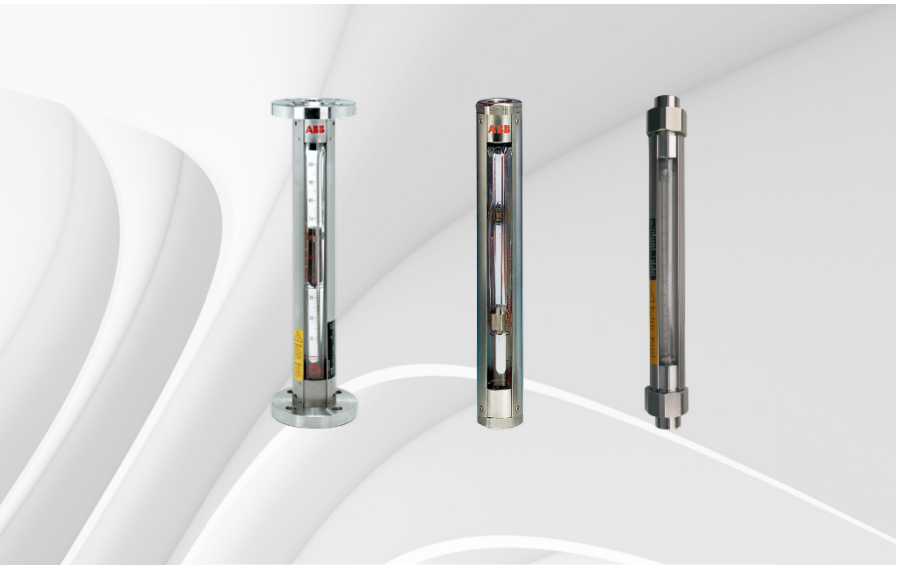
ABB MEASUREMENT & ANALYTICS | COMMISSIONING INSTRUCTION

VA Master FGM1190

Glass tube variable area flowmeter



Measurement made easy

FGM1190

Introduction

Glass tube variable area flowmeter for the measurement of clear liquids and gases.

Additional Information

Additional documentation on VA Master FGM1190 is available for download free of charge at www.abb.com/flow.
Alternatively simply scan this code:

Table of contents

1 Safety

General information and instructions

These instructions are an important part of the product and must be retained for future reference.
Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly. The specialist personnel must have read and understood the manual and must comply with its instructions.
For additional information or if specific problems occur that are not discussed in these instructions, contact the manufacturer.
The content of these instructions is neither part of nor an amendment to any previous or existing agreement, promise or legal relationship.
Modifications and repairs to the product may only be performed if expressly permitted by these instructions.
Information and symbols on the product must be observed. These may not be removed and must be fully legible at all times.
The operating company must strictly observe the applicable national regulations relating to the installation, function testing, repair and maintenance of electrical products.

Warnings

The warnings in these instructions are structured as follows:

⚠ DANGER

The signal word '**DANGER**' indicates an imminent danger. Failure to observe this information will result in death or severe injury.

⚠ WARNING

The signal word '**WARNING**' indicates an imminent danger. Failure to observe this information may result in death or severe injury.

⚠ CAUTION

The signal word '**CAUTION**' indicates an imminent danger. Failure to observe this information may result in minor or moderate injury.

NOTICE

The signal word '***NOTICE***' indicates possible material damage.

Note

'**Note**' indicates useful or important information about the product.

… 1 Safety

Intended use

This device is intended for the following uses:

- For conveying liquids, gases (including unstable liquids and gases) and vapors.
- For flow measurement of the operating volume under constant operating conditions (pressure, temperature, density). An output of the flow is also possible in standard or mass units.

The device has been designed for use exclusively within the technical limit values indicated on the name plate and in the data sheets.
The following technical limit values must be observed:

- The permissible pressure (PS) in the permissible measuring medium temperature (TS) may not up-scale the pressure-temperature values (p/T ratings).
- The maximum or minimum operating temperature must not be up-scaled or down-scaled.
- The maximum ambient temperature must not be exceeded.

When using measuring media, the following points must be observed:

- Measuring media may only be used if, based on the state of the art or the operating experience of the user, it can be assured that the chemical and physical properties necessary for operational security of the materials of the wetted parts of the temperature sensor will not be adversely affected during the operating time.
- Media containing chloride in particular can cause corrosion damage to stainless steels which, although not visible externally, can damage wetted parts beyond repair and lead to the measuring medium escaping. It is the operator's responsibility to check the suitability of these materials for the respective application.
- Measuring media with unknown properties or abrasive measuring media may only be used if the operator is able to perform regular and suitable tests to ensure the safe condition of the device

The operator bears sole responsibility for the use of the devices in relation to suitability, intended use and corrosion resistance of the materials in relation to the measuring medium.
The manufacturer is not liable for damage arising from improper or non-intended use.

Repairs, alterations, and enhancements, or the installation of replacement parts, are only permissible insofar as these are described in this manual. Approval by ABB Automation Products GmbH must be sought for any activities beyond this scope. Repairs performed by ABB-authorized specialist shops are excluded from this.

Improper use

The following are considered to be instances of especially improper use of the device:

- Operation as a flexible compensating adapter in piping, for example for compensating pipe offsets, pipe vibrations, pipe expansions, etc.
- For use as a climbing aid, for example for mounting purposes.
- For use as a bracket for external loads, for example as a support for piping, etc.
- Material application, for example by painting over the housing, name plate or welding/soldering on parts.
- Material removal, for example by spot drilling the housing.

Warranty provisions

Using the device in a manner that does not fall within the scope of its intended use, disregarding this manual, using underqualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.

Manufacturer’s address

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Measurement & Analytics
Schillerstr. 72
32425 Minden
Germany
Tel: +49 571 830-0
Fax: +49 571 830-1806

Customer service center
Tel: +49 180 5 222 580
Email: automation.service@de.abb.com

2 Use in potentially explosive atmospheres

The glass tube variable area flowmeter can be used without further restrictions in the hazardous area of Zone 2 and Zone 22.

Flowmeter Ex marking

II 3G Ex h T6...T3 Gc
II 3D Ex h T6...T3 Dc

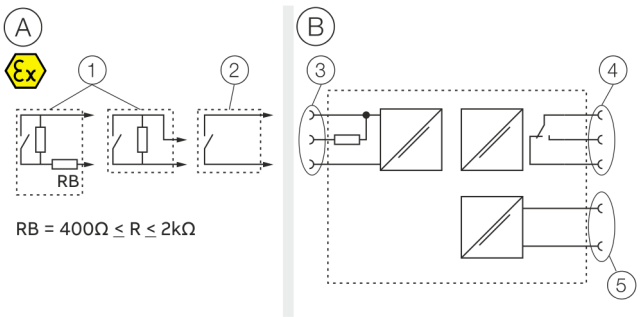
Ta= −40...+60°C

Surface temperature
Notice: The maximum surface temperature of the device corresponds to the maximum measuring medium temperature (if this is higher than the ambient temperature). If there are uncertainties regarding the maximum measuring medium temperature, the corresponding security surcharges for the maximum surface temperature when using the device are included in the calculations.

D55AX alarm signaling unit Ex marking

II 3G ec IIC T6...T3 Gc
The rated voltage of the alarm signaling unit is U_M = 60 V AC, 75 V DC.

Electrical connection for the alarm signaling unit



(A) Hazardous area
(B) Non-hazardous area
(1) Alarm signaling unit in NAMUR wiring
(2) D55AX alarm signalling unit
(3) Switching amplifier input
(4) Switching amplifier output
(5) Switching amplifier power supply

Figure 1: Connection of an alarm signalling unit to a switching amplifier (example)

The circuits (between the alarm signalling units and the switching amplifier) are intrinsically safe. The switching amplifier itself must be mounted outside the hazardous area.

Information for safe operation in potentially explosive atmospheres

When operating in hazardous areas, observe the following points and instructions.

Assembly / Commissioning
When installing the flowmeter, ensure that there are no external mechanical influences on the flowmeter.

Operation
- Make sure that the chemical resistance and temperature resistance of the gaskets are observed.
- Make sure that the permissible operating conditions and ambient conditions are observed.
- Make sure that the measuring medium does not contain any corrosive metal particles.
- Make sure that the liquid measuring media do not have any gas inclusions.
- Avoid pulsating flow of the measuring media.
- Avoid compression oscillations, see **Prevention of compression oscillations when measuring gases** on page 9.

Maintenance / Repair
Ensure that only original parts are used during maintenance and repair work.
- Make sure that there are no solid particles or loose parts in the piping.
- When cleaning the plastic thermowell, use a moist cleaning cloth only to avoid the risk of explosion due to electrostatic charging.

3 Functional description

The VA Master FGM1190 series flowmeters work according to the float principle.
The position of the float in the conical glass meter tube is proportional to the flow. It can be read on the scale fitted to the meter tube.

Four different types of scale can be used:

- Directly readable scale in flow units
- Percentage scale
- DK/DS scale
- Millimeter scale

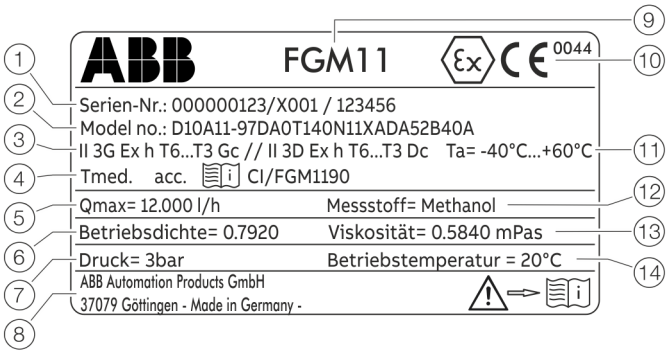
When using the DK/DS scale a flow rate table is available for the flowmeter. For other operating conditions, the user can create additional tables.

Flowmeters in sizes ½ in to 2 in are provided with a percentage scale in the standard design. The device has a factory plate indicating the flow rate for the display of 100 %.
The other scale values can be linearly converted. A special reading curve is therefore not required.
On request, conversion equations for flow calculation for other operating conditions will be made available.

4 Product identification

Name plate

The name plate is located on the flowmeter.

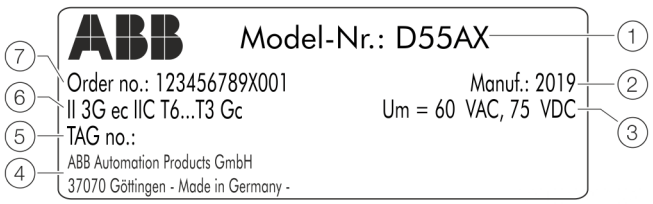


1. Serial number
2. Ordering number
3. ATEX marking
4. Permissible measuring medium temperature with reference to the commissioning instruction
5. Maximum flow rate
6. Operating density
7. Operating pressure
8. Manufacturer address
9. Type designation
10. CE mark
11. Ambient temperature
12. Measuring medium
13. Viscosity of the measuring medium
14. Operating temperature

Figure 2: Name plate for devices with directly readable scale (example)

Note

For information on permissible measuring medium temperature (T_{med}) see **Specification** on page 16.



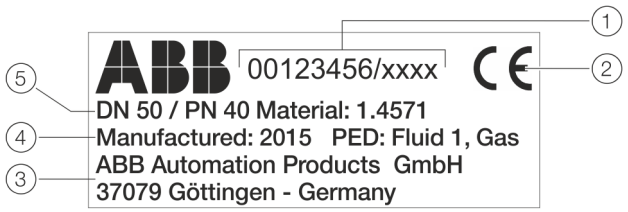
1. Model number
2. Year of manufacture
3. Operating voltage
4. Manufacturer address
5. TAG number
6. ATEX marking
7. Ordering number

Figure 3: Alarm signalling unit name plate

Factory tag

The factory plate is on the flowmeter in addition to the name plate. Depending on the nominal diameter of the flowmeter (> DN 25 or ≤ DN 25), it is identified with two different factory plates (also refer to article 4, paragraph 3, Pressure Equipment Directive 2014/68/EU):

Pressure equipment in the scope of the Pressure Equipment Directive

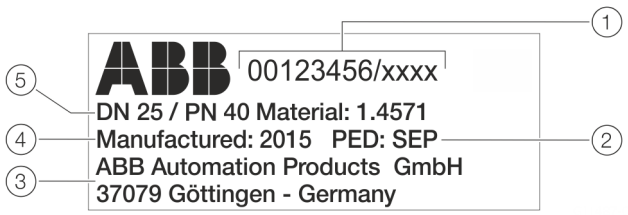


1. Serial number of the sensor
2. CE mark
3. Manufacturer address
4. Year of manufacture and specification of the fluid group in accordance with the PED
5. Nominal diameter / nominal pressure rating and material of the pressure bearing part (wetted part)

Figure 4: Factory plate for nominal diameter > DN 25 (example)

The respective fluid group in accordance with the Pressure Equipment Directive is indicated under PED.
Example: Fluid Group 1 = hazardous fluids, gaseous.

Pressure equipment outside the scope of the Pressure Equipment Directive



1. Serial number of the sensor
2. Reason for exception article 4, paragraph 3 of the Pressure Equipment Directive
3. Manufacturer address
4. Year of manufacture
5. Nominal diameter / nominal pressure rating and material of the pressure bearing part (wetted part)

Figure 5: Factory plate for nominal diameter ≤ DN 25 (example)

In PED the exception to article 4 paragraph 3 of the Pressure Equipment Directive is specified.
The pressure equipment is classified in the SEP (= Sound Engineering Practice) "Good Engineering Practice" category.

5 Transport and storage

Inspection

Check the devices immediately after unpacking for possible damage that may have occurred from improper transport. Details of any damage that has occurred in transit must be recorded on the transport documents.
All claims for damages must be submitted to the shipper without delay and before installation.

Transport

- The center of gravity of some devices is not at the center of the equipment.
- Use any of the available attachment points on the device for transport.
- Make sure that all transport locking devices are available and correctly installed.
- Mark transport packaging visibly with the notice ‘Caution Glass’.

Storage

Bear the following points in mind when storing devices:

- Store the device in its original packaging in a dry and dust-free location.
- Observe the permitted ambient conditions for transport and storage.
- Avoid storing the device in direct sunlight.
- In principle, the devices may be stored for an unlimited period. However, the warranty conditions stipulated in the order confirmation of the supplier apply.

The ambient conditions for the transport and storage of the device correspond to the ambient conditions for operation of the device.
Adhere to the device data sheet!

… 5 Transport and storage

Returning devices

Use the original packaging or a secure transport container of an appropriate type if you need to return the device for repair or recalibration purposes.
Fill out the return form (see **Return form** on page 19) and include this with the device.
In accordance with the EU Directive governing hazardous materials, the owner of hazardous waste is responsible for its disposal or must observe the following regulations for shipping purposes:
All devices delivered to ABB must be free from any hazardous materials (acids, alkalis, solvents, etc.).

Address for returns:
Please contact Customer Center Service according to page 4 for nearest service location.

6 Installation

Safety instructions

⚠ WARNING

Risk of injury due to process conditions.
The process conditions, for example high pressures and temperatures, toxic and aggressive measuring media, can give rise to hazards when working on the device.

- Before working on the device, make sure that the process conditions do not pose any hazards.
- If necessary, wear suited personal protective equipment when working on the device.
- Depressurize and empty the device / piping, allow to cool and purge if necessary.

⚠ WARNING

Risk of fire due to non-permissible slip additives for oxygen applications.
Only use permissible slip additives for oxygen applications (e.g. Arkema Voltaelf).

⚠ CAUTION

Risk of injury due to breaking of the meter tube.
Make sure that the technical limit values for operation are complied with.
Equip the device with an additional splinter guard if necessary.

- The flow direction must correspond to the direction indicated on the device (if labeled).
- The maximum torque must not be exceeded for all flange connections.
- The devices must be installed without mechanical tension (torsion, bending)
- Install flange devices with plane parallel counter flanges.
- Devices must only be installed for the intended operating conditions and with suitable gaskets.
- Flange bolts and nuts must be secured to provide protection against pipe vibrations.

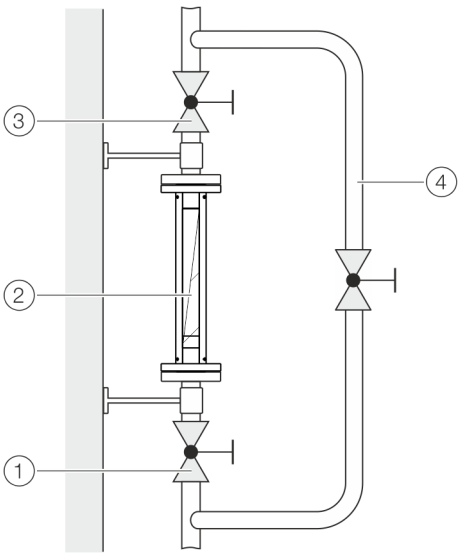
- Protect device against external mechanical shock and impacts. Do not drop.

Installation conditions

General

The following points are to be considered during installation:

- Prior to installation in the piping, remove the wooden pole used as a transportation lock from the meter tube.
- The glass tube variable area flowmeter is installed vertically in the piping. The measuring media must flow from bottom to top.
- Keep the device as far away as possible from pipe vibrations and powerful magnetic fields.
- The nominal diameter of the piping should be the same as the connection nominal diameter.
- Inlet and outlet sections are not required.
- Avoid pulsating flows and sudden pressure surges.
- Use valves which open slowly.
- If the flowmeter is installed in a pipeline where decommissioning is impossible or inexpedient, a bypass line should be provided.
- For gaseous measuring media, the flowmeter should be installed as close as possible to the pipe constrictions. The nominal diameter of the piping at the outlet of the flowmeter should be measured as small as possible.
- Stop and throttle valves should preferably be attached to the outlet of the flowmeter.
- For liquid measuring media, the nominal diameter of the piping should be dimensioned as large as possible (if economically viable).



1 Stop valve in the inlet
2 Flowmeter
3 Stop valve in the outlet
4 Bypass line

Figure 6: Installation of the flowmeter

Installation recommendations

Refer to VDI / VDE Directive 3513 sheet 3, Selection and Installation Recommendations for Variable Area Flowmeters.

Pressure chambers and collecting tanks

If piston pumps or compressors are used for the transport of the measuring media, a pulsating flow of the measurement media must be expected.
In order to reduce the pulsating of the float, the installation of pressure chambers or collecting tanks in the piping before the flowmeter is recommended.

Operating conditions

A variable area flowmeter is specified for a defined set of operating conditions of the measuring medium. For liquids and gases, these are pressure and temperature-related properties (density and viscosity) under operating conditions.
For gases, in particular, this means operating at a specific operating pressure and operating temperature. The specified accuracy of the device always refers to the operating conditions underlying the specification.

Pressure loss

The available operating pressure at the measuring point must be higher than the pressure loss listed for the flowmeter in the specifications.
It is important to also consider the pressure loss downstream from the flowmeter due to losses in the piping and other fittings.

Prevention of compression oscillations when measuring gases

During low flow amounts and low operating pressure, so-called compression oscillations of the float can occur.
To prevent self-generated compression oscillations, note the following information from VDI / VDE 3513 Sheet 3:

- Select a flowmeter with the lowest possible pressure loss.
- Minimize the piping length between the flowmeter and the nearest upstream or downstream throttling location.
- Set the limit of the regular measuring range from the usual 10 to 100 % to 25 to 100 %.
- When setting the flow rate value, always start by assuming larger values.
- Increase the operating pressure and consider its effect on the flow rate changes due to the change in gas density in the operating conditions.
- Minimize non-throttled, free volumes upstream and downstream of the device.

… 6 Installation

… Operating conditions

Pressure shocks
Especially when measuring gases, it is possible that pressure or shock waves can occur when fast opening solenoid valves are employed and the piping cross-sections are not throttled, or if there are gas bubbles in liquids.
As a result of the sudden expansion of the gas in the piping, the float is forcibly driven against the upper floatstop. Under certain conditions, this can lead to destruction of the device.

Avoid pressure shocks when operating the devices.

Solids content in the measuring medium
Variable area flowmeters have only limited suitability for measuring media containing solids.
Depending on the concentration, particle size and type of solid, increased mechanical abrasion may occur, especially at the critical measuring edge of the float.
In addition, solidified deposits on the float can change its weight and shape.
These effects can lead to erroneous measurement results, depending on the float type.
In general, the use of appropriate filters is recommended in such applications.
For the flow measurement of measuring media containing magnetic particles, we recommend the installation of a magnetic separator upstream of the variable area flowmeter.

Mounting

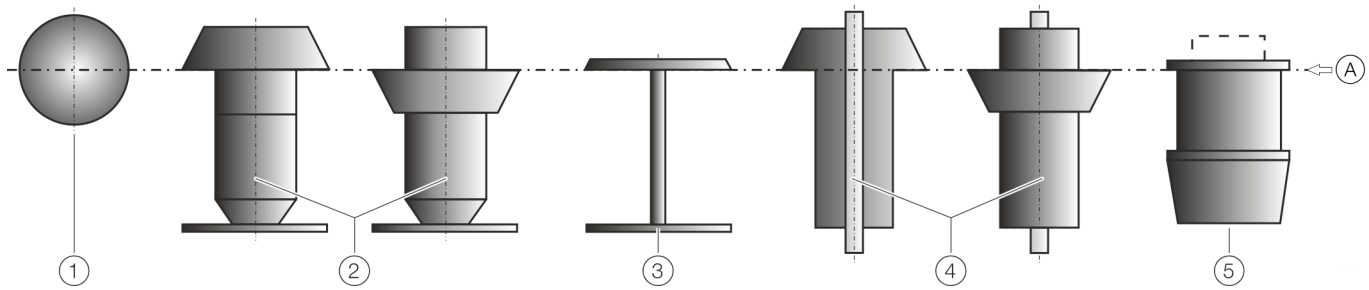
General information
The flowmeters of the FGM1190 series are intended for the vertical cable mounting.
The following points must be observed during installation in the pipeline:

- The measuring medium must flow from bottom to top.
- The piping may not exert any inadmissible forces or torques on the device The device must be disconnected from the power supply for installation.
- Install flange devices with plane parallel counterflanges and use suited gaskets only.
- The maximum torque must be complied with for all flange screws
- Use gaskets made from a material that is compatible with the measuring medium and measuring medium temperature.
- Gaskets must not extend into the flow area, since possible turbulence could influence the accuracy of the device

The flowmeters with smaller meter tube sizes are generally sufficiently supported by the pipeline. If this is not ensured (e.g. in the case of plastic pipes or larger nominal sizes), the flowmeters and pipelines must be secured by wall or mounting clips.

Flowmeter installation
Install the flowmeter in the center of pipeline at the required position using the respective threaded connections or flanges.

7 Commissioning



Ⓐ Index markers
① Ball float
② Float with guide ring
③ Float with low pressure loss
④ Guided floats
⑤ BL type float

Figure 7: Index markers on the floats

⚠ CAUTION

Risk of burns due to hot measuring media

The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!

- Before starting work on the device, make sure that it has cooled sufficiently.

During commissioning of the flowmeter, observe the following points:

- Open the shut-off valves slowly to prevent pressure surges that can damage the flowmeter.
- For liquid measurement media, vent the piping if necessary.
- For devices with alarm signalling units, set the units to the desired values.

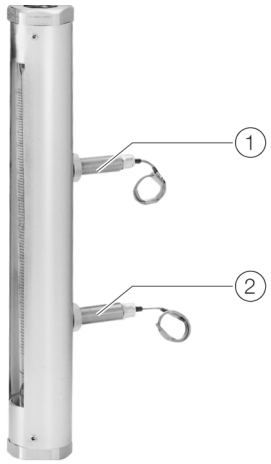
The flow rate can now be read from the scale line on the scale, which is consistent with the index marker of the float.

During operation if there are strong vibrations of the float during the measurement, observe the following points:

- If the part of the scale where the vibrations occur is not used, an extended floatstop in the inlet can help. The lower measurement range of the scale can no longer be used.
- As an alternative, a flowmeter with a larger nominal diameter or using a float with a low pressure loss can help.

8 Alarm signalling unit

General



① Max. alarm signalling unit ② Min. alarm signalling unit

Figure 8: Alarm signaling unit 55AX1000

One or two 55AX1000 type alarm signaling units can optionally be attached to the flowmeter housing.
The alarm signaling unit is designed as a potential-free contact, actuated by a magnet in the float.
An external one or two-channel switching amplifier is required to operate the alarm signaling unit.

Note
The alarm signaling unit is suited only in connection with type FGM1190 flowmeters with a meter tube size > ¼ in.
The alarm signaling unit is suited only in connection with float types G(N)SVT, (N)SVP and BL.

The alarm signaling unit is used in a guide slot in the flowmeter housing and can be adjusted across the entire measuring range.

Specifications	
Operating mode	Inert gas switch (reed contact, bistable switching behavior)
Switching behavior	
• Lower limit value	Contact closes in the event of a falling float
• Upper limit value	Contact closes in the event of a rising float
Switching capacity	Maximum 10 VA, U_B = 30 V, 50 / 60 Hz
Permissible ambient temperature	−20 to 60 °C (−4 to 140 °F)
Connection type	Silicone cable SIHF-I 2 x 0.5 mm², length 1.75 m (5.74 ft)
IP rating	IP 65 (in accordance with DIN EN 60529)
Material	
• Alarm signaling unit	Brass, nickel-plated
• Housing	Polyamide
Weight	Approx. 0.7 kg (1.54 lb)

Switching amplifier

Model KF_SR2-Ex1W: 1-channel
Model KF_SR2-Ex2W: 2-channel

Specifications	
Power supply	230 V AC, +10 % / −15 %, 45 to 60 Hz 115 V AC, +10 % / −15 %, 45 to 60 Hz 24 V DC, +10 % / −15 %
Output	One or two switching relays with potential-free changeover contacts
Switching capacity	Maximum 250 V, maximum 4 A, maximum 500 VA
Maximum permissible cable length	Between the switching amplifier and alarm signalling unit: 300 m (984 ft)
Permissible ambient temperature range	−20 to 60 °C (−4 to 140 °F)
Electrical connection	Screw terminals, maximum 2.5 mm² (14 AWG)
Type of assembly	35 mm top-hat rail in accordance with EN 60715:2001
IP rating	IP 20 in accordance with EN 60529
Weight	approx. 150 g (0.3 lb)

Note
See the switching amplifier data sheets for information on Ex-marking and the Ex relevant specifications for the switching amplifiers.

9 Maintenance / Repair

⚠ WARNING

Risk of injury due to process conditions.
The process conditions, for example high pressures and temperatures, toxic and aggressive measuring media, can give rise to hazards when working on the device.

- Before working on the device, make sure that the process conditions do not pose any hazards.
- If necessary, wear suited personal protective equipment when working on the device.
- Depressurize and empty the device / piping, allow to cool and purge if necessary.

⚠ WARNING

Risk of fire due to non-permissible slip additives for oxygen applications.
Only use permissible slip additives for oxygen applications (e.g. Arkema Voltaelf).

⚠ CAUTION

Risk of burns due to hot measuring media
The device surface temperature may exceed 70 °C (158 °F), depending on the measuring medium temperature!

- Before starting work on the device, make sure that it has cooled sufficiently.

Note
Loss of CE conformity!
For pressure equipment consisting of assemblies, CE conformity is only for devices in the factory-supplied state.
Components should only be replaced by the manufacturer's service personnel or an authorized specialist workshop.
Replacing components yourself will render the CE conformity invalid.

Spare parts

Repair and maintenance activities may only be performed by authorized customer service personnel.
When replacing or repairing individual components, use original spare parts.

Note
Spare parts can be ordered from ABB Service.
www.abb.com/contacts

Cleaning

Soiling of the meter tube and the float will impair the measuring accuracy of the device. The necessary cleaning interval is dependent on the operating conditions and must be set individually.
The meter tube and the float must be removed in order to clean the device.

NOTICE

Damage to the float!
Damage to the float due to incorrect disassembly.

- Observe the following points when disassembling the meter tube and the float!

- The float is precision made. During assembly/disassembly, ensure that the guide ring and the measuring edge are not damaged. A damaged float causes inaccuracies in the measurement and can cause damage to the meter tube under certain circumstances.
- Make sure that the meter tube is not exposed to impacts or mechanical loads during disassembly.
- When taking out the meter tube, note where the float stops are installed. Ensure that the float stops are installed in their original positions again during assembly.

… 9 Maintenance / Repair

… Cleaning

Disassembly of the meter tube

To disassemble the meter tube and the float, proceed as follows:

1. Loosen process connections and remove the flowmeter from the pipeline. For devices of the FGM1190-87 series, loosen the upper and lower union nut and remove the flowmeter laterally from the pipeline.
2. Carefully loosen the hexagon screws present on the upper connection fitting and remove the connection fitting.
3. Carefully remove the meter tube upward from the housing. While doing so, make sure that the float does not fall out or is damaged.
4. Remove float from the housing.

Assembly is carried out in reverse order to disassembly, observing the following points:

- Make sure that the guide ring of the float (if present) points toward the inlet.
- Replace damaged O-rings and grease with silicone grease or another lubricant prior to installation of the meter tube.
- Secure the hexagon screws on the upper connection fitting using a suited screw lock lacquer during assembly.

10 Dismounting and disposal

Dismounting

⚠ WARNING

Risk of injury due to process conditions.

The process conditions, for example high pressures and temperatures, toxic and aggressive measuring media, can give rise to hazards when dismantling the device.

- If necessary, wear suited personal protective equipment during disassembly.
- Before disassembly, make sure that the process conditions do not pose any safety risks.
- Depressurize and empty the device / piping, allow to cool and purge if necessary.

Bear the following points in mind when dismantling the device:

- Switch off the power supply.
- Disconnect electrical connections.
- Allow the device / piping to cool and depressurize and empty. Collect any escaping medium and dispose of it in accordance with environmental guidelines.
- Use suited tools to disassemble the device, taking the weight of the device into consideration.
- If the device is to be used at another location, the device should preferably be packaged in its original packing so that it cannot be damaged.
- Observe the notices in **Returning devices** on page 8.

Disposal

Note

Products that are marked with the adjacent symbol may **not** be disposed of as unsorted municipal waste (domestic waste).
They should be disposed of through separate collection of electric and electronic devices.

This product and its packaging are manufactured from materials that can be recycled by specialist recycling companies.

Bear the following points in mind when disposing of them:

- As of 8/15/2018, this product will be under the open scope of the WEEE Directive 2012/19/EU and relevant national laws (for example, ElektroG - Electrical Equipment Act - in Germany).
- The product must be supplied to a specialist recycling company. Do not use municipal waste collection points. These may be used for privately used products only in accordance with WEEE Directive 2012/19/EU.
- If there is no possibility to dispose of the old equipment properly, our Service can take care of its pick-up and disposal for a fee.

11 Specification

Temperature limits °C (°F)

Ambient temperature $T_{amb.}$
Permissible ambient temperature range:

- Liquid measuring media: −40 to 60 °C (−40 to 140 °F)
- Gas measuring media: −40 to 40 °C (−40 to 104 °F)

Measuring medium temperature T_{medium}

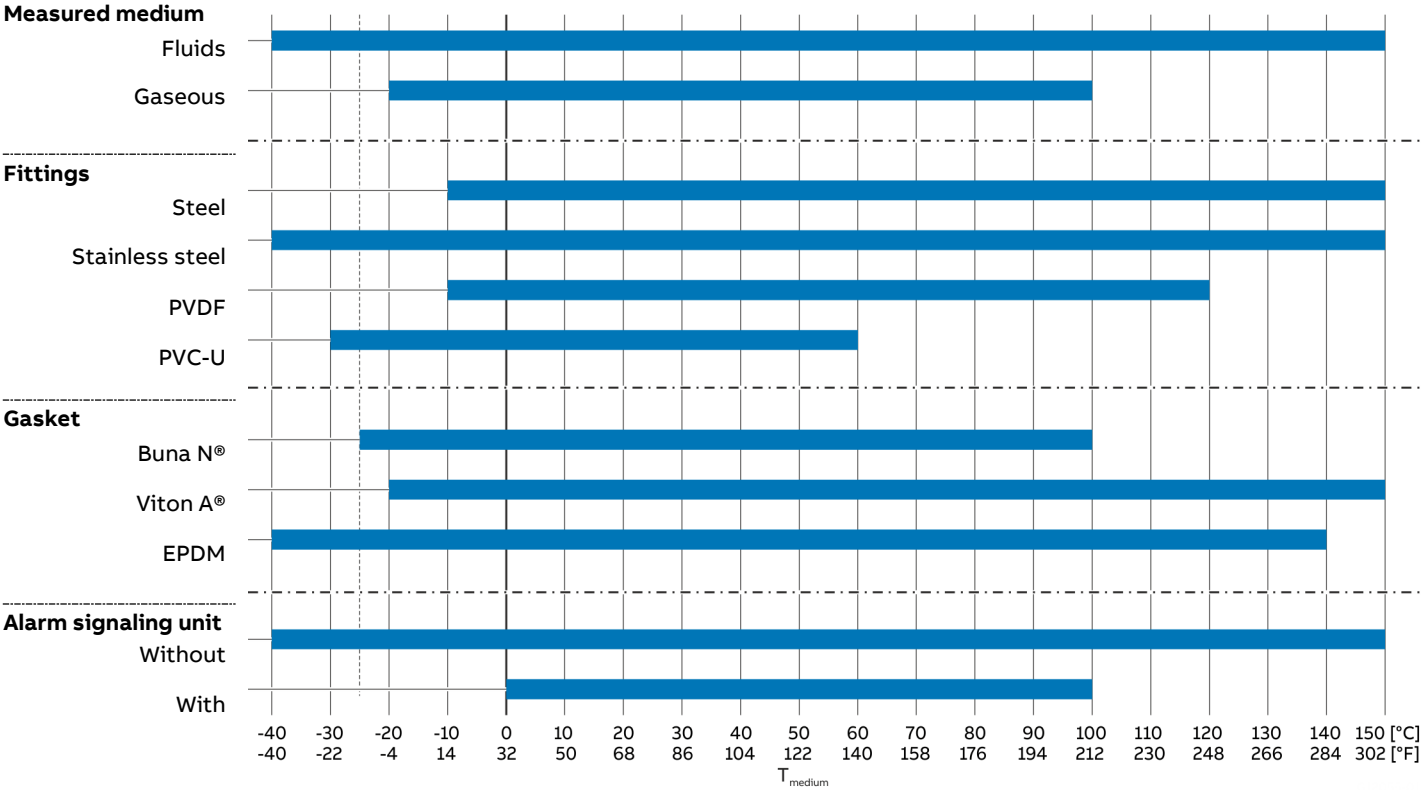


Figure 9: Measuring medium temperature permitted depending on the measuring medium and equipment

For more information about the maximum measuring medium temperature, see **Material load** on page 17.

… 11 Specification

Operating pressure

Maximum permissible operating pressure		
Measuring tube sizes	**Fluids**	**Gases**
⅛ in, ¼ in	30 bar (3 MPa / 435.1 psi)	30 bar (3 MPa / 435.1 psi)
½ in	21 bar (2.1 MPa / 304.6 psi)	17 bar (1.7 MPa / 246.5 psi)
¾ in	17 bar (1.7 MPa / 246.5 psi)	13 bar (1.3 MPa / 188.6 psi)
1 in	14 bar (1.4 MPa / 203 psi)	10 bar (1 MPa / 145 psi)
1 ½ in	9 bar (0.9 MPa / 130.5 psi)	4 bar (0.4 MPa / 58 psi)
2 in	7 bar (0.7 MPa / 101.5 psi)	2 bar (0.2 MPa / 29 psi)

With meter tube sizes of 1 in to 2 in, the maximum permissible operating pressure is reduced by 1 % for each 2 °C (3.6 °F) at operating temperatures of over 95 °C (203 °F) (for liquids).
The reduced pressure values for gas applications are a result of safety considerations.
The resistance of the polycarbonate thermowell is reduced along with increasing temperatures. For this reason, consider the following when measuring gas:

- The listed maximum permissible operating pressure applies for measuring medium temperatures up to 30 °C (86 °F) and ambient temperatures up to 30 °C (86 °F).
- For measuring medium or ambient temperatures over 30 °C (86 °F), the maximum permissible operating pressure is reduced by 1.05 % for each 1 °C (1.8 °F) (for gas).

Material load

Metal fitting with female thread
Metal fitting with DIN 11851 thread
Types FGM1190-87, -95, -97

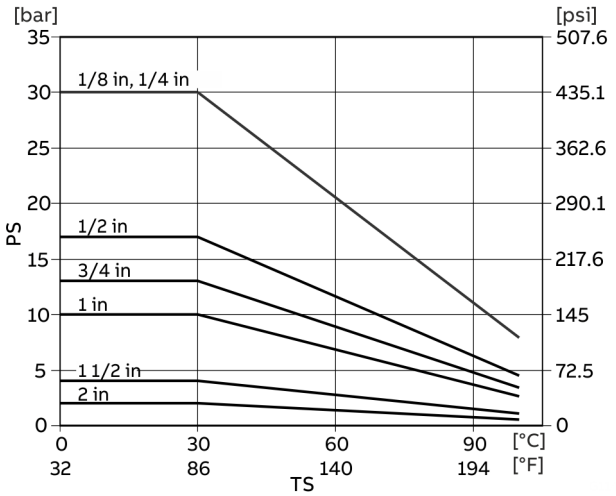


Figure 10: Material load curve for gas

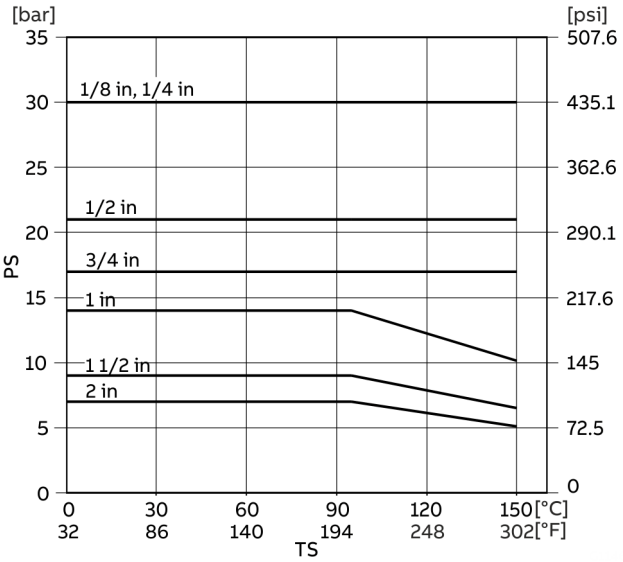


Figure 11: Material load curve for liquids

… 11 Specification

… Material load

Plastic fitting
Types FGM1190-97, -98

Plastic fitting with flange PN 40, PN 16, Class 150, 300
Metal fitting with flange PN 40, PN 16, Class 300
Type FGM1190-98

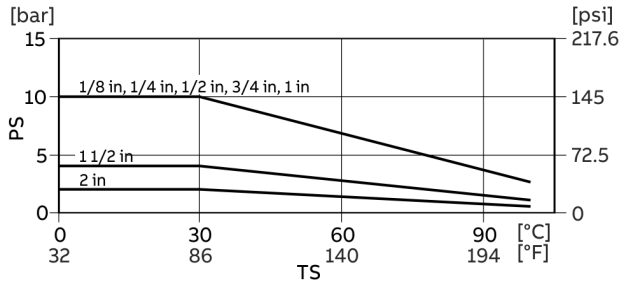


Figure 12: Material load curve for gas

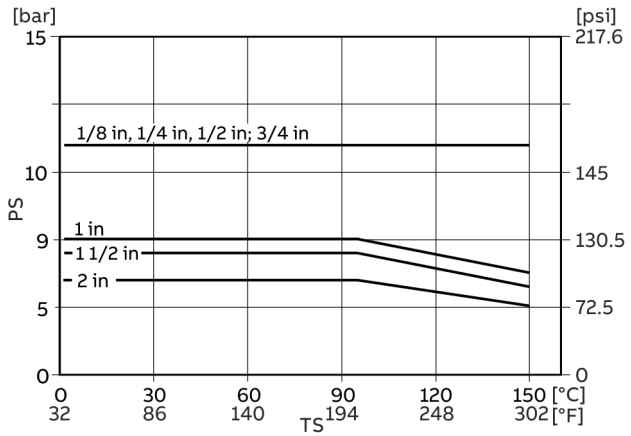


Figure 13: Material load curve for liquids

Metal fitting with flange PN 40, PN 16, CL 300
Type FGM1190-98

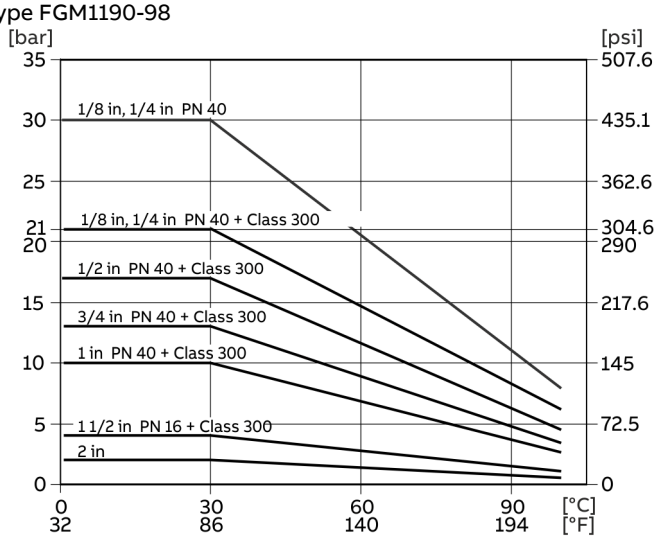


Figure 14: Material load curve for gas

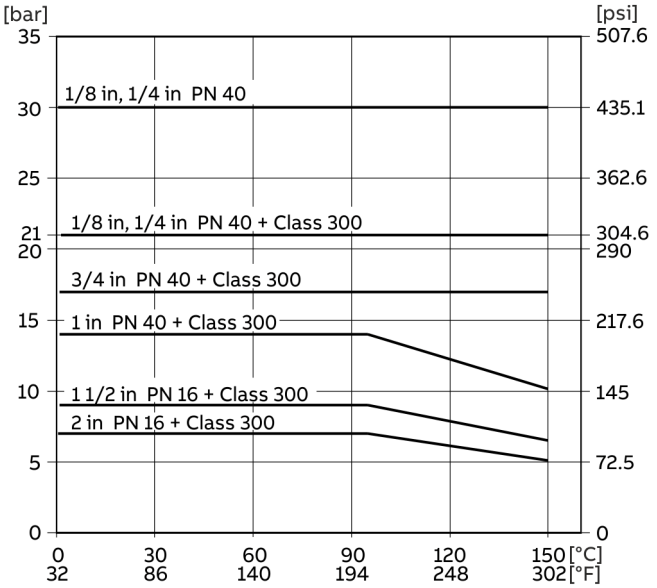


Figure 15: Material load curve for liquids

12 Additional documents

Note
All documentation, declarations of conformity and certificates are available in ABB's download area.
www.abb.com/flow

Trademarks

Buna-N is a registered trademark of DuPont Dow Elastomers.

Hastelloy B-3 is a Haynes International trademark

Viton is a DuPont de Nemours trademark

13 Appendix

Return form

Statement on the contamination of devices and components

Repair and/or maintenance work will only be performed on devices and components if a statement form has been completed and submitted.
Otherwise, the device/component returned may be rejected. This statement form may only be completed and signed by authorized specialist personnel employed by the operator.

Customer details:

Company:	
Address:	
Contact person:	Telephone:
Fax:	Email:

Device details:

Type:	Serial no.:
Reason for the return/description of the defect:	

Was this device used in conjunction with substances which pose a threat or risk to health?

☐ Yes ☐ No

If yes, which type of contamination (please place an X next to the applicable items):

☐ biological	☐ corrosive / irritating	☐ combustible (highly / extremely combustible)
☐ toxic	☐ explosive	☐ other toxic substances
☐ radioactive		

Which substances have come into contact with the device?

1.
2.
3.

We hereby state that the devices/components shipped have been cleaned and are free from any dangerous or poisonous substances.

Town/city, date	Signature and company stamp

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