316Ti
  Float: 1.4571/316Ti
- Type 5 — **N**
  Flange connection: GG25
  Liner: Hard rubber
  Float: 1.4571/316Ti
- Type 6 — **P**
  Flange connection: GG25
  Liner: PTFE
  Float: PVDF weighted
- Type 7 — **Q**
  Threaded connection: Steel (cast iron)
  Float: aluminium
- Type 8 — **R**
  Threaded connection: stainless steel 1.4571/316Ti
  Float: aluminium
- Type 9 — **S**
  Flange connection: GG25
  Float: aluminium
- Type 10 — **T**
  Flange connection: GG25
  Liner: PTFE
  Float: PVDF

* Not available for types 1, 2, 7 and 8.

Selection and ordering data

F VA Unox
variable area meter
glas flow tube

7ME5815- _ _ _ _ _ - _ _ _ _ (see left)

Gasket material	
• Buna N (Standard)	1
• Viton	4
• PTFE	5
• EPDM	8
Contacts (only with magnetic float)	
• Without contact	0
• Contact K17/A (closes when limit is fallen below)	1
• Contact K17/B (opens when limit is fallen below)	2
• 2 contacts K17/A	3
• 2 contacts K17/B	4
• Changeover contact K23	5
• 1 per contact K17/A and K17/B	6
Connection size (see page 18)	
• Female thread G1/4, NPT 1/4	B
• Female thread G3/8, NPT 3/8	C
• Female thread G1/2, NPT 1/2	D
• Female thread G3/4, NPT 3/4	E
• Female thread G1, NPT 1	F
• Female thread G1 1/4, NPT 1 1/4	G
• Female thread G1 1/2, NPT 1 1/2	H
• Female thread G2, NPT 2	J
• Flange connection DN 15	M
• Flange connection DN 25	N
• Flange connection DN 40	P
• Flange connection DN 50	Q
• Flange connection DN 65	S
• Flange connection DN 80	R
Connection type	
• Female thread DIN ISO 228	A
• Female thread (NPT)	C
• Flange connection DIN 2501	D
• Flange connection ANSI 16.5 B	E
Float version	
• Standard	0
• Guided	1
• Mat.No. 1.4571/316Ti with magnet	2
• PVC with magnet	3
• PVC with magnet (only for liquids)	4
• Viscosity-compensated (SV)	5
• PVC	6
• PVDF	7
• Aluminium with magnet	8
• Special version (specify in plain text)	9

Further designs

Please add"**-Z**" to Order No. And specify Order code(s)

B06	With calibration certificate
Y01	Measured medium, always required, specify in plain text: Medium, measuring range, dimension, density, viscosity, operating temperature, operating pressure
Y02	With engraved scale >90°C (194°F)
Y04	Silicone-free version
Y05	Water as measured medium Viscosity: 1mPa.s (cp), Density 1 kg/l (62,43 lb/cu.ft)
Y99	Special version (specify in plain text)

F VA Unox

Selection and ordering data

F VA Unox **7ME5890-** □□□□□ - □□□ **0**
Glass flow tube
Spare parts see right

Flow tube		
Without flow tube		0A
Size A	1	1A
Size A	3	2A
Size A	5	3A
Size A	10	4A
Size A	25	5A
Size A	35	6A
Size B	30	1B
Size B	40	2B
Size B	50	3B
Size B	65	4B
Size B	80	5B
Size B	100	6B
Size C	125	1C
Size C	160	2C
Size C	200	3C
Size C	250	4C
Size C	315	5C
Size C	400	6C
Size C	500	7C
Size D	650	1D
Size D	800	2D
Size D	1000	3D
Size D	1250	4D
Size D	1600	5D
Size D	2000	6D
Size D	2500	7D
Size D	3000	8D
Size E	4000	1E
Size E	5000	2E
Size E	6500	3E
Size F	8000	1F
Size F	10000	2F
Size G	12500	1G
Size G	16000	2G
Size H	20000	1H
Size H	25000	2H
Float material		
without float		A08
Flow tube: Size/material		
A / mat.No. 1.4571/316Ti		A1
A / Aluminium		A3
A / PVDF, not weighted		A7
A / PVC, not weighted		A8
B / mat.No. 1.4571/316Ti		B1
B / Aluminium		B3
B / PVC, weighted		B7
B / PVC, not weighted		B8
C / mat.No. 1.4305/303		C1
C / mat.No. 1.4571/316Ti		C2
C / Aluminium		C3
C / PVC, weighted		C7
C / PVC, not weighted		C8
D / mat.No. 1.4305/303		D1
D / mat.No. 1.4571/316Ti		D2
D / Aluminium		D3
D / PVC, weighted		D7
D / PVC, not weighted		D8
E/ F / mat.No. 1.4305/303		E1
E/ F / mat.No. 1.4571/316Ti		E2
E/ F / Aluminium		E3
E/ F / PVC, weighted		E7
E/ F / PVC, not weighted		E8
G/ H / mat.No. 1.4571/316Ti		F2
G/ H / Aluminium		F3
G/ H / PVC, weighted		F4
G/ H / PVC, not weighted		F5

Selection and ordering data

F VA Unox **7ME5890-** □□□□□ - □□□ **0**
Glass flow tube
Spare parts see left

Float design	
• Standard	0
• With magnet	1
• Guided	2
• With magnet and guided (only for flow tube sizes E, F, G, H)	3
• Version without float	8
Gasket material (only together with a flow tube)	
Without gaskets	0A
Flow tube: size/material	
A, B, C / Buna N	1B
D to D1000 / Buna N	3B
D up to D1250 / Buna N	4B
E / Buna N	5B
F / Buna N	6B
G / Buna N	7B
H / Buna N	8B
Flow tube: size/material	
A, B, C / Viton	1D
D up to D1000 / Viton	3D
D for D1250 and above / Viton	4D
E / Viton	5D
F / Viton	6D
G / Viton	7D
H / Viton	8D
Accessories	
Without accessories	A
2 stainless steel limit springs for:	
Flow tube size A, B	B
Flow tube size C	C
Flow tube size D	D
2 stainless steel limits with float guide rod and Buna N limits	
Flow tube size C	H
Flow tube size D	J
Flow tube size E	K
Flow tube size F	L
Flow tube size G	M
Flow tube size H	N

Further designs

Please add"**-Z**" to Order No. And specify Order code(s)

B06	With calibration certificate
Y01	Measured medium, always required, specify in plain text: Medium, measuring range, dimension, density, viscosity, operating temperature, operating pressure
Y02	With engraved scale >90°C (194°F)
Y04	Silicone-free version
Y05	Water as measured medium Viscosity: 1mPa.s (cp), Density 1 kg/l (62,43 lb/cu.ft)
Y99	Special version (specify in plain text)

Fig. 1 F VA Minix variable area meter

Application

The F VA Minix variable area meters are used to measure the volume of transparent liquids and gases passing through closed piping. The built-in needle valve permits manual control of flow rates. Standard scales are available for liquids with a density of 1 kg/l (62.43 lb/cu.ft) and for air. The scales must be recalculated for all other media depending on the physical characteristics.

Design and operation

The main components of the F VA Minix variable area meters are the glass variable-area flow tube with float, the fitting, the connection parts and the valve. The flow is displayed directly on the scale present on the flow tube (e.g. in l/h) and is read at the position of the float's widest diameter.

Special features

- Product scales for liquids and gases
- Rugged versions with various materials
- Can be used for high pressures
- Suitable for panel mounting and battery assembly

Connection and mode of operation

The variable area meter must be fitted vertically and without tension. Reductions or expansions in the pipe diameter upstream or downstream of the variable area meter have no influence on the accuracy. With liquids, the valve can be fitted at the top or bottom. With gases, the valve can only be fitted at the top so as to prevent pulsations resulting from compression. Since variable area meter respond extremely sensitively to changes in flow, control elements should always be adjusted slowly.
The calibration has been carried out for defined media conditions. Deviations in the density, pressure or temperature of gases, or in the density or viscosity of liquids, result in measurement errors. It is essential to observe the calibration conditions. When ordering, it is therefore essential to provide data on the medium, density and viscosity at the operating temperature and pressure if the conditions deviate from the standard values in the measuring range tables. With gases, it is additionally necessary to specify the exact reference point of the pressure (pressure above atmospheric, or absolute pressure).

1 Fitting
2 Connection unit with valve insert
3 Valve spindle
4 Locking screw
5 O-ring gasket
6 Threaded plug
7 Rotary knob
8 O-ring gasket
9 Limit stop
10 Limit stop washer [1]
11 Gasket
12 Float
13 Flow tube
14 Connection unit
15 O-ring gasket
16 Pressure plug
17 Screw cap
18 O-ring gasket [1]
19 Valve seat [1]
20 Spacer sleeve [1]
21 Circlip [1]

[1] Only with MINIX MA 152 and MA 302

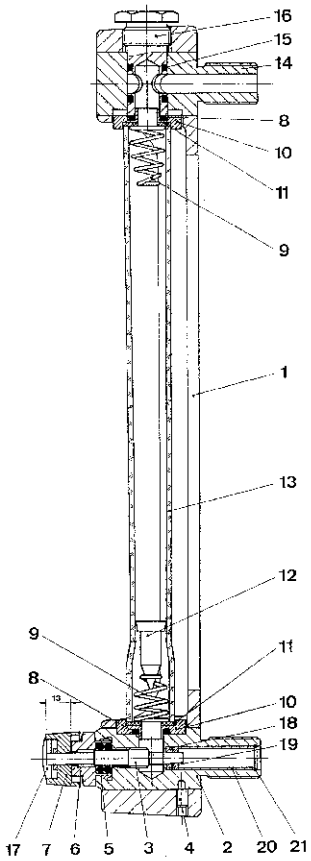


Fig. 2 F VA Minix, design

Note of application

The operator of these measuring instruments is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the meter parts in contact with the medium are suitable for the used process media. The unit may only be used within the pressure and voltage limits specified in the operating instructions. Before replacing the measuring tubes, check that the meter is free of hazardous media and pressures. The flowmeter meets the requirements of the PED 97/23/EC as stated in the table on page 2.

Technical Data

Application	See page 35
Mode of operation	See page 35
Measuring principle	Float
Input	
Flow	Vertically upwards
Pressure limit	Max. 10 bar / 145 psi
Rated operating conditions	
Ambient conditions	
Temperature limits	-10 to +70 °C (14 to 158 °F)
Medium conditions	
• Accuracy	Class 2,5 (according to VDE/VDI 3513, sheet 2)
• Measuring range	Dependent on flow tube and medium (see measuring range table)
• Dimensions for meas. variable	l/h
Design	
Connections	Male thread DIN/NPT ¼" or ½" or hose bushing (DIN 3254)
Material	
• Flow tube	Borosilicate glass
• Connection	Brass, stainless steel mat.No. 1.4571/316Ti
• Float	Aluminium, stainless steel mat.No. 1.4571/316Ti
• Gasket	Buna N, Viton
• Fitting	Aluminium
Weight	
• MA 70	0,5 kg (1,10 lb)
• MA 151	0,5 kg (1,10 lb)
• MA 152	1,5 kg (3,31 lb)
• MA 301	0,5 kg (1,10 lb)
• MA 302	1,7 kg (3,75 lb)
Certificates and approvals	
Classification according to PED 97/23/EC	For gases of fluid group 1 and liquids of fluid group 1; complies with requirements of article 3, paragraph 3 (sound engineering practice SEP)

Dimensional drawings

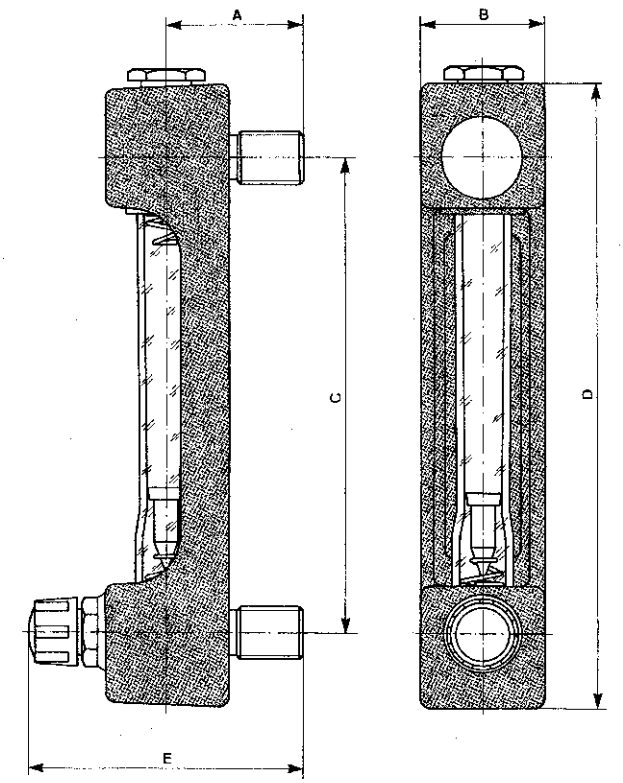


Fig. 3 Minix, dimensions

Type	Dimension in mm (inch)									
	A [1]		B		C		D		E [1]	
MA 70	38	(1,50)	27	(1,06)	90	(3,54)	120	(4,72)	76	(2,99)
MA 151	38	(1,50)	31	(1,22)	170	(6,69)	202	(7,95)	76	(2,99)
MA 152	55	(2,17)	50	(1,97)	190	(7,48)	250	(9,84)	118	(4,65)
MA 301	38	(1,50)	31	(1,22)	320	(12,60)	352	(13,86)	76	(2,99)
MA 302	55	(2,17)	30	(1,18)	340	(13,39)	400	(15,75)	118	(4,65)

[1] Dimensions A and E only apply to the standard design with DIN male thread, brass.

Measuring range

Note:
With liquids, only available for media with viscosity = 1 mPa·s (1cp) !

Type	Connection		Flow tube	Measuring range			
	Male thread	Hose bushing		Liquids ρ = 1 kg/l (62,43 lb/cu.ft), viscosity = 1 mPa·s (1cp)		Gases air at p_{abs} = 1,013 bar (14,69 psi) and T=20°C (68°F), ρ=1,293 kg/m³, v=0,0181 mPa.s	
				Float 1.4571/316Ti		Float, aluminium	
				l/h	USgpm	l/h	scfm
MA70	1/4"	10 mm (0,39 inch)	70.01	0,1 to 1	(0,0004 to 0,0044)	2,0 to 20	(0.0012 to 0.012)
			70.02	0,2 to 2	(0,0008 to 0,0088)	4,0 to 40	(0.0024 to 0.024)
			70.05	0,5 to 5	(0,0022 to 0,022)	9,0 to 90	(0.0053 to 0.053)
			70.11	1 to 10	(0,0044 to 0,044)	20 to 200	(0.012 to 0.118)
			70.12	2 to 20	(0,0088 to 0,088)	40 to 400	(0.024 to 0.235)
			70.13	3 to 30	(0,0132 to 0,132)	47 to 470	(0.028 to 0.277)
			70.14	4 to 40	(0,0176 to 0,176)	-	-
			70.15	5 to 50	(0,022 to 0,22)	-	-
MA151	1/4"	10 mm (0,39 inch)	151.3	0,1 to 1,5	(0,0004 to 0,0066)	2,5 to 25	(0.001 to 0.015)
			151.5	0,2 to 2,5	(0,0008 to 0,011)	4 to 45	(0.002 to 0.026)
			151.10	0,5 to 5	(0,0022 to 0,022)	8 to 80	(0.005 to 0.047)
			151.25	1 to 12	(0,0044 to 0,053)	20 to 200	(0.012 to 0.118)
MA152	1/2"	13 mm (0,51 inch)	152.5	5 to 55	(0,022 to 0,242)	90 to 900	(0.053 to 0.530)
			152.10	10 to 100	(0,044 to 0,44)	150 to 1500	(0.088 to 0.883)
			152.20	15 to 210	(0,066 to 0,92)	300 to 3000	(0.177 to 1.766)
			152.30	30 to 300	(0,132 to 1,32)	500 to 5000	(0.294 to 2.943)
			152.40	40 to 420	(0,176 to 1,85)	600 to 6000	(0.353 to 3.531)
			152.60	60 to 530	(0,26 to 2,33)	750 to 7500	(0.441 to 4.414)
MA301	1/4"	10 mm (0,39 inch)	A1	0,1 to 1,0	(0,0004 to 0,004)	2 to 20	(0.001 to 0.012)
			A3	0,3 to 3	(0,0013 to 0,013)	5 to 50	(0.003 to 0.029)
			A5	0,5 to 5	(0,0022 to 0,022)	9 to 90	(0.005 to 0.053)
			A10	1 to 10	(0,0044 to 0,044)	16 to 160	(0.009 to 0.094)
			A25	2,5 to 25	(0,011 to 0,11)	40 to 400	(0.024 to 0.235)
MA302	1/2"	13 mm (0,51 inch)	B30	3 to 30	(0,0132 to 0,132)	50 to 500	(0.029 to 0.294)
			B40	4 to 40	(0,0176 to 0,176)	65 to 650	(0.038 to 0.383)
			B50	5 to 50	(0,022 to 0,22)	80 to 800	(0.047 to 0.471)
			B65	6,5 to 65	(0,029 to 0,29)	110 to 1100	(0.065 to 0.647)
			B80	8 to 80	(0,035 to 0,35)	140 to 1400	(0.082 to 0.824)
			B100	10 to 100	(0,044 to 0,44)	160 to 1600	(0.094 to 0.942)
			C125	12,5 to 125	(0,055 to 0,55)	200 to 2000	(0.118 to 1.177)
			C160	16 to 160	(0,070 to 0,70)	300 to 3000	(0.177 to 1.766)
			C200	20 to 200	(0,088 to 0,88)	360 to 3600	(0.212 to 2.119)
			C250	24 to 240	(0,106 to 1,06)	400 to 4000	(0.235 to 2.354)
			C315	31,5 to 315	(0,139 to 1,39)	500 to 5000	(0.294 to 2.943)
			C400	40 to 400	(0,176 to 1,76)	640 to 6400	(0.377 to 3.767)
			C500	50 to 500	(0,22 to 2,20)	800 to 8000	(0.471 to 4.709)

Selection and ordering data for liquids

ρ = 1 kg/l (62,43 lbs/cu.ft), viscosity = 1 mPa.s (1cp)

F VA Minix **7ME5850-** ___ 0 ___ - 0 ___ A 2
variable area meter
Glass flow tube

Flow tube size	Measuring range in l/h (Usgpm)	
MA 70		
70.01	0,1 to 1 (0,0004 to 0,0044)	1 A A
70.02	0,2 to 2 (0,0008 to 0,0088)	2 A A
70.05	0,5 to 5 (0,0022 to 0,022)	3 A A
70.11	1 to 10 (0,0044 to 0,044)	4 A A
70.12	2 to 20 (0,0088 to 0,088)	5 A A
70.13	3 to 30 (0,0132 to 0,132)	6 A A
70.14	4 to 40 (0,0176 to 0,176)	7 A A
70.15	5 to 50 (0,022 to 0,22)	8 A A
MA 151		
151.3	0,1 to 1,5 (0,0004 to 0,0066)	1 B A
151.5	0,2 to 2,5 (0,0008 to 0,011)	2 B A
151.10	0,5 to 5 (0,0022 to 0,022)	3 B A
151.25	1 to 12 (0,0044 to 0,053)	4 B A
MA 152		
152.5	5 to 55 (0,022 to 0,242)	1 C A
152.10	10 to 100 (0,044 to 0,44)	2 C A
152.20	15 to 210 (0,066 to 0,92)	3 C A
152.30	30 to 300 (0,132 to 1,32)	4 C A
152.40	40 to 420 (0,176 to 1,85)	5 C A
152.60	60 to 530 (0,26 to 2,33)	7 C A
MA 301		
A 1	0,1 to 1 (0,0004 to 0,004)	1 D A
A 3	0,3 to 3 (0,0013 to 0,013)	2 D A
A 5	0,5 to 5 (0,0022 to 0,022)	3 D A
A 10	1 to 10 (0,0044 to 0,022)	4 D A
A 25	2,5 to 25 (0,011 to 0,11)	5 D A
MA 302		
B 30	3 to 30 (0,0132 to 0,132)	1 E A
B 40	4 to 40 (0,0176 to 0,176)	2 E A
B 50	5 to 50 (0,022 to 0,22)	3 E A
B 65	6,5 to 65 (0,029 to 0,29)	4 E A
B 80	8 to 80 (0,035 to 0,35)	5 E A
B 100	10 to 100 (0,044 to 0,44)	6 E A
C 125	12,5 to 125 (0,055 to 0,55)	1 F A
C 160	16 to 160 (0,07 to 0,7)	2 F A
C 200	20 to 200 (0,088 to 0,88)	3 F A
C 250	24 to 240 (0,106 to 1,06)	4 F A
C 315	31,5 to 31 (0,139 to 1,39)	5 F A
C 400	40 to 400 (0,176 to 1,76)	6 F A
C 500	50 to 500 (0,22 to 2,20)	7 F A

Gasket material	
• Buna N	1
• Viton	4

Connection type	
• female thread DIN, brass	A
• female thread DIN, 1.4571/316Ti	B
• female thread NPT, brass	C
• female thread NPT, 1.4571/316Ti	D
• hose bushing, brass	E
• hose bushing, 1.4571/316Ti	F

Further designs

Please add "**-Z**" to order no. and specify order code

Y01	Medium (always required if density is not 1 kg/l if density is not 1 kg/l (62,43 lb/cu.ft) specify in plain text Medium, measuring range, dimension, density with dimension, viscosity with dimension, operating temperature, operating pressure
Y02	with engraved scale (>90°C (>194°F))
Y04	Silicone-free version
Y05	Medium: water viscosity: 1mPas (cp), density 1 kg/l (62,43 lb/cu.ft)
B06	with calibration certificate
Y99	Special version, specify in plain text

Selection and ordering data for air

air at p_{abs} = 1,013 bar (14,69 psi) and T=20°C (68°F), ρ=1,293 kg/m³, v=0,0181 mPa.s

F VA Minix **7ME5850-** ___ 0 ___ - 0 ___ A 1
variable area meter
Glass flow tube

Flow tube size	Measuring range in l/h (scfm)	
MA 70		
70.01	2 to 20 (0,0012 to 0,012)	1 A C
70.02	4 to 40 (0,0024 to 0,024)	2 A C
70.05	9 to 90 (0,0053 to 0,053)	3 A C
70.11	20 to 200 (0,012 to 0,118)	4 A C
70.12	40 to 400 (0,024 to 0,235)	5 A C
70.13	47 to 470 (0,028 to 0,277)	6 A C
MA 151		
151.3	2,5 to 25 (0,001 to 0,015)	1 B C
151.5	4 to 45 (0,002 to 0,026)	2 B C
151.10	8 to 80 (0,005 to 0,047)	3 B C
151.25	20 to 200 (0,012 to 0,118)	4 B C
MA 152		
152.5	90 to 900 (0,053 to 0,53)	1 C C
152.10	150 to 1500 (0,088 to 0,883)	2 C C
152.20	300 to 3000 (0,177 to 1,766)	3 C C
152.30	500 to 5000 (0,294 to 2,943)	4 C C
152.40	600 to 6000 (0,353 to 3,531)	5 C C
152.60	750 to 7500 (0,441 to 4,414)	7 C C
MA 301		
A 1	2 to 20 (0,001 to 0,012)	1 D C
A 3	5 to 50 (0,003 to 0,029)	2 D C
A 5	9 to 90 (0,005 to 0,053)	3 D C
A 10	16 to 160 (0,009 to 0,094)	4 D C
A 25	40 to 400 (0,024 to 0,235)	5 D C
MA 302		
B 30	50 to 500 (0,029 to 0,294)	1 E C
B 40	65 to 650 (0,038 to 0,383)	2 E C
B 50	80 to 800 (0,047 to 0,471)	3 E C
B 65	110 to 1100 (0,065 to 0,647)	4 E C
B 80	140 to 1400 (0,082 to 0,824)	5 E C
B 100	160 to 1600 (0,094 to 0,942)	6 E C
C 125	200 to 2000 (0,118 to 1,177)	1 F C
C 160	300 to 3000 (0,177 to 1,766)	2 F C
C 200	360 to 3600 (0,212 to 2,119)	3 F C
C 250	400 to 4000 (0,235 to 2,354)	4 F C
C 315	500 to 5000 (0,294 to 2,943)	5 F C
C 400	640 to 6400 (0,377 to 3,767)	6 F C
C 500	800 to 8000 (0,471 to 4,709)	7 F C

Gasket material	
• Buna N	1
• Viton	4

Connection type	
• female thread DIN, brass	A
• female thread DIN, 1.4571/316Ti	B
• female thread NPT, brass	C
• female thread NPT, 1.4571/316Ti	D
• hose bushing, brass	E
• hose bushing, 1.4571/316Ti	F

Further designs

Please add "**-Z**" to order no. and specify order code

Y01	Medium (always required if density is not 1 kg/l if density is not 1 kg/l (62,43 lb/cu.ft) specify in plain text Medium, measuring range, dimension, density with dimension, viscosity with dimension, operating temperature, operating pressur
Y02	with engraved scale (>90°C (>194°F))
Y04	Silicone-free version
Y05	Medium: water viscosity: 1mPas (cp), density 1 kg/l (62,43 lb/cu.ft)
B06	with calibration certificate
Y99	Special version, specify in plain text

Fig. 1 F VA 250 variable area flow meter

Application

The VA 250 variable area flowmeters with a standard length of 250 mm (9.84 inch) and a completely metal design can be used to measure many different types of liquids and gases passing through closed piping. The robust design means that they can also be used in rough conditions. Different types of flanges, liners and float materials satisfy the requirements of the pharmaceutical and chemical industries.
The measured value is displayed directly on the scale, and output via a switch contact or as a current output.
The main applications for the VA 250 can be found in the following fields:

- Chemical industry
- Water
- Power generation and distribution.

Special features

- Standard design available at short notice
- Robust all-metal fitting with impact-resistant housing cover
- Can also be used for corrosive and flammable media
- Use possible at high pressures and temperatures
- Product and percentage scales
- Can be optionally fitted with heating and cooling sheaths
- Contamination-insensitive guiding of float.

Design and mode of operation

The VA 250 operates like the other units in the VA range according to the variable-area flow tube principle: the flowing medium lifts the conical float in the flow tube. The annular gap is then increased until equilibrium exists between the buoyant force of the medium and the force due to the weight of the float. The height of the float is directly proportional to the flow quantity. The movement of the float is transmitted by a magnet to a slave magnet in the display unit outside the flow tube.
The contacts or the electric remote sensor are controlled by a contact lug or a cam which is mounted on the pointer shaft.

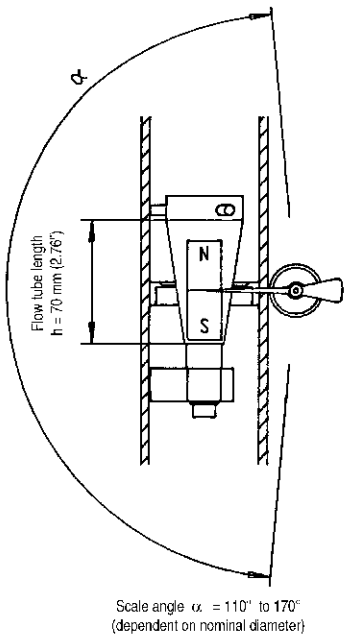


Fig. 2 Flow tube/scale angle

Note of application

The operator of these measuring instruments is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the flowmeter parts in contact with the medium are suitable for the used process media. No external loads may act on the meter. Provide a touch guard for surface temperatures of > 70°C. This touch guard must be designed in a way that the max. allowable ambient temperature on the unit is not exceeded. The flowmeter may only be used within the pressure and voltage limits specified on the identification plate. Before replacing the measuring tubes, check that the unit is free of hazardous media and pressures. The measuring instruments are primarily designed for static loads.

Classification according to PED 97/23/EC

	Order No. 7ME5820-7ME5821-	Permissible media	Category
DN 15	xAxxx-xxxx	Gases and liquids of fluid group 1	Art. 3.3
DN 25	xBxxx-xxxx	Gases and liquids of fluid group 1	Art. 3.3
DN 50	xCxxx-xxxx	Gases and liquids of fluid group 1	III
DN 80	xDxxx-xxxx	Gases and liquids of fluid group 1	III
DN 100	xExxx-xxxx	Gases and liquids of fluid group 1	III

Technical specification

Application	see page 39
Design and mode of operation	see page 39
Measuring principle	variable-area flowmeter
Input	
Measuring range	see tables on page 41 and 42
Pressure rating	PN10 (MWP 145 psi) to PN40 (MWP 580 psi) depending on version (see Tables on page 41 and 42)
Flow	vertically upwards
Dimension for measured variables	l/h, from 4.000 l/h (17,6 USgpm) in m³/h
Rated operating conditions	
Mounting	vertical
Ambient temperature	<80°C (176°F) <70°C (158°F) with contact display
Medium conditions	
• Accuracy	± 2% of full-scale value (± 1,6% as option, but not for PTFE liner)
• Temperature of medium	max. 125°C (257°F) (300°C (572°F) as option)

Viscosity limits

Q_{max} [m³/h]	Q_{max} [USgpm]	Viscosity [mPa.s] (cp)
≤ 0,1	≤ 0,44	1,0
> 0,1 to 0,5	> 0,44 to 2,2	1,0 to 3,0
> 0,5 to 3	> 2,2 to 13	1,0 to 5,0
> 3 to 10	> 13 to 44	1,0 to 8,0
> 10 to 25	> 44 to 110	1,0 to 10
> 25 to 50	> 110 to 220	1,0 to 15
> 50 to 100	> 220 to 440	1,0 to 25
> 100	> 440	1,0 to 50

Design	
Flanges	DIN, ANSI
Material	
• Fitting	Stainless steel 1.4571/ 316Ti
• Float	Stainless steel 1.4571/ 316Ti, Hastelloy, Titanium, Aluminium
• Wetted parts materials	Stainless steel 1.4571/316Ti, PTFE, C22.8, Hastelloy depending on version
Degree of protection (display unit)	IP65

Technical specification

F VA 251 (magnet spring contact)	
Switching principle	**Magnet spring contact, twin contact**
Connection	Appliance plug to DIN 43650
Max. switching frequency	5/min
Max. rating	AC 250V / 1A / 50VA DC 250V / 1A / 30W Rating data apply to resistive loads; a suppressor circuit is required for inductive loads
Hysteresis	± 3% of full-scale value
Ambient temperature	-20 to +70°C (-4 to 158°F)
F VA251 (inductive contact)	
Switching principle	**Inductive contact, single contact; twin contact as option**
Connection	PG 11
Rated voltage	10..28V DC
Self-inductance	500µH
Self-capacitance	80 nF
Ambient temperature	
• without EX-protection	-20 to +70°C (-4 to 158°F)
F Va 252 (electric remote sensor, current output)	
Principle	**Rotation angle transmitter**
Connection	2-, 3- or 4-wire system
Power supply	DC 12 to 30V
Self-capacitance	<10 nF
Short-circuit current	max. 160mA
Output	
• 2-wire system	4 to 20mA
• 3-and 4-wire systems	0 to 20mA
Load	max. 900Ω at 30V
Ambient temperature	
• without EX-protection	-20 to +70°C (-4 to 158°F)

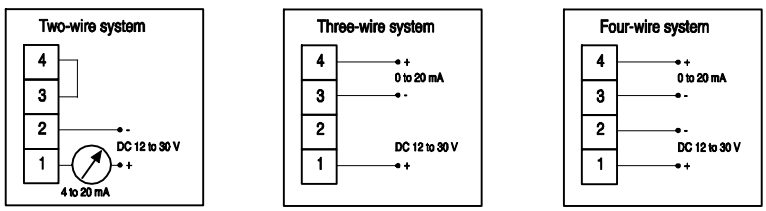


Fig. 3 F VA 252 rotation angle transmitter, connection diagrams

Measuring ranges for liquids

		Version	AF-S	CF-S	CF-K	EF-H	FF-P [1]		
		Wetted parts mat.	C22.8 mat.No. 1.4571/316Ti	mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti	PTFE/ Hastelloy C	PTFE		
		Fitting	mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti	mat.No. 1.4571/ 316Ti	mat.No.1.4571/316Ti		
		Flange	C22.8	mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti	mat.No. 1.4571/ 316Ti with PTFE liner	mat.No.1.4571/316Ti with PTFE liner		
		Float/flow tube	mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti	Hastelloy	PTFE		
		Max.tem-perature of medium	125°C (257°F) optional 300°C (572°F)	125°C (257°F) optional 300°C (572°F)	125°C (257°F) optional 160°C (320°F)	80°C (176°F)	50°C (122°F)		
		Nominal pressure	DN15 to DN80/ (1/2 to 3 inch): PN40 (580 psi) DN100 (4 inch): PN16 (232 psi)	DN15 to DN80/ (1/2 to 3 inch): PN40 (580 psi) DN100 (4 inch): PN16 (232 psi)	DN15 to DN25 (1/2 to 1 inch): PN40 (580 psi)	PN16 (232 psi)	PN16 (232 psi)		
Connection DIN2501									
DN 15 DN 25 DN 50 DN 80 DN 100	Full-scale value l/h	(USgpm)	Flow tube					Nominal diameter	l/h (Usgpm)
	16	(0,07)	A			x			
	25	(0,11)	B			x			
	40	(0,18)	C			x			
	63	(0,28)	D			x			
	100	(0,44)	E			x			
	160	(0,7)	F	x	x				
	250	(1,1)	G	x	x		x	DN15-25 (1/2-1 inch)	250 (1,1)
	400	(1,76)	H	x	x		x	DN15-25 (1/2-1 inch)	400 (1,76)
	630	(2,77)	J	x	x		x	DN15-25 (1/2-1 inch)	630 (2,77)
	1.000	(4,4)	K	x	x		x	DN25 (1 inch)	1.000 (4,4)
	1.600	(7,0)	L	x	x		x	DN25 (1 inch)	1.600 (7,0)
	2.500	(11,0)	M	x	x		x	DN25 (1 inch)	2.500 (11,0)
	4.000	(17,6)	N	x	x		x	DN50 (2 inch)	4.000 (17,6)
	6.300	(27,7)	P	x	x		x	DN50 (2 inch)	6.300 (27,7)
	10.000	(44)	Q	x	x		x	DN50 (2 inch)	10.000 (44)
	16.000	(70)	R	x	x		x		
	20.000	(88)	S	x	x		x		
	25.000	(110)	T	x	x		x	DN80-100 (3-4 inch)	25.000 (110)
	40.000	(176)	U	x	x		x		
	50.000	(220)	V	x	x		x		
	63.000	(277)	W	x	x		x		
	100.000	(440)	X	x	x				

[1] For the FF-P version, only the measuring ranges of the listed nominal diameters are possible

Nominal diameter	Pressure loss mbar (psi)
DN 15 (1/2 inch)	60 (0,87)
DN 25 (1 inch)	60 (0,87)
DN 50 (2 inch)	90 (1,3)
DN 80 (3 inch)	160 (2,3)
DN 100 (4 inch)	240 (3,5)

Measuring ranges and pressure losses for liquids (density ρ= 1kg/l (62,43 lb/cu.ft) and viscosity 1mPa.s(cp)) with standard scales. The dynamic range is always 1:10.

Measuring ranges for air

Connection DIN2501	Version	CL-A	CL-T	CL-K	EL-T	FL-R
	Wetted parts mat.	mat.No. 1.4571/316Ti Aluminium	mat.No.1.4571/ 316Ti, Titanium	mat.No.1.4571/ 316Ti	PTFE/ Hastelloy C, Titanium	PTFE
	Fitting	mat.No.1.4571/ 316Ti	mat.No..1.4571/ 316Ti	mat.No.1.4571/ 316Ti	mat.No. 1.4571/ 316Ti	mat.No.1.4571/316Ti
	Flange	mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti with PTFE liner	mat.No.1.4571/316Ti with PTFE liner
	Float/flow tube	Aluminium/ mat.No.1.4571/ 316Ti	Titanium mat.No.1.4571/ 316Ti	mat.No.1.4571/ 316Ti	Titanium/ Hastelloy	PTFE
	Max. temperature of medium	125°C (257°F) optional 300°C (572°F)	125°C (257°F) optional 300°C (572°F)	125°C (257°F) optional 160°C (320°F)	80°C (176°F)	50°C (122°F)
	Nominal pressure	DN15 to DN80/ (1/2 to 3 inch): PN40 (580 psi) DN100 (4 inch): PN16 (232 psi)	DN15 to DN80/ (1/2 to 3 inch): PN40 (580 psi) DN100 (4 inch): PN16 (232 psi)	DN15 to DN25 (1/2 to 1 inch) PN40 (580 psi)	PN16 (232 psi)	PN16 (232 psi)

DN 15, DN 25, DN 50, DN 80, DN 100

Full-scale value m³/h	(USgpm)	Flow tube	CL-A	CL-T	CL-K	EL-T	FL-R
0,5	(0.294)	A			X		
1,0	(0.589)	B			X		
1,6	(0.942)	C			X		
2,5	(1.47)	D			X		
4,0	(2.35)	E			X		
12,0	(7.06)	F	X	X		X	X
16,0	(9.42)	G	X	X		X	X
25,0	(14.71)	H	X	X		X	
25,0	(14.71)	H					X
40,0	(23.54)	J	X	X		X	X
63,0	(37.08)	K	X	X		X	X
100,0	(58.86)	L	X	X		X	
100,0	(58.86)	L					X
160,0	(94.17)	M	X	X		X	X
250,0	(147.1)	N	X	X		X	
400,0	(235.4)	P	X	X		X	
400,0	(235.4)	P					X
630,0	(370.8)	Q	X	X		X	

Nominal diameter	Pressure loss mbar (psi)	Minimum inlet pressure mbar (psi)
DN 15 (1/2 inch)	40 (0,58)	500 (7,25)
DN 25 (1 inch)	40 (0,58)	100 (1,45)
DN 50 (2 inch)	65 (0,94)	100 (1,45)
DN 80 (3 inch)	80 (1,16)	100 (1,45)
DN 100 (4 inch)	80 (1,16)	100 (1,45)

Measuring ranges and pressure losses for air (p_{abs}= 1,013 bar (14,69 psi) at T=20°C (68°F)). The dynamic range is 1:10 for each flow tube.

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Installation and operating instructions

The main information for installation and startup is listed below. Further information can be obtained from VDI/VDE 3513, sheet 3, installation recommendations for variable area meters.

Installation instructions

The variable area meter is delivered protected in a PVC sleeve, and is ready for operation. It has been checked for correct functioning prior to delivery. Before installing, check that the float moves freely: the float must slide smoothly in the flow tube without sticking or tilting. The pointer must smoothly follow the movement of the float. In the rest position (zero flow), the pointer must point to the marked reference point (first scale line). In the end position of the float, the pointer must be positioned above the full-scale value.

The variable area meter must be fitted into the piping vertically and without tension. Magnetic fields from other equipment may influence the result. If several variable area meters are installed next to one another, the following minimum distances must be observed between the main axes of the variable area meters:

- DN 15 to 50 (½ to 2 inch): 250 mm (9.84 inch)
- DN 80 to 100 (3 to 4 inch): 400 mm (15.74 inch).

The flange screws of the PTFE-lined fittings must only be tightened with the following maximum torques:

- DN 15 to 25 (½ to 2 inch): 14 Nm
- DN 50 (2 inch): 25 Nm
- DN 80 (3 inch): 35 Nm
- DN 100 (4 inch): 42 Nm

Interference-free inlet and outlet pipe sections are not usually required. However, additional measures (inlet pipe sections, flow stabilizers) may be meaningful to retain the measuring accuracy in the case of highly asymmetric flow profiles.

To prevent pulsations resulting from compression when measuring gases, a throttle should be positioned directly downstream of the variable area meter. To avoid faulty measurements, the arrangement should be selected such that the pressure in the variable area meter corresponds to the reference pressure for the calibration.

The flowmeter may only be used within the pressure and voltage limits specified on the identification plate.

Startup

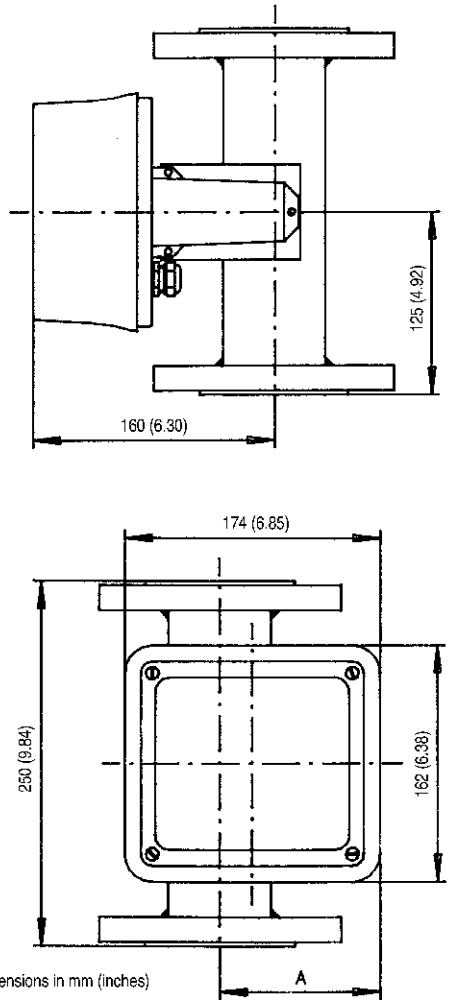
1. When starting up new plants, material residues (e.g. welding spatter) are carried over in the medium and could be deposited on the variable area meter. In such cases it is recommendable to clean the variable area meter after a short period of operation.

2. The float must not be exposed to sudden pressures. It is therefore recommendable to start with a closed valve which is then slowly regulated to the operating pressure. Liquids should be vented carefully to prevent pressure surges resulting from gas bubbles.

3. The variable area meter outputs values in all scale ranges according to its accuracy class. Each time a flow is started, permit the variable area meter to settle. When measuring in the lowest range, initially set a higher flow for a short time.

Maintenance and repair

Depending on the medium, contamination, abrasion or chemical reactions may attack the orifice and the float, thus influencing the accuracy of the measurement. In such cases it is recommendable to dismount the variable area meter and to clean it, including the float, with appropriate agents. The orifice and float must not be damaged mechanically or by aggressive cleaning agents. If erosion is noticed on the orifice or float, recalibration or replacement is necessary. Following all maintenance and cleaning operations, carry out a function test of the variable area meter before using it again.



DN-connection	Dimensions „A" in mm (inch) Versions		Weight kg (lb)
	AF-S, CF-S,CF-K CL-A, CL-T, CL-K	EF-H, FF-P, EL-T, FL-R	
15 (1/2inch)	86 (3,4)	89 (3,5)	4 (8,8)
25 (1 inch)	92 (3,6)	96 (3,8)	5 (11)
50 (2 inch)	92 (3,6)	111 (4,4)	9 (19,8)
80 (3 inch)	125 (4,9)	132 (5,2)	13 (28,7)
100 (4 inch)	138 (5,4)	138 (5,4)	15 (33)

Fig. 4 F VA 250, dimensions in mm (inch)

Selection and ordering data

F VA 250
variable area meter, made completely of metal for measurement of liquids — Order No. **7ME5820-** ▢▢▢▢▢ - ▢▢▢▢ ▢▢▢ — Order code

Version	
• Type AF-S (standard) Fitting: stainless steel 1.4571/316Ti Flange: steel C22.8 Float: stainless steel 1.4571/316Ti	**1**
• Type CF-S (standard) Fitting: stainless steel 1.4571/316Ti Flange: stainless steel 1.4571/316Ti Float: stainless steel 1.4571/316Ti	**2**
• Type CF-K Fitting: stainless steel 1.4571/316Ti Flange: stainless steel 1.4571/316Ti Float: stainless steel 1.4571/316Ti	**3**
• Type EF-H Fitting: stainless steel 1.4571/316Ti Flange: 1.4571/316Ti with PTFE liner Float: Hastelloy	**4**
• Type FF-P Fitting: stainless steel 1.4571/316Ti Flange: 1.4571/316Ti with PTFE liner Float: PTFE	**5**

see right

Norm.diam./flange connection		
• DN15	(1/2" ANSI)	**A**
• DN25	(1" ANSI)	**B**
• DN50	(2" ANSI)	**C**
• DN80	(3" ANSI)	**D**
• DN100	(4" ANSI)	**E**

Flow tube

Size	Full-scale value l/h	(Usgpm)	
A	16	(0,07)	**A**
B	25	(0,11)	**B**
C	40	(0,18)	**C**
D	63	(0,28)	**D**
E	100	(0,44)	**E**
F	160	(0,7)	**F**
G	250	(1,1)	**G**
H	400	(1,76)	**H**
J	630	(2,77)	**J**
K	1000	(4,4)	**K**
L	1600	(7,0)	**L**
M	2500	(11)	**M**
N	4000	(17,61)	**N**
P	6300	(27,7)	**P**
Q	10000	(44)	**Q**
R	16000	(70,4)	**R**
S	20000	(88)	**S**
T	25000	(110)	**T**
U	40000	(176)	**U**
V	50000	(220)	**V**
W	63000	(277)	**W**
X	100000	(440)	**X**

Flange connection standard		
EN1092-1 (standard)	**1**	
ANSI B 16.5	**2**	
Special connections (thread or other pressure stages)	**9**	**L1Y**

Temperature shield	
Without (standard)	**0**
With temperature shield 125 to 200°C (257 to 392°F)	**1**
With displaced display 200 to 300°C (392 to 572°F)	**2**

Selection and ordering data

F VA 250
variable area meter made completely of metal for measurement of liquids — Order No. **7ME5820-** ▢▢▢▢▢ - ▢▢▢▢ ▢▢▢ — Order code

see left

Heating/cooling sheath	
Without (standard)	**0**
H/K with flange connection	**2**
H/K without flange connection	**3**

Display	
With local display (standard)	**A**
With magnet spring contact F VA 251	**B**
With inductive contact F VA 251	**C**
With electric remote sensor F VA 252 (0 bis 20mA)	**D**
With electric remote sensor F VA 252 (4 bis 20mA)	**E**

Contact function	
No contact (standard)	**A**
For magnet spring contact (twin contact):	
• Close on upward or downward violation of limit	**D**
• Open on upward or downward violation of limit	**E**
• Close on downward violation, open on upward violation of limit	**G**
• Open on downward violation, close on upward violation of limit	**H**
For inductive contacts:	
• Open on downward violation of limit	**J**
• Close on downward violation of limit	**K**
• Close on upward or downward violation of limit	**L**
• Open on upward or downward violation of limit	**M**
• Close on downward violation, open on upward violation of limit	**N**
• Open on downward violation, close on upward violation of limit	**P**

Calibration		
Standard calibration		
• Without calibration certificate	**0**	
• With calibration certificate	**1**	
• Special calibration (1,6% accuracy)	**9**	**R 1 Y**

Further designs Please add "**-Z**" to Order No. and specify Order code(s)	**Order code**
Acceptance test B to DIN50049, Section. 3.1 and EN10204	**C 1 2**
Measured medium, specify in plain text (always required): Medium, measuring range, dimension, density, density dimension, viscosity, viscosity dimension, operating temperature, operating pressure	**Y 0 1**
Silicone-free version	**Y 0 4**
Water as measured medium Viscosity: 1mPas (cp) Density: 1 kg/l (62,43 lb/cu.ft)	**Y 0 5**
Stainless steel tag plate	**Y 1 7**
Special version: specify in plain text	**Y 9 9**

Note:See table on page 3 for possible combinations of nominal diameters and flow tube.
Teletransmitters and contacts cannot be ordered simultaneously.

Selection and ordering data

F VA 250
variable area meter,
made completely of metal,
for measurement of gases

Order No. **7ME5821-** | Order code

Version		
• Type CL-A Fitting: stainless steel 1.4571/316Ti Flange: stainless steel Float: aluminium	**1**	
• Type CL-T Fitting: stainless steel 1.4571/316Ti Flange: stainless steel 1.4571/316Ti Float: titanium	**2**	
• Type CL-K Fitting: stainless steel 1.4571/316Ti Flange: stainless steel1.4571/316Ti Float: stainless steel 1.4571/316Ti	**3**	
• Type EL-T Fitting: stainless steel 1.4571/316Ti Flange: 1.4571/316Ti with PTFE liner Float: titanium	**4**	
• Type FL-R Fitting: stainless steel 1.4571/316Ti Flange: 1.4571/316Ti mit PTFE liner Float: PTFE	**5**	
Nom.diam./flange connection		
• DN15 (1/2" ANSI)	**A**	
• DN25 (1" ANSI)	**B**	
• DN50 (2" ANSI)	**C**	
• DN80 (3" ANSI)	**D**	
• DN100 (4" ANSI)	**E**	
Flow tube		
Size — Full-scale value m³/h (Usgpm)		
A 0,5 (2,2)	**A**	
B 1,0 (4,4)	**B**	
C 1,6 (7,04)	**C**	
D 2,5 (11,0)	**D**	
E 4,0 (17,6)	**E**	
F 12,0 (53)	**F**	
G 16,0 (70)	**G**	
H 25,0 (110)	**H**	
J 40,0 (176)	**R**	
K 63,0 (277)	**J**	
L 100 (440)	**K**	
M 160 (704)	**L**	
N 250 (1100)	**M**	
P 400 (1761)	**N**	
Q 630 (2774)	**P**	
Flange connection standard		
EN 1092-1 (standard)	**1**	
ANSI B 16.5	**2**	
Special connections (thread or other pressure stages)	**9**	**L1Y**
Temperature shield		
Without (standard)	**0**	
With temperature shield 125 to 200°C (257 to 392°F)	**1**	
With displaced display 200 to 300°C (392 to 572°F)	**2**	

see right

Selection and ordering data

F VA 250
variable area meter
made completely of metal
for measurement of gases

Order No. **7ME5821-** | Order code

see left

Heating/cooling sheath		
Without (standard)	**0**	
H/C with flange connection	**2**	
H/C without flange connection	**3**	
Display		
With local display (standard)	**A**	
With magnetic spring contact F VA 251	**B**	
With inductive contact F VA 251	**C**	
With electric remote sensor F VA 252 (0 to 20mA)	**D**	
With electric remote sensor F VA 252 (4 to 20mA)	**E**	
Contact function		
No contact (standard)	**A**	
<u>For magnet spring contacts:</u>		
• Close on upward or downward violation of limit	**D**	
• Open on upward or downward violation of limit	**E**	
• Close on downward violation, open on upward violation of limit	**G**	
• Open on downward violation, close on upward violation of limit	**H**	
<u>For inductive contacts:</u>		
• Open on downward violation of limit	**J**	
• Close on downward violation of limit	**K**	
• Close on upward or downward violation of limit	**L**	
• Open on upward or downward violation of limit	**M**	
• Close on downward violation, open on upward violation of	**N**	
• Open on downward violation, close on upward violation of limit	**P**	
Calibration		
Standard calibration		
• Without calibration certificate	**0**	
• With calibration certificate	**1**	
• Special calibration (1,6% accuracy)	**9**	**R1Y**

Further designs Please add "**-Z**" to Order No. and specify Order code(s)	**Order code**
Acceptance test B to DIN50049, Section 3.1 and EN10204	**C12**
Measured medium, specify in plain text (always required) Medium, measuring range, dimension, density, density dimension, viscosity, viscosity dimension, operating temperature, operating pressure	**Y01**
Silicone-free version	**Y04**
Stainless steel tag plate	**Y17**
Special version: specify in plain text	**Y99**

Note: See table on page 4 for possible combinations of nominal diameters and flow tube.
Teletransmitter and contacts cannot be ordered simultaneously.

Fig.1 F I Gardex flowmeter

Application

The F I Gardex flowmeter is a robust device for measuring and monitoring the flow of liquid and gaseous media in any flow direction. The measured value is indicated on a scale, and is optionally available via contact switches or a current output. Standard scales are available for liquids with a density of 1 kg/l (62.43 lb/cu.ft). The accuracy corresponds to ±3% of the full-scale value. When selecting the size, it is recommendable for the normal flow (operating point) to be approx. 75% of the maximum flow listed in Table (see Technical data).

Benefits

- Product scale for liquids and gases
- Simple installation resulting from rugged sandwich design
- Can be optionally fitted with limit contact and remote transmitter.

Design and mode of operation

The sensor of the F I Gardex flowmeter consists of a baffle plate with balance beam and operates according to the eflection method (Fig. 2).

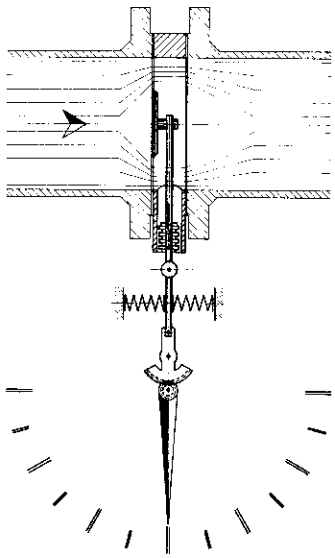


Fig.2 F I Gardex, design

The baffle plate (b) causes a back-pressure in the medium, and the balance beam (c) is deflected. This movement is transmitted via the beam to the indicator mechanism (e) using a bellows bushing (d). A gear unit (f) converts the deflection of the balance beam into a rotary movement of the pointer (h).
The pointer movement is damped by an eddy-current brake (g). The bellows bushing isolates the measured medium from the display unit.

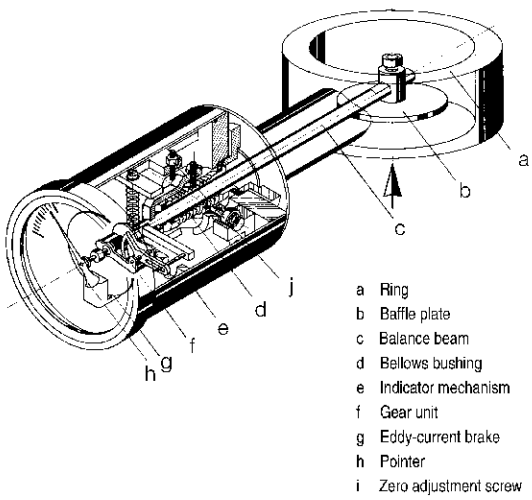
Connection and installation instructions

The flowmeter can be used for any flow direction and in any mounting position. However, because of the possibility of contamination of the bellows, installation with the indicator pointing downwards should be avoided. The desired flow direction must already be specified when ordering so that the weight of the sensor (baffle plate) can be taken into consideration in the calibration. Subsequent changing of the flow direction may result in larger inaccuracies and may necessitate a subsequent correction of the zero point.

The calibration is carried out at defined conditions of the medium. Deviations in the density, pressure or temperature of gases, or changes in the density or viscosity of liquids, result in errors. It is therefore essential to observe the calibration conditions which are specified on the scale. Therefore the measured medium, density and viscosity at operating temperature and pressure must be specified when ordering. With gases, it is additionally necessary to specify the exact pressure reference point (pressure above atmospheric, or absolute pressure).

To avoid oscillations of the baffle plate when measuring gases, the full static pressure must be applied to the device. The valve must therefore be installed downstream of the flowmeter. The position of the valve is unimportant when measuring liquids. The recommended inlet and outlet pipe sections must always be provided.

The ring (sandwich design) is installed, centered and screwed tight together with the corresponding gaskets (not included) between two flanges of the pipeline. The arrow on the device indicates the flow direction for the medium.



Contact assembly

Various contacts/remote transmitters are available:

- Magnet spring contacts as twin contacts
- Inductive contacts as single or twin contacts
- Current output.

Maintenance

No maintenance work is necessary.

Zero correction

A corresponding correction can be made if the pointer zero is offset (e.g. resulting from a changed mounting position). The flowmeter need not be dismounted to do this.

Remove the housing cover to the front by loosening the three screws and rotating. You can then adjust the zero point using the screw (j, Fig. 3).It is recommendable to first bring the pointer into a positive indication, and to then turn it back until it rests properly on the limit pin.

It is recommendable to subsequently check the function. To do this, apply a flow to move the indicator up to 60 to 100%. Alternatively, you can press in the bushing rod. With a zero flow, the pointer must again rest on the limit pin.

Startup

When starting up new plants, material residues (e.g. welding spatter) are carried over in the medium and could be deposited on the flowmeter. In such cases it is recommendable to clean the flowmeter after a short period of operation.
To avoid sudden pressures in the tube it therefore recommendable to start with a closed valve which is then slowly regulated to the operating pressure.

Note of application

The operator of these measuring instruments is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the flowmeter parts in contact with the medium are suitable for the used process media. The flowmeter may only be used within the pressure and voltage limits specified in the operating instructions. Before replacing the measuring tubes, check that the unit is free of hazardous media and pressures. Provide a touch guard for surface temperatures of > 70°C. This touch guard must be designed in a way that the max. allowable ambient temperature on the unit is not exceeded. The flowmeter meets the requirements of the PED 97/23/EC, article 3, paragraph 3. Only use for gases of fluid group 1.
The max. allowable pressure for the nominal diameters DN 25 up to DN 150 is 10 or 16 bar, for the nominal diameter DN 200 10 bar, for the nominal diameter DN 250 6 bar and for the nominal diameter DN 300 4 bar.

Technical data

Application	See page 47
Design and mode of operation	See page 47
Measuring principle	Baffle plate
Input	
Measuring range	See table on page 50
• For liquids	0,4 to 1.350 m³/h / 1,76 to 5944 USgpm
• For gases	12 to 40.500 m³/h / 7,06 to 23.833 scfm
Dynamic range	1 : 5
Dimension of measured variable	m³/h
Max. permissible pressure	
• DN 25 to DN400 (1 to 16 inch) Option: ANSI B 16.5 Option: PN16 / PN25	10 bar (145 psi)
Rated operation conditions	
Mounting position	Vertical or horizontal
Flow direction	No limitations
Inlet and outlet pipe sections	
• DN 25 to DN 150 / 1" bis 6"	At least 5 D (with v < 2,5 m/s (8,2 ft/s)), otherwise 10 D
• DN 200 to DN 400 / 8" bis 12"	At least 10 D (bei v < 2,5 m/s (8,2 ft/s)), otherwise 20 D
Medium conditions	
• Accuracy	± 3 % of full-scale value; ± 5 % of full-scale value with magnet spring contact and electric remote transmitter
Temperature of medium	Dependent on gasket material and version
• Standard version	≤ 90 °C / 194 °F
• With temperature shield	≤ 130 to 250 °C (266 bis 482 °F)
Design	
Ring connection	DN 25 to DN 400: DIN 2501 1" to 12": ANSI B 16.5 RF
Material	
• Indicator housing	Mat. No. 1.4301 /304
• Ring and transverse pipe, baffle plate, balance beam, bellows and gasket	See Table on page 50
Degree of protection (indicator unit)	
• Standard design	IP65
• Version with contact/remote	IP54
transmitter weight	See Table on page 50
Certificates and approvals	
Classification according to PED 97/23/EC	For gases of fluid group 1 and liquids of fluid group 1; complies with requirements of article 3, paragraph 3 (sound engineering practice SEP)

Technical specification of contacts

Switching principle	**Magnet spring contact, twin contact**
Connection	PG 9
Hysteresis	± 3% of full-scale value
Degree of protection	IP 54
Ambient temperature	-20 to +70°C (-4 to 158°F)
Max. switching frequency	5/min
Max. rating	AC 250V / 1A / 50VA DC 250V / 1A / 30W Rating data apply to resistive loads; a suppressor circuit is required for inductive loads
Switching principle	**Inductive contact, single contact, twin contact**
Connection	PG 9
Rated voltage	DC 8V
Degree of protection	IP 65
Self-inductance	100µH
Self-capacitance	30 nF
Ambient temperature	
• Without EX protection	-20 to +70°C (-4 to 158°F)

Technical specification of angle transmitter

Switching principle	**Rotation angle transmitter** (see Fig. 3)
Connection	Appliance plug (acc. IEC 61984) with PG7
Operating voltage U_B	DC 24V (-5 to +25%)
Current consumption	approx. 16 mA + I_A
Current output I_A	0..20 mA or 4..20 mA
Load (at U_B 24 V)	Max. 750Ω
Ambient temperature	-20 to +80°C (-4 to 176°F)
Ex approval	None
Remark	To comply with EN 50082-2 (EMC), a screened cable must be used which is earthed at one end

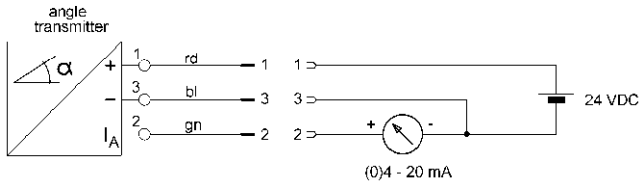


Fig. 3 Wiring diagram for angle transmitter

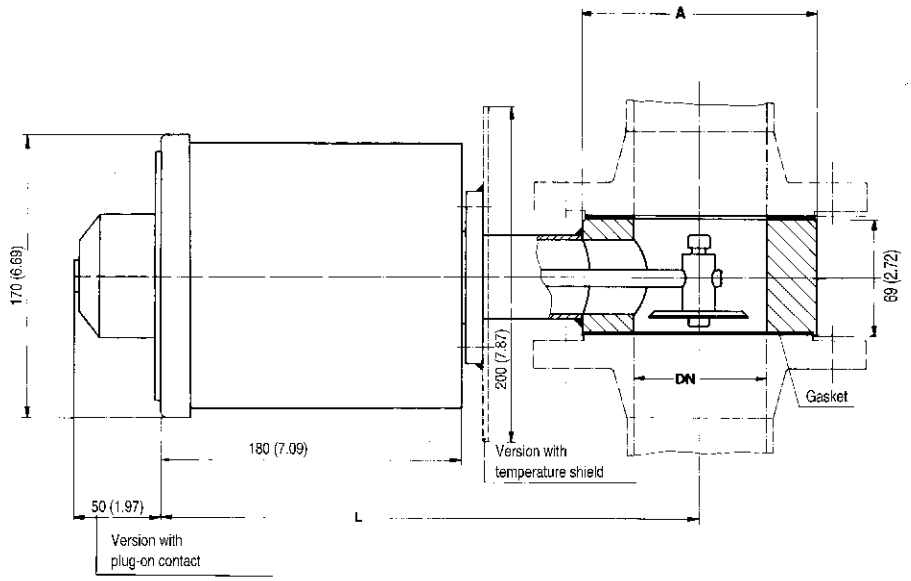


Fig. 4 Gardex, dimensions in mm (inch)

Measuring ranges, pressure losses and dimensions (liquids and gases)

Standard measuring range: liquids (p= 1kg/l (62,43 lb/cu.ft), viscosity 1 mPa.s (1 cp)) (dynamic range 1:5)
air (Pe= 0 bar pressure above atmospheric, T= 20°C (68°F), ρ=1,293 kg/m³, v=0,0181 mPa.s) (dynamic range 1:5)

Nom. diameter of pipe DN	Full-scale value for water [m3/h]			Full-scale value for air [m3/h]			min. inlet pressure [bar]	Pressure loss *) [mbar]	PN 10/16 dimensions [mm]		weight [kg]
	Measuring range			Measuring range							
	small	medium	large	small	medium	Large			L	A	
25	2	4	6	60	120	180	0,6	270-380	280	71	6,5
40	3	9	15	90	270	450	0,5	100-250	295	92	7,5
50	9	27	45	270	810	1350	0,4	50-150	305	106	8,5
65	12	36	60	360	1080	1800	0,4	50-150	315	126	9,5
80	18	54	90	540	1620	2700	0,4	50-150	325	142	10,5
100	30	90	150	900	2700	4500	0,4	50-150	330	162	11,5
125	55	160	270	1650	4875	8100	0,4	50-150	345	192	13,5
150	70	205	345	2100	6225	10350	0,3	40-120	365	217	15,5
200	120	360	600	3600	10800	18000	0,3	40-120	390	273	19,5
250	200	585	975	6000	17625	29250	0,3	40-120	425	327	23,5
300	270	810	1350	8100	24300	40500	0,3	40-120	450	377	27
350	350	1050	1731	10500	31500	52500	0,3	40-120	480	437	33,5
400	450	1350	2261	13611	40833	68056	0,3	40-120	506	489	38,5

***) The pressure loss indicates the range from the small up to the large measuring range.**

Measuring ranges, pressure losses and dimensions (liquids and gases)

Nom. diameter of pipe inch	Full-scale value for water [USgpm]			Full-scale value for air [scfm]			min. inlet. pressure [psi]	pressure loss*) [psi]	PN 10/16 dimensions [inch]		weight (lb)
	Measuring range			Measuring range							
	small	medium	large	small	medium	large			L	A	
1	8,8	17,6	26	35,31	70,62	105,93	8,7	3,9 -5,5	11,02	2,48	14,3
1 1/2	13,2	40	66	52,92	158,89	264,81	7,25	1,45-3,6	11,61	3,27	16,5
2	40	119	198	158,89	476,66	794,44	5,8	0,73-2,2	12,01	3,94	18,7
2 1/2	53	159	264	211,85	635,55	1059,25	5,8	0,73-2,2	12,4	4,72	20,9
3	79	238	396	317,78	953,32	1588,87	5,8	0,73-2,2	12,8	5,2	23,1
4	132	396	660	529,63	1588,87	2648,12	5,8	0,73-2,2	12,99	6,38	25,4
5	242	704	1189	970,98	2868,8	4766,62	5,8	0,73-2,2	13,58	7,56	29,8
6	308	903	1519	1235,79	3663,24	6090,68	4,4	0,58-1,74	14,37	8,54	34,2
8	528	1585	2642	2118,5	6355,49	10592,49	4,4	0,58-1,74	15,35	10,75	43,0
10	881	2576	4293	3530,83	10371,81	17212,8	4,4	0,58-1,74	16,73	12,87	51,8
12	1189	3566	5944	4766,62	14299,86	23833,1	4,4	0,58-1,74	17,72	14,84	59,5
14	1541	4622	7620	6178,95	18536,86	30894,76	4,4	0,58-1,74	18,9	17,20	73,9
16	198,9	5942,8	9953,1	8009,69	24029,06	40049,03	4,4	0,58-1,74	19,92	19,25	84,88

SITRANS Fl Gardex versions

Version	Type 1	Type 2	Type 3	Type 4	Type 5
Ring and transverse pipe	Steel DN 25 to 40 (1 to 1 1/2") ST-37 DN 50 to 65 (2 to 2 1/2") ST-52.3 DN 80 (3") and above ST-37	Stainless steel Mat. No. 1.4571/316Ti	Steel DN 25 to 40 (1 to 1 1/2") ST-37 DN 50 to 65 (2 to 2 1/2") ST-52.3 DN 80 (3") and above ST-37		
Liner	-		Hard rubber		Hastelloy C
Baffle plate, balance beam, bellows	Stainless steel, mat. No. 1.4571/316Ti		Stainless steel, mat. No. 1.4571/316Ti	Hastelloy C	Hastelloy C
Gasket (between transverse pipe flange and cast housing)	Buna N up to 90°C (194°F) Viton up to 160°C (320°F) Klinger SIL C 4500 up to 250°C (482°F)		Buna N up to 90°C (194°F) Viton up to 90°C (194°F)		PTFE up to 160°C (320°F

Selection and Ordering data

F I Gardex flowmeter — Order No. **7ME5842-** ☐☐☐☐☐ - ☐☐☐☐ (see righ)

Version (according to Table on page 40)	
• Type 1 Ring: steel Baffle plate: stainless steel	**0**
• Type 2 Ring: stainless steel 1.4571/316Ti Baffle plate:stainless steel 1.4571/316Ti	**1**
• Type 3 Ring: steel with rubber liner Baffle plate: stainless steel	**2**
• Type 4 Ring: steel with rubber liner Baffle plate: Hastelloy	**3**
• Type 5 Ring: steel with Hastelloy liner Baffle plate: Hastelloy	**4**
Nominal diameter	
• DN25 (1" ANSI)	**A**
• DN40 (1 1/2" ANSI)	**B**
• DN50 (2" ANSI)	**C**
• DN65 (2 1/2" ANSI)	**D**
• DN80 (3" ANSI)	**E**
• DN100 (4" ANSI)	**F**
• DN125 (5" ANSI)	**G**
• DN150 (6" ANSI)	**H**
• DN200 (8" ANSI)	**J**
• DN250 (10" ANSI)	**K**
• DN300 (12" ANSI)	**L**
• DN350 (14" ANSI)	**M**
• DN400 (16" ANSI)	**N**
Measuring ranges	
(acc. To Table on page 50) Liquid measurement	
• Small	**A**
• Medium	**B**
• Large	**C**
Gas measurement	
• Small	**D**
• Medium	**E**
• Large	**F**
• Special measuring range, specify in plain text	**Z**
Flange connection standard	
DIN 2501 (BS 4504)	
• DN 25 to 250 PN10/16 (DN 300 only wi	**1**
• ANSI B 16.5 150 lb/sqinch	**2**
• Other flanges, specify in plain text	**9**
Temperature shield	
• Without	**0**
• With stainless steel temperature shield (130 to 250°C (266 to 482°F))	**2**
Gasket material	
• Buna N	**1**

Selection and ordering data

F I Gardex flowmeter — Order No. **7ME5842-** ☐☐☐☐☐ - ☐☐☐☐ (see left)

Display	
• With local display	**A**
• With magnet spring contact	**B**
• With inductive contact	**C**
• With electr. remote transmitter (0 to 20mA)	**D**
• With electr. remote transmitter (0 to 20mA)	**E**
Contact function	
• No contact	**A**
For magnet spring contact (twin contact):	
• Closes on upward or downward violation of limit	**D**
• Opens on upward or downward violation of limit	**E**
• Closes on downward violation, opens on upward violation of limit	**G**
• Opens on downward violation, closes on upward violation of limit	**H**
For inductive contact (twin contact):	
• Opens on downward violation of limit	**J**
• Closes on downward violation of limit	**K**
• Closes on upward or downward violation of limit	**L**
• Opens on upward or downward violation of limit	**M**
• Closes on downword violation, opens on upward violation of limit	**N**
• Opens on downward violation, closes on upward violation of limit	**P**
Flow direction	
• Downwards (vertical piping)	**1**
• Upwards (vertical piping)	**2**
• From left to right (horizontal piping)	**3**
• From right to left (horizontal piping)	**4**
Further designs	
Please add "**-Z**" to Order No. and specify Order code(s)	
B06 with calibration certicate (not with electric remote transmitter)	
Y01 Special scale Specify in plain text: Medium, measuring range, dimension, density, density dimension, viscosity, viscosity dimension, operating temperature, operating pressure	
Y04 Silicone-free version	
Y05 Water as measured medium Viscosity: 1mPas (cp) Density: 1 kg/l (62,43 lb/cu.ft)	
Y99 Special version, specify in plain text	

Fig. 1 F O N4 orifice flowmeter

Application

The F O N4 orifice flowmeter is used to measure the flow of transparent liquids in closed piping. Any mounting location, position and flow direction can be selected for the flowmeter. The flowmeter can also be used for flow monitoring if equipped with limit contacts.

Design and mode of operation

The F O N4 orifice flowmeter primarily consists of an orifice plate as the sensor and a float as the display element. A differential pressure is produced across the orifice plate which is fitted in the main stream between two flanges in the piping. In a bypass, this differential pressure produces a volume flow in a variable area meter. The height of the float indicates the flow rate. The flow is read at the position of the float's widest diameter.

Installation and start-up

- The measuring regulations for the flow DIN EN ISO 5167 not only include the version of orifice units but also require an installation conforming to standards so that the indicated uncertainty in measurement can be kept. The standard installation must already be considered during the projecting of the pipeline. The orifice unit must be installed in a straight pipeline which is long enough. Bends, valves and the like must be installed in such a distance of the orifice unit that the trouble has faded there. Orifice units with large diameters are highly sensitive to troubles.
- Observe the recommendations with respect to inlet and outlet pipe sections for the orifice plate according to DIN EN ISO 5167 at page 57
- Align orifice with the sharp edge (+ marking) to the entry side
- Insert differential pressure sensor with gaskets concentrically between the flanges of the pipeline and tighten uniformly.
- Loosen the union nut (G2), align the indicating part vertically downwards and then tighten union nut.
- For floats with magnets and contact switches, lead the float along the whole contact to the polarization during the start-up.

Special features

- Suitable for any mounting positions without reduction in accuracy
- Complies with requirements for treatment and disinfection of swimming/ bathing pools (DIN 19 643)
- Simple installation
- Direct visualization of flow rate in bypass

Maintenance

Contamination, especially around the bypass orifice, may lead to faults in the measurement. The bypass orifice plate can be dismounted and cleaned without interrupting the main flow if the ball valves are closed first.

Contact assembly

The bistable contact assembly K18 consists of a contact spring set sealed in a glass tube filled with protective gas. The contact springs are polarized by a fixed magnet such that they exhibit a bistable response.

Retrofitting of contact switches is only possible if the floats used are equipped with magnets.

Two contacts can be selected:

- K18 A: contact closes when the limit is fallen below
- K18 B: contact closes when the limit is exceeded.

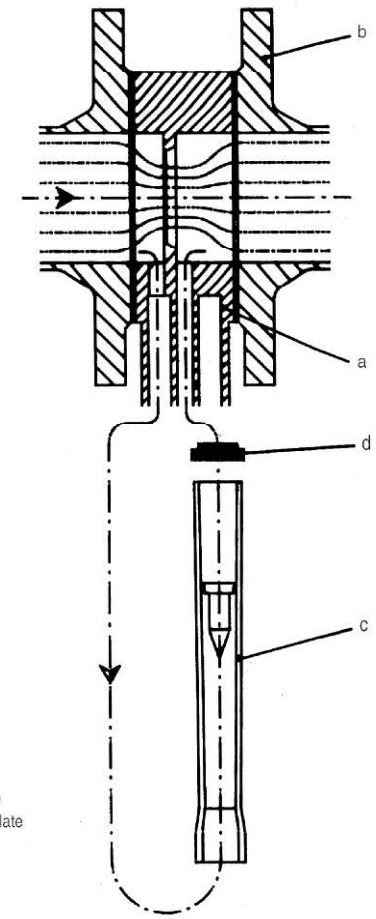
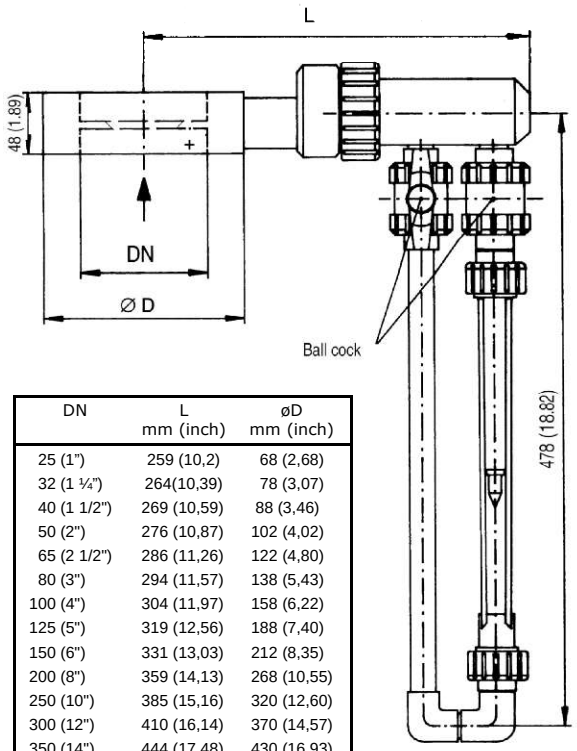


Fig. 2 Measuring principle

Technical specifications

Application	See page 53
Mode of operation	See page 53
Measuring principle	Orifice plate as differential pressure sensor with variable area meter in bypass
Input	
Flow	Any
Rated operating conditions	
Ambient conditions	
Temperature and pressure limits	
• With water and non-corrosive liquids	≤ 40°C (104°F) 10 bar (145 psi) 50 °C (122°F) 6,25 bar (90,64 psi) 60 °C (140 °F) 2,5 bar (36,25 psi)
• With corrosive liquids	≤ 20°C (68°F) 10 bar (145 psi) 40 °C (104°F) 4 bar (58 psi) 60°C (140 °F) 1 bar (14,5 psi)
Medium conditions	
• Accuracy	± 2% of full scale value
• Measuring range	See Table on page 55
- for liquids	0,6 to 1.600 m³/h (2,64 to 7.045 USgpm) A special scale must be provided for liquids with a density other than 1 kg/l (62,43 lb/cu.ft)
• Dimensions for measured variable	m³/h
Viscosity limits for all measuring ranges	1,0 to 1,3 mPas·s (cp)
Design	
Metering tube connections	Ring between DIN-Flanges of nominal pressure rating PN 10/145 psi DN 40/1½" to DN 400/16" (DIN 2501)
Inlet and outlet pipe sections	According to DIN EN ISO 5167, see also delta p: Inlet and outlet pipe sections page 57
Wetted parts materials	
• Ring	PVC
• Orifice plate	PVC, stainless steel, matNo. 1.4571/316Ti, as option
• Flow tube	Trogamid T can be used with water up to 50°C (122°F), otherwise up to 60°C (140°F)or polysulfone for use up to 60°C (140°F)
• Ball cocks	PVC
• Connecting tube	PVC
• Float	Stainless steel, mat.No. 1.4305/303, optional: stainless steel, mat.No. 1.4571/316Ti, PVC
• Limits	Polysulfone
• Gasket	Buna N/ Neoprene
• Bypass orifice plate	Stainless steel, mat.No. 1.4571/316Ti, optional PVC
Certificates and approvals	
Classification according to PED 97/23/EC	For liquids of fluid group 2; complies with requirements of article 3, paragraph 3 (sound engineering practice SEP)

Contacts	
K18 A	Closes when the limit is fallen below
K 18 B	Opens when the limit is fallen below
Housing/Plug	PP/PA 6
Contact material	Rhodium
Degree of protection	IP 65
Ambient temperature	-20 to +60 °C (-4 to 140°F)
Max. switching frequency	5/min
Max. rating K18 A/B	AC 250 V/0,5 A/10 VA DC 250 V/0,5 A/5 W Rating data apply to resistive loads; a suppressor circuit is required for inductive loads.



DN	L mm (inch)	øD mm (inch)
25 (1")	259 (10,2)	68 (2,68)
32 (1 ¼")	264(10,39)	78 (3,07)
40 (1 1/2")	269 (10,59)	88 (3,46)
50 (2")	276 (10,87)	102 (4,02)
65 (2 1/2")	286 (11,26)	122 (4,80)
80 (3")	294 (11,57)	138 (5,43)
100 (4")	304 (11,97)	158 (6,22)
125 (5")	319 (12,56)	188 (7,40)
150 (6")	331 (13,03)	212 (8,35)
200 (8")	359 (14,13)	268 (10,55)
250 (10")	385 (15,16)	320 (12,60)
300 (12")	410 (16,14)	370 (14,57)
350 (14")	444 (17,48)	430 (16,93)
400 (16")	466 (18,35)	482 (18,98)

Fig. 3 F O N4, dimensions in mm (inch)

Note of application

It must be ensured that the materials selected for the parts of the meter coming into contact with the media are suitable for the used process media.
The device may only be used within the pressure and voltage limits specified on the identification plate.
Before replacing the measuring tubes, check that the device is free of hazardous media and pressures.
The device is primarily designed for steady loads.
The flowmeter meets the requirements of Article 3 Paragraph 3 of the PED 97/23/EC. It must only be used for Group 2 liquids.

Measuring ranges for liquids

Standard measuring ranges for liquid: (p = 1 kg/l (62,43 lb/cu.ft), viscosity 1 mPa·s (1 cp))

Nominal diameter		Measuring range (Input pressure>=0,5bar(7,25psi))		Pressure consumption		Diameter ratio	Weight	
DN	(inch)	m3/h	(Usgpm)	Δp mbar	(psi)	ß	kg	(lb)
25	1	0,6 to 3,0 0,9 to 4,5 1,2 to 6,0	(2,64 to 13,2) (3,96 to 19,8) (5,28 to 26,4)	335 250 205	(4,86) (3,63) (2,97)	0,54 0,64 0,72	1,4	3,09
32	(1 ¼)	0,8 to 4,0 1,5 to 7,5 2,0 to 10,0	(3,52 to 17,6) (6,6 to 33,0) (8,8 to 44,0)	335 250 205	(4,86) (3,63) (2,97)	0,48 0,64 0,72	1,4	3,09
40	(1 1/2)	1,2 to 6,0 2,0 to 10,0 3,2 to 16,0	(5,28 to 26,4) (8,8 to 44,0) (14,1 to 70,0)	335 275 200	(4,86) (3,99) (2,90)	0,48 0,60 0,73	1,5	(3,31)
50	(2)	2,0 to 10,0 3,0 to 15,0 5,0 to 25,0	(8,8 to 44,0) (13,2 to 66,0) (22,0 to 110,0)	330 280 200	(4,79) (4,06) (2,90)	0,49 0,59 0,73	1,6	(3,53)
65	(2 1/2)	3,2 to 16,0 6,0 to 30,0 8,0 to 40,0 9,0 to 45,0	(14,1 to 70,0) (26,4 to 132,0) (35,0 to 176,0) (39,6 to 198,1)	330 250 210 200	(4,79) (3,63) (3,05) (2,90)	0,48 0,64 0,72 0,75	1,8	(3,97)
80	(3)	5,0 to 25,0 10,0 to 50,0 13,0 to 65,0 15,0 to 75,0	(22,0 to 110,0) (44,0 to 220,0) (57,0 to 286,0) (66,0 to 330,2)	330 240 200 190	(4,79) (3,48) (2,90) (2,76)	0,49 0,66 0,74 0,78	1,9	(4,19)
100	(4)	10,0 to 50,0 16,0 to 80,0 20,0 to 100,0 24,0 to 120,0	(44,0 to 220,0) (70,0 to 352,0) (88,0 to 440,0) (105,7 to 528,3)	300 235 200 190	(4,35) (3,41) (2,90) (2,76)	0,55 0,67 0,73 0,78	2,0	(4,41)
125	(5)	13,0 to 65,0 24,0 to120,0 32,0 to 160,0 39,0 to 195,0	(57,0 to 286,0) (106,0 to 528,0) (141,0 to 704,0) (171,7 to 858,4)	325 245 200 190	(4,71) (3,55) (2,90) (2,76)	0,50 0,66 0,74 0,79	2,3	(5,07)
150	(6)	20,0 to 100,0 32,0 to 160,0 50,0 to 250,0 54,0 to 270,0	(88,0 to 440,0) (141,0 to 704,0) (220,0 to 1100,0) (237,7 to 1188,6)	315 245 180 175	(4,57) (3,55) (2,61) (2,54)	0,52 0,64 0,76 0,78	2,5	(5,51)
200	(8)	34,0 to 170,0 60,0 to 300,0 80,0 to 400,0 99,0 to 495,0	(150,0 to 749,0) (264,0 to 1321,0) (352,0 to 1761,0) (435,8 to 2179,0)	320 250 200 185	(4,64) (3,63) (2,90) (2,68)	0,51 0,65 0,73 0,79	3,1	(6,83)
250	(10)	50,0 to 250,0 80,0 to 400,0 130,0 to 650,0 150,0 to 750,0	(220,0 to 1100,0) (352,0 to 1761,0) (572,0 to 2862,0) (660,3 to 3301,6)	250 270 200 190	(3,63) (3,92) (2,83) (2,76)	0,50 0,61 0,74 0,78	3,5	(7,72)
300	(12)	80,0 to 400,0 120,0 to 600,0 200,0 to 1000,0	(352,0 to 1761,0) (528,0 to 2642,0) (881,0 to 4403,0)	315 265 180	(4,57) (3,84) (2,61)	0,52 0,62 0,76	4,1	(9,04)
350	(14)	100,0 to 500,0 200,0 to 1000,0 270,0 to 1300,0	(440,0 to 2202,0) (881,0 to 4403,0) (1189,0 to 5724,0)	325 235 190	(4,71) (3,41) (2,76)	0,50 0,67 0,75	5,1	(11,24)
400	(16)	140,0 to 700,0 240,0 to 1200,0 320,0 to 1600,0	(616,0 to 3082,0) (1057,0 to 5284,0) (1409,0 to 7045,0)	320 250 200	(4,64) (3,63) (2,90)	0,51 0,65 0,73	5,8	(12,79)

Ordering data for standard measuring range

F O N4 **7ME5832-0 00 - 0AW0**
Orifice flowmeter
- Flow tube Trogamid
- Float: mat. No. 1.4305
- Contacts: without
- Orifice: PVC
- Calibration certificate: without

Nom. diam.	Measuring range in m³/h	(USgpm)	
DN 25 (1")	0,6 to 3,0	(2,64 to 13,2)	PA
	0,9 to 4,5	(3,96 to 19,8)	PB
	1,2 to 6,0	(5,28 to 26,4)	PC
DN 32 (1 1/4")	0,8 to 4,0	(3,52 to 17,6)	QA
	1,5 to 7,5	(6,6 to 33,0)	QB
	2,0 to 10,0	(8,8 to 44,0)	QC
DN 40 (1 1/2")	1,2 to 6,0	(5,28 to 26,4)	AA
	2,0 to 10,0	(8,8 to 44,0)	AB
	3,2 to 16,0	(14,1 to 70,0)	AC
DN 50 (2")	2,0 to 10,0	(8,8 to 44,0)	BA
	3,0 to 15,0	(13,2 to 66,0)	BB
	5,0 to 25,0	(22,0 to 110,0)	BC
DN 65 (2 1/2")	3,2 to 16,0	(14,1 to 70,0)	CA
	6,0 to 30,0	(26,4 to 132,0)	CB
	8,0 to 40,0	(35,0 to 176,0)	CC
	9,0 to 45,0	(39,6 to 198,1)	CD
DN 80 (3")	5,0 to 25,0	(22,0 to 110,0)	DA
	10,0 to 50,0	(44,0 to 220,0)	DB
	13,0 to 65,0	(57,0 to 286,0)	DC
	15,0 to 75,0	(66,0 to 330,2)	DD
DN 100 (4")	10,0 to 50,0	(44,0 to 220,0)	EA
	16,0 to 80,0	(70,0 to 352,0)	EB
	20,0 to 100,0	(88,0 to 440,0)	EC
	24,0 to 120,0	(105,7 to 528,3)	ED
DN 125 (5")	13,0 to 65,0	(57,0 to 286,0)	FA
	24,0 to 120,0	(106,0 to 528,0)	FB
	32,0 to 160,0	(141,0 to 704,0)	FC
	39,0 to 195,0	(171,7 to 858,4)	FD
DN 150 (6")	20,0 to 100,0	(88,0 to 440,0)	GA
	32,0 to 160,0	(141,0 to 704,0)	GB
	50,0 to 250,0	(220,0 to 1100,0)	GC
	54,0 to 270,0	(237,7 to 1188,6)	GD
DN 200 (8")	34,0 to 170,0	(150,0 to 749,0)	HA
	60,0 to 300,0	(264,0 to 1321,0)	HB
	80,0 to 400,0	(352,0 to 1761,0)	HC
	99,0 to 495,0	(435,8 to 2179,0)	HD
DN 250 (10")	50,0 to 250,0	(220,0 to 1100,0)	JA
	80,0 to 400,0	(352,0 to 1761,0)	JB
	130,0 to 650,0	(572,0 to 2862,0)	JC
	150,0 to 750,0	(660,3 to 3301,6)	JD
DN 300 (12")	80,0 to 400,0	(352,0 to 1321,0)	KA
	120,0 to 600,0	(528,0 to 2642,0)	KB
	200,0 to 1000,0	(881,0 to 4403,0)	KC
DN 350 (14")	100,0 to 500,0	(440,0 to 2202,0)	LA
	200,0 to 1000,0	(881,0 to 4403,0)	LB
	270,0 to 1300,0	(1189,0 to 5724,0)	LC
DN 400 (16")	140,0 to 700,0	(616,0 to 3082,0)	MA
	240,0 to 1200,0	(1057,0 to 5284,0)	MB
	320,0 to 1600,0	(1409,0 to 7045,0)	MC

Ordering data for special measuring range

F O N4 **7ME5832- Z 0 -**
Orifice flowmeter

Flow tube	
Trogamid	0
Polysulfone	1
Nominal diameter	
DN 25 (1")	P
DN 32 (1 1/4")	Q
DN 40 (1 1/2")	A
DN 50 (2")	B
DN 65 (2 1/2")	C
DN 80 (3")	D
DN 100 (4")	E
DN 125 (5")	F
DN 150 (6")	G
DN 200 (8")	H
DN 250 (10")	J
DN 300 (12")	K
DN 350 (14")	L
DN 400 (16")	M
Float	
Material	
- Mat.No. 1.4305/303	0
- Mat.No. 1.4571/316Ti	1
- Mat.No. 1.4571/316Ti with Magnet	2
- PVC weighted	3
- PVC weighted, with magnet	4
Contacts (only with magnetic float)	
Without	0
- Contact K 18/A (closes when limit is fallen below)	1
- Contact K 18/B (closes when limitis exceeded)	2
- 2 contacts K 18/A	3
- 2 contacts K 18/B	4
- 1 each Kontakt K 18/A und K 18/B	5
Orifice	
- PVC	AW
- Stainless steel mat.No.1.4571	
Nominal diameter DN 40 (1 1/2")	BA
Nominal diameter DN 50 (2")	BB
Nominal diameter DN 65 (2 1/2")	BC
Nominal diameter DN 80 (3")	BD
Nominal diameter DN 100 (4")	BE
Nominal diameter DN 125 (5")	BF
Nominal diameter DN 150 (6")	BG
Nominal diameter DN 200 (8")	BH
Nominal diameter DN 250 (10")	BJ
Nominal diameter DN 300 (12")	BK
Nominal diameter DN 350 (14")	BL
Nominal diameter DN 400 (16")	BM
Calibration certificate	
- Without	0
- With calibration certificate	1

Further designs
Please add "**-Z**" to Order No. And specify Order codes
- **Y01** measured medium: specify in plain text: medium: always required measuring range with dimension, density with viscosity with dimension, operating temperature, operating pr
- **Y04** Silicone-free version
- **Y05** Medium: Water; Viscosity: 1 mPa.s (1cp)

F O N4

Inlet - and outlet pipe sections

Minimum values for undisturbed straight pipe sections in multiples of the pipe diameter D according to DIN EN ISO 5167

Diameter ratio m Diameter ratio ß	0,01 0,10	0,04 0,20	0,06 0,25	0,09 0,30	0,12 0,35	0,16 0,40	0,20 0,45	0,25 0,50	0,30 0,55	0,36 0,60	0,42 0,65	0,49 0,70	0,56 0,75
Fittings upstream of primary device	Required straight pipe section in the **inlet**												
90°- elbow or T-piece	10 (6)	10 (6)	10 (6)	10 (6)	12 (6)	14 (7)	14 (7)	14 (7)	16 (8)	18 (9)	22 (11)	28 (14)	36 (18)
Two or more 90°- elbows													
in the same plane	14 (7)	14 (7)	14 (7)	16 (8)	16 (8)	18 (9)	18 (9)	20 (10)	22 (11)	26 (13)	32 (16)	36 (18)	42 (21)
in different planes	34 (17)	34 (17)	34 (17)	34 (17)	36 (18)	36 (18)	38 (19)	40 (20)	44 (22)	48 (24)	54 (27)	62 (31)	70 (35)
Adapter (from 2 D to D Over a lenght of 1,5 D to 3 D)	5	5	5	5	5	5	5	6 (5)	8 (5)	9 (5)	11 (6)	14 (7)	22 (11)
Diffuserr (from 0,5 D to D over A lenght of 1 D to 2 D)	16 (8)	16 (8)	16 (8)	16 (8)	16 (8)	16 (8)	17 (9)	16 (9)	20 (10)	22 (11)	25 (13)	30 (15)	38 (19)
Valve, fully open	18 (9)	18 (9)	18 (9)	18 (9)	18 (9)	20 (10)	20 (10)	20 (11)	24 (12)	26 (13)	28 (14)	32 (16)	36 (18)
Gate valve, fully open	12 (6)	12 (6)	12 (6)	12 (6)	12 (6)	12 (6)	12 (6)	12 (6)	14 (7)	14 (7)	16 (8)	20 (10)	24 (12)
For all fittings listed	Required straight pipe section in the **outlet**												
	4 (2)	4 (2)	4 (2)	5 (2,5)	5 (2,5)	6 (3)	6 (3)	6 (3)	6 (3)	7 (3,5)	7 (3,5)	7 (3,5)	8 (4)
Disturbance	Requirded straight pipe section in the **inlet** (for all diameter ratios ß)												
Abrupt symetrical reduction in diameter with a Diameter ratio >= 0,5	30 (15)												
Thermometer case													
<= 0,03 D	5 (3)												
0,03 D to 0,13 D	20 (10)												
Data outside brackets: Data in brackets:	Apply to orifice plates, nozzles and Venturi nozzles; pipe lenght measured in the outlet from the diffuser end. Apply to orifice plates, nozzles and Venturi nozzles; an additional tolerance of ± 0.5% must be added arithmetically to the relative tolerance to DIN EN ISO 5167, September 1995.												

The data for T-pieces apply to T-pieces in the inlet where the flow is split into two parts and the measurement made in one part. A turbulence is formed downstream of T-pieces which combine two flows and requires longer inlet sections.

Orifice plate flowmeter
F O Turbo-Lux 2

Fig 1 Orifice plate flowmeter Turbo-Lux 2

Application

The orifice plate flowmeter Turbo-Lux 2 is used to measure the volume of transparent fluids in closed pipeline systems. Any mounting position and direction of flow is possible. The main field of application is the utilisation in stationary water extinguishing systems. The flowmeter complies with the requirements of the "Verband der Schadensversicherer e.V. (VdS)" "Association of damage insurers".

Mode of operation and design

The orifice plate flowmeter Turbo-Lux 2 consists of a differential pressure sensor (fig. 2, 1) for stationary installation as well as a portable bypass meter to measure the auxiliary flow (fig. 2, 2). The differential pressure sensor complies essentially with DIN the VDI guidelines 2040. The bypass meter contains a conical glass tube (fig. 2, 3) with a float (fig. 2, 4). The water flows vertically upwards through the glass tube which is equipped with a bypass orifice at the top (fig. 2, 5). A filter (fig. 2, 6) at the inlet side prevents the ingression of foreign particles to a large extent. Inlet and outlet ports for the flow to be measured in the bypass are arranged concentrically to ensure simple assembly and combination with the stationary differential pressure sensor.

Installation of the differential pressure sensor

A straight pipe section to achieve non turbulence with a length in relation to the diametral pitch in accordance with DIN EN ISO 5167 must be provided both upstream and downstream from the differential pressure sensor (see page 4). In the case of installation in sprinkler systems, we refer for example to the VdS CEA guideline for sprinkler systems 4001, in which 10 x D is prescribed upstream of the pressure sensor and 5 x D downstream of the sensor. The installation can be conducted in the direction required by the user - horizontal up to vertical (fig. 4). However, ensure that the flow direction corresponds to the direction of flow indicated by the arrow on the instrument and that the differential pressure sampling tube (fig. 2, 7) is installed in a horizontal position. Adequate free space must be provided for the mounting of the bypass meter. The concentric installation between the flanges of the pipeline is essential to guarantee the adherence to the measuring tolerance. The central offset may not exceed 0.5 mm. A centring assembly (fig. 3) can be supplied for all dimensions of differential pressure sensor to aid centring in installation between flanges.

Mounting the bypass meter

The bypass meter can be used for all specified nominal diameters. The pipeline must be drained before the screw caps are loosened (fig. 2, 10) in order to prevent the leakage of fluid. The bypass meter is connected and screwed into place using the union nut (fig. 2, 9).

It must always be mounted in a truly vertical position to allow the float (fig. 2, 4) to move freely in the measuring tube (fig. 2, 3). Any contaminants which have passed through the filter must be removed. Tighten union nut and the screw cap manually, if possible. The screw threads must run smoothly - e.g. by lubricating with grease. The pipeline must be filled with water slowly to prevent water hammer.

Measurement

Read the exact value as soon as a consistent flow has been attained, i.e. when the float has reached a stable position. Read the value at the greatest diameter of the float. The pipeline must always be filled.
When the bypass meter is commissioned or set into operation, bubbles of air will initially accumulate at the top part, which must be removed. For this purpose, the union nut (fig. 2, 9) must be somewhat loosened during operation and the device must be rotated by 360°, so that the air bubbles can escape. Then tighten the union nut once again.

Reading the measured value

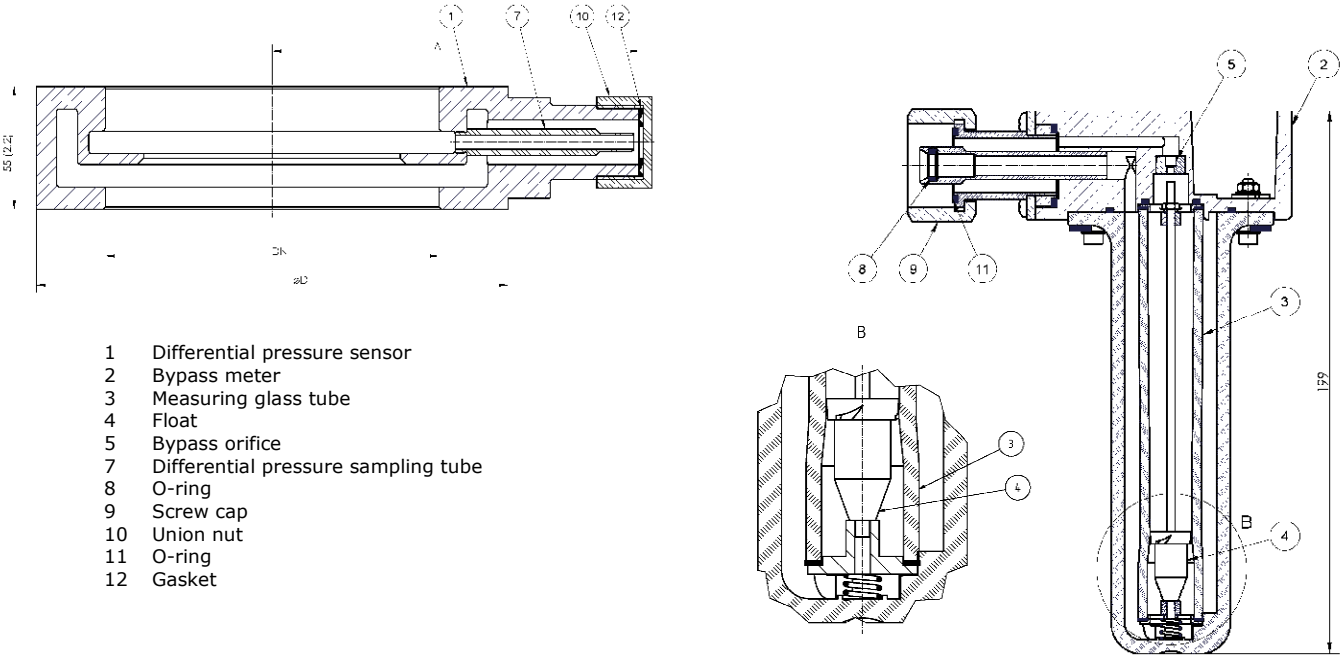
The flow rate is printed in m³/min for the main values (100/ 90/ 80/ 70/ 60/ 50/ 40/ 20 %) on the scale for each nominal diameter. The scale division in brackets is also listed to assist the determination of intermediate values.
An extended table in which a flow value is assigned to each line can be found on page 61.

Maintenance

If the filter is blocked by deposits (fig. 2, 6) the flowmeter must be returned to the manufacturer to be cleaned and tested.
Ensure that the O-ring (fig. 2, 8) and the G 1 thread of the orifice plate are lubricated with grease.

Operating note

The operator of these measuring units is responsible for the suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. In particular, it must be ensured that the materials selected for the parts of the measuring unit coming into contact with the medium are suitable for the process media to be used. The unit may only be used within the pressure and voltage limits specified in the operating instructions. Before replacing the measuring tubes, check that the unit is free from hazardous media and pressures. The instrument complies with the requirements according to Article 3 Paragraph 3 of the guideline relating to pressure instruments 97/23/EU. The most hazardous permissible media are the fluids defined in Group 2.



1 Differential pressure sensor
2 Bypass meter
3 Measuring glass tube
4 Float
5 Bypass orifice
7 Differential pressure sampling tube
8 O-ring
9 Screw cap
10 Union nut
11 O-ring
12 Gasket

Connections	Intermediate flange connection		
	Dimensions		Weight
	A±0.5	øD ±0.5	
DN	mm	mm	kg
50 PN 10/16	-	-	-
80 PN 10/16	130	138	1,3
100 PN 10/16	140	158	1,6
150 PN 10/16	165	212	2,1
200 PN 10/16	190	268	3,0
250 PN 10	215	320	4,0
indicating part	-	-	0,7

Fig.2 Turbo-Lux 2, Position drawing and dimensions in mm (inch)

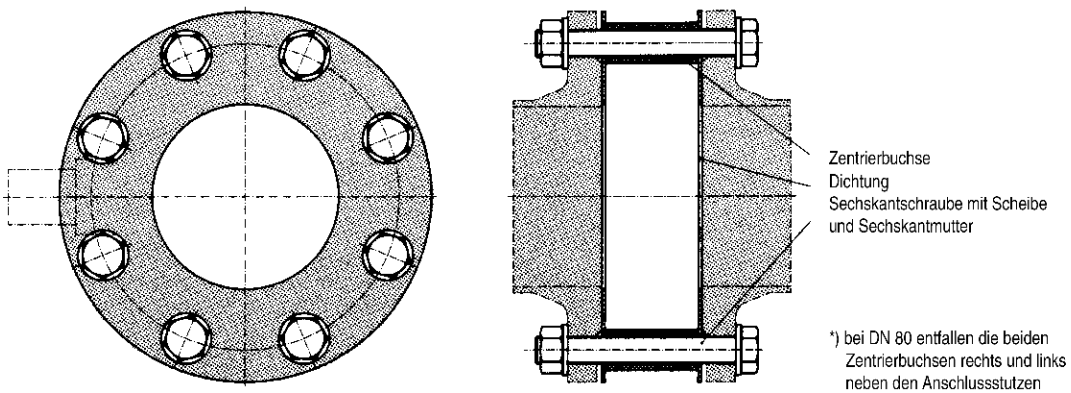


Fig. 3 centring assembly (only for the intermediate flange model)

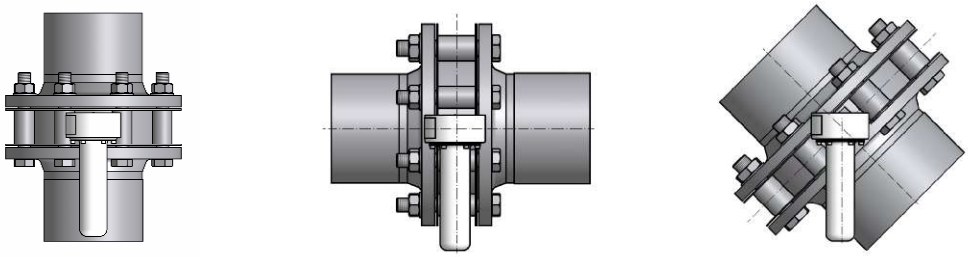


Fig.4 Examples of installation

Flow table for the bypass meter Turbo-Lux 2

Flowrate - Water Orifice for intermediate flange model										
Anzeige	DN 80		DN 100		DN 150		DN 200		DN 250	
in %	m³/min	l/min	m³/min	l/min	m³/min	l/min	m³/min	l/min	m³/min	l/min
100	2,10	2100	3,00	3000	6,00	6000	12,00	12000	18,00	18000
98	2,06	2058	2,94	2940	5,88	5880	11,76	11760	17,64	17640
96	2,02	2016	2,88	2880	5,76	5760	11,52	11520	17,28	17280
94	1,97	1974	2,82	2820	5,64	5640	11,28	11280	16,92	16920
92	1,93	1932	2,76	2760	5,52	5520	11,04	11040	16,56	16560
90	1,89	1890	2,70	2700	5,40	5400	10,80	10800	16,20	16200
88	1,85	1848	2,64	2640	5,28	5280	10,56	10560	15,84	15840
86	1,81	1806	2,58	2580	5,16	5160	10,32	10320	15,48	15480
84	1,76	1764	2,52	2520	5,04	5040	10,08	10080	15,12	15120
82	1,72	1722	2,46	2460	4,92	4920	9,84	9840	14,76	14760
80	1,68	1680	2,40	2400	4,80	4800	9,60	9600	14,40	14400
78	1,64	1638	2,34	2340	4,68	4680	9,36	9360	14,04	14040
76	1,60	1596	2,28	2280	4,56	4560	9,12	9120	13,68	13680
74	1,55	1554	2,22	2220	4,44	4440	8,88	8880	13,32	13320
72	1,51	1512	2,16	2160	4,32	4320	8,64	8640	12,96	12960
70	1,47	1470	2,10	2100	4,20	4200	8,40	8400	12,60	12600
68	1,43	1428	2,04	2040	4,08	4080	8,16	8160	12,24	12240
66	1,39	1386	1,98	1980	3,96	3960	7,92	7920	11,88	11880
64	1,34	1344	1,92	1920	3,84	3840	7,68	7680	11,52	11520
62	1,30	1302	1,86	1860	3,72	3720	7,44	7440	11,16	11160
60	1,26	1260	1,80	1800	3,60	3600	7,20	7200	10,80	10800
58	1,22	1218	1,74	1740	3,48	3480	6,96	6960	10,44	10440
56	1,18	1176	1,68	1680	3,36	3360	6,72	6720	10,08	10080
54	1,13	1134	1,62	1620	3,24	3240	6,48	6480	9,72	9720
52	1,09	1092	1,56	1560	3,12	3120	6,24	6240	9,36	9360
50	1,05	1050	1,50	1500	3,00	3000	6,00	6000	9,00	9000
48	1,01	1008	1,44	1440	2,88	2880	5,76	5760	8,64	8640
46	0,97	966	1,38	1380	2,76	2760	5,52	5520	8,28	8280
44	0,92	924	1,32	1320	2,64	2640	5,28	5280	7,92	7920
42	0,88	882	1,26	1260	2,52	2520	5,04	5040	7,56	7560
40	0,84	840	1,20	1200	2,40	2400	4,80	4800	7,20	7200
35	0,74	735	1,05	1050	2,10	2100	4,20	4200	6,30	6300
30	0,63	630	0,90	900	1,80	1800	3,60	3600	5,40	5400
25	0,53	525	0,75	750	1,50	1500	3,00	3000	4,50	4500
20	0,42	420,00	0,60	600,00	1,20	1200,00	2,40	2400,00	3,60	3600,00

Pressure loss particulars

Flow	Δp mbar (psi)
20	13.6 (0.19)
50	85.0 (1.23)
100	340.0 (4.93)

Technical Data Turbo-Lux 2

Application field	see page 59
Mode of operation and design	see page 59
Measuring principle	Orifice plate as differential pressure sensor with bypass meter
Inlet	
Nominal diameters	DN 80 PN 10/16 DN 100 PN 10/16 DN 150 PN 10/16 DN 200 PN 10/16 DN 250 PN 10
Nominal pressure	PN 16
Pressure limit	max. 16 bar
Measuring accuracy:	± 2.5% final value ± 5% starting value
Operational conditions	
Temperature limits	max. 50 °C
Constructive design	
Materials (fig. 2)	
- Differential pressure sensor (1)	Aluminium M.-No. 3.2582.05
-Differential pressure sampling tube (7)	M.-No. 2.0380 (Ms58)
- Float (4)	Stainless steel
- Bypass orifice (5)	Stainless steel
- Filter (6)	Stainless steel
- Gasket (11/12)	Buna N
Certificates and approvals	
Classification in accordance with guideline for pressure instruments 97/23/EU	For liquids of fluid group 2; complies with requirements of article 3, paragraph 3 (sound engineering practice SEP)
Vds certification number	G4060003

Ordering data

F O Turbo-Lux 2
Orifice plate flowmeter

7ME5834- [ ][ ][ ] 0 [ ] - [ ][ ] A 0

Orifice plate for installation between flange	
without	**0**
DN 80 (Qv: 0.42 - 2.1 m³/min.)	**1**
DN 100 (Qv: 0.6 - 3.0 m³/min.)	**2**
DN 150 (Qv: 1.2 - 6.0 m³/min.)	**3**
DN 200 (Qv: 2.4 - 12.0 m³/min.)	**4**
DN 250 (Qv: 3.6 - 18.0 m³/min.)	**5**
Centering assembly orifice plate for installation between flanges	
without	**A**
DN 80	**B**
DN 100	**C**
DN 150	**E**
DN 200	**F**
DN 250	**G**
Bypass meter FO Turbo-Lux 2	
without	**A**
for orifice plate to be installed between flange	**B**
Replacement union cap	
without union cap	**0**
with union cap including gasket	**1**
Calibration certificate	
without calibration certificate	**0**
with calibration certificate	**1**

Fig.1 F I Intra flap flowmeter for transparent liquids

Fig. 2 F I Prima flap flowmeter for opaque liquids

Application

The F I Intra/Prima flap flowmeter is used to check and display the flow of liquids in closed pipelines. The device can be optionally fitted with an inductive contact for remote transmission of switching points.
The main applications for the FI can be found in the following fields:

- Chemical industry
- Water, waste water
- Building installations

Special features

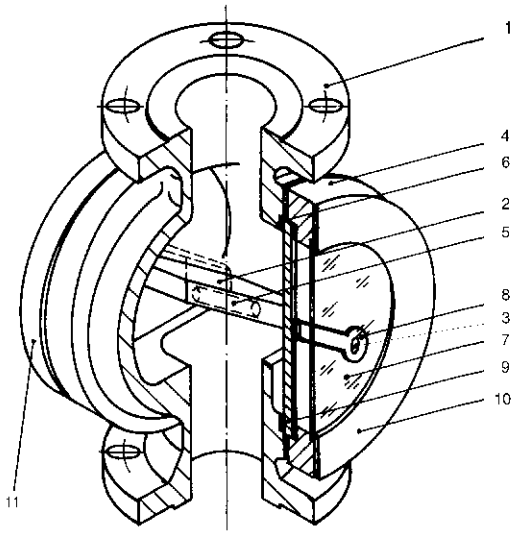
- Extremely robust design
- Suitable for transparent and turbid liquids
- Vertical or horizontal installation
- Simple, maintenance-friendly design
- Liquid temperatures up to 250 °C (482 °F)
- Inductive contact for flow monitoring (option).

Design and mode of operation (Fig.3)

The F I operates according to the flap principle. The fitting (1) contains a measuring flap (2) which can be rotated around an axis (3). At rest (i.e. no flow), the flap closes the pipeline by its own weight. As soon as there is a flow, the flap is lifted depending on the flow velocity. The respective flow quantity can be read directly in transparent liquids from the position of the flap. The bottom edge of the flap is the reference edge.
In turbid or opaque liquids, the movement of the flap is transmitted by a magnet (5) mounted on the flap to an external mechanical pointer (8), and the flow is displayed on a scale. The scale and pointer are protected against external effects and contamination by a Plexiglass or glass pane.
The scale has the standard dimension m^3/h, and can be calculated for an application-specific medium and operating pressure/temperature if the density differs from 1 kg/l (62,43 lb/cu.ft). Special scales are available at extra charge.
An inductive contact is triggered by a contact lug mounted on the pointer.

Intra: - for transparent liquids
- with plexiglass or glass pane to be read directly

Prima: - for turbid or opaque liquids
- with external mechanical pointer



1 Fitting
2 Measuring flap
3 Flap axis
4 Pressure ring
5 Magnet [1]
6 Gasket
7 Plexiglass or glass pane [2]
8 Pointer [2]
9 Scale pane [1][2]
10 Front ring [1]
11 Dummy flange

[1] Only with SITRANS F I Prima.
[2] With Intra: glass pane.

[1] Only with F I Prima
[2] With Intra glass pane

Fig. 3 flap flowmeter, design

Note of application

The operator of these measuring instruments is responsible for suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the flowmeter parts in contact with the medium are suitable for the used process media. No external loads may act on the meter. Provide a touch guard for surface temperatures of > 70°C (158°F). This touch guard must be designed in a way that the max. allowable ambient temperature on the unit is not exceeded. The flowmeter may only be used within the pressure and voltage limits specified in the operating instructions. Before replacing the measuring tubes, check that the unit is free of hazardous media and pressures. The flowmeter meets the requirements of the PED 97/23/EC, article 3, paragraph 3. The most hazardous allowable media are liquids of fluid group 1.

Technical specifications

Application	See page 63
Design and mode of operation	See page 63
Measuring principle	Flap principle
Input	
Measuring range	See table on page 66
Pressure rating	Connection PN 10 to 16 Permissible operating pressure 8 to 16bar/116 - 232psi (depending on design (see Tables below)
Rated operating conditions	
Mounting position	Vertical or horizontal
Ambient temperature	< 80 °C / 176 °F (with contact displays: see there)
Medium conditions	
• Accuracy	± 5 % of full-scale value
Temperature of medium	Dependent on gasket material and design
For SITRANS FI Intra	
• Gasket: Buna N, scale pane: hard glass	≤ 90 °C / 194 °F
• Gasket: Viton, scale pane: borosilicate glass	≤ 150 °C / 302 °F
For SITRANS FI Prima	
• Gasket: Klinger-SIL-C 8200, scale pane: W. No. 1.4571	≤ 150 °C (302°F)
• Gasket: Klinger-SIL-C 4500, scale pane: W. No. 1.4571	≤ 250 °C (482°F)
Viscosity limits	viscosity
• Q_{max} [m^3/h]	[mPa · s]
≤ 0,1	1,0
> 0,1 to 0,5	1,0 to 3,0
> 0,5 to 3	1,0 to 5,0
> 3 to 10	1,0 to 8,0
> 10 to 25	1,0 to 10
> 25 to 50	1,0 to 15
> 50 to 100	1,0 to 25
> 100	1,0 to 50
• Q_{max} [USgpm]	[cp]
≤ 0,44	1,0
> 0,44 to 2,2	1,0 to 3,0
> 2,2 to 13,2	1,0 to 5,0
> 13,2 to 44	1,0 to 8,0
> 44 to 110	1,0 to 10
> 110 to 220	1,0 to 15
> 220 to 440	1,0 to 25
> 440	1,0 to 50
Design	
Flanges	DIN 2501 PN 10 to 16 (DN 65 with 4-hole-flange) ANSI B 16.5 RF 150 lb/sq.in
Material	
• Fitting	EN-GJL-250 (GG25), EN-GJL-250 (GG25) rubbercoated stainless steel mat.No. 1.4581
• Flap	stainless steel mat.No.1.4571/ 316Ti
• Flap axis	stainless steel mat.No.1.4571/ 316Ti
Degree of protection (display unit)	Design with contact: IP54
Certificates and approvals	
Classification according to PED 97/23/EC	For liquids of fluid group 1; complies with requirements of article 3, § 3 (sound engineering practice SEP)

Technical specifications data of contacts

Prima

Switching principle	Inductive contact, single contact Power supply via disconnector unit (relay)
Connection	PG 11
Rated voltage	DC 8 V
Self-inductance	160 µF
Self-capacitance	20 nF
Ambient temperature	-20 to +70 °C (-4 to 158 °F)

Installation and operating instructions

The main information for installation and startup is listed below.

Installation

The flowmeter is delivered protected in a PVC sleeve, and is ready for operation. It has been checked for correct functioning prior to delivery. Before installing, check that the flap moves freely. Inlet and outlet pipe sections are not required.

Startup

When starting up new plants, material residues are carried over in the medium and could be deposited on the transmission magnets (measuring flap). The flowmeter must be cleaned in such cases.

To prevent pressure surges resulting from gas bubbles, start with a closed valve which is then slowly regulated to the operating pressure. The valve can be mounted either upstream or downstream of the flowmeter.

If the magnetic coupling between the flap and the pointer is interrupted, the pointer can be lifted again using a separate magnet. Alternatively, the flap can be fully opened and then closed again. The magnetic coupling is then effective again.

Cleaning

Remove the dummy flange at the rear or the glass pane including the gasket. The fitting can then be cleaned; in the process, check that the measuring flap moves freely. Remove the flap if necessary, and clean its bearing. To prevent coating with residues, always clean the flowmeter if the plant is to be shut down for a longer period. The glass panes can be carefully cleaned using a gentle solvent.

Sealing and replacing the hard glass plate

The hard glass plate is secured between two gaskets by a pressure ring on the housing, and can be removed by unscrewing the ring. When refitting the plate, ensure that the zero mark on the scale coincides with the rest position of the flap (bottom edge). It is recommendable to check the gasket following installation or an extended operating period. If necessary, gently tighten the pressure ring screws with uniform distribution of the pressure.

The gaskets must be replaced each time the flowmeter is taken apart.

Versions

F I Intra

Version	Type A	Type AA	Type C	Type D
Fitting	EN-GJL-250 (GG 25)		EN-GJL-250 (GG 25) rubber-coated	Stainless steel mat.No. 1.4581
Pressure ring	GG 25			
Rear cover	Dummy flange GG 25	Hard glass (at temp. > 90°C (194°F): borosilicate glass)		
Scale pane	Hard glass (at temp. > 90°C (194°F): borosilicate glass)			
Max. temperature of medium	150°C (302°F) dependet on gasket and scale pane		90°C (194°F)	150°C (302°F) Dependent on gasket and scalepane
Max. operating pressure Connection DIN 2501, PN 10 to 16	DN 25: 16 bar DN 40 to 50: 10 bar DN 65 to 150: 8 bar		DN 40 to 50: 10 bar DN 65 to 150: 8 bar	DN 25: 16 bar DN 40 to 50: 10 bar DN 65 to 150: 8 bar
ANSI B 16.5 RF 150 lb/sq.inch	1": 232 psi 1 1/2 to 2": 145 psi 2 1/2 to 6": 116 psi		1 1/2 to 2": 145 psi 2 1/2 to 6": 116 psi	1": 232 psi 1 1/2 to 2": 145 psi 2 1/2 to 6": 116 psi

Standard designs for clear and transparent liquids

F I Prima

Version	Type A	Type C	Type D
Fitting		EN-GJL-250 (GG 25) rubber coated	Stainless steel mat.No. 1.4581
Pressure rings	EN-GJL-250 (GG 25)	EN-GJL-250 (GG 25)	Stainless steel mat.No. 1.4581
Dummy flange, rear		EN-GJL-250 (GG 25) rubber coated	Stainless steel mat.No. 1.4571/316Ti
Scale cover	Temperature <= 70°C (158°F): acrylic glass Temperature > 70°C (158°F): safety glass		
Scale Pane	Stainless steel, mat.No. 1.4571/316 Ti		
Max. temperature of medium	250 °C (482°F), dependent on gasket	90 °C (194°F)	250 °C (482°F), dependent on gasket
Max. operating pressure Connection DIN 2501, PN 10 to 16	DN 25 to 150: 16 bar	DN 40 to 150: 16 bar	DN 25 to 150: 16 bar
ANSI B 16.5 RF 145 to 232 psi	1 to 6": 232 psi	1 1/2" to 6": 232 psi	1 to 6": 232 psi

Design versions for turbid and opaque liquids; transmission of flap movement via magnetic coupling

Dimensions, weights

Flange connections (to DIN 2501, PN 16)		Dimensions in mm (inch) With attached contact					Flange DIN	Max. pressure				Approx. weight	
DN	(inch)	A	B Prima	B Intra	C	E	D	Prima bar	Prima (psi)	Intra bar	Intra (psi)	Prima ca. kg (lb)	Intra ca. kg (lb)
25	(1")	160 (6,30)	136 (5,35)	127 (5,00)	107 (4,21)	68 (2,68)	115 (4,25)	16	(232)	16	(232)	6,0 (13,22)	5,5 (12,12)
40	(1 1/2")	200 (7,87)	157 (6,18)	147 (5,79)	140 (5,51)	94 (3,70)	150 (5,00)	16	(232)	10	(145)	11,5 (25,35)	12,5 (27,55)
50	(2")	230 (9,06)	172 (6,77)	169 (6,65)	170 (6,69)	122 (4,80)	165 (6,00)					15,5 (34,17)	14,0 (30,86)
65	(2 1/2")	290 (11,42)	192 (7,56)	194 (7,64)	210 (8,27)	144 (5,67)	185 (7,00)					27,0 (59,52)	20,0 (44,09)
80	(3")	310 (12,20)	217 (8,54)	240 (9,45)	235 (9,25)	170 (6,69)	200 (7,50)					40,0 (88,18)	27,0 (59,52)
100	(4")	350 (13,78)	243 (9,57)	276 (10,87)	280 (11,02)	210 (8,27)	220 (9,00)	16	(232)	8	(116)	54,0 (119,04)	48,0 (105,82)
125	(5")	400 (15,75)	258 (10,16)	291 (11,46)	300 (11,81)	219 (8,62)	250 (10,00)					64,0 (141,09)	64,0 (141,09)
150	(6")	400 (15,75)	291 (11,46)	322 (12,68)	300 (11,81)	219 (8,62)	285 (11,00)					71,0 (156,52)	71,0 (156,52)

F I Prima / F I Intra, dimensions and weights

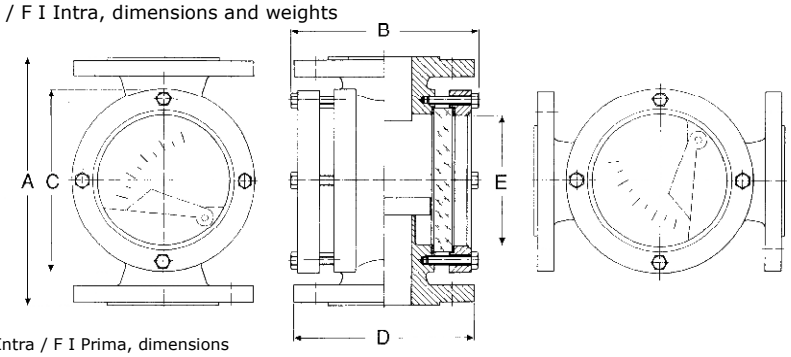


Fig. 4 F I Intra / F I Prima, dimensions

Measuring ranges and pressure losses

Connection DIN 1092-1 measuring ranges in m³/h

Connection DIN 2501	Measuring ranges in m³/h for the selected flow directions for liquids with density p = 1 ±0,05 kg/l (pressure loss in mbar shown in brackets)											
	Vertical flow						Horizontal flow					
	Small measuring range Column A		Large measuring range Column B		Measuring range for rubber coated design		Small measuring range Column A		Large measuring range Column B		Measuring range for rubber coated design	
DN 25	0,5 to 2,5	(16)	1,0 to 5,0	(60)	-		0,5 to 2,5	(8)	0,5 to 5,0	(58)	-	
DN 40	1,0 to 6,0	(14)	1,2 to 12,0	(35)	2 to 10	(35)	1,0 to 6,0	(13)	1,2 to 12	(16)	1 to 10	(16)
DN 50	2,0 to 12	(26)	2,0 to 20	(50)	2 to 16	(50)	1,2 to 12	(8)	3,0 to 30	(69)	2 to 20	(69)
DN 65[1)]	3,0 to 20	(28)	5,0 to 40	(46)	2,2 to 22	(46)	2,5 to 25	(36)	5,0 to 50	(146)	3,5 to 35	(146)
DN 80	5,0 to 30	(24)	5,0 to 50	(58)	5 to 40	(58)	5,0 to 50	(50)	7,0 to 70	(118)	5 to 50	(118)
DN 100	7,0 to 50	(32)	10 to 100	(83)	10 to 80	(83)	5,0 to 50	(19)	10 to 120	(147)	10 to 100	(147)
DN 125	8 to 60	(13)	12 to 120	(91)	10 to 100	(91)	5,0 to 50	(10)	10 to 140	(92)	10 to 120	(92)
DN 150	10 to 70	(10)	15 to 160	(24)	15 to 140	(24)	5,0 to 60	(5)	10 to 160	(39)	15 to 140	(39)

Measuring ranges and pressure losses with vertical and horizontal flows
[1)] DN 65 with 4-hole-flange

Connection ANSI B16.5 RF measuring ranges in USgpm

Connection ANSI B16.5 RF	Measuring ranges in USgpm for the selected flow directions for liquids with density p = 62,43 lb/cu.ft±3,12 lb/cu.ft (pressure loss in psi shown in brackets)											
	Vertical flow						Horizontal flow					
inch	Small measuring range Column A		Large measuring range Column B		Measuring range for rubber coated design		Small measuring range Column A		Large measuring range Column B		Measuring range for rubber coated design	
1"	2,2 to 11	(0,23)	4,4 to 22	(0,87)	-		2,2 to 11	(0,12)	2,2 to 22	(0,84)	-	
1 1/2"	4,4 to 26	(0,20)	5,3 to 53	(0,51)	8,8 to 44	(0,51)	4,4 to 26	(0,19)	5,3 to 53	(0,23)	4,4 to 44	(0,23)
2"	8,8 to 53	(0,38)	8,8 to 88	(0,73)	8,8 to 70	(0,73)	5,3 to 53	(0,12)	13 to 132	(1,00)	8,8 to 88	(1,00)
2 1/2"	13 to 88	(0,41)	22 to 176	(0,67)	9,7 to 97	(0,67)	11 to 110	(0,52)	22 to 220	(2,12)	15 to 154	(2,12)
3"	22 to 132	(0,35)	22 to 220	(0,87)	22 to 176	(0,84)	22 to 220	(0,73)	31 to 310	(1,71)	22 to 220	(1,71)
4"	31 to 220	(0,46)	44 to 440	(1,20)	44 to 352	(1,20)	22 to 220	(0,28)	44 to 530	(2,13)	44 to 440	(2,13)
5"	35 to 264	(0,19)	53 to 530	(1,32)	44 to 440	(1,32)	22 to 220	(0,15)	44 to 616	(1,33)	44 to 530	(1,33)
6"	44 to 308	(0,15)	66 to 704	(0,35)	66 to 618	(0,34)	22 to 264	(0,07)	44 to 704	(0,57)	66 to 616	(0,57)

Measuring ranges and pressure losses with vertical and horizontal flows

selection and Ordering data flap flowmeter for clear, transparent liquids

F I Intra

Order No. **7ME5840-** _ _ _ _ - _ _ _ _

(max. oper. pressure 8 to 16 bar (116 to 232 psi), dependent on nominal diameter according page 66)	
Version (see Table on page 55)	
• Type A Fitting and pressure rings: gray cast iron (GG25) Rear dummy flange: gray cast iron (GG25)	**0**
• Type AA Fitting and pressure rings: gray cast iron (GG25) Rear pressure plate: hard glass	**1**
• Type C Fitting (rubber-coated) and pressure rings: gray cast iron (GG25) Rear pressure plate: hard glass	**4**
• Type D Fitting: stainless steel (1.4581) Press.rings: gray cast iron (GG25) Rear pressure plate: hard glass	**6**
Nominal diameter	
• DN 25 (1")	**A A**
• DN 40 (1 1/2")	**B B**
• DN 50 (2")	**C C**
• DN 65 (2 1/2"); 4-hole-flange with DIN 2501	**D D**
• DN 80 (3")	**E E**
• DN 100 (4")	**F F**
• DN 125 (5")	**G G**
• DN 150 (6")	**H H**
Glass panes (scale pane and pressure plate)	
• Hard glass	**0**
• Borosilicate glass (temperature of medium > 90°C (194 °F))	**1**
• Borosilicate glass scale pane (only version type A)	**2**
Connection standard	
• DIN 2501 (BS 4504)	**1**
• ANSI B 16.5 RF	**2**
Measuring flap/flap axis	
• Stainless steel mat.No. 1.4571/316Ti	**1**
• Hastelloy	**2**
Gasket material	
Buna N	**A**
Viton	**B**
Flow direction	
Small measuring range [1] see column A in Table on page 56	
• Upwards (vertical pipeline)	**A**
• From left to right (horizontal pipeline)	**B**
• From right to left (horizontal pipeline)	**C**
Large measuring range [1] see column B in Table on page 56	
• Upwards (vertical pipeline)	**D**
• From left to right (horizontal pipeline)	**E**
• From right to left (horizontal pipeline)	**F**
Rear scale (only with glass pressure plate)	
• Without scale	**0**
• With scale on the glass plane	**1**

Further designs Please add "-Z" to Order No. and specify Order code(s)	**Order Codes**
Measured medium (always required with density odd 1 kg/l (62,43 lb/cu.ft)) Specify in plain text: Medium, measuring range, dimension, density, density dimension, viscosity, viscosity dimension, operating temperature, operating pressure	**Y 0 1**
Silicone-free version	**Y 0 4**
Water as measured medium Viscosity: 1mPas (cp) Density: 1 kg/l (62,43 lb/cu.ft)	**Y 0 5**
Special version, specify in plain text	**Y 9 9**

selection and Ordering data flap flowmeter for opaque liquids

F I Prima

Order No. **7ME5841-** _ _ _ _ - _ _ _ _

(max. oper. pressure 8 to 16 bar (116 to 232 psi), dependent on nominal diameter according page 66	
Version (see Table on page 55)	
• Type A Fitting and pressure rings: gray cast iron (GG25) Rear dummy flange: gray cast iron (GG25) - Standard measuring range	**0**
- Special measuring range	**1**
• Type C Fitting (rubber-coated) and pressure rings: gray cast iron (GG25) Rear pressure plate: GG, rubber coated	**4**
• Type D Fitting: stainless steel 1.4581 pressure rings: gray cost iron (GG25) rear pressure plate: stainless steel (1.4571/316Ti)	**6**
Nominal diameter	
• DN 25 (1")	**A A**
• DN 40 (1 1/2")	**B B**
• DN 50 (2")	**C C**
• DN 65 (2 1/2"); 4-hole-flange with DIN 2501	**D D**
• DN 80 (3")	**E E**
• DN 100 (4")	**F F**
• DN 125 (5")	**G G**
• DN 150 (6")	**H H**
Scale cover	
• Acrylic glass	**0**
• Hard glass	**1**
Connection standard	
• DIN 2501 (BS 4504)	**1**
• ANSI B 16.5 RF	**2**
Measuring flap/flap axis	
• Stainless steel, mat. No. 1.4571/316Ti	1
• Hasteloy	2
Gasket material	
• Klinger-Sil-C 8200	A
• Klinger-Sil-C 4500	B
Flow direction	
Small measuring range [1] see column A in Table on page 56	
• Upwards (vertical pipeline)	A
• From left to right (horizontal pipeline)	B
• From right to left (horizontal pipeline)	C
Large measuring range [1] see column B Table on page 56	
• Upwards (vertical pipeline)	D
• From left to right (horizontal pipeline)	E
• From right to left (horizontal pipeline)	F
Contacts	
• Without	0
• Inductive contact type SJ3.5-N (max. temprature of medium 90°C (194°F))	1
• Inductive contact type SJ3.5-SN (max. temprature of medium 120°C (248°F)	2

Further designs Please add "-Z" to order No. and specify Order code(s)	**Order Codes**
Measured medium (always required with density odd 1kg/l (62,43 lb/cu.ft)) Specify in plain text: Medium, measuring range, dimension, operating temperature, operating pressure	**Y 0 1**
Silicone-free version	**Y 0 4**
Water as measured medium Viscosity: 1mPas(cp) Density: 1kg/l (62,43 lb/cu.ft)	**Y 0 5**
Special version, spcify in plain text	**Y 9 9**

[1] The small and large measuring ranges are identical for the rubber-coated version (type C)

Level indicator
Menkar K/KM stainless steel

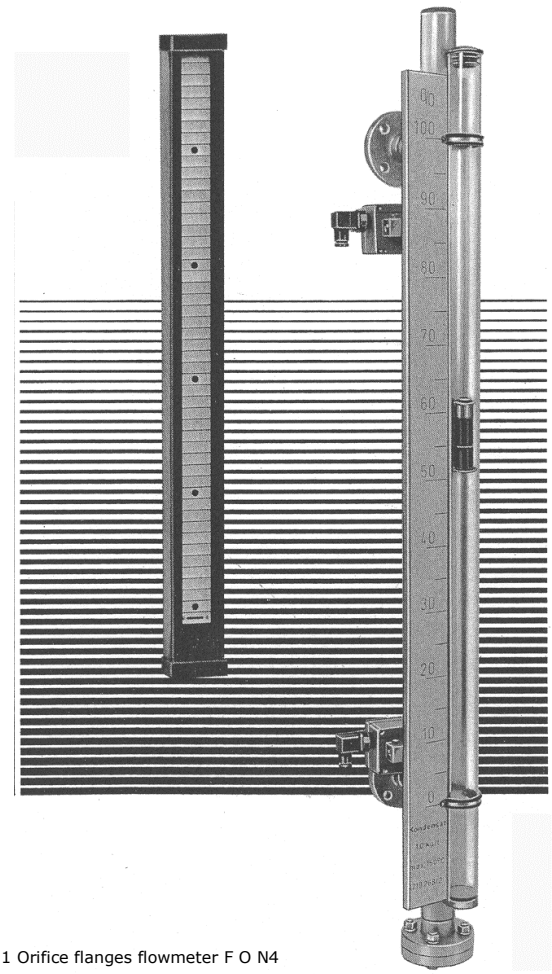


Fig. 1 Orifice flanges flowmeter F O N4

Application

MECON level indicators from the MENKAR product range are suitable for the continuous measuring and monitoring of the level of a fluid in user defined open or closed vessels. The level in the vessel to be monitored is transmitted via a float analogue in the ratio 1:1 to the indicating scale/magnet flapper type indicator. The measuring is independent of the operating pressure. The units are distinguished by a sturdy construction, trouble free operation and excellent readability, even from a considerable distance.

According to the ambient spatial conditions, the unit can be installed in a horizontal position with two horizontal couplings or with U-shaped standing or suspended connection lines.

The indicating scale can be designed to measure in percentage (0–100% in relation to the distance between the couplings, or in relation to the overall height or the total volume), in volumetric units (m^3 and l) or units of height (m, dm or cm). The mark division is aligned to the height.

Accessories can be supplied comprising different magnet activated contact units for control processes (acoustic or optical signals, motor control and valve control or similar devices). User defined sequence and the number of contacts are only restricted by a specified minimum clearance.

When fluids with a tendency to crystallisation are to be monitored, a steam/hot water jacket heating (terminal connection DN 15 DIN 2501, PN 10), an electric heater or a heat or a cold insulation can be supplied as a special construction.

Mode of operation

The MENKAR level indicators operate according to the system of communicating tubes or according to the float principle, as described below:
The medium leaves the vessel entering the standpipe through the lower connection line. The measuring float located in the standpipe then floats in the fluid whereby its degree of elevation (in the zone "h") corresponds to the actual level in the vessel.
This degree of elevation or each movement of the float (in the case of alteration in the fluid level) is transmitted via a magnet installed in the measuring float. In the MENKAR "K" on the indicating float element, or in the MENKAR "KM" on the magnetic flappers (turning from white to red). The red side indicates the actual level.
The touch sensitive switches are activated by the measuring float.
The magnetic transmission system operates without contact.

Special features

- Universal opportunities of application with almost all kinds of fluids
- Simple, sturdy construction with magnetic transmission of measured values
- Strong, magnetic coupling system without mechanical transmission elements
- Excellent readability, even from considerable distances
- can also be supplied for high pressures and temperatures
- User defined number and arrangement of contacts: only limited by the dimensions of the contact housing
- No hydraulic connection between indicating part and medium
- Simple assembly and installation
- Low maintenance
- Selection of materials according to user's needs
- Wide measuring/indicating zone. over 5000 mm in divided design
- can also be supplied with magnet flapper display (Types KM 70—KM 71)

Type selection

MENKAR K 70—K 77

K 70:	with on site display
K 71:	with on site display and touch sensitive switch(es)
K 72:	with on site display and integral transducer 4 –20 mA
K 76:	with touch sensitive switch(es); without on site display
K 76:	with integral transducer 4 –20 mA 4-20mA; without on site display

MENKAR KM 70—KM 72

In these types the indicating system consists of a magnet flapper type indicator. The length of the flapper type indicator complies with the indicating zone ("h").

KM 70:	with magnet flapper display
KM 71:	with magnet flapper display and touch sensitive switch(es)
KM 72:	with magnet flapper display and integral transducer 4 – 20 mA

Operating note

The operator of these level indicators is responsible for the suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. It must be ensured that the materials selected for the parts of the level indicator coming into contact with the medium are suitable for the used process media. The level indicator may only be used within the pressure, temperature and voltage limits specified in the operating instructions. Before replacing the standpipe/float, check that the unit is free from hazardous media and pressures. The units are designed for predominantly recumbent load.

The unit meets the requirements of the PED 97/23/EC, article 3, paragraph 3. The most hazardous permissible media are fluids of fluid group 2.

Assembly/Installation

Installation "C":

For side installation in open and closed vessels.

Installation "I":

For U-pipe connection, only with closed vessels. Elbow pipes are not included in the scope of delivery.

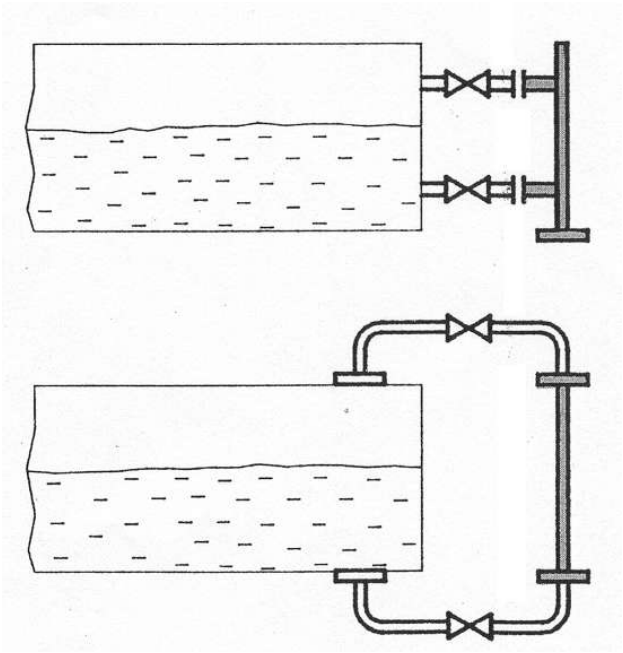


Fig.2 Installation level indicator MENKAR

Technical data

Measuring/indicating tolerance:	±5 mm
Magnet flapper type indicator:	±10 mm
Measuring range	min.: 300 mm max.: - 5000 mm undivided > 5000 mm divided
Scale	
• Standard	%-division
• Option	c, m, m³-division
Density of medium	from 0.4 kg/dm³
Pressure limit*	
• Standard	10 respectively 16 bar
• Option	64 respectively. 320 bar
Temperature of medium*	-0…+350°C
Direction of installation	vertical
Connection flange	Standard in accordance with DIN 2501 (installation C)
• for installation "C"	DN25/PN40
• for installation "I"	DN50/PN40
front flanges/blank flange	
• for installation B	DN25/PN 40
• for installation D	Special flange
Wetted parts	
• Measuring tube (1)	Stainless steel
• Connection tubes (2)	Stainless steel
• tank connection flanges (3)	Stainless steel
• Measuring tube flanges (5)	Stainless steel
• Bottom seal flanges (6)	Stainless steel
• Indicator tube (7)	Plexiglas
• Indicator float (9)	Aluminium
• Indicator Scale (10)	Aluminium with Astralon insert
• Measuring float	see table on page 73

Project development

The MENKAR units are manufactured, according to type, in installation lengths of up to 5000 mm; longer installation lengths are supplied in a sectioned design to facilitate the transport. The fitting is carried out via flange connections. The following points should be observed corresponding to the respective operating data and the ambient conditions:

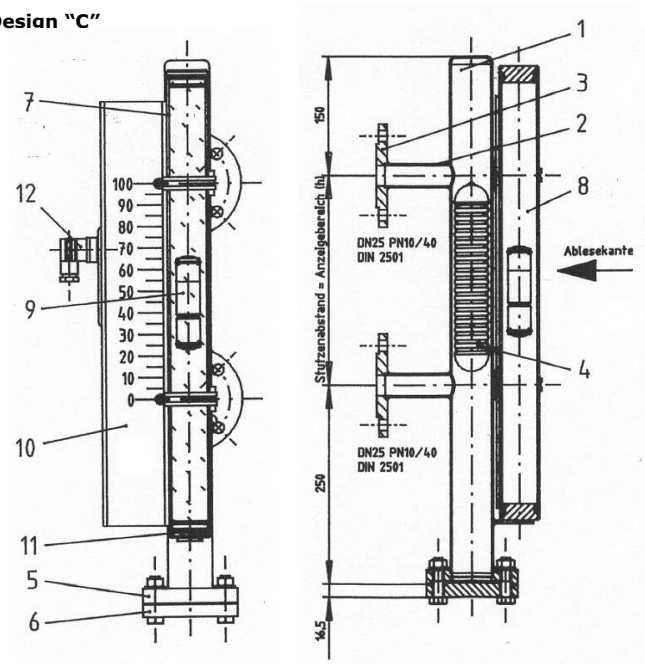
- Installation
- Type and design of unit
- Installation length/measuring range
- Type of scale (%, units of volume or height). A volumetric measuring table must be supplied by users requiring volumetric unit scales. The scales may also be subsequently compiled and retrofitted. If rectangular, cubic or cylindrical vessels with flat or convex/concave bottoms in horizontal or vertical arrangement are to be used, the scale can be calculated in volumetric units by the manufacturer (on reimbursement of the net costs involved). The geometric dimensions of the vessel must be supplied to achieve this purpose.
- Gate valve: The equipment of the connection lines with a gate valve is recommended for cleaning purposes and to facilitate the installation and dismounting of the level indicator without the necessity of interruption of operation.

Supplementary data:

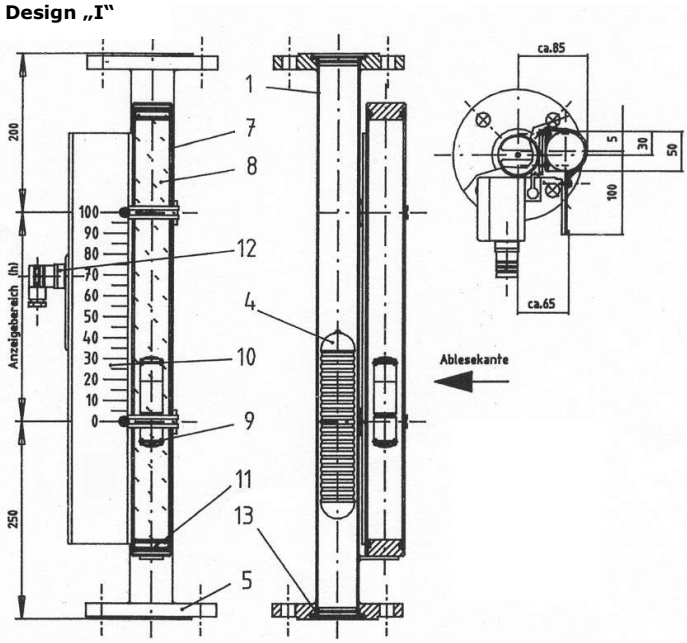
- Type of medium (including density and viscosity)
- Operating pressure and operating temperature
- Nominal width and design of the connection flange
- Nominal width and design of the front and blank flanges, in the case of deviation from the standard
- Gasket material

Design and single parts

Design "C"



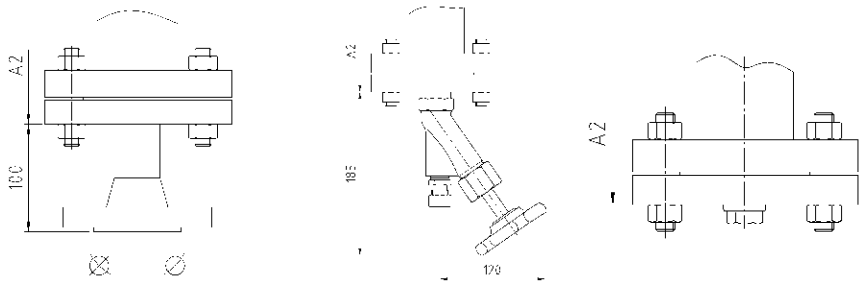
Design „I"



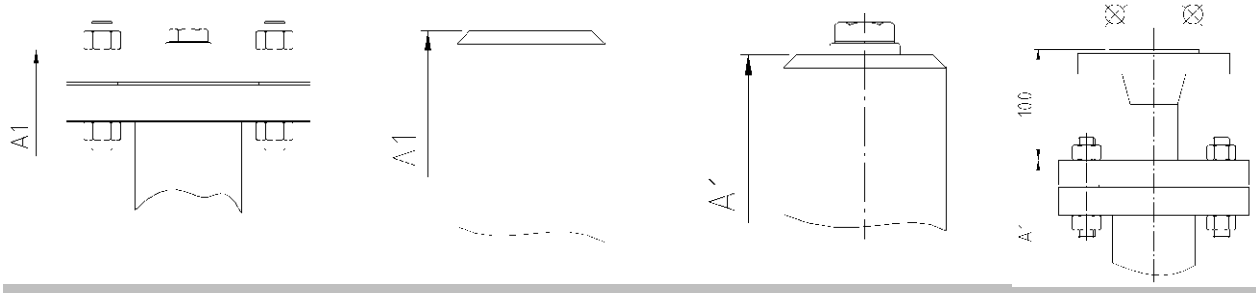
1	Standpipe
2	Connection couplings*
3	Connection flange*
4	Measuring float
5	Front flanges
6	Blank flange*
7	Indicating tube
8	Indicating fluid (not included in standard scope of delivery)
9	Variable area indicator
10	Indicating element
11	Sealing plug
12	Contact
13	Retaining ring (only supplied with design "I")
14	Air bleed valve* (Option)
15	Bleed valve* (Option)

*only supplied with design "C"

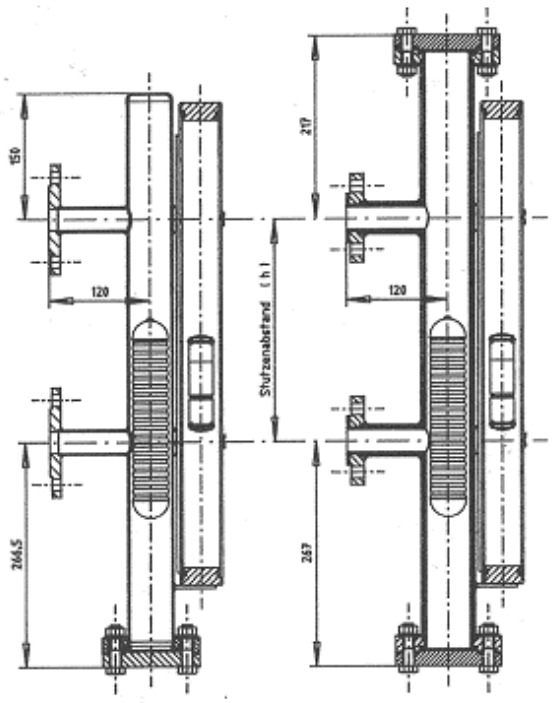
Dimensions drain connection

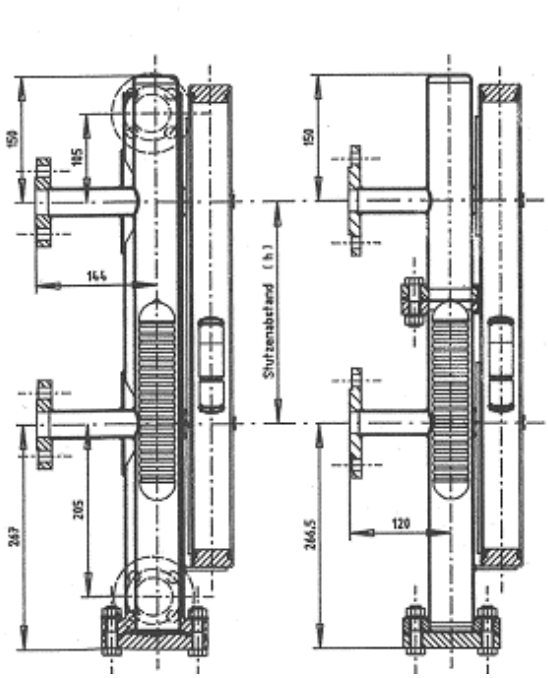


Dimensions ventilation



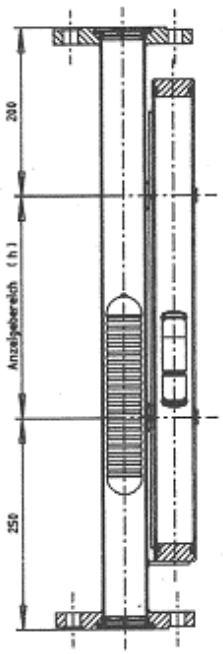
Dimensions: Menkar K 70/KM 70



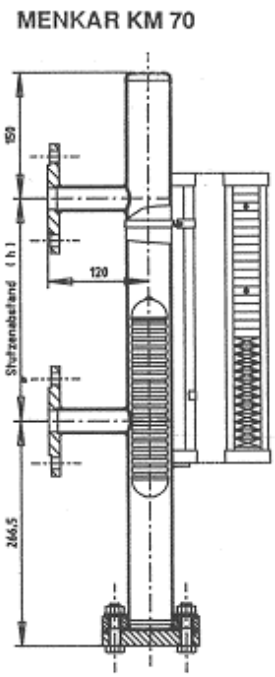


With heating or cooling jacket

With demountable construction



Mounting Form I



With magnet flapper display

Selection chart for measuring floats

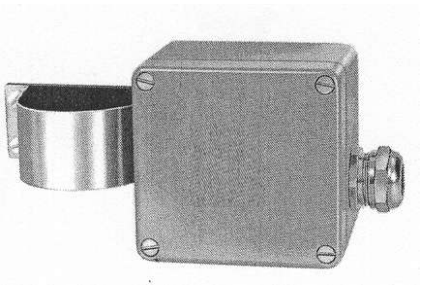
Nr.	Density [kg/dm³]	Material	Pressure max. [bar]	Temperature max. [°C]	Remarks
1A 1B 1C 1D	0.40 – 0.500 0.51 – 0.600 0.61 – 0.700 0.71 – 0.795	Titanium	10	350	
1E 1F 1G	0.51 – 0.600 0.61 – 0.700 0.71 – 0.795	Titanium		350	Pressure relieved**
2 3 4	0.60 – 0.675 0.68 – 0.755 0.76 – 0.835	Titanium	25	350	
5 6 7 8	0.85 – 0.950 0.96 – 1.150 1.16 – 1.295 1.30 – 1.500*	1.4571	25 bar at 150°C 16 bar at 350°C		
6A 7A 8A	1.00 – 1.150 1.16 – 1.295 1.20 – 1.500*	1.4571		350	Pressure relieved****
9 10 11	0.70 – 0.800 0.81 – 0.900 0.91 – 1.000*	Titanium	75	350	
15 16	0.60 – 0.750 0.76 – 1.200	Glass	35	350	without PTFE cladding
17 18	0.76 – 0.840 0.85 – 1.200	Glass	35	220	with PTFE cladding
19 20 21 22	0.85 – 0.950 0.96 – 1.150 1.16 – 1.295 1.30 – 1.200	PVC	6 bar at 60°C 10 bar at 40°C		
23 24 25 26	0.85 – 0.950 0.96 – 1.150 1.16 – 1.295 1.30 – 1.500	PVDF	6 bar at 120°C 10 bar at 80°C		

* When required for higher density operation, the floats can be weighted accordingly.

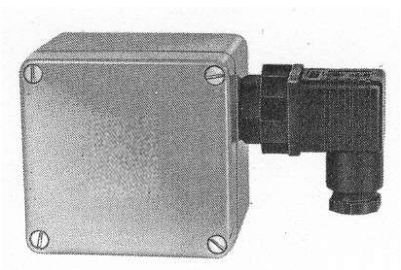
** For the prevention of an accumulation of condensate in the measuring float, application is only recommended with buffer gas pressure over the medium!

Supplementary systems

KA 23 and KA 23i:



KA 33 and KA 33i:



1. Magnetic contact systems

Contacts can be selected with reed contacts and inductive slot initiators.
The reed gas contacts can be used directly as a passive switch in existing electric circuits; the inductive contacts require an isolated switch amplifier.

1.1 Reed contacts

These contacts are integrated in the KA 23, KA 33 models. They are distinguished only by their housing respectively by their cable connection. See tables for technical data.

1.2 Inductive contacts

Slot initiators with control lugs are integrated in the KA 23i and KA 33i models. They are employed separately as switches in the intrinsically safe electric circuit. A floating relay output with a changeover contact is available for the connection to the user electric circuit. See tables for technical data.

Technical Data	KA 23	KA 33 KA 33i
Housing material	Aluminium	
Protection class	IP 65	
Mounting	Clip on standpipe	Clamps on indicating part
Cable connection	PG11	Hirschmann connector
Type of contact	Protective gas changeover contact made of Ag-Pd, potential free	
	KA 23i, KA 33i: inductive	
Contact rating (max.)	AC: 250V eff./1A/50VA; DC: 250V/1A/100W	

2. integral transducer

The transducer uses the variable resistance principle. A row of magnetically operated reed switches from an accumulative resistance when actuated by the magnetically coupled measuring float. The row of switches are housed in an non-magnetic stainless steel tube on the outside of the Menkar measuring tube. The magnetic scanning is 15mm. On request, other magnetic scanning is possible.

The transmitter energises the transducer and provides an isolated 4 – 20 mA output proportional to the tank level.

Ordering data Menkar K 70–76/KM 70–72

order no. 7 M E 5 8 6 2 - _ _ _ _ _ - _ _ _ _

Design							
K70/B one site display	**1 A**						
K71/B one site display and touch sensitve switche(s)	**1 B**						
K72/B one site display and integral transducer 4 - 20 mA	**1 C**						
K72/B integral transducer 4 - 20 mA, without one site display	**1 D**						
K76/B touch sensitve switche(s), without one site display	**2 A**						
K77/B integral transducer 4 - 20 mA, without one site display	**2 B**						
K70/B magnet flapper display	**3 A**						
K71/B magnet flapper display and touch sensitve switche(s)	**3 B**						
K72/B magnet flapper display and integral transducer 4-20 mA	**3 C**						
connection flange							
DN 20 DIN 2501 PN 40		**A**					
DN 25 DIN 2501 PN 40		**B**					
DN 50 DIN 2501 PN 40		**C**					
speciale connection flange		**Z**					
drain connection							
drain plug			**1**				
drain valve			**2**				
drain flange DN 15 DIN 2501 PN 40			**3**				
drain flange DN 20 DIN 2501 PN 40			**4**				
drain flange DN 25 DIN 2501 PN 40			**5**				
speciale drain connection			**9**				
ventilation							
cap				**1**			
cap with screw plug				**2**			
flange with screw plug				**3**			
flange with ventilation falnge DN 15 PN 40				**4**			
flange with ventilation falnge DN 20 PN 40				**5**			
flange with ventilation falnge DN 25 PN 40				**6**			
speciale ventilation				**9**			
Measuring floats							
in Titanium density 0,40 - 0,500 kg/ dm³					**1 A**		
in Titanium density 0,51 - 0,600 kg/ dm³					**1 B**		
in Titanium density 0,61 - 0,700 kg/ dm³					**1 C**		
in Titanium density 0,71 - 0,795 kg/ dm³					**1 D**		
in Titanium density 0,51 - 0,600 kg/ dm³ pressure relieved					**1 E**		
in Titanium density 0,61 - 0,700 kg/ dm³ pressure relieved					**1 F**		
in Titanium density 0,71 - 0,795 kg/ dm³ pressure relieved					**1 G**		
in Titanium density 0,60 - 0,675 kg/ dm³					**0 2**		
in Titanium density 0,68 - 0,755 kg/ dm³					**0 3**		
in Titanium density 0,76 - 0,835 kg/ dm³					**0 4**		
in W.Nr. 1.4571 density 0,85 - 0,950 kg/ dm³					**0 5**		
in W.Nr. 1.4571 density 0,96 - 1,150 kg/ dm³					**0 6**		
in W.Nr. 1.4571 density 1,16 - 1,295 kg/ dm³					**0 7**		
in W.Nr. 1.4571 density 1,20 - 1,500 kg/ dm³					**0 8**		
in W.Nr. 1.4571 density 1,00 - 1,150 kg/ dm³ pressure relieved					**6 A**		
in W.Nr. 1.4571 density 1,16 - 1,295 kg/ dm³ pressure relieved					**7 A**		
in W.Nr. 1.4571 density 1,20 - 1,500 kg/ dm³ pressure relieved					**8 A**		
in Titanium density 0,70 - 0,800 kg/ dm³					**0 0**		
in Titanium density 0,81 - 0,900 kg/ dm³					**1 0**		
in Titanium density 0,91 - 0,795 kg/ dm³					**1 1**		
in Glas density 0,60 - 0,750 kg/ dm³					**1 5**		
in Glas density 0,76 - 0,1,20 kg/ dm³					**1 6**		
in Glas density 0,60 - 0,840 kg/ dm³ with PTFE cladding					**1 7**		
in Glas density 0,84 - 0,1,20 kg/ dm³ with PTFE cladding					**1 8**		
in PVC density 0,85 - 0,950 kg/ dm³					**1 9**		
in PVC density 0,96 - 1,150 kg/ dm³					**2 0**		
in PVC density 1,16 - 1,295 kg/ dm³					**2 1**		
in PVC density 1,20 - 1,500 kg/ dm³					**2 2**		
in PVDF density 0,85 - 0,950 kg/ dm³					**2 3**		
in PVDF für density 0,96 - 1,150 kg/ dm³					**2 4**		
in PVDF für density 1,16 - 1,295 kg/ dm³					**2 5**		
in PVDF für density 1,20 - 1,500 kg/ dm³					**2 6**		
Seal							
KLINGER SIL C 4500						**A**	
Viton						**B**	
contact function							
without contact							**0**
change over contact K 23							**1**
contact K 33							**2**
contact K 33i							**3**
center distance in mm:							_ _ _ _ _

Level indicator
Menkar KK 80–KK 81

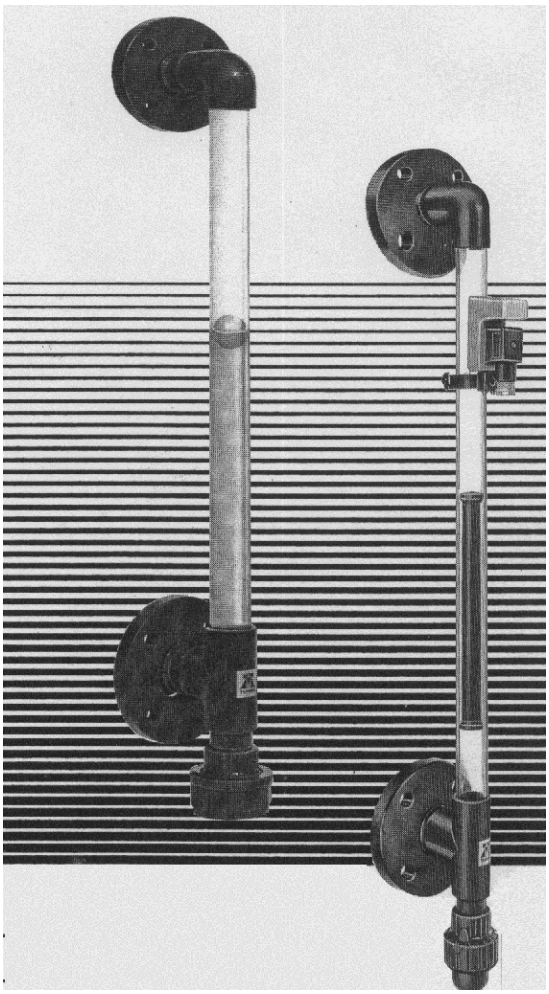


Fig.1 Level indicator MENKAR KK 80–KK 81

Application

Continuous measuring, display and monitoring of levels of fluid (density of medium from 1 kg/l) in open and closed vessels.
The MENKAR KK plastic designs are employed especially in water treatment plants, in vessels containing caustic materials from purification plants and for completely desalinated water and boiler feed water.
The units can be equipped with magnet activated solenoid operated touch sensitive switches for control processes (acustic or optical signals, motor and valve controls or similar devices).

Operating note

The operator of these measuring units is responsible for the suitability, proper use and corrosion resistance of the used materials with regard to the measuring material. In particular. it must be ensured that the materials selected for the parts of the measuring unit coming into contact with the medium are suitable for the process media to be used.
The unit may only be used within the pressure and voltage limits specified in the operating instructions. Before replacing the measuring tubes, check that the unit is free from hazardous media and pressures.

Design and operation

The MENKAR level indicators operate according to the system of communicating tubes and the float principle.
The medium leaves the vessel and enters the standpipe through the lower couplings. The measuring float incorporated in the standpipe indicates the actual fluid level in the vessel.

The float also functions as an indicating float. A float with an integrated magnet system is required (MENKAR KK 81 and KK 81) for the activation of the contacts.

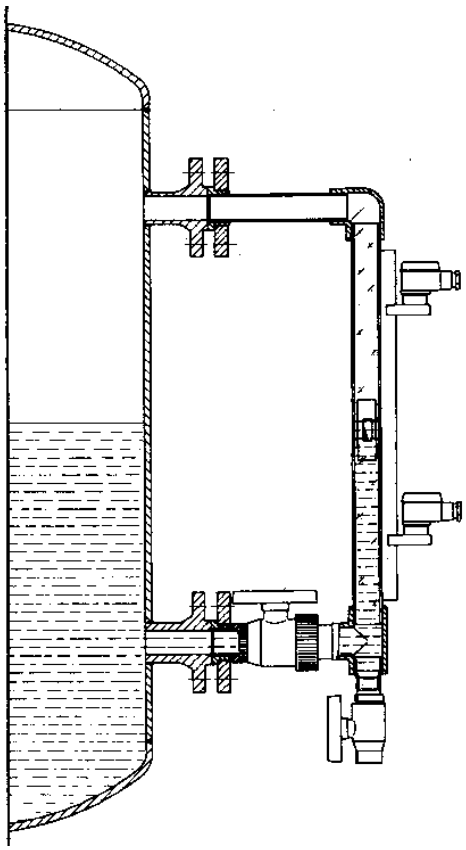


Fig. 2 Design and operation MENKAR KK 80–KK 81

Technical data

Coupling clearance	min. 300 mm max. 2000 mm
Connections	Swivel flange DN25 (PN10/16)

Pressure/temperature limits

in accordance with DIN 8062		
Media	Ts [°C]	PS [bar]
For use with water and non aggressive fluids	20	16
	40	10
	60	2,5
For use with aggressive fluids	20	10
	40	4
	60	1

Special features

- Low price plastic design
- Simple assembly
- Maintenance free
- Good readability: even at greater distances
- User defined number and arrangement of contacts, only restricted by dimensions of contact housing.

Designs

Type selection

MENKAR KK 80:	indicating only, without scale
MENKAR KK 80/A:	with display scale (%-division)
MENKAR KK 81:	Indicating with adjustable touch sensitive switch(es)

Type MENKAR KK 80

Design 1	
Standpipe:	PVC, transparent (with evacuation screw)
Measuring/display float:	plastic ball (polypropylene)
Design 2	as in design 1, but with lower standpipe with incorporated bleed valve
Design 3:	as in design 2, but with additional lower connection couplings with gate valve
Design 4:	as in design 3, but with additional upper connection couplings with gate valve

Type MENKAR KK 80/A

As in MENKAR KK 80 (design 1–4), but with additional indicating scale made of Astralon (%-division)

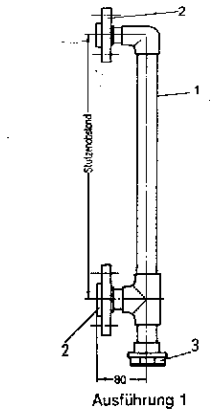
Type MENKAR KK 81

As in MENKAR KK 80 (design 1–4), but with additional touch sensitive switch(es Type K 18

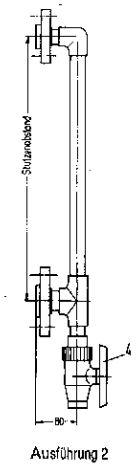
Measuring/indicating float KK 81:

PVC (rod shaped) with integrated magnet system for touch sensitive operation

Design 1- 4 (MENKAR KK 80)

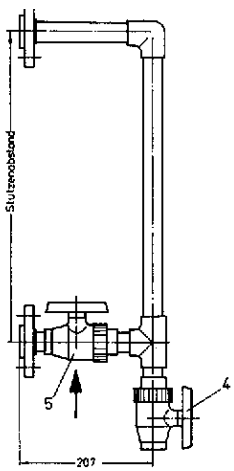


Design 1

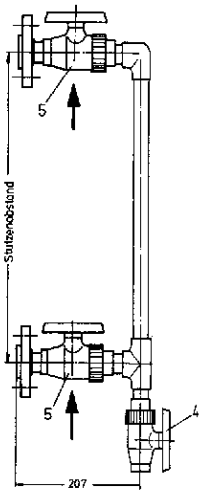


Design 2

1 standpipe PVC transparent
2 loose flange
3 evacuation screw
4 bleed valve
5 gate valve

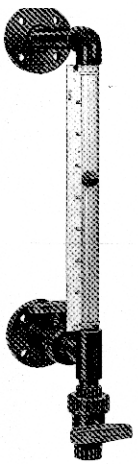


Design 3



Design 4

MENKAR KK 80/A
example Design 3



Measuring/ display float

Ball float for
MENKAR KK80 and
MENKAR KK80/A

float with integrated
magnet system for
MENKAR KK81

Touch sensitive switch Type K 18

The bistable magnetic contact system K 18 is employed to indicate the position of the magnet float in the standpipe. It incorporates a gas reed contact which is activated via the magnetic field of the float. The K 18 is sensitive to excessively high current load (max. 500mA) due to the low spring tension of the contact reeds. High self induction voltage can be generated when inductive switchgears, for example relays, are switched off. Therefore precautions are recommended to guarantee a long service life (see separate data sheet magnetic contact system K 18).

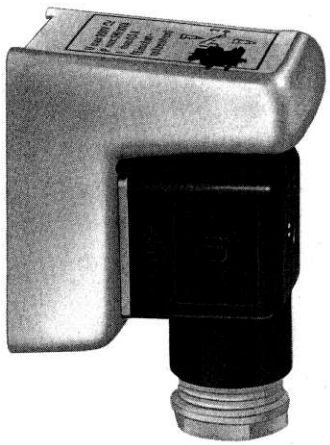


Fig. 3 Touch sensitive switch K 18

The K 18 can be supplied in 2 versions:

- **Type K 18/A**
  opens on overranging of the limit
- **Type K 18/B**
  closes on overranging of the limit

Warning!

The maximum switching capacity and the maximum admissible peak inrush current may not be exceeded, as this induces a welding effect on the contact reeds causing them to adhere to each other.
During the initial commissioning process, move the float completely past the contact to permit polarisation.

Techn. data Touch sensitive switch Type K 18

Contact material	Rhodium with inactive protective gas
Max. switching capacity	10W, 12 VA
Max. switching current	220V direct or alternating voltage
Contact resistance	0,1Ω
Contact insulation resistance	10^{11}Ω
Contact close time	2ms
Contact open time	0.07ms
Switching frequency	2000/sec
Contact duration of bounce	0.5ms
Temperature range	–40°C to +50°C
Housing material	Plastic
Terminal connection	Standard terminal DIN 43650
Protection class	IP65
Max. peak inrush current	0.5A
Max. starting current	
220V =	22mA
110V =	45mA
24V	0.5A
10V ~	0.5A

Ordering data

MENKAR KK 80 - KK 81
level indicator in plastic

order no.

7ME5861- ▢▢ **A** ▢▢ **- 0AA0**

Design	
• KK 80 with evacuation srew	**1A**
• KK 80 with incorporated bleed valve	**2A**
• KK 80 with incorporated bleed valve and additional lower connection couplings with gate valve	**3A**
• KK 80 with incorporated bleed valve and additional both connection couplings with gate valve	**4A**
• KK 80/A with evacuation srew	**1B**
• KK 80/A with incorporated bleed valve	**2B**
• KK 80/A with incorporated bleed valve and additional lower connection couplings with gate valve	**3B**
• KK 80/A with incorporated bleed valve and additional both connection couplings with gate valve	**4B**
• KK 81 with evacuation srew	**1C**
• KK 81 with incorporated bleed valve	**2C**
• KK 81 with incorporated bleed valve and additional lower connection couplings with gate valve	**3C**
• KK 81 with incorporated bleed valve and additional both connection couplings with gate valve	**4C**

Connection	
• DN25 DIN2501 PN10	**1**
• 1" ANSI B16.5 150 RF	**2**
• special connection	**9**

cantact function	
• without contact	**0**
• Contact K18/A (closes when limit is fallen below)	**1**
• Contact K18/B (closes when limit is exceeded)	**2**
• contact K17/A and K17/B	**3**

Further designs Please add "**-Z**" to Order No. and specify Order code(s)	**order no.**
center distance in mm	▢▢▢▢
Measured medium	Y01

General Terms of Sale and Delivery

I. Scope of delivery duty
1. Our General Terms of Sale and Delivery apply to our offers and deliveries as far as they are not otherwise clearly stated or excluded in our offer. Our offers are valid for a period of 3 month calculated from the date of our offer as far as not otherwise indicated.
2. We assume that the placed order is accepted with the receipt of our written confirmation of order. Electronic, telephonic or verbal supplements must be confirmed in writing to be effective. The prices in our offer are only binding after the delivery of our confirmation of order. We reserve the right to adjust the prices after the submission of our offer.
3. Documents like illustrations, drawings and data lists belonging to the offer or the confirmation of order show only reference values. The indicated measuring range is kept by us as far as possible. We particularly reserve the right to deviations.

II. Price
Our prices do not include sales tax (VAT). The prices are valid for deliveries ex works excluding packing and freight. All spare part or single part orders with an invoice amount below € 50,- net are increased to this minimum invoice amount. For general modifications of the production costs, price adjustments are reserved for delivery times over 4 months as far as not otherwise agreed on, i.e. with a price escalator clause. Deliveries to foreign countries take place ex works Aachen. The freight costs are charged DDU except of other agreements.

III. Retention of title
1. The supplied goods remain our property until complete payment has been effected for all demands. This also applies where particular or all claims were entered to a current invoice and where the balance is drawn and accepted. The retention of title is then extended to the respective balance.
2. The customer is entitled to sell the goods supplied under retention of title to a third party in the normal course of business. Other orders, in particular mortgages or safety transfer are not permitted.
3. Already now the customer hands over all demands to us which will accrue for him from the resale against his buyers or against third parties independent of whether the product is resold without processing or after it. It is forbidden to the customer to make agreements with his buyers which exclude or impair our rights somehow. The customer particularly may not make any agreement that destroys or impairs the assignment in advance of the demand to us. Even after the assignment the customer is authorized to collect the demands handed over to us. However, our authorization to collect the demands personally remains untouched of this as long as the customer pays duly. We can demand that the customer announces us the assigned demands and their debtors, that he gives all details required for a collection, that he hands over the necessary documents and that he informs his debtors about the assignment.
4. Provided that the product delivered under reservation is resold with other goods which do not belong to us, the demand of the customer against his buyer is seen as assigned to the amount of the delivery price agreed on between us and the customer (including value added tax).
5. Processing or transformation of reserved goods by the customer is always made for us. If the reserved product is processed or mixed inseparably with other objects which do not belong to us, we receive a joint ownership of the new product proportional to the value of the reserved product and related to the legal relationship between us and the customer, to the other processed or mixed objects at the time of the processing or mixing. If the goods delivered under reservation are connected with other movable objects to a uniform thing or mixed inseparably and if the other thing can be regarded as main thing, we make the agreement that the customer assigns his joint ownership to us in case that the main thing belongs to him. The customer keeps the property or the joint ownership for us. The same as for the reserved product can be applied to the thing arising from processing, mixing or connection.
6. We are obliged to release the guarantees entitled to us in this respect as their value exceeds the demands to be guaranteed for more than 10%.

IV. Terms of payment
1. For orders with a value exceeding 25.000,- €, a third of the amount must be paid in advance with receipt of the confirmation of order. The second third is due when the goods are ready for despatch. The remaining sum of the total amount must be paid at the latest 30 days on receipt of our invoice cash purely net.
2. The payments must be transferred to our indicated bank account cash or non-cash within 30 days after invoice date without any deduction.
3. Cheques and bills of exchange are only accepted after special agreements and only as payment but not as fulfilment regarding all collection and discount expenses. Passing on and prolongation are not considered as fulfilment.
4. In case of late payment we are entitled - after sending a reminder and considering the extension - to charge the costs arising for demands of a bank credit without special proof, at least however 2% over the respective discount rate of the state central bank.
5. The customer can only reckon up against our claims or assert a lien if the counter demand of the customer is undisputed or a legally valid title exists.
6. Partial deliveries are regarded as closed deliveries. Their invoices are subject to the above mentioned terms of payment.

V. Delivery period
Indicated delivery times are valid ex works on receipt of all documents. They are kept if shipments are ready for despatch meeting the deadline and if the customer was informed about it. Partial deliveries are permitted. The delivery periods are kept if possible without paying for the consequences of possible delays. Unforeseen events or acts of God , e.g. breakdowns, committee development, shortage of staff, war, mobilization, elementary events in our factory or of our sub-supplier, official interventions or regulations, difficulties during obtaining of raw material etc. prolong the delivery period appropriately or release us from the whole order - after agreement - provided that these events have a considerable effect on the fulfilment of the whole contract within the period stipulated or on some parts of the contract due soon. In important cases, the customer is informed as soon as possible after detection about beginning and end of such modifications by the factory management. If the customer cancels the current contract, the seller is allowed to demand a replacement of the actual damage or effort or at least 10% of the order value as cancellation charge alternatively insofar as the buyer does not prove a little damage. This regulation does not exclude a further reaching compensation demand on the part of the seller in case of non-compliance after delivery.

VI. Danger transition
The danger is passed at the latest to the customer with the dispatch of the parts to be delivered. If the dispatch is delayed by a behaviour of the customer, then the danger is passed to the customer with the communication of the dispatch readiness.

VII. Packing
The dispatch is carried out in the known and accepted packing which is calculated separately and not taken back. A special packing is only used on explicit request of the customer if the additional costs arising from it are reimbursed. Complaints about inadequate packing and their consequences only affect us if the type of packing did not comply with special regulations of the authority or the customer and which can be explained by their non-observance.

VIII. Guarantee
1. For the parts to be delivered/the performance we are liable for a period of 12 months after the time of the danger transition for the use of the materials indicated in our confirmation of order and for the expert execution, particularly for faultless parts without defects and for the existence of assured characteristics. Our guarantee obligation presupposes that the customer has met in writing the examination and rebuke obligations being incumbent upon him in accordance with §§ 377, 378 HGB (code of ommerce). Customer's complaints must always be submitted specified in writing.
2. In case of a well-founded complaint, we oblige ourselves to remove the defects by exchange or by rework of the parts complained about. We will pay the arising charges for an improvement or an exchange.
3. If we are not willing or not able for the improvement/substitute delivery within the bounds of removing the defect, particularly if the improvement/substitute delivery is delayed over adequate periods set to us, the customer is authorized to withdraw from the contract or to assert on reduction excluding further reaching claims. This also applies if we culpably break the obligation being incumbent upon us to remove the defects.
4. Damage compensation entitlements independent of their legal justification are excluded. However, this is not valid if there exists a written characteristic assurance which extends on the risk of consequent damages of a defect. Insofar as a property damage results for the customer as consequence of a lack of an assured characteristic, our compensation liability is restricted to the respective compensation delivery of our product personal liability insurers. Further reaching damage compensation complaints are only entitled to the customer if the damage was caused by us, our staff, representatives or fulfilment assistants intentionally or roughly negligent.
5. In principle, a defect elimination in the bounds of our guarantee obligation is only made in our factory after returning the part complained about post free or carriage and duty paid. The costs of the return including the costs of the substitute delivery must be paid by the customer. As far as the customer requests engineers, fitters, mechanics or other employees of our company due to suspected defects, the arising costs are charged to the customer as far as the customer's complaint proves to be not justifiable.

IX. Liability
1. Further reaching liabilities than those regulated under point VIII does not consist in the contract relationship between the customer and us and to be more precise without consideration for the respective legal basis.
2. Insofar as the liability opposite to us is excluded or limited, this is also valid with regard to the personal liability of our employees/fulfilment assistants.
3. Customer claims asserted against us outside of the guarantee are in lapse within 6 months calculated from the moment of danger transition/buying.

X. Right of withdrawal of the supplier
1. We reserve the right to withdraw from the contract without compensation obligation in case of unforeseen events as described under point V of the delivery.
2. If required, we are authorized to demand certainty for the service in return or to withdraw from the contract crediting the made charges even after conclusion of the sales contract.

XI. Place of jurisdiction
1. Place of fulfilment is Aachen, court jurisdiction for both parties is Aachen. The agreement on the court jurisdiction is only valid for contract parties who are not merchants or who belong to the tradesmen described in § 4 HGB (code of commerce) if claims are asserted in the way of the dunning proceeding (§§ 688 ZO).
2. The contract and its interpretation are subject to the law of the Federal Republic of Germany.

XII. Transferability and liability of the contract
1. Customer and supplier may transfer their contract rights to third parties only by mutual consent.
2. The contract is binding even with a legal ineffectiveness of single points of its conditions.
3. Contrary terms of delivery and payment are not accepted insofar as they are not noted down particularly in writing.

Version: 12/2003