

## Glass Tube Variable Area Flowmeters FAG1190-87, FAG1190-95, FAG1190-97, FAG1190-98

### ■ Function

- The flowrate of liquids and gases can be measured with the Glass Tube Variable Area Flowmeters.

### ■ Application Areas

- Designed for flowrate measurements in many branches of industry including system manufacture, food industry, water treatment plants and the chemical industry.
- An adaptation for aggressive fluids is possible because the fluid wetted parts can be made from a wide variety of different materials.

### ■ Instrument Advantages

- Precision tube with integral tri-flat or bead float guide surfaces, or pole guides.
- A stainless steel housing is standard.
- The use of O-ring seals simplifies removal of the meter tube.
- Meter tube and float can be exchanged independently.

### ■ Important Instrument Features

- Magnetic actuated alarm switches can be added starting with the 1/2" size. (See Alarm Transmitter 55AX1000 Page 14).
- The serviceability was verified by the DVGW-Research Center at the Engler-Bunte-Institute.
- Suitable for vacuum operation.
- Polycarbonate safety protection tube for gas service.
- Couplings simplify the installation and removal of the instrument.



**Rugged Uncomplicated  
Industrial Instrument**

**ABB**

## Basic Safety Information

### Instrument Safety Standards

- This instrument satisfies the basic safety requirements defined in the Pressure Equipment Directive and is designed using the latest state of the art technology. It was tested at the factory, based on the safety requirements, and shipped in proper working order. In order to maintain this condition over the expected life of the instrument the requirements described in the Operation Manual must be observed.
- Please observe the special information for instrument start-up of the explosion-protected design.

### Regulated Usage of Pressure Equipment „Variable Area Flow Measurement Principle"

This instrument is designed to

- transport liquids, gases (including unstable gases) and steam (fluids)
- measure the actual volume flowrate at constant operating conditions (pressure, temperature, density). An output of the flowrate in normal or mass units is possible.

### Included in the Regulated Usage Requirements are:

- installations compatible with the specified limits
- observing and following the information relative to allowable fluids
- observing and following the information in this Operation Manual
- observing and following the information in the accompanying documents (Specifications, Diagrams, Dimension Drawings)

### The Following Uses of the Instrument are Prohibited:

- installation as an elastic compensation piece in a pipeline, e.g. to compensate for pipeline misalignment, pipeline vibrations, pipeline expansions, etc.
- use as a step ladder, e.g. for assembly purposes.
- use as a support for external loads, e.g. as a bracket for pipelines etc.
- material removal by drilling the housing or the addition of materials or parts by painting (covering the Name Plate), welding or soldering.
- repairs, modifications and additions and the use of replacement parts are only permitted as described in the Operation Manual. Additional tasks must be approved by ABB. We accept no liability for unauthorized tasks.

The operation, service and maintenance requirements in the Operation Manual must be observed. The manufacturer assumes no responsibility for damages resulting from improper or prohibited use.

### Specification Limits

The instrument is designed exclusively for use within the specifications listed on the Name Plate and in the Operation Manual. The following limits must be observed:

- the allowable pressure (PS) and the allowable fluid temperature (TS) must be  $\leq$  less than the pressure-temperature values (p/T-Ratings). The specifications of the Factory Tag / Instrument Tag must be observed.
- the maximum and minimum operating temperatures listed in the instrument Specifications may not be exceeded.
- the allowable ambient temperature range specified in the instrument Specifications may not be exceeded
- The Protection Class of the housing is IP 65 per EN60529.

### Allowable Fluids



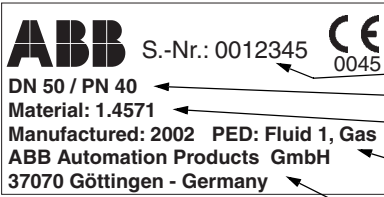
#### Caution!

- Only such fluids may be metered for which assurance is available, either from technical information or operational experience of the user, that the chemical and physical properties of the fluid wetted parts in the flowmeter (process connections, meter tube and float) will not be adversely affected during the expected life of the flowmeter.
- Fluids with unknown characteristics may only be metered if the user performs periodic inspections to assure that the safety parameters of the flowmeter have not been compromised.

**Specifications on the Name Plate**

The Name Plate is mounted on the housing of the flowmeter primary. The CE-Mark used on the two different Name Plates is a function of the size of the pressure equipment (> DN 25 [1"] or ≤ DN 25 [1"]) (see also Art.3 Par. 3 PED/DGRL 97/23/EG):


**a) Pressure Equipment for Sizes > DN 25 [1"]**



**The Name Plate includes the following specifications:**

- CE-Mark (with the Number of the issuing Agency) to certify compliance of the instrument (pressure equipment) with the requirements in PED.
- Manufacturer's serial number for identification of the pressure equipment.
- Meter size and pressure rating of the pressure equipment
- Material used to manufacture the pressure equipment and gasket material (fluid wetted).
- Year of manufacture and specification of the applicable fluid group per PED (Pressure Equipment Directive [PED/DGRL]) Fluid Group 1 = hazardous fluids, liquids, gases (including unstable gases)
- Pressure equipment manufacturer's name.

**a) Pressure Equipment for Sizes ≤ DN 25 [1"]**



**This Name Plate contains most of the same specifications included on the plate described above a) with the following exceptions:**

- There is no CE-Mark on the pressure vessel per Art. 3 Par. 3 of PED/DGRL.
- The the reason for the exemption is described in Art. 3 Par. 3 of PED/DGRL. The pressure equipment is categorized as SEP (= Sound Engineering Practice).

**Personnel Qualifications**

The electrical installation, start-up and maintenance of the instrument should only be carried out by trained personnel who have been authorized to perform these tasks by the system operator. The personnel must have read and understood the Operation Manual and follow its instructions.

**User Responsibilities**

- Prior to use for metering abrasive fluids, the user must consider the resistance of the fluid wetted parts. The fluids wetted parts are meter tube, float and the gaskets. ABB will gladly provide assistance in their selection, however cannot not accept any liability for their selection.
- Observe the National Codes in your country relative to the installation, functional tests, repair and maintenance of electrical equipment.







**Possible Dangers During Transport**

Note when transporting of the instrument to the installation site:

- that the center of gravity may be off-center
- possible obstacles into which the instrument may bump and
- transport protective devices (e.g. plugs in openings)

## Safety Signs, Symbols, Name and Instrument Plates and CE-Mark

All safety signs, symbols and the Name and Instrument Plates are to maintained in a readable condition and replaced if damaged or lost. Observe the following general information:

	<b>Warning</b>	Information indicating a risk or dangerous situation which could result in serious injury to personnel or even death.
	<b>Caution</b>	Information indicating a dangerous situation or unsafe procedure which could result in injury to personnel or damage to property.
	<b>Notice</b>	Information indicating a situation which may cause damage to the product or something in its vicinity if it is not corrected.
	<b>Important</b>	The symbol Important ("Information") indicates user tips or other important information which, if ignored, may result in a loss of comfort or influence the function of the instrument. (Not an indication of a dangerous/harmful situation).
	<b>Ex-Protection</b>	This symbol identifies an instrument with Ex-Protection. When used in Ex-Areas the applicable specifications in the Chapter "Ex-Protection" must be observed.
	<b>CE-Mark</b>	<p>The CE-Mark symbolizes the compliance of the instrument with the following directives and the fulfillment of the their basic safety requirements:</p> <ul style="list-style-type: none"> <li>• <b>CE-Mark on the Name Plate (on the converter)</b> <ul style="list-style-type: none"> <li>– Compliance with the EMC-Directive 89/336/EWG</li> <li>– Compliance with the Ex-Directive 94/9/ EU (only for instruments with Ex-Protection)</li> </ul> </li> <li>• <b>CE-Mark on the Name Plate (on the flowmeter primary)</b> <ul style="list-style-type: none"> <li>– Compliance with the Pressure Equipment Directive (PED/DGRL) 97/23/EG</li> </ul> </li> </ul> <p>A CE-Mark is not present on the Name Plate for pressure equipment if:</p> <ul style="list-style-type: none"> <li>– the max. allowable pressure (PS) is less than 0.5 bar.</li> <li>– a minimum pressure risk exists (meter sizes <math>\leq</math> DN 25 [1"]), a certification procedures is not required.</li> </ul>

### Possible Dangers During Installation

Before installing assure that:

- the flow direction agrees with the direction arrow .
- the instrument is installed in a stress free manner (parallel mating flanges) and that gaskets suitable for the operating conditions are used.
- the pipeline up- and downstream from the flowmeter is supported (see Information in the Operation Manual).

### Possible Dangers During Electrical Installation

- Only trained personnel may make the electrical connection in accordance with Interconnection Diagrams.
- Ground the flowmeter system.



#### Caution!

- Installation and maintenance tasks may only be performed by trained personnel.

### Possible Dangers During Use in Ex-Areas

Special requirements apply in Ex-Areas for connecting the alarm signals. Observe the specially identified specifications in the Operation Manual and the Specifications on Page 17.

### Possible Dangers During Operation

- Abrasive fluids and/or cavitation can lead to the damage of pressure containing parts.

- When metering hot fluids touching the surface can lead to burns.
- Aggressive fluids can lead to corrosion and abrasion. The pressurized fluid could exit prematurely.

### Possible Dangers During Inspection and Maintenance

- Prior to working on the instrument (opening, removal) assure that the instrument and the adjacent pipeline or reservoir are depressurized.



#### Caution!

- Before opening the instrument ascertain whether hazardous material had been present in the flowmeter. Hazardous residues may still be present in the flowmeter and exit when it is opened.
- If pipeline vibrations are present, it is recommended that the flange bolts and nuts be secured to prevent their loosening.
- Within the framework of operator responsibilities, perform a regular periodic inspection to check:
  - flowmeter operation
  - the seals
  - wear (corrosion, abrasion, cavitation)

## Functional Description

Glass tube Variable Area Flowmeters in the SeriesFAG1190-87, FAG1190-97, FAG1190-98 operate based on the variable area flow measurement principle and are suitable for metering liquids and gases.

The position of the float in the conical meter tube is a measure of the flowrate. The position is read on the scale on the meter tube. Four different scale formats are available:

- Diameter ratio scale Dt/Df.  
The ratio of the inside diameter of the meter tube to the outside diameter of the float. Only for meter tube sizes 1/16", 1/8" and 1/4"
- Percent scale
- Millimeter scale
- Direct reading scale in engineering units

A flowrate table is included with all flowmeters utilizing diameter ratio scales. When operating conditions change, the user can prepare additional flowrate tables.

The standard design for flowmeter sizes 1/2" to 2" includes a percent scale. A factor tag is attached to the flowmeter indicating the flowrate equivalent to 100%. The remaining scale values can be calculated using a linear proportionality. A special flowrate curve is therefore not required. Upon request, conversion equations for other operating conditions will be provided.

### Flowmeter Designs

FAG1190-87	with pipe coupling connections per DIN 2950
FAG1190-95	with horizontal internal threaded connections (others upon request)
FAG1190-97	with internal threaded connections
FAG1190-97	with threaded connections per DIN 11851 for the food industry
FAG1190-98	with flanged connections

## Installation

### General

Check that the allowable operating conditions will not be exceeded at the location where the flowmeter is to be installed (see Specifications). Possible injuries may result if the meter tube should break. Provide for flying glass protection if the instrument has been ordered without a Polycarbonate protection tube.

As a rule, flowmeters for gas applications should be installed as close as possible to pipe restrictions and, if possible, a valve should be installed in the outlet fitting. The inside diameter of the pipeline should be reduced to its minimum size. For liquids however, the pipeline can be sized based on economic considerations.

Variable Area flowmeters must be installed vertically with the outlet at the top. The wooden support rod in the meter tube should be removed.

### Pressurized Chambers and Volume Tanks

Pressurized chambers and volume tanks are often utilized in flowmeter installations in order to damp out pulsations and quiet float oscillations. This is especially advantageous when the flow is produced by piston pumps or compressors. When pressurized tanks are utilized for liquids, the pressurizing gas connections should be at the top..

If the instrument and the fluid should not come in contact with each other, volume tanks can be used. The correct size for the pressurized chambers or volume tanks appropriate for the installation will be supplied upon request.

### Installation Recommendations

See also VDI/VDE-Guideline 3513 Sheet 3, Section and Installation Recommendations for Variable Area Flowmeters.

### Damping and Compression Oscillations when Metering Gases

If a specific critical volume is exceeded between the closest throttling locations up- or downstream of the flowmeter, compression oscillations (float bounce) may occur when the operating pressure is low.

To prevent these self generated compression oscillations the following measures can be applied:

- Select a flowmeter with the lowest possible pressure drop.
- Minimize the pipeline length between the flowmeter and the closest up- or downstream throttling location.
- Increase the operating pressure, and consider its effect on the flowrate values due to the change in the gas density at the new operating conditions.

### Minimum Required Upstream Pressure when Metering Gases

Even if the flow is pulsation free, it is possible that spontaneous float oscillations may occur. They occur when a critical volume between the flowmeter and the nearest up- and downstream throttling location is exceeded, whereby these float oscillations most often occur when the flowrate and operating pressure are both low. To prevent these self generated compression oscillations the following measures can be applied:

- Minimize the pipeline length between the flowmeter and the closest up- or downstream throttling locations
- Reduce the usual flow range from 10–100 % to 25–100 %
- Set the flowrate by approaching the required value from a higher flowrate
- Increase the operating pressure, and consider its effect on the flowrate values due to the changes in the gas density at the new operating conditions

## Specifications

### Scale Formats

#### Diameter Ratio Scale Dt/Df

For meter sizes 1/16" to 1/4", direct reading upon request

#### Percent Scale

For meter sizes 1/2" to 2", direct reading or mm scale upon request

### Materials, Connections, Weights

Materials			
Fluid Wetted Parts		Standard	Others
Meter Tube		Borosilicate glass	
Float	Meter Tube Size 1/16" & 1/8"	Glass SS1.4401/316 Sapphire	Carboloy Tantalum
	1/4"	Glass SS1.4401/316	Sapphire Carboloy Tantalum
	1/2" to 2"	SS1.4571/316Ti	SS1.4571/316Ti Hast. B/C PVC Alum PVC (lead filled) PTFE
Float stop Inlet	1/16" 1/8" & 1/4" 1/2" to 2"	SS1.4310/301 SS1.4571/316Ti	- - Hast. B/1.4310/304
Outlet „Spring“	1/16" to 1/4" 1/2" to 2"	SS1.4310/301 SS1.4310/301	SS1.4571/316Ti
Fitting	1/16" to 2"	SS1.4571/316Ti	Steel PVC <sup>1)</sup> PVDF
O-Ring		Buna N	Viton A Ethylene-Propylene Silicone
Others			
Housing		SS1.4301/304	
Flanges		SS1.4301/304	

### Scale Length

100 mm for Meter Tube Size 1/16"  
 130 mm for Meter Tube Size 1/8" to 1/4"  
 250 mm for Meter Tube Size 1/2" to 2"

### Accuracy Class (per VDI/VDE 3513)

Meter Tube Size 1/16": 6  
 Meter Tube Size 1/8" to 2": 1.6  
 Meter Tube Size 1/2" to 2" with float type "BL": 6

### Connections

Threaded or flanged connections see Dimensions Page 12

### Weight

See Dimensions Page 12, 13

### Max. allow. Operating Pressure

Meter Tube Size	Liquids	Gases
	Pressure [bar]	Pressure [bar]
1/16"	30	30
1/8"	30	30
1/4"	30	30
1/2"	21	17
3/4"	17	13
1"	14	10
1 1/2"	9	4
2"	7	2

Reductions of the max. allow. pressure

For meter tube sizes 1" to 2" the max allow. pressure is reduced by 1 % per 2 °C increase for operating temperatures over 95 °C (liquids).

The reduced pressures for gases are due to safety considerations.

The strength of the Polycarbonate protection tube is reduced as the temperature increases. Therefore there are additional pressure restrictions when metering gases, see below:

- Listed max allow. operating pressure valid up to 30 °C fluid temperature and 30 °C ambient temperature. For fluid or ambient temperatures over 30 °C the max allow. operating pressure is reduced by 1.05 % / 1 °C (gases).

### Max. Ambient Temperature

#### Liquids

-40 °C to +60 °C

#### Gases

-40 °C to +40 °C

### Max. Fluid Temperature

#### a) as a function of the fluid type

Liquids -40 °C to +180 °C  
 Gases -20 °C to +100 °C

#### b) as a function of the gasket material

Buna N (NBR11..) 0 °C to +100 °C  
 Viton A (FKM11..) 0 °C to +180 °C  
 Ethylene-Propylene (EPDM) 0 °C to +100 °C

#### c) as a function of the gasket material

PVC + 40 °C  
 Others +180 °C

#### d) as a function of the fitting material

PVDF +120 °C  
 PVC + 60 °C  
 Steel/stn. stl. +180 °C

#### e) as a function of the needle valve material

Stainless steel 0 °C to +180 °C  
 Brass 0 °C to +100 °C

#### f) as a function of the alarm transmitter 55AX1000

with alarm signal 0 °C to +100 °C

For details see Figs. 1 to 6 (Page 7)

**Metal Fittings with Internal Threads and Metal Fittings with Threads DIN11851  
 FAG1190-95, FAG1190-97, FAG1190-87**

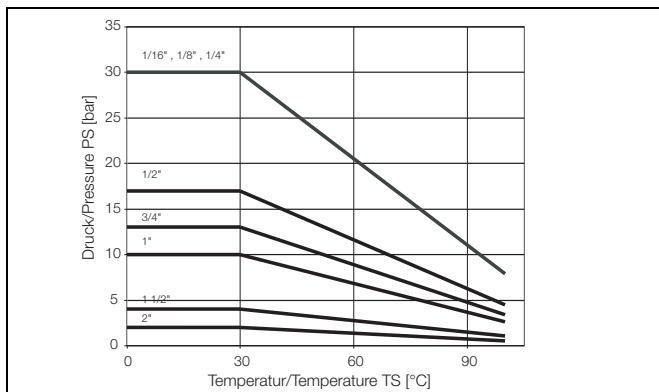


Fig. 1: Gas

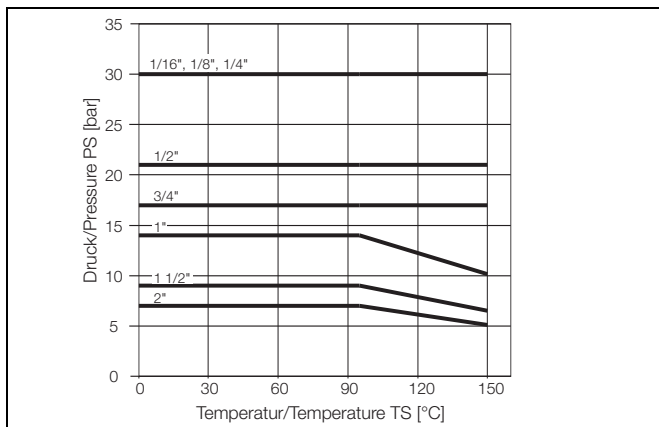


Fig. 2: Liquid



**Caution!**  
 For PVDF fitting material, the fluid temperature limits are reduced to 120 °C,  
 for PVC fitting material to 60 °C!

**Plastic Fittings FAG1190-95, FAG1190-97, FAG1190-98  
 Plastic Fittings with Flanges PN 14, 16, Class 150, 300  
 FAG1190-98**

**Metal Fittings with Flanges Class 150 FAG1190-98**

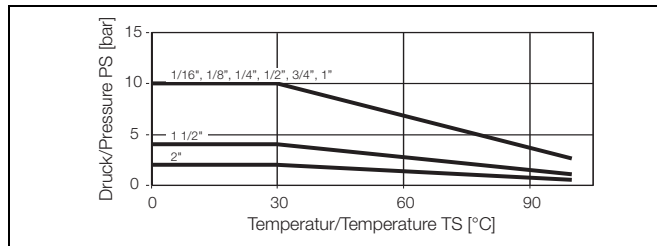


Fig. 3: Gas

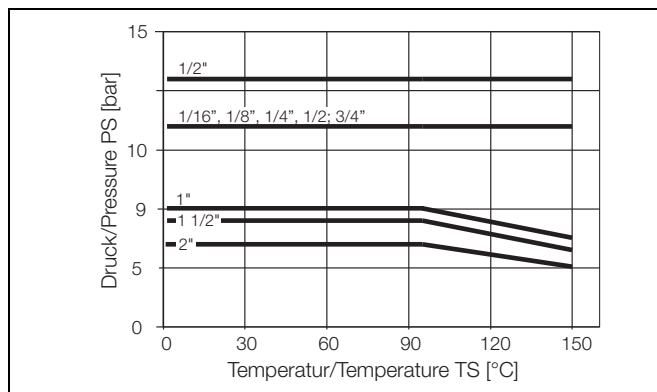
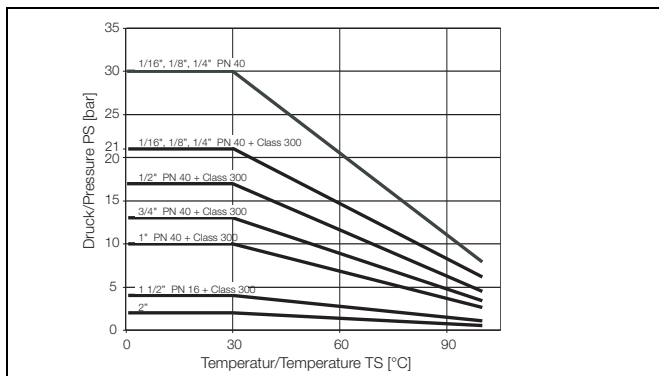


Fig. 4: Liquid



**Caution!**  
 The temperature range of the gaskets, needle valves and alarm switches, when used, must be considered Page 6.

**Metal Fittings with Flanges PN 40, 16, Class 300**  
**FAG1190-98**

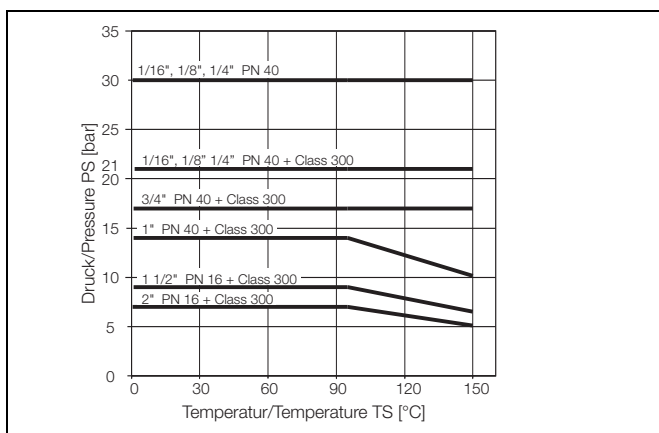


**Fig. 5:** Gas

**Start-Up**

At start-up, increase the flowrate step wise by slowly opening the shut off valve. This will preclude pressure shocks which could possibly damage the float, float stops or the glass meter tube. When metering liquids, a method to bleed the pipeline system at start-up should be considered, if required. The flowrate is read at the graduations on the scale of the meter tube at the location of the reading edge of the float. The reading edges for the various float shapes are shown in figure on Page 9.

If strong float oscillations occur when metering low flowrates and the lower portion of the scale is normally not used, the problem can be resolved by utilizing a flowmeter with a longer inlet float stop. This will preclude using the lower portion of the scale. Relief can also be attained by installing a larger sized flowmeter with a low pressure drop float.



**Fig. 6:** Liquids



**Attention!**

For PVDF fitting material the fluid temperature limits are reduced to 120 °C,  
 for PVC fitting material to 60 °C!

### Overview of Meter Sizes and Flow Ranges

Meter Size	Meter Tube Size	min. Flow Range				max. Flow Range			
		l/h Water		m <sup>3</sup> /h Air <sup>1)</sup>		l/h Water		m <sup>3</sup> /h Air <sup>1)</sup>	
1/4"	1/16"	0.003	to 0.03	0.00029	to 0.0029	0.1	to 1.12	0.004	to 0.04
1/4"	1/8"	0.037	to 0.37	0.0022	to 0.022	1	to 10	0.033	to 0.33
1/4"	1/4"	0.47	to 4.7	0.0223	to 0.223	13	to 132	0.4	to 4.03
1/2"	1/2"	4	to 43	0.13	to 1.3	45	to 419	1.8	to 12.3
3/4"	3/4"	14	to 144	0.4	to 4.3	130	to 1300	3.8	to 38.7
1"	1"	30	to 310	0.9	to 9.2	420	to 2800	12	to 83.0
1 1/2"	1 1/2"	50	to 560	1.7	to 17.3	400	to 4800	12	to 142.5
2"	2"	140	to 1420	4	to 42.6	1800	to 9650	54	to 285.4
2"	2"p	800	to 9000	20	to 270	3400	to 17000	100	to 510

1) based on 0 °C, 1013 mbar

### Floats

#### Ball Floats

are used to meter smaller flowrates in meter sizes 1/16" to 1/4". In order to offer a wide spectrum of flow ranges in a single meter tube, a variety of ball float materials with differing densities are available.

#### Floats with Guide Rings

used in combination with beadguide meter tubes and percent scales. This is the standard Variable Area Flowmeter design.

The float type "GSVT" is largely independent of viscosity effects and is available in a variety of materials and weights. Flowrates approximately 25% to 30% higher can be measured by reversing the float head „GNSVT“. This float geometry is not suitable for fluids with higher viscosities. The VIC values listed in the flow range tables must be considered.

The float is guided at the reading edge and the tail guide at the three ribs in the beadguide meter tube.

#### Floats with Minimum Pressure Drop

were developed especially for metering gases at low pressures and assure an extremely low pressure drop through the flowmeter. They are used in combination with the beadguide meter tubes.

#### Floats with Guide Rods

These floats have a hole through the length axis of the float in which a rod, rigidly fixed to the meter tube, guides the floats in their vertical movement.

#### Flat Type "BL"...

are specially designed for high flowrate metering. They are guided by the 3 ribs in the beadguide meter tube.

For quotation purposes there are approximately 100,000 possible Variable Area Flowmeter design combinations, consisting of meter tube - float - scale- combinations.

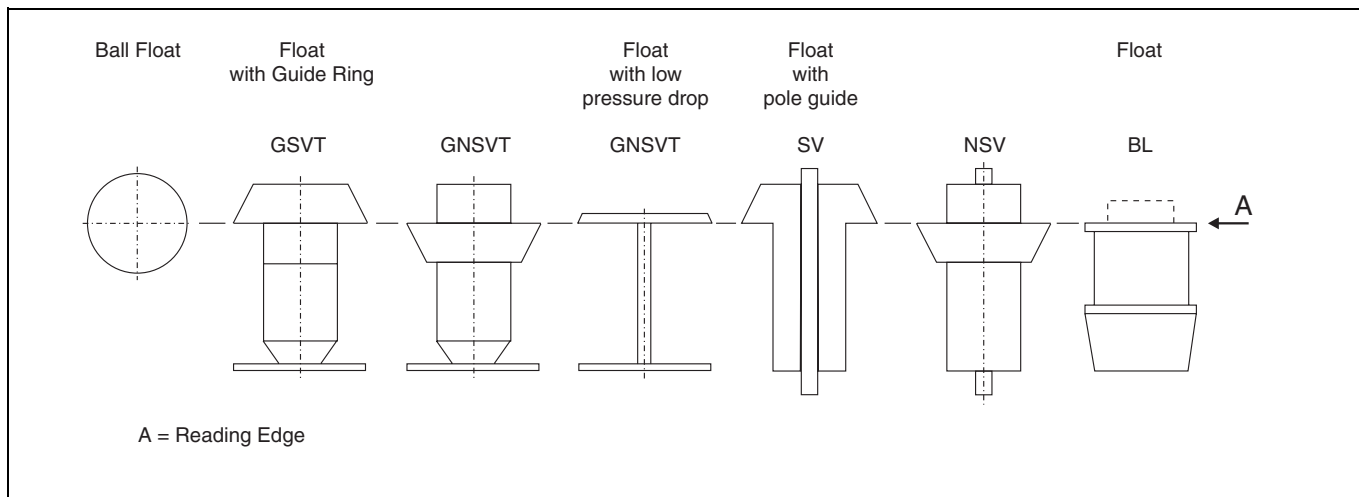


Fig. 7: Float Types

## Meter Tubes

### Glass Meter Tubes

#### Tri-flat Meter Tubes (Fig. 8)

These meter tubes are used in the smallest sizes 1/16" to 1/4". The tubes expand conically in the flow direction and contain three flats which are parallel to the central axis of the meter tube. The ball float is guided by these three flats over the entire flow range and the minimal space between the float and flats in the meter tube assures readability of the float position even in cloudy fluids. The float is guided exactly in the middle of the meter tube.

#### Plain Taper Meter Tubes 1/2" to 2" (Fig. 9)

are usually only used for extreme operating conditions (pressure shocks, vibrating pipelines, etc.). In the sizes 1-1/2" and 2", higher flow range end values are possible because flow area is greater than in the beadguide meter tubes. The float is guided by a pole guide in the plain tapered meter tubes.

#### Beadguide Meter Tubes (Fig. 10)

are the standard in this size range. This meter tube type incorporates three ribs which are parallel to the center axis of the meter tube and perform the same functions as the flats described above in the tri-flat meter tubes. They guide the float over the entire flow range. Here also the minimal space between the float reading edge and the beadguides assures readability of the float position even in cloudy fluids. They are used together with a float with guide rings.

### Scales

#### Diameter Ration Scale Dt/Df

The diameter ratio scale is a linear representation of the open annular flow ratio. It can be used universally for both liquids and gases and is particularly advantageous when operating conditions vary. A flowrate table is included at no cost for converting the scale indications into flowrate values. Conversions to other operating conditions can be readily made using our Calculation Program FlowCalc. This scale type is the standard for the tri-flat meter tubes with ball floats.

#### Percent Scale

The linearized percent scale is the standard scale for all other Variable Area Flowmeters, used predominantly with the beadguide and plain tapered meter tubes. It indicates a percentage value based on maximum flowrate and extends over a range from 8 to 100 %. Knowledge of the operating conditions, the physical characteristics of the fluid and the geometric design of the float can be used to readily calculate or convert the maximum flowrate value. Each percent scale provides the guaranteed accuracy.

#### Direct Reading Scale

This scale indicates the volume or mass flowrate per unit of time directly (e.g. l/h Hydrogen, cm<sup>3</sup>/min H<sub>2</sub>O). It is valid only for exactly defined operating conditions. The universal applicability of the meter tubes is somewhat limited when direct reading scales are used.

#### Millimeter Scale

This scale is usually only used when a fixed flowrate is to be reproduced and the actual flowrate value plays a subordinate role. For applications with viscous fluids this scale may be considered as universal.

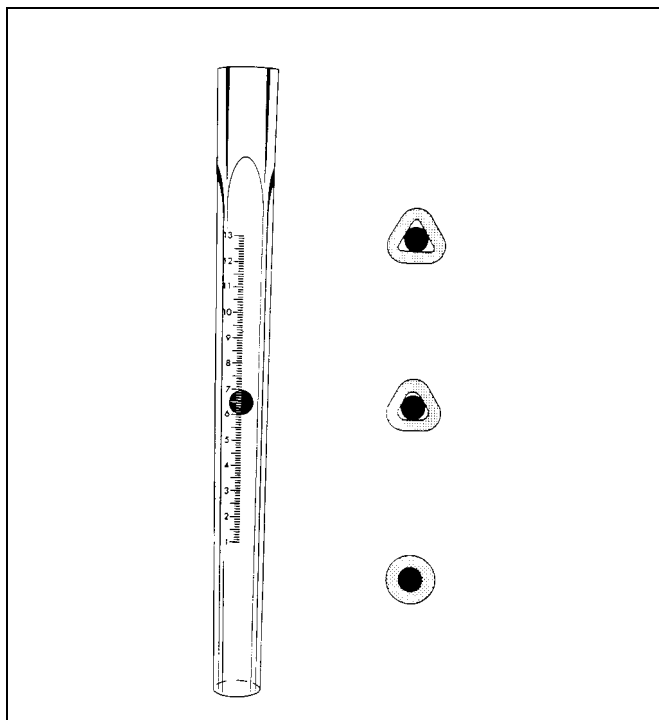


Fig. 8: Tri-flat Meter Tube

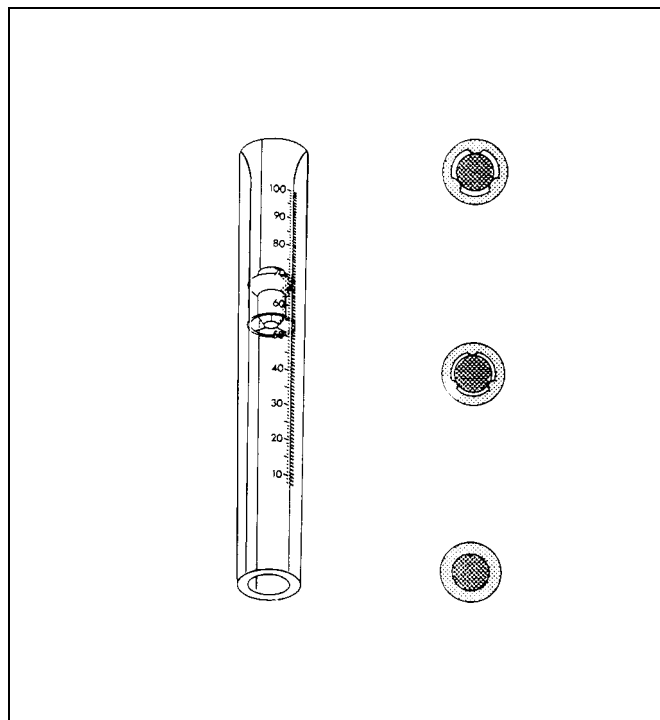


Fig. 10: Beadguide Meter Tube

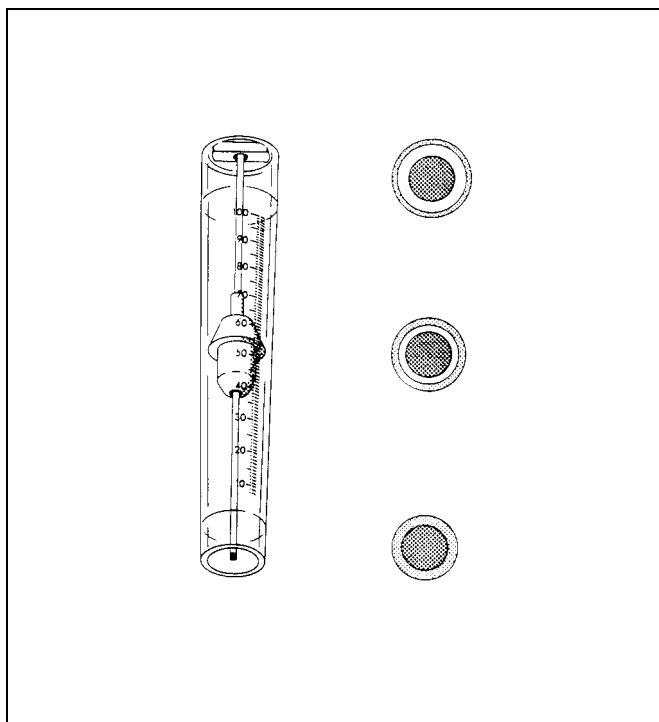
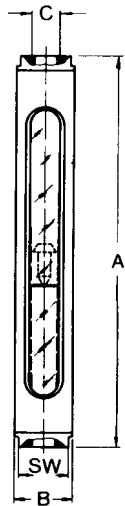


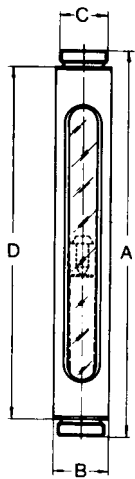
Fig. 9: Plain Taper Meter Tube

Dimensions



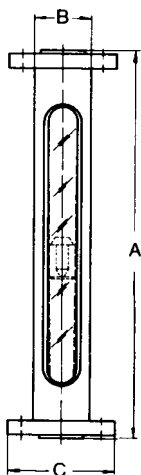
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Meter Tube Size	Threaded Connections			Size of Wrench SW	Weight appr. kg
	C	A ±1	∅ B		
1/16" / 1/8" / 1/4"	G 1/4	260	29	27	0.5
1/2"	G 1/2	405	40	36	1.7
3/4"	G 3/4	405	53	50	2.3
1"	G1	405	58.5	55	2.7
1 1/2"	G1 1/2	420	78	65	4.4
2"	G2	420	97	85	6.5



Mod. 10A1197(V)

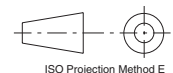
Meter Tube Size	Threaded Connections per DIN 11851 DIN 405 Part 1					
	∅ B	C	Threaded Connections	A	D	Weight appr. kg
1/2"	40	Rd 34 x 1/8"	SC 15	423	383	1.7
3/4"	53	Rd 44 x 1/6"	SC 20	423	379	2.3
1"	58.5	Rd 52 x 1/6"	SC 25	423	379	2.7
1 1/2"	78	Rd 65 x 1/6"	SC 40	441	393	4.4
2"	97	Rd 78 x 1/6"	SC 50	437	390	6.5



Mod. 10A1198DA (P)

Meter Tube Size	Flange Connections per DIN 2501						ANSI - Drilled for CL 300								
	DN	PN	C	k	No. Holes	d2	DN	C	k	No. Holes	d2	A ±1	∅ B	Weight appr. kg	
1/16" / 1/8" / 1/4"	10	40	90	60	4	14	1/2"	95.2	66.7	4	15.9	270	29	1.4	
1/2"	15	40	95	65	4	14	1/2"	95.2	66.7	4	15.9	415	40	2.4	
3/4"	20	40	105	75	4	14	3/4"	117.5	82.6	4	19.0	415	53	3.5	
1"	25	40	115	85	4	14	1"	123.8	88.9	4	19.0	415	58.5	4.7	
1 1/2"	40	16	150	110	4	18	1 1/2"	156.6	114.3	4	22.5	425	78	7.5	
2"	50	16	165	125	4	18	2"	165.1	127.0	8	19.0	425	97	10.0	

All dim's in mm



ISO Projection Method E

Fig. 11: Dimensions

Dimensions

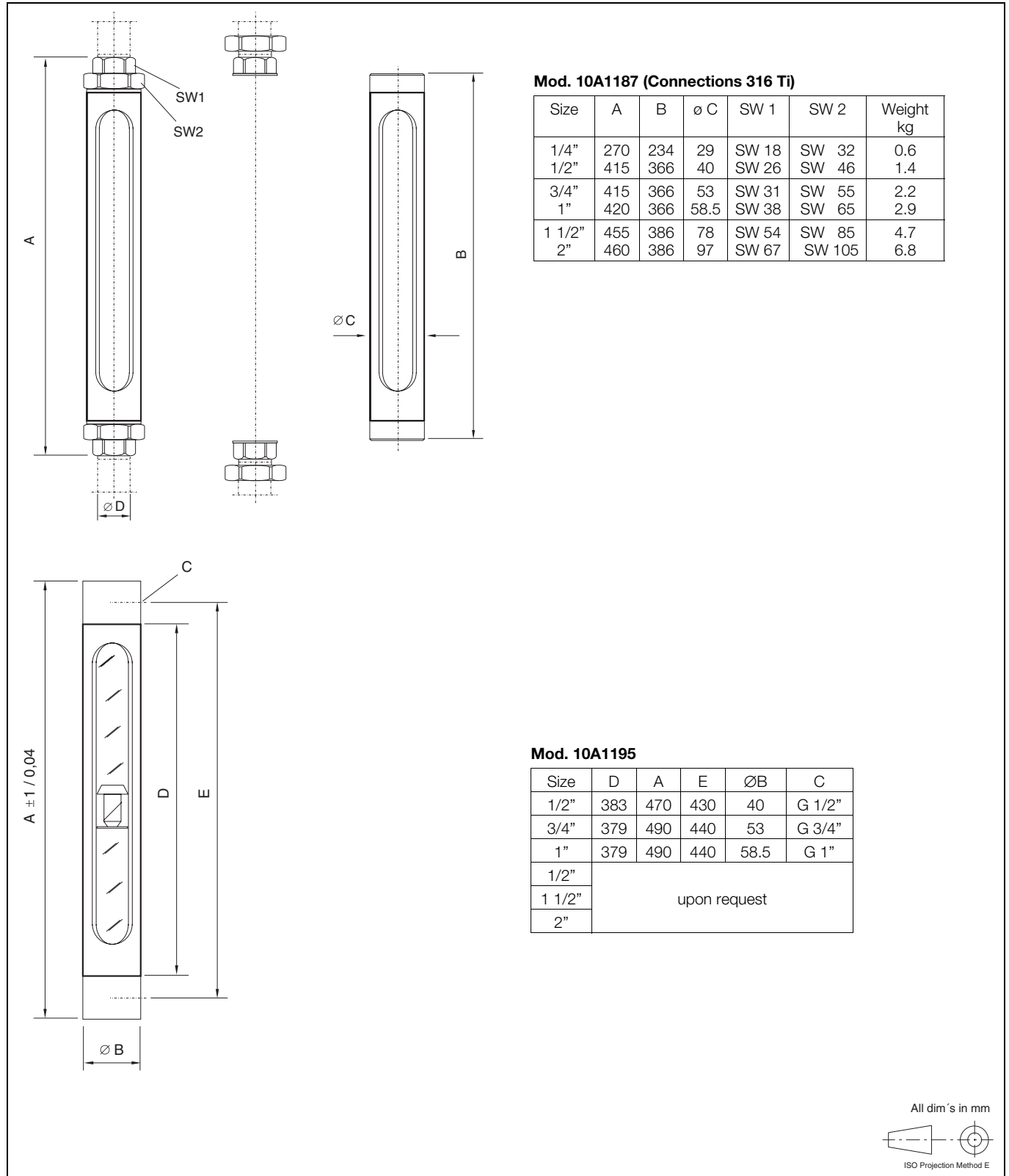


Fig. 12: Dimensions

## Alarm Signal Transmitter 55AX1000 for FAG1190-87

### Application

The Alarm Signal Transmitter includes one or two alarm switches, (inert gas switches) which are actuated by a magnet embedded in the float. They are used in conjunction with the float designs G(N)SVT, (N)SVP and BL. (Please observe the footnotes in the Flow Range tables)..

### Operation

The Alarm Signal Transmitter is positioned in a guide slot in the flowmeter housing and can be adjusted over the entire flow range. The inert gas switches are configured as bistable contacts. The signal from the lower alarm is actuated when the float drops below the lower alarm switch position. The contact is closed. The signal from the upper alarm is actuated when the float travels above the upper switch position. The contact is closed. The control circuits (between the alarm switches and the transistorized Switch Amplifier WE 77) are intrinsically safe. The Switch Amplifier must, however, be installed outside of the Ex-Zone.



Fig. 13:

### Specifications

#### 1) Alarm switch

Inert gas switch (reed contact)

#### Switching mode

Bistabile

#### Contact configuration

Lower alarm contact:  
Contact opens for a rising float  
Upper alarm contact:  
Contact closes for a rising float

#### Power

Max. 10 VA,  $U_B = 30$  V, 50/60 Hz

#### Connection cable

SIHF-I 2x0.5 Silicone

#### Cable length

1.75 m

#### Protection Class per DIN EN 60529

IP65

#### Allow. ambient temperature

-20 to +60 °C

#### 2) Switch amplifier (Ex)

KF\_SR2-Ex1W: for 1 alarm switch  
KF\_SR2-Ex2W: for 2 alarm switches

#### Supply power

230 V +10 %, -15 %; 45-60 Hz  
115 V +10 %, -15 %; 45-60 Hz

#### Output

1 or 2 switching relays with potential free contacts

#### Power

Max. 250 V, max. 4 A, max. 500 VA

#### Max. allow. cable length

Switch amplifier / alarm switch: 300 m

#### Allow. Ambient Temperature

-25 to +60 °C

**Alarm Signal Transmitter 55AX1000 for FAG1190-87**

**Materials, Connections, Weights**

**Alarm switch**  
 Nickel plated brass

**Housing**  
 Polyamide

**Electr. connections**  
 Screw terminals

**Weight**  
 appr. 0.7 kg

**Ordering Information**

Include with the Ordering Number the Instrument Name

Ordering Number	55AX1				
<b>Alarm signals</b>					
Max.		1			
Min.		2			
Max. and Min.		3			
<b>Switch amplifier</b>					
None		0			
1-channel		1			
2-channel		2			
<b>Supply power</b>					
None				0	
115 V, +10 %, -15 %, 45-60 Hz				1	
230 V, +10 %, -15 %, 45-60 Hz				2	
Others				9	
<b>Design level</b>					A
<b>Application</b>					F
Models 10A1187, 10A1197					

### Needle Valve for Series FAG1190-87 (10A1187) and FAG1190-97 (10A1197)

#### Application

Separate installation in pipeline up- or downstream from the flowmeter.

#### Design

Internal threads

#### Construction features

- Material: Brass, PN 100, max. 100 °C
- Valve in flow through housing
- Good setting resolution

#### Specifications

Part No.	Part No. for O <sub>2</sub> applica- tions	Dimensions					
		DN	ØD	A	C	E	SW1
1D125D1004	D125D001U01	G 1/4	50	72	10	50	22
1D125D1005	D125D001U02	G 1/2	63	72	12	55	25
1D125D1006	D125D001U03	G 3/4	63	95	14	67	32
1D125D1017	D125D001U04	G 1	90	130	17	74.5	40

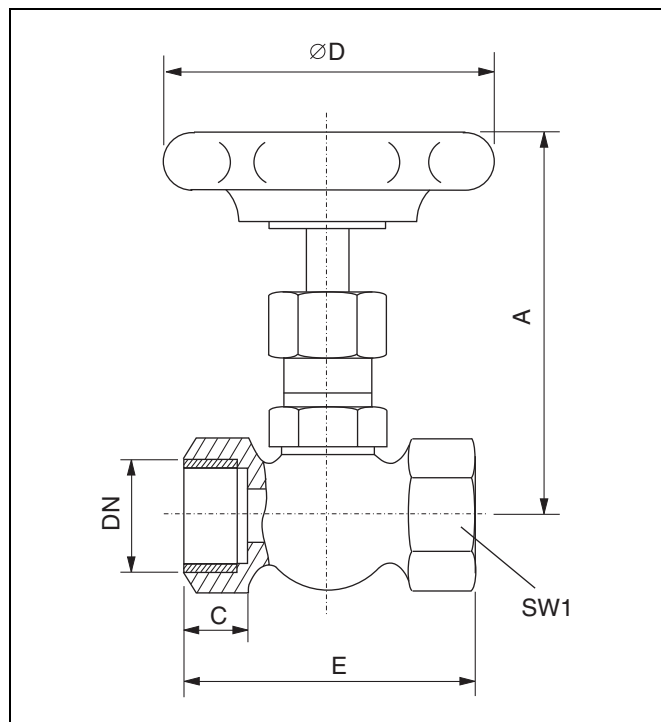


Fig. 14:

#### Application

Separate installation in pipeline up- or downstream from the flowmeter.

#### Design

Internal threads

#### Construction features

- Material: Stn. stl. steel 1.4571/316Ti, PN 200, max. 180 °C
- Valve in flow through housing
- Good setting resolution

#### Specifications

Part No.	Dimensions					
	DN	ØD	A	B	C	E
1D125D1001	G 1/4	50	72	25	13	50
1D125D1002	G 1/2	63	72	30	16	60
1D125D1003	G 3/4	63	95	35	18	75
1D125D1019	G 1	90	130	45	22	100
D125D003U02	1/4" NPT	50	72	25	13	50
D125D003U01	3/8" NPT	50	72	25	13	55
D125D003U03	1/2" NPT	63	72	30	16	60

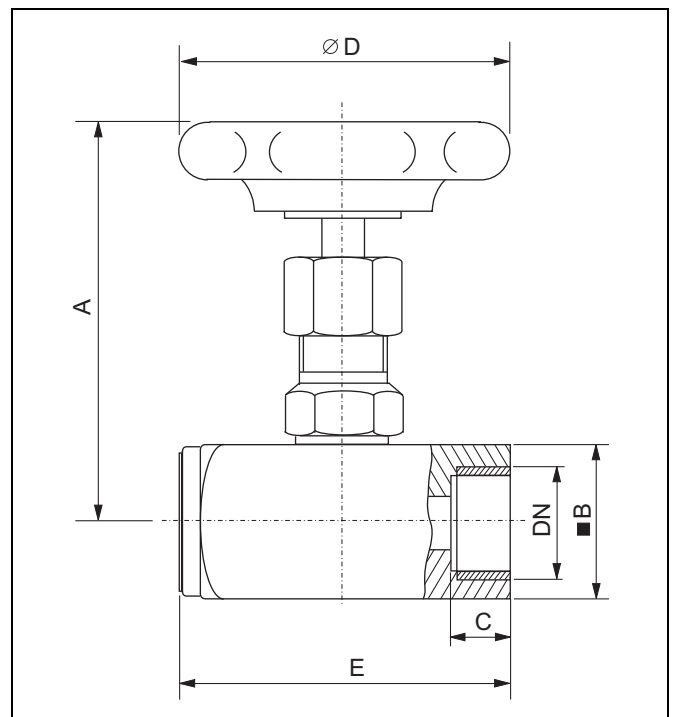


Fig. 15:

## Additional Information for Ex-Area Installations

The glass tube flowmeter can be used without restrictions in Zone 2 and Zone 22 explosion hazardous areas.

The instrument markings: II 3G T6 or 3D T85 °C.

For higher fluid temperatures these are valid as the Temperature Class or surface temperatures.

Please consider:

- The chemical resistance/temperature for the gaskets
- The allowable pressure
- The allowable ambient conditions

**Caution!**

The instruments must be installed so that there are no external mechanical forces acting on the flowmeter.

To prevent electrostatic charges, the housing pipe must be connected to PA (transition resistance < 1 GOhm). This is usually achieved over the process connections. Use a pipe clamp to connect to PA if necessary.

EN 50281-1-2 and 60079-14 are to be maintained.

For repairs only original parts may be used.

The alarms are also designed for Zone 2/22 Ex-Areas.

Markings: EEx nA IIC T6

The test voltage is  $U_T = 60 \text{ V}$ .

Corrosive metal particles are not allowed in liquid applications.

Gas inclusions in liquid applications and pulsating flows should be avoided.

Use slow opening valves.

### Ordering Information 10A1187, Threaded Connections with Pipe Couplings

Include with the Ordering Number the Instrument Name, Model Number, meter size, flow range, fluid, density and viscosity at operating temperature, operating temperature and pressure, max. operating temperature and pressure, scale format: e.g. % or direct reading in l/h m<sup>3</sup>/min or others upon request.

<b>Ordering Number</b>	D10A1187									
<b>Connection Type Vertical</b>										
<b>Design Level</b>	D									
<b>Housing Design</b>										
Standard	A									
With guide rod	P									
<b>Alarm Signal Transmitter</b>										
None	0									
Provisions for adding transmitter	1									
<b>Fitting Material</b>										
SS1.4571/316Ti	T									
<b>Material Connections In-/Outlet</b>										
Will be expanded during specification writing	X									
<b>Burst Protection</b>										
None	20									
With	40									
<b>Material O-Rings</b>										
Viton A	A									
Ethylene-Propylene	F									
Buna N	N									
<b>Instrument Connections</b>										
Pipe fittings	3									
<b>Meter Tube SizeThreads (Gi)</b>										
1/4" 1/4	1									
1/2" 1/2	3									
3/4" 3/4	3									
1" 1	4									
1 1/2" 1 1/2	5									
2" 2	6									
1/16" 1/4	7									
1/8" 1/4	8									
<b>Accuracy</b>										
Standard	A									
Calibration	B									
Viscosity calculation 4 % of max.	C									
<b>Name Plate</b>										
German	D									
English	E									

**Glass Tube Variable Area Flowmeter**

FAG1190-87, FAG1190-95, FAG1190-97-FAG1190-98

D184S041U02

**Ordering Information 10A1195/97, Threaded Connections Vertical / Horizontal**

Include with the Ordering Number the Instrument Name, Model Number, meter size, flow range, fluid, density and viscosity at operating temperature, operating temperature and pressure, max. operating temperature and pressure, scale format: e.g. % or direct reading in l/h m<sup>3</sup>/min or others upon request.

<b>Ordering Number</b>	<b>D10A119</b>									
<b>Connection Type</b>										
Threads horizontal (upon request)	5									
Threads vertical	7									
<b>Design Level</b>	D									
<b>Housing Design</b>										
Standard	A									
With guide rod	P									
<b>Alarm Signal Transmitter</b>										
None	0									
Provisions for adding transmitter	1									
<b>Fitting Material</b>										
PVC	C									
PVDF	F									
Steel	S									
SS1.4571/316Ti	T									
<b>Material Connections In-/Outlet</b>										
Will be expanded during specification writing	X									
<b>Installation Type</b>										
Pipeline mounting / none	20									
Pipeline mounting with burst protection	40									
Panel mount	50									
Panel mount with burst protection	60									
<b>Material O-Rings</b>										
Viton A	A									
Ethylene-Propylene	F									
Buna N	N									
<b>Instrument Connections</b>										
Pipe threads	1									
Threads DIN 11851	2									
NPT-threads	6									
<b>Meter Tube SizeThreads (Gi)11851</b>										
1/4" 1/4 -	1									
1/2" 1/2 SC 15	3									
3/4" 3/4 SC 20	3									
1" 1 SC 25	4									
1 1/2" 1 1/2 SC 40	5									
2" 2 SC 50	6									
1/16" 1/4 -	7									
1/8" 1/4 -	8									
<b>Accuracy</b>										
Standard	A									
Calibration	B									
Viscosity calculation 3 % of max.	C									
<b>Name Plate</b>										
German	D									
English	E									

### Ordering Information 10A1198, Flanged Connections

Include with the Ordering Number the Instrument Name, Model Number, meter size, flow range, fluid, density and viscosity at operating temperature, operating temperature and pressure, max. operating temperature and pressure, scale format: e.g. % or direct reading in l/h m<sup>3</sup>/min or others upon request

<b>Ordering Number</b>		<b>D10A1198</b>																		
<b>Connection Type Flanged Verticals</b>																				
Design Level				<b>D</b>																
<b>Housing Design</b>																				
Standard				<b>A</b>																
With guide rod				<b>P</b>																
<b>Alarm Signal Transmitter</b>																				
None						<b>0</b>														
Provisions for adding transmitter						<b>1</b>														
<b>Fitting Material</b>																				
PVC								<b>C</b>												
PVDF								<b>F</b>												
Steel								<b>S</b>												
SS1.4571/316Ti								<b>T</b>												
<b>Material Connections In-/Outlet</b>																				
Will be expanded during specification writing								<b>X</b>												
<b>Burst Protection</b>																				
None										<b>20</b>										
With										<b>40</b>										
<b>Material O-Rings</b>																				
Viton A												<b>A</b>								
Ethylene-Propylene												<b>F</b>								
Buna N												<b>N</b>								
<b>Instrument Connections</b>																				
Flanges DIN 2501 PN 40 (1 1/2" and 2" = PN 16)												<b>4</b>								
Flanges ANSI Cl 300 (upon request)												<b>5</b>								
Flanges ANSI Cl 150												<b>7</b>								
<b>Meter Tube Size</b>	<b>DN</b>	<b>ANSI</b>																		
1/4"	DN 10	1/2"																		<b>1</b>
1/2"	DN 15	1/2"																		<b>3</b>
3/4"	DN 20	3/4"																		<b>3</b>
1"	DN 25	1"																		<b>4</b>
1 1/2"	DN 40	1 1/2"																		<b>5</b>
2"	DN 50	2"																		<b>6</b>
1/16"	DN 10	1/2"																		<b>7</b>
1/8"	DN 10	1/2"																		<b>8</b>
<b>Accuracy</b>																				
Standard																				<b>A</b>
Calibration																				<b>B</b>
Viscosity calculation 4 % of max,																				<b>C</b>
<b>Name Plate</b>																				
German																				<b>D</b>
English																				<b>E</b>

EU-Certificate of Compliance



**EG-Konformitätserklärung**  
**EC-Certificate of Compliance**

Hiermit bestätigen wir die Übereinstimmung der  
*Herewith we confirm that our*



**Glaskonus-Durchflussmesser**  
*Glass Tube Flowmeter*

**Modell 10A11.. / FAG11..**  
*Model 10A11.. / FAG11..*

mit den grundlegenden Sicherheits- und Gesundheitsanforderungen gem. der Richtlinie 94/9/EG des Rates der Europäischen Gemeinschaft. Die Sicherheits- und Installationshinweise der Produktdokumentation sind zu beachten.  
*are in compliance with the Essential Health and Safety Requirements with refer to the council directives 94/9/EC of the European Community. The safety and installation requirements of the product documentation must be observed.*

Die Glaskonus-Durchflussmesser dienen zur Messung des Durchflusses von Gasen und Flüssigkeiten.  
*The Glass Tube Flowmeter are utilized to meter the flow rate of gases or liquids.*

Geräte-Kennzeichnung: II 3 G T6 bzw. II 3 D T 85°C ... T<sub>MED</sub>  
EEEx n A IIC T6 (nur Grenzalarm)  
Apparatus code: II 3 G T6 resp. II 3 D T85°C ... T<sub>MED</sub>  
EEEx n A IIC T6 (Alarm only)

Sicherheitstechnische Daten: siehe Betriebsanleitung D184B003U15  
*Safety values: resp. refer to Instruction Manual D184B003U02*

Angewandte Normen: EN 13 463-1:2001 EN 50 021:1999  
Standards:

Göttingen, 25. Juni 2003

  
Unterschrift / Signature

BZ-13-8016, Rev.1, 6029

**ABB Automation Products GmbH**

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EU-Declaration of Conformity Pressure Equipment Directive



**EG-Konformitätserklärung**  
**EC-Declaration of Conformity**



Hiermit bestätigen wir die Übereinstimmung des aufgeführten Gerätes mit den Richtlinien des Rates der Europäischen Gemeinschaft, welche mit dem CE-Zeichen gekennzeichnet sind. Die Sicherheits- und Installationshinweise der Produktdokumentation sind zu beachten.  
*Herewith we confirm that the listed instrument is in compliance with the council directives of the European Community and are marked with the CE marking. The safety and installation requirements of the product documentation must be observed.*

Hersteller: <i>manufacturer:</i>	ABB Automation Products GmbH, 37070 Göttingen - Germany
Modell: <i>model:</i>	10A11..
Richtlinie: <i>directive:</i>	Druckgeräterichtlinie 97/23/EG <i>pressure equipment directive 97/23/EC</i>
Einstufung: <i>classification:</i>	Ausrüstungsteile von Rohrleitungen <i>pipng accessories</i>
Normengrundlage: <i>technical standard:</i>	AD 2000 Merkblätter
Konformitätsbewertungsverfahren: <i>conformity assessment procedure:</i>	B1 (EG-Entwurfsprüfung) + D (Qualitätssicherung Produktion) <i>B1 (EC design-examination) + D (production quality assurance)</i>
EG-Baumusterprüfbescheinigung: <i>EC type-examination certificate:</i>	Nr. 07 202 4534 Z 0024/2/H
benannte Stelle: <i>notified body:</i>	TÜV Nord e.V. Rudolf-Diesel-Str. 5 37075 Göttingen - Germany
Kennnummer: <i>identification no.</i>	0045

Göttingen, den 03.12.2002

  
ppa .....  
(B.Kammann, Standortleiter APR Göttingen)

BZ-25-0009 Rev.02  
Änderungsnr. 5424



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