



flow

DURCHFLUSS

SITRANS F VA Tubex Variable Area Meter

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SITRANS F VA Tubux

Variable Area Meter

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Instructions

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General Information

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Dear customer,

Please read this manual before starting work!
It contains important information and data which guarantee the device's availability and save you service costs when observed. This makes handling this measuring instrument much easier and leads to reliable measuring results.

The product described in the manual has left the factory in a perfect, tested condition with regard to its safety. In order to maintain this condition and to ensure fault-free and safe operation of the product, it may only be used in the manner described by the manufacturer. In addition, the fault-free and safe operation of this product is conditional upon proper transportation, proper storage and installation and careful operation and maintenance. This manual contains the information required to use the product described for its intended purpose.

This manual is an integral part of the scope of delivery even if it was delivered separately for logistical reasons. For reasons of simplicity it does not contain full details of all versions of the product described, nor can it cover every situation which could arise during installation, operation, maintenance and use in systems. If you require further information, or if problems which are not dealt with in sufficient detail in this document arise, please request the desired information from your local or responsible Siemens branch.



Note

Particularly before using the device for new applications, for example in research and development, we recommend consulting our advisors about your application.



Note

The devices described in these instructions are not approved for use in potentially hazardous **areas with risks of explosion**. Due to this they **must not be installed** in these areas.

1.1 Warning And Information Texts

This manual describes how to use, start, operate and maintain the device.

Special attention must be paid to warning and information texts. These are separated from the rest of the text and marked by special pictograms (see the examples below). They provide you with valuable tips for avoiding operating errors.

The warning notices in this manual and on the device itself have the following meanings:

**Danger**

means that failure to take the necessary safety precautions will result in death, serious injury and/or considerable material damage.

**Warning**

means that failure to take the necessary safety precautions could result in death, serious injury and/or considerable material damage.

**Caution**

with a warning triangle means that failure to take the necessary precautions may lead to minor injury.

Caution

without a warning triangle means that failure to take the necessary precautions may lead to material damage.

Attention

means that failure to observe the appropriate notice may lead to an unwanted event or condition.

**Note**

is an important piece of information about the product itself, the handling of the product or the part of the manual to which particular attention is being drawn.

We would like to point out that the contents of this manual are not part of a previous or existing agreement, promise or legal relationship or an amendment thereto. All obligations of Siemens AG result from the contract of purchase, which also contains the full and solely valid warranty agreement. These contractual warranty conditions are neither extended nor restricted by the contents of this manual.

Warning



This device may only be installed and operated if qualified personnel have previously ensured that a suitable power supply is used, which guarantees that no dangerous voltages can reach the device in normal operation or in the event of a fault in the system or its components.

Fault-free and safe operation of this device depends upon proper transportation, storage, installation and assembly and on careful operation and maintenance.

1.2 Qualified Personnel

Qualified personnel means people who are familiar with the installation, assembly, commissioning and operation of the product, and who possess appropriate qualifications for their respective activities, e.g.:

- training, instruction or authorization to operate and maintain devices/systems according to the safety standards for electrical circuits, high pressures and corrosive media.
- For devices with explosion protection: training, instruction or authorization to carry out work on electrical circuits for systems with a risk of explosion.
- training or instruction according to safety engineering standards for the care and use of suitable safety equipment.

1.3 Pressurized Equipment Directive

The SITRANS F VA Tubex is primarily designed for steady loads.

Caution



It must particularly be ensured that the materials selected for the parts of the meter coming into contact with the media are suitable for the process media used.

No external loads may act on the meter!

A touch guard must be provided at surface temperatures of $> 70\text{ °C}$. The touch guard must be designed in such a way that the maximum permissible ambient temperature for the device is not exceeded.

The device may only be used within the pressure and voltage limits specified on the rating plate.

Before replacing the measuring tubes, it must be ensured that the device is free of hazardous media and pressures.

The device meets the requirements of the Directive on Pressurized Equipment 97/23/EC as stated in the table below:

Device	MLFB: 7ME5810-	Most hazardous permissible media	Category
G 1/4 to G 3	xxxax-xxxx; a \neq 2	Group 2 gases	Art.3.3
< DN 25 (G 1/4 ... G 3/4)	xxxax-xxxx; a = 2	Group 1 gases	Art.3.3
> DN 25 (G 1 ... G 3)	xxxax-xxxx; a = 2	Group 1 gases	I

Technical Description

2

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2.1 Range Of Application

The SITRANS F VA Tubux 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. The flow tube is also optionally available with a percentage or a 2 mm scale.

2.2 Design And Operation

The main components of the SITRANS 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. The contacts are controlled by a contact lug; signals to the electric remote sensor are transmitted contact-free.

2.3 Special Features

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



Fig. 2-1: Variable area meter SITRANS F VA Tubux

2.4 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.

In versions with a float guide rod, the float is usually held in place at the top by a rubber buffer. Push this buffer down to the bottom limit by pressing on the float.

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 and if the fitting is made of stainless steel. When using for the first time, move the float completely past the contact to permit polarization.

2.5 Versions

2.5.1 Standard Versions

Eight standard versions are defined in the price list using different combinations of fittings, connection materials and floats (the type number corresponds to the 4th digit of the second block of the order number).

Version	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	
Can be used for	liquids					gases			
Fitting	Steel	Mat. No. 1.4571/ 316 Ti	Steel	PVC	Mat. No. 1.4571/316Ti/ Steel	Steel	Stahl	Mat. No. 1.4571/316Ti/ Steel	
Connection	Steel (cast iron)	Mat. No. 1.4571/ 316 Ti	Mat. No. 1.4571/ 316 Ti	PVC	Steel	Steel (cast iron)	W.-Nr. 1.4571/316Ti	Steel (cast iron)	
Float	Mat. No. 1.4571/316Ti, 1.4305/303	Mat. No. 1.4571/ 316 Ti	Mat. No. 1.4571/316Ti	PVC, weighted	Mat. No. 1.4571/316Ti	Aluminium (PVC and PVDF as special versions)		Aluminium (PVC as spe- cial versions)	
Magnet	-	-	-	-	X	-	-	X	
Flow tube, size	A and B	X	X	X	X	-	X	X	-
	C to F	X	X	X	X	X	X	X	X
	G and H	X	-	X	-	X	X	X	X

Table 2-1: Standard versions of variable area meters

2.5.2 Float Guide Rods

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 H 25000
Option: flow tube C 125 and upwards

Gases: Standard: flow tube D 2500 to H 25000
Option: flow tube C 125 and upwards

2.5.3 Floats

There are three versions of floats:

- Non-guided floats
- Guided floats
- Viscosity-compensated floats.

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

Flow tube	mPas (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

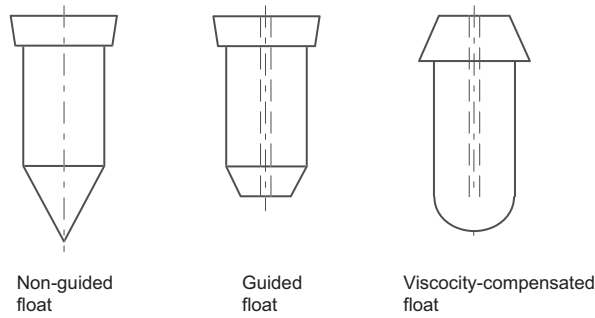


Fig. 2-2: Float versions

2.5.4 Contact Assemblies

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
- K 23: changeover contact

Fig. 2-3: Contact K 17, dimensions in mm (inches)

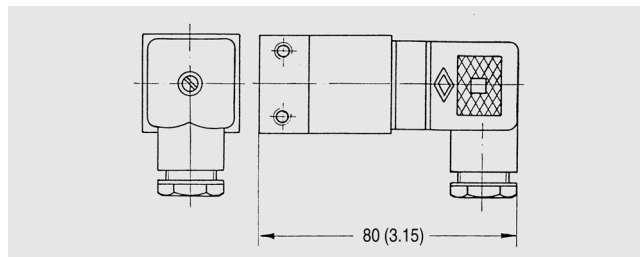
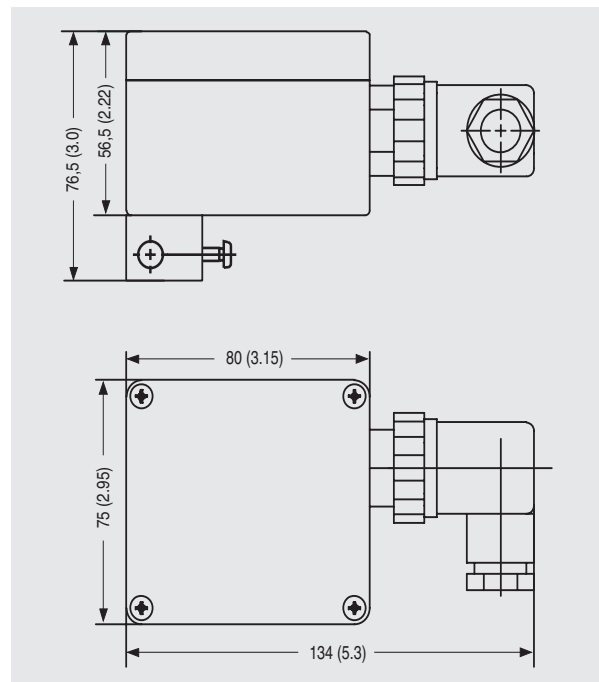


Fig. 2-4: Changeover contact K 23, dimensions in mm (inches)



2.6 Measuring Ranges

2.6.1 Liquids

Connection Female thread G, NPT	PVC adhesive bushing	Flow tube	Pressure loss		Max. measuring range for the selected floats							
					Up to flow tube B100 mat. no.		Viscosity- compensated, mat no.		with magnet mat. no.		PVC weighted	
					1.4305, 1.4571	303,316Ti	1.4571	316Ti	1.4571	316Ti		
mm (inch)		mbar	(psi)	l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)	l/h	(USgpm)	
(G ¹ / ₄), (G ³ / ₈), G ¹ / ₂	20 (0,79)	A 1	10	(0.145)	1	(0.0044)	-	-	-	-	-	-
		A 3			3	(0.013)	-	-	-	-	-	-
		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	(0.140)
		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)
		C 160			160	(0.70)	125 *	(0.55) *	150	(0.66)	90	(0.40)
		C 200			200	(0.88)	160 *	(0.70) *	180	(0.79)	110	(0.48)
C 250			250	(1.10)	200 *	(0.88) *	240	(1.06)	140	(0.62)		
C 315	40	(0.58)	315	(1.39)	240 *	(1.06) *	300	(1.32)	175	(0.77)		
C 400			400	(1.76)	300 *	(1.32) *	360	(1.59)	220	(0.97)		
C 500			500	(2.20)	360 *	(1.59) *	480	(2.11)	250	(1.10)		
(G ¹ / ₂), (G ³ / ₄), G1	32 (1,26)	D 650	19	(0.28)	650	(2.86)	400 *	(1.76) *	600	(2.64)	500	(2.20)
		D 800			800	(3.52)	500 *	(2.20) *	750	(3.30)	600	(2.64)
		D 1000			1.000	(4.4)	600 *	(2.64) *	950	(4.18)	750	(3.30)
		D 1250			1.250	(5.5)	750 *	(3.30) *	1.200	(5.3)	1.000	(4.40)
		D 1600	24	(0.35)	1.600	(7.0)	1.000 *	(4.40) *	1.500	(6.6)	1.250	(5.50)
		D 2000			2.000	(8.8)	1.200 *	(5.30) *	1.800	(7.9)	1.600	(7.0)
		D 2500	33	(0.48)	2.500	(11.0)	1.400 *	(6.20) *	2.400	(10.6)	2.000	(8.8)
		D 3000			3.000	(13.0)	1.800 *	(7.9) *	2.800	(12.3)	2.400	(10.6)
(G ¹ / ₄), (G ¹ / ₂), G2	63 (2,48)	E 4000	25	(0.36)	4.000 *	(17.6) *	2.500 *	(11.0) *	3.800 *	(16.7) *	3.200	(14.0)
		E 5000			5.000 *	(22.0) *	3.000 *	(13.0) *	4.800 *	(21.1) *	3.800	(16.7)
		E 6500			6.500 *	(28.6) *	4.000 *	(17.6) *	6.400 *	(28.0) *	5.000	(22.0)
		F 8000			8.000 *	(35.0) *	4.500 *	(19.8) *	7.500 *	(33.0) *	6.400	(28.0)
		F 10000			10.000 *	(44.0) *	5.500 *	(24.0) *	9.500 *	(42.0) *	7.500	(33.0)
(G2), (G ² / ₂), G3	-	G 12500	34	(0.49)	12.500 *	(55.0) *	7.000 *	(31.0) *	12.000 *	(53.0) *	-	-
		G 16000			16.000 *	(70.0) *	9.000 *	(40.0) *	16.000 *	(70.0) *	-	-
		H 20000	38	(0.55)	20.000 *	(88.0) *	11.000 *	(48.0) *	18.000 *	(79.0) *	-	-
		H 25000			25.000 *	(110.0) *	14.000 *	(62.0) *	24.000 *	(106.0) *	-	-

Table 2-2: Standard measuring range for liquid (r = 1 kg/l (62.43 lbs/cu.ft), viscosity 1 mPa·s (1 cp))
(dynamic range 1:10)

Remarks

* Guided float.

Non-standard sizes for the thread are listed in brackets.

Standard versions are bold printed

2.6.2 Air

Connection	Flow tube	Pressure loss	Max. measuring range for the selected floats									
			Aluminium, mat. No. 3.1645		Aluminium, mat. No. 3.1645 with magnet		PVC		PVDF		PVC with magnet	
		mbar (psi)	l/h (USgpm)	l/h (USgpm)	l/h (USgpm)	l/h (USgpm)	l/h (USgpm)	l/h (USgpm)	l/h (USgpm)	l/h (USgpm)	l/h (USgpm)	
Female thread G, NPT (G¼), (G¾), G½	PVC adhesive bushing mm (inch)	4 (0.058)	A 1	16 (0.07)	-	-	10 (0.044)	10 (0.044)	-	-	-	
			A 3	50 (0.22)	-	-	25 (0.11)	25 (0.11)	-	-	-	
			A 5	80 (0.35)	-	-	50 (0.22)	50 (0.22)	-	-	-	
			A 10	160 (0.70)	-	-	80 (0.35)	80 (0.35)	-	-	-	
			A 25	400 (1.76)	-	-	250 (1.10)	250 (1.10)	-	-	-	
			B 30	500 (2.20)	-	-	320 (1.40)	360 (1.59)	-	-	-	
			B 40	650 (2.86)	-	-	450 (1.98)	500 (2.20)	-	-	-	
			B 50	800 (3.52)	-	-	550 (2.42)	650 (2.86)	-	-	-	
			B 65	1100 (4.84)	-	-	750 (3.30)	800 (3.52)	-	-	-	
			B 80	1400 (6.2)	-	-	900 (3.96)	1000 (4.4)	-	-	-	
			B 100	1600 (7.0)	-	-	1100 (4.84)	1250 (5.5)	-	-	-	
			C 125	2000 (8.8)	6.5 (0.094)	2500 (11.0)	1400 (6.2)	1500 (6.6)	2200 (9.7)			
			C 160	3000 (13.0)		3200 (14.0)	1800 (7.9)	2000 (8.8)	3000 (13)			
			C 200	3600 (16.0)		4000 (17.6)	2200 (9.7)	2500 (11)	3600 (16)			
			C 250	4000 (17.6)		5000 (22.0)	2800 (12.3)	3000 (13)	4500 (19.8)			
C 315	5000 (22)	15 (0.218)	6400 (28.0)	3400 (15.0)	3600 (16)	6000 (26)						
C 400	6400 (28)		8000 (35.0)	4000 (17.6)	5000 (22)	7000 (31)						
C 500	8000* (35)*		-	5000* (22.0)*	5500* (24)*	-						
(G½), (G¾), G1	-	7 (0.102)	D 650	10000 (44)	12000 (53)	7000 (31.0)	8000 (35)	10000 (44)				
			D 800	13000 (57)	15000 (66)	9000 (39.6)	9000 (40)	12000 (53)				
			D 1000	16000 (70)	20000 (88)	11000 (48)	12000 (53)	16000 (70)				
			D 1250	20000 (88)	24000 (106)	14000 (62)	15000 (66)	20000 (88)				
			D 1600	28000 (123)	32000 (141)	18000 (79)	20000 (88)	25000 (110)				
			D 2000	36000 (159)	40000 (176)	22000 (97)	25000 (110)	32000 (141)				
			D 2500	40000* (176)*	-	28000* (123)*	30000* (132)*	-				
			D 3000	50000* (220)*	-	32000* (141)*	36000* (159)*	-				
(G¼), (G½), G2	-	10 (0.145)	E 4000	64000* (282)*	75000* (330)*	45000 (198)	50000 (220)	60000 (264)				
			E 5000	80000* (352)*	100000* (440)*	55000 (242)	65000 (282)	80000 (352)				
			E 6500	100000* (440)*	125000* (550)*	75000 (330)	80000 (352)	100000 (440)				
			F 8000	140000* (616)*	150000* (660)*	90000 (396)	100000 (440)	125000 (550)				
			F 10000	160000* (704)*	180000* (793)*	120000 (528)	125000 (550)	160000 (704)				
(G2), (G2½), G3	-	13 (0.189)	G 12500	200000* (881)*	220000* (969)*	130000* (572)*	150000* (660)*	175000* (771)*				
			G 16000	280000* (1233)*	300000* (1321)*	180000* (793)*	200000* (881)*	240000* (1057)*				
		14 (0.203)	H 20000	320000* (1409)*	360000* (1585)*	220000* (969)*	250000* (1100)*	300000* (1320)*				
			H 25000	400000* (1761)*	450000* (1981)*	280000* (1233)*	300000* (1320)*	360000* (1585)*				

Table 2-3: Standard measuring range for air (p_{abs} = 1.013 bar (14.69 psi) at T = 0 °C (32 °F)) (dynamic range 1:10)

Remarks

* Guided float.

Non-standard sizes for the thread are listed in brackets.

Standard versions are bold printed

2.7 Technical Data

SITRANS F Tubex

Range of application	see section 2.1
Mode of operation	see section 2.2 et sqq.
Measuring principle	Float
Input	
Flow	Vertically upwards
Pressure limit with threaded connection	
<ul style="list-style-type: none"> • ≤ G$\frac{3}{4}$ • G1 • G1$\frac{1}{4}$ to G3 	Max. 10 bar (145 psi) Max. 8 bar (116 psi) Max. 5 bar (73 psi)
Rated operating conditions	
<u>Temperature limits</u>	
<ul style="list-style-type: none"> • With float made of mat. No. 1.4305, 1.4571 or aluminium • With float made of PVDF • With float made of PVC • With fitting made of PVC 	-10 to +150 °C (14 to 302 °F) -10 to +100 °C (14 to 212 °F) -10 to +50 °C (14 to 122 °F) -10 to +50 °C (14 to 122 °F) Etched scale is necessary with medium temperature > 90 °C (194 °F)
<u>Medium conditions</u>	
<ul style="list-style-type: none"> • Accuracy • Measuring range - For liquids - For gases • Dimensions for measured variable 	Class 1.6 (according to VDE/VDI 3513, sheet 2) Dependent on flow tube, see Tables on pages 3/82 and 3/83 0.1 l/h to 25 m ³ /h (0.00044 to 110 USgpm) 1.6 l/h to 400 m ³ /h (0.007 to 1761 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 l/h (up to flow tube D2500) m ³ /h (flow tube D3000 and above)
Design	
Connections	Screwed gland G $\frac{1}{4}$ to G3
Material	
<ul style="list-style-type: none"> • Flow tube • Connection • Float • Float guide rod • Gasket 	Borosilicate glass (length 300 mm (11.8 inch)) Cast iron, stainless steel, mat. No. 1.4571, steel/PVC / 316Ti, steel PVC Stainless steel, mat. No. 1.4305/303, mat. No. 1.4571, PVC and PVDF, aluminium/316Ti Stainless steel, mat. No. 1.4571 / 316Ti Buna N up to 90 °C (194 °F), Viton up to 150 °C (302 °F), EPDM (for potable water plants) up to 150 °C (302 °F)

• Limit	Springs made of stainless steel for non-guided floats, otherwise rubber buffers for guided floats
Weight	
<ul style="list-style-type: none"> • With threaded connection G$\frac{1}{2}$ • With threaded connection G1 • With threaded connection G2 • With threaded connection G3 	2.5 kg (5.51 lb) 5.5 kg (12.12 lb) 9 kg (19.8 lb) 24 kg (52.9 lb)

Classification according to pressurized equipment directive (DGRL 97/23/EC)

	Order No. 7ME5810-	Permissible media	Category
G $\frac{1}{4}$ to G3	xxxax-xxxx; a ≠ 2	Gases of fluid group 2 and liquids of fluid group 1	Article 3.3
= DN 25 (G $\frac{1}{4}$ to G $\frac{3}{4}$)	xxxax-xxxx; a = 2	Gases of fluid group 1 and liquids of fluid group 1	Article 3.3
> DN 25 (G1 to G3)	xxxax-xxxx; a = 2	Gases of fluid group 1 and liquids of fluid group 1	I

Technical data of contacts

Switching principle	Magnetic contact unit, bistable
Designation	
<ul style="list-style-type: none"> • Flow tube size C 125 to H 25000 • Flow tube size D 650 to H 25000 	K 17 A, K17 B K 23
Housing/plug	PP/PA 6
Contact material	Rhodium
Degree of protection	IP 65
Ambient temperature	-20 to +80 °C (-4 to +176 °F)
Max. switching frequency	5/min
Max. rating	
<ul style="list-style-type: none"> • K 17 • K 23 	AC 250 V/0.5 A/10 VA DC 250 V/0.5 A/5 W 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

2.8 Dimensions

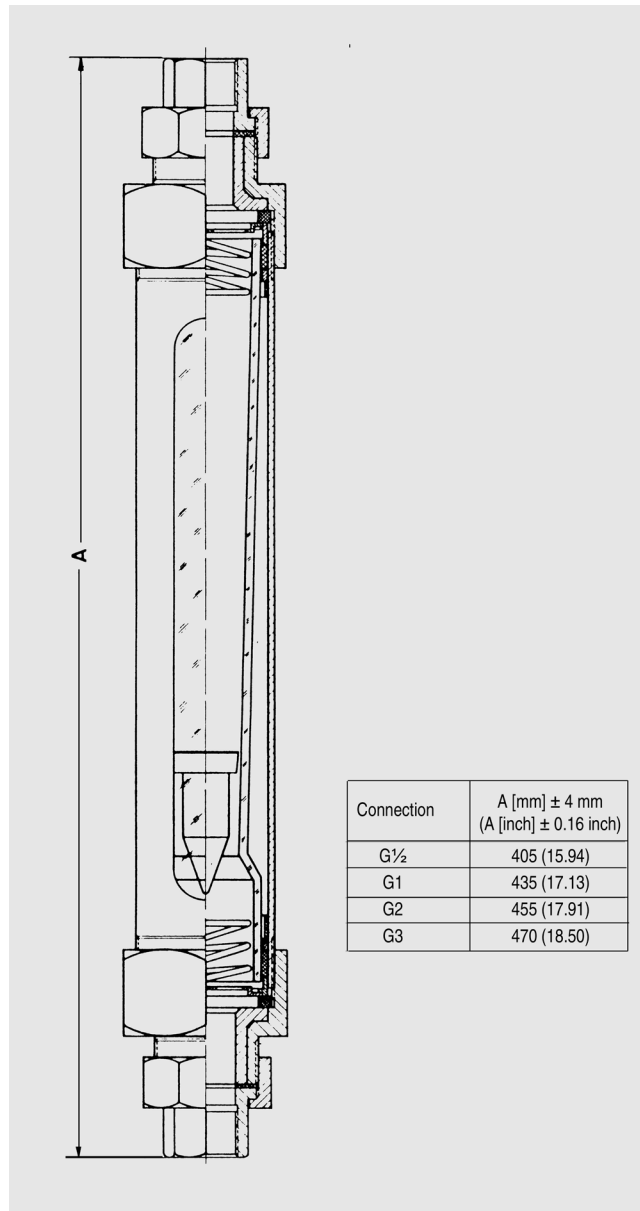


Fig. 2-5: SITRANS F VA Tubex, dimensions in mm (inches)



1P A5E00129176

Siemens AG

Automation and Drives
Process Instrumentation and Analytics
D-76181 Karlsruhe