



Figure 1 TM Trogflux variable area meter

Application

The TM Trogflux 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 lbs/cu.ft). The scales must be recalculated for all other media depending on the physical characteristics.

Design and Operation

The main components of the TM 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 rotameter 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 rotameters 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 Data TM Trogflux

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 Polyamid flow tube	max. +60 °C (140 °F) with water +50 °C (122 °F)
• for Polysulfon flow tube	max. +90 °C (196 °F)
Medium conditions	
• Accuracy	Class 2.5 (according to VDE/VDI 3513, sheet 2)
• Measuring range	
- for liquids	12.5 l/h to 25 m ³ /h / 0.0055 to 110 USGpm
- for gases	200 l/h to 430 m ³ /h / 0.88 to 1,893 USGpm
A special scale must be provided for liquids with a density other than 1 kg/l / 62.43 lbs/cu.ft and all gases.	
• Dim. for measured variable	l/h (up to flow tube D2500) m ³ /h (flow tube E4000 and above)
Design	
Connections	PVC-adhesive bushing, female thread, cast iron
Material	
• Flow tube	Polyamid, Polysulfon
• 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 red	Stainless steel Mat.-No. 1.4571 / 316 Ti (option with flow tubes C 125 to D 2500)
• Gasket	Perbunan (with Polyamid flow tube), Viton (with polysulfone flow tube), EPDM (for potable water plants)
• Limit	Polysulfon
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 Data Contacts	
Designation	K18 A, K18 B
Housing/plug	PP/PA 6
Contact material	Rhodium
Degree of protection	IP65
Ambient temperature	-20 up to +80 °C / -4 up 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

Connection		Flow tube	Dynamics	Max. measuring range for the selected floats									
PVC adhesive bushing (mm)	Female thread			Stainless steel Mat.-No.		Stainless steel with magnet, Mat.-No.		PVC weighted		PVC with magnet weighted		Viscosity-compensated stainless steel Mat.-No.	
				1.4305	303	1.4571	316Ti					1.4571	316Ti
				l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)
20	(G ^{1/4}), (G ^{3/8}), G ^{1/2}	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	(G ^{1/2}), (G ^{3/4}), G1	D 650 ¹⁾	1:10	650	(2.86)	600	(2.64)	500	(2.20)	450	(1.98)	400*	(1.76)*
			1:10	600	(2.64)	550	(2.42)	450	(1.98)	400	(1.76)	350*	(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	(G ^{1/4}), (G ^{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*	(28.0)*	5,000	(22.0)	5,000	(22.0)	4,000*	(17.6)*
		F 10000	1:10	10,000*	(44.0)*	9,500*	(42.0)*	7,500	(33.0)	7,500	(33.0)	5,500*	(24.2)*
		G 16000	1:4	16,000 ³⁾	(70.0) ³⁾	16,000*	(70.0)*	12,500	(55.0)	12,500	(55.0)	-	-
		H 20000	1:3	20,000 ³⁾	(88.0) ³⁾	19,000*	(84.0)*	-	-	-	-	-	-
		J 25000	1:3	25,000 ³⁾	(110.0) ³⁾	25,000*	(106.0)*	-	-	-	-	-	-

Standard measuring range for liquid ($\rho = 1 \text{ kg/l}$ (62,43 lbs/cu.ft), viscosity 1 mPa·s (1 cp) (connections in brackets are non-standard))

Measuring Ranges for Air

Connection		Flow tube	Dynamics	Max. measuring range for the selected floats							
PVC adhesive bushing (mm)	Female thread			Aluminium Mat.-No. 3.1645		Aluminium with magnet Mat.-No. 3.1645		PVC non-weighted		PVC with magnet weighted	
				l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)
				20	(G ^{1/4}), (G ^{3/8}), G ^{1/2}	C 125	1:10	2,000	(8.81)	2,500	(11)
C 315	1:10	5,000	(22)			6,400	(28)	3,400	(15)	6,000	(26)
32	(G ^{1/2}), (G ^{3/4}), G1	D 650 ¹⁾	1:10	TS 10,000	(TS 44)	TS 12,000	(TS 53)	TS 7000	(TS 31)	TS 10,000	(TS 44)
			1:10	PS 9000	(PS 39.6)	PS 10,500	(PS 46)	PS 6,500	(PS 28.6)	PS 9,000	(PS 39.6)
		D 1000	1:10	16,000	(70)	20,000	(88)	11,000	(48)	16,000	(70)
		D 1600	1:10	28,000	(123)	32,000	(141)	18,000	(79)	25,000	(110)
		D 2500	1:10	40,000	(176)	50,000	(220)	28,000	(123)	40,000	(176)
63	(G ^{1/4}), (G ^{1/2}), G2	E 4000	1:10	64,000*	(282)*	75,000*	(330)*	45,000	(198)	60,000	(264)
		E 6500	1:10	100,000*	(440)*	125,000*	(550)*	75,000	(330)	100,000	(440)
		F 10000	1:10	160,000*	(704)*	180,000*	(793)*	120,000	(528)	160,000	(704)
		G 16000	1:4	280,000*	(1233)*	300,000*	(1321)*	190,000*	(837)*	-	-
		H 20000	1:3	350,000*	(1541)*	400,000*	(1761)*	240,000*	(1057)*	-	-
		J 25000	1:3	430,000*	(1893)*	480,000*	(2113)*	300,000*	(1321)*	-	-

Standard measuring range for air ($p_{abs} = 1,013 \text{ bar}$ (14,69 psi), at $T=0^\circ\text{C}$ (32°F)) (connections in brackets are non-standard))

Pressure Losses

Medium	Liquid			Air	
	Flow tube	Float		Aluminium float	
		Mat.-Nr. 1.4305	Mat.-Nr. 303	Mat.-Nr. 3.1645	Mat.-Nr. 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	(0.742)	23	(0.334)	
H 20000	65	(0.945)	31	(0.451)	
J 25000	91	(1.323)	43	(0.625)	

* Guided float

¹⁾ With Polyamid flow tube

²⁾ With Polysulfon flow tube

³⁾ Float, flow tube G, H and J: Mat.-No.. 1.4571/316Ti

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 adhesive bushing mm (inches)	Bushing female thread	with female thread	with PVC adhesive bushing		approx. kg (lbs)
		A ±4 mm (0,16 inch)	A ±4 (mm) (0,16 inch)	B ±4 (mm) (0,16inch)	
d					
20 (0.79)	G½	344 (13.54)	340 (13.39)		0.4 (0.88)
32 (1.26)	G1	353 (13.90)	352 (13.86)	36 (12.05)	0.7 (1.54)
63 (2.49)	G2	372 (14.65)	382 (15.04)		2.2 (4.85)

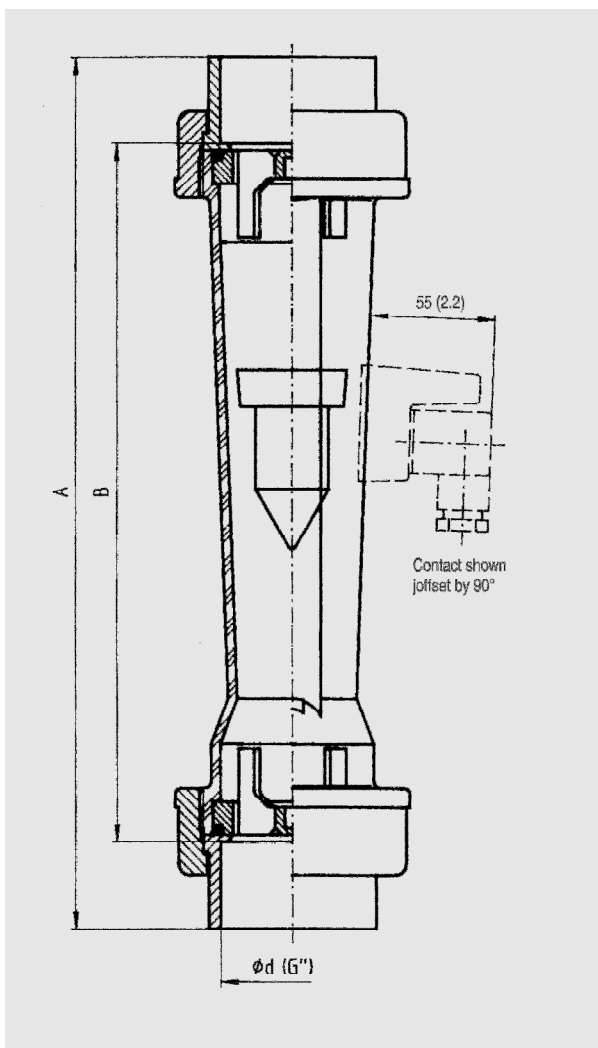


Figure 2 TM Trogflux, dimensions in mm (inches)

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

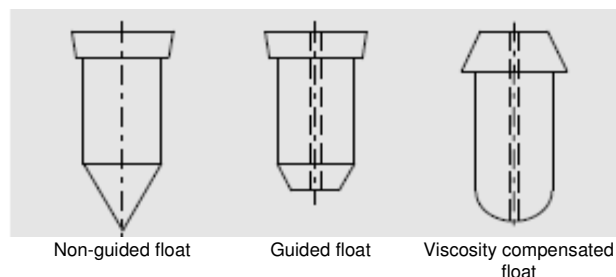


Figure 3 Float versions

Pressure and Temperature Limits

t [°C (°F)]	Polyamid	Polysulfon
	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)	10.0 (145)
	40 (104)	10.0 (145)
	60 (140)	2.5 (36)
With corrosive liquids	20 (68)	10.0 (145)
	40 (104)	4.0 (58)
	60 (140)	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 flow meter meets the requirements of the PED 97/23/EG, article 3, paragraph 3. The most hazardous allowable media are gases of fluid group 2.