



Figure 1 TM Intra flap flow meter for transparent liquids



Figure 2 TM Prima flap flow meter for opaque liquids

Application

The TM Intra/ TM Prima flap flow meter 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 TM 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).

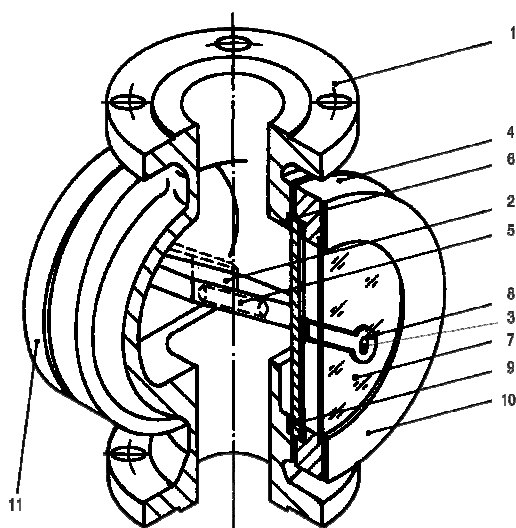
Design and Mode of Operation (Figure3)

The TM Intra / Prima 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 m³/h, and can be calculated for an application-specific medium and operating pressure/temperature if the density differs from 1 kg/l (62.43 lbs/cu.ft). Special scales are available at extra charge.

An inductive contact is triggered by a contact lug mounted on the pointer.



- | | |
|------------------------|--|
| 1 Fitting | 7 Plexiglass or glass pane ¹⁾ |
| 2 Measuring flap | 8 Pointer ¹⁾ |
| 3 Flap axis | 9 Scale pane ^{1,2)} |
| 4 Pressure ring | 10 Front ring ¹⁾ |
| 5 Magnet ¹⁾ | 11 Dummy flange |
| 6 Gasket | |

- ¹⁾ Only with SITRANS FI Prima.
²⁾ With Intra: glass pane.

Figure 3 flap flow meter, design

Note of Application

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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. 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 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. The flow meter meets the requirements of the PED 97/23/EG, article 3, paragraph 3. The most hazardous allowable media are liquids of fluid group 1.

Technical Data

Measuring principle	Flap principle
Input	
Measuring range	see table on page 4
Pressure rating	connection PN 10 to 16 permissible operating pressure 8 to 16 bar / 116 - 232 psi 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
• Gasket: Perbunan, scale plane: hard glass	90 °C / 194 °F
• Gasket: Viton, scale plane: borosilicate glass	150 °C / 302 °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	1.0 to 5.0
>13 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 ANSI B 16.5 RF 150 lbs/sq.in
Material	
• Fitting	EN-GJL-250 (GG25), EN-GJL-250 (GG25) rubber coated 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, paragraph 3 (sound engineering practice SEP)

Technical Data of Contacts

TM Prima	
Switching principle	Inductive contact, single contact supply by switching device (relays)
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) or -20 to +60 °C (-4 to 140 °F) with Ex-protection
Ex approval	Ex ia IIC T6

Installation and Operating Instructions

The main information for installation and startup is listed below.

Installation

The flow 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 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 flow meter 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 flow meter.

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 flow meter 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 flow meter is taken apart.

Versions

TM Prima

Version	Type A	Type C	Type D
Fitting		EN-GJL-250 (GG 25) rubber coated	Stainless steel mat. No. 1.4581
Pressure ring	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), depending 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	1½" to 6" : 232 psi	1 to 6" : 232 psi

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

TM 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	140 °C (284 °F) dependant on gasket and scale pane			
max. operating pressure	DN 25 : 16 bar		DN 40 to 50 : 10 bar	DN 25 : 16 bar
Connection DIN 2501, PN 10 to 16	DN 40 to 50 : 10 bar DN 65 to 150 : 8 bar		DN 65 to 150 : 8 bar	DN 40 to 50 : 10 bar DN 65 to 150 : 8 bar
ANSI B 16.5 RF	1" : 232 psi		1½ to 2" : 145 psi	1" : 232 psi
150 lbs/sq. inch	1½ to 2" : 145 psi 2½ to 6" : 116 psi		2½ to 6" : 116 psi	1½ to 2" : 145 psi 2½ to 6" : 116 psi

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Standard designs for clear and transparent liquids

Measuring Ranges and Pressure Losses

Connection DIN 2501	Measuring ranges in m³/h for the selected flow directions for liquids with density $\rho = 1 \pm 0,05$ 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	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 / horizontal flows

Measuring Ranges and Pressure Losses

Connection ANSI B16.5 RF	Measuring ranges in USgpm for the selected flow directions for liquids with density $\rho = 62,43 \text{ lbs/cu.ft} \pm 3,12 \text{ lbs/cu.ft}$ (pressure loss in psi shown in brackets)								
inch	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		
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)	-		
1½"	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)		
2½"	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 / horizontal flows

Dimensions, Weights

Flange connection (to DIN 2501, PN 16)	Dimension in mm (inches) with attached contact						Flange DIN	Max. pressure		Approx. weight			
	Prima		Intra					Prima	Intra	Prima		Intra	
DN (inch)	A	B	B	C	E	D	bar (psi)	bar (psi)	approx. kg (lb)		approx. kg (lb)		
25 (1")	160 (6.30)	136 (5.32)	127 (5.00)	107 (4.21)	68 (2.68)	115 (4.53)	16 (232)	16 (232)	6.0 (13.22)	5.5 (12.12)			
40 (1½")	200 (7.87)	157 (6.18)	147 (5.79)	140 (5.51)	94 (3.70)	150 (5.91)	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 (6.50)			15.5 (34.17)	14.0 (30.86)			
65 (2½")	290 (11.42)	192 (7.56)	194 (7.64)	210 (8.27)	144 (5.67)	185 (7.28)			17.0 (59.52)	20.0 (44.09)			
80 (3")	310 (12.20)	217 (8.54)	240 (9.45)	235 (9.25)	170 (6.69)	200 (7.87)	16 (232)	8 (116)	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 (8.66)			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 (9.84)			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 (11.22)							

TM Prima / TM Intra, dimensions and weights

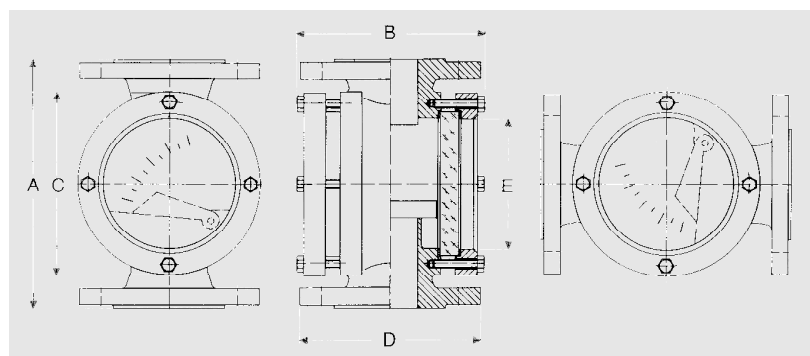


Figure 4 TM Intra / TM Prima, dimensions