

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 ±2% 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).

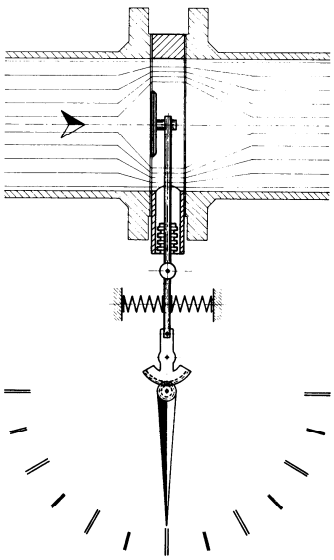


Fig.2 F I Gardex, design

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.

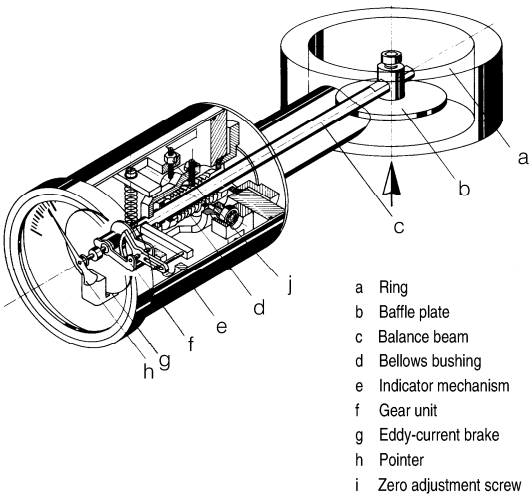
Connection and installation instructions

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/EG, 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 1
Design and mode of operation	See page 1
Measuring principle	Baffle plate
Input	
Measuring range	See table on page 4
• For liquids	4 to 1.350 m³/h / 17,6 to 5942,8 USgpm
• For gases	120 to 40.833 m³/h / 70,62 to 24029,06 scfm
Dynamic range	1 : 5
Dimension of measured variable	m³/h
Max. permissible pressure	
• DN 25 to DN 400 (1 to 16 inch) Option: ANSI B 16.5 Option: PN16 / PN25	25 bar (362,6 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 16"	At least 10 D (bei v < 2,5 m/s (8,2 ft/s)), otherwise 20 D
Medium conditions	
• Accuracy	± 2 % 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 4
Degree of protection (indicator unit)	
• Standard design	IP65
• Version with contact/remote transmitter	IP54
Weight	See Table on page 4
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

Measuring principle	**Rotation angle transmitter**
Connection	Rectangular connector 7-pin
Operating voltage U_B	DC 12 - 36V
Power consumption	< 0.2 W (without load)
Current output I_A	4..20 mA
Load (at U_B 24 V)	max. 300Ω
Ambient temperature	-20 to +70°C
Ex approval	None
Remark	To comply with EN 50082-2 (EMC), a screened cable must be used which is earthed at one end

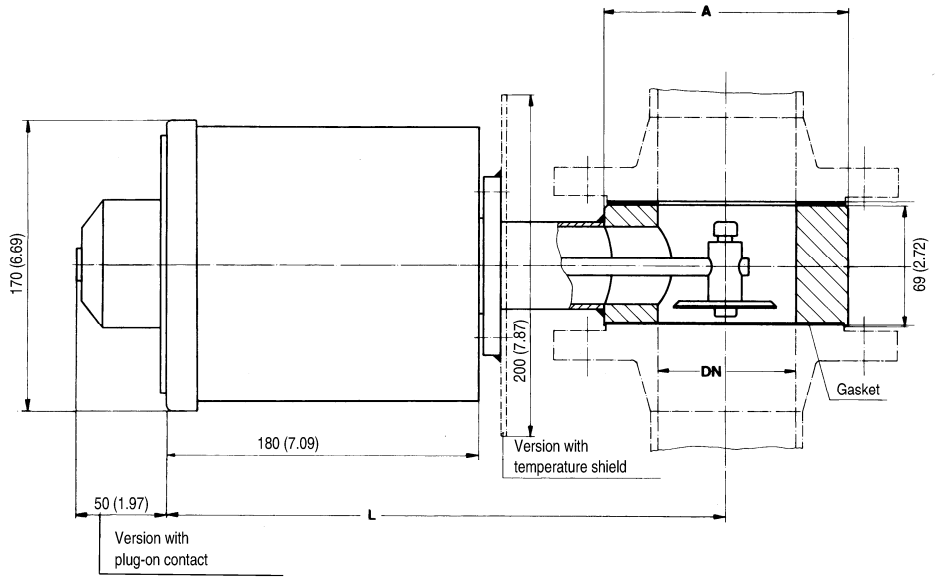


Fig. 3 Gardex, dimensions in mm (inch)

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= 0°C (32°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 (PN 10)	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	17,2	73,9
16	198,9	5943	9953	8009,69	24029,06	40049,03	4,4	0,58-1,74	19,92	19,25	84,9

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-** ☐☐☐☐☐ - ☐☐☐☐

Version (according to Table on page4)	
• 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 4)	
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 with PN10)	**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**
• Viton	**4**
• Klinger SIL C 8200	**5**

Selection and ordering data

F I Gardex flowmeter — Order No. **7ME5842-** ☐☐☐☐☐ - ☐☐☐☐

Display	See left
• 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 (4 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	