FLOWguard M

Operating Manual

English Original

1 Contents

2 Safety notices

This manual contains notices which must be followed for your personal safety and to prevent property damage. The notices are distinguished by a warning triangle and depicted as follows according to the degree of danger.

DANGER

means failure to take the respective precautions will result in death or serious bodily injury.

WARNING

means failure to take the respective precautions may result in death or serious bodily injury.

CAUTION

along with a warning triangle means failure to take the respective precautions may result in minor bodily injury.

CAUTION

without a warning triangle means failure to take the respective precautions may result in minor property damage.

ATTENTION

means failure to observe the respective notice may result in an undesirable event or condition.

NOTE

indicates important information about the product, handling the product, or the respective part of the documentation to which particular attention is being drawn and the observance of which is advised.

In addition to these notices in this publication, the general safety and accident prevention notices must be observed.
In the event information in this publication is inadequate in any situation, you may contact our telephone service for additional information.
Please carefully read this printed publication prior to installation and startup.

CE mark

This product meets the specifications of EMC directive 2004/108/EC and the low voltage directive 2006/95/EC.

3 General information

This product left the factory in a safe condition. To maintain this condition and ensure safe operation of the device, the user must observe the notices and warnings in these operating instructions.

NOTE

For clarity purposes these instructions do not include all detail information about all models of the product and further cannot include every possible setup, operation or maintenance scenario.
For additional information or in the event of special problems not adequately addressed in these instructions, you may phone us for the necessary information.
We further advise the contents of these instructions are not part of a previous or existing agreement, commitment or legal relationship, nor does it amend said. Any obligations of GTS, Inc. arise from the respective purchase agreement which also includes the full and sole applicable warranty policy. These contractual warranty terms are neither expanded nor limited by the explanations in these instructions.
The contents reflect the state of technology at the time of print. Technical changes made during the course of further development are reserved.

DISCLAIMER OF WARRANTY

The user is responsible for any modifications to the device not expressly specified in these operating instructions.

Qualified PERSONNEL

refer to persons familiar with the setup, installation, startup and operation of the product and holding the respective qualifications according to their duties, e.g.:

- Training or instruction/authorisation to operate and maintain devices/systems in accordance with the standards of safety engineering for electric circuits, high pressures and aggressive as well as hazardous media.
- For devices with explosion protection: Training or instruction/authorization to perform work on electric circuits for explosive installations.
- Training or instruction in accordance with the standards of safety engineering in the care and use of suitable safety equipment.

CAUTION

Assemblies sensitive to static electricity may be damaged by voltages far below the threshold of human perception. These voltages already occur when touching a component or electrical connections in an assembly without being electro-statically discharged. The damage a surge causes to an assembly is oftentimes not immediately detectable but will only become apparent after a considerable operating time.

4 Introduction

Fig. 1 Probe housing

The device is used to monitor the flow in open and closed conveying systems. Typical applications are pipes, transfer points and conveyor belts.

The sensor detects the conveyed material. The microwave signal sent by the sensor is changed by the material. These changings are analyzed by sensor and the control of the relay contacts will be affected according to the parameterization.

The sensor features active self-monitoring. An additional relay operated by closed-circuit principle, is used to report when maintenance is required. In its go-state, the closed relay contact allows for series connection with additional contacts of other devices, thus allowing monitoring using a centralized alarm.

The microwave metering element inside a robust stainless steel housing consists of a combination transmitter/receiver unit. The touchless measuring method allows for wear- and maintenance-free continuous operation.

Performance characteristics

- Microwave metering element
- Reliable measurement, even with abrasive materials
- Measurement of microwave-impenetrable material in open and closed systems
- Measurement of microwave-impenetrable material in closed systems (material-dependent)
- Easy installation and startup
- Sensor with active self-monitoring
- Level and status displayed via LEDs and LED bar graph display
- Useful signal via relay contact output
- Additional relay contact output to prompt maintenance
- 24VDC supply

5 General information on construction and operation

5.1 Safety instructions

If the device can no longer be operated safely, it must be put out of operation and secured to prevent unintentional operation. Reasons for this may include:

- visible damage to the device
- Failure or malfunction
- Storage or operation outside the approved temperature range
- Moisture inside the device
- severe transport stress

Before the device is put into operation again, a professional routine test must be performed in accordance with DIN EN 61010, Part 1. This test should be performed by the manufacturer.

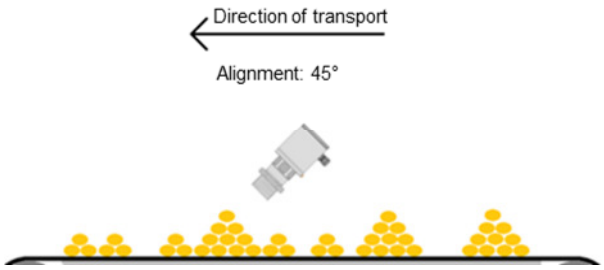
5.2 Intended use

The FLOWguard M measuring system is intended to measure material in a microwave-impenetrable material, or to measure a microwave-penetrable material in closed systems or systems isolated from waves.
The measuring system is one which transmits directed electromagnetic waves and receives the reflections. To limit the wavelength to the required frequency band, ensure the sensor is only operated within the approved temperature range.
The sensor features a standby and signal output. The signal output is provided as a changeover contact. The outputs are designed as control outputs. Therefore it is not allowed to use voltages and currents higher than those specified in the technical data.

6 Installation instructions

The sensor is fitted into a stainless steel housing. The housing is equipped with a 1½" G external thread used for screw into a socket and can be fixed with a nut.

- The sensor should be installed where the highest material distribution can be expected in the process with a preferably consistent material flow.
- The cable glands should point down to prevent water from entering.
- When operating multiple microwave sensors in close proximity in the same product flow, ensure they will not interact.
- The sensor should be installed so material cannot deposit in front of the sensor or abrasive materials damage the sensor. We recommend installing the sensor flush with the inside wall.
- The following drawings show various installation options:



The sensor detects the contours of the surface.
A cleated belt side-wall can impact measurement.
The measuring range or room can be limited with metal sheeting.

Fig. 2 Installation on conveyor belt

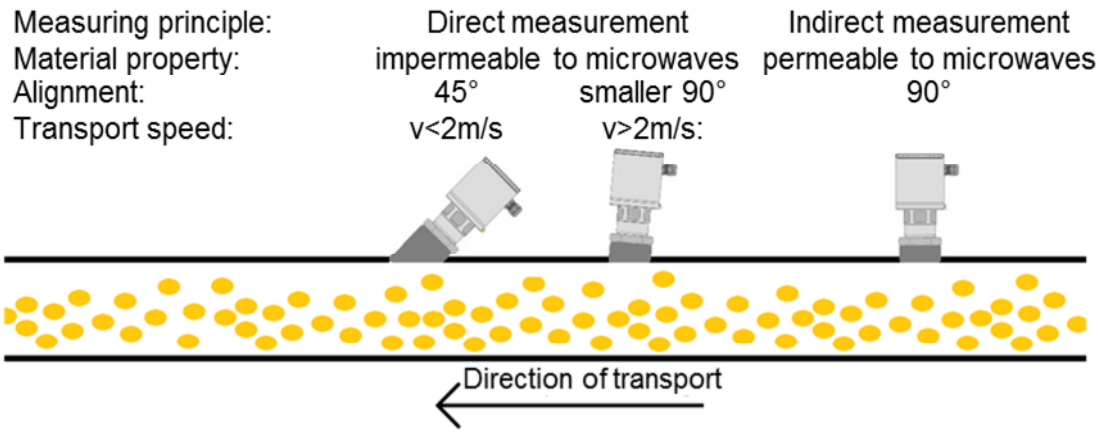


Fig. 3 Installation inside piping

The sensor detects the changes in the contours of the material or of the spread in the measuring range. The material should not be able to deposit in front of the sensor.

Sensor installation accessories:

Welded sockets:

Socket type 1:	22.5mm long	; material: steel
Socket type 2:	22.5mm long	; material: V4A stainless steel
Socket type 3:	48.0mm long	; material: V4A stainless steel
Socket type 4:	45° angle; material: steel	

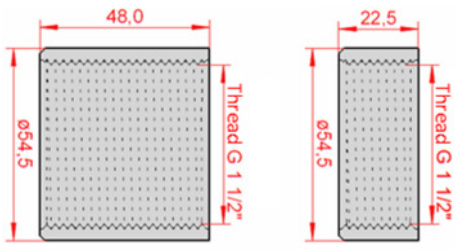


Fig. 4 Socket dimensions

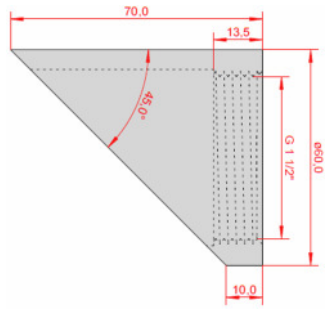


Fig. 5 Dimensions 45° socket

Type 1 - 3: This installation should be preferred for measuring of microwave-penetrable or microwave-impenetrable material with a high conveying speed.

Type 4: This installation should be preferred for measuring of microwave-impenetrable material with a low conveying speed.

6.1 Mounting plate with socket:

Socket type 5: socket to 99.5mm * 99.5mm mounting plate; material: V2A stainless steel

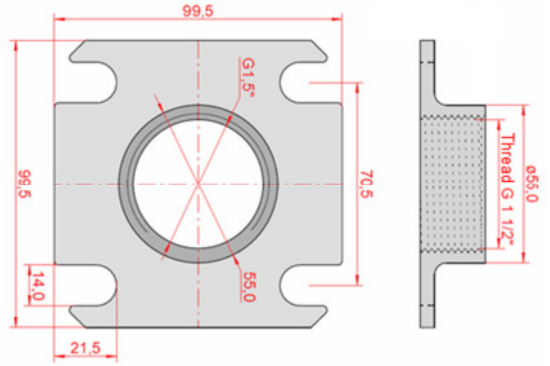


Fig. 6 Dimensions socket on mounting plate

Type 5: The piping or duct must be made from microwave-penetrable material. Otherwise a measuring room can be created by fully surrounding the sensor area with microwave-impenetrable material, e.g. wide metal sheeting or metal film.
Be sure not to cover the sensor surface during installation.

7 Electrical connection

After opening of the cover plate all control elements, display and terminal block are visible.

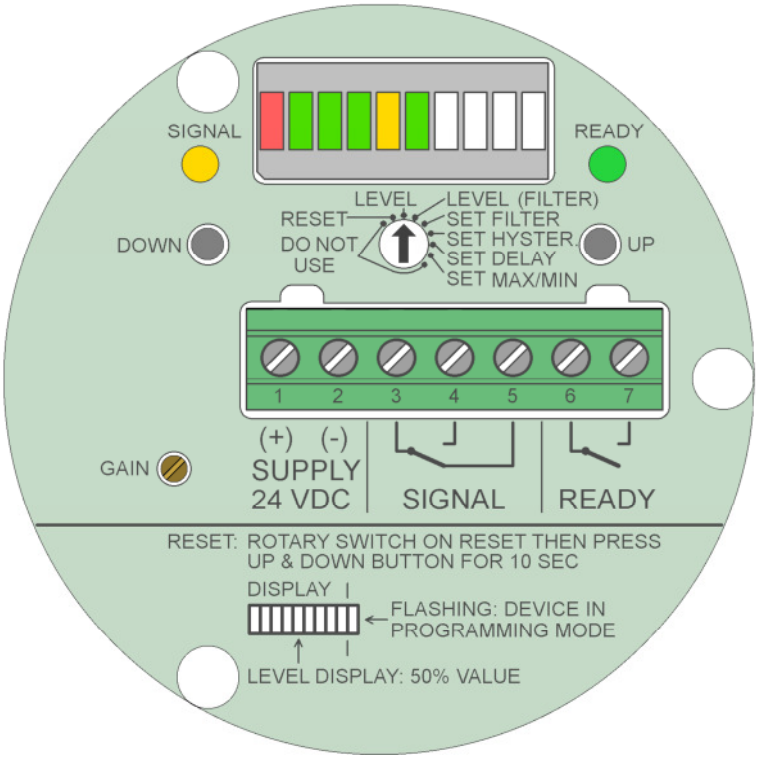


Fig. 7 Front panel

Kl_1	Supply voltage (+Us)
Kl_2	Supply voltage (–Us)
Kl_3	Contact output (COM)
Kl_4	Contact output (NO)
Kl_5	Contact output (NC)
Kl_6	Standby contact (COM)
Kl_7	Standby output (NO)

Failure to observe the technical connection requirements may result in malfunctions, defect or device damage.
We recommend fusing the supply voltage in the supply line.
The outputs should be used so as to ensure a safe system under zero potential or in the event of a cable defect.
If the receiver is ready for use, the Ready LED will light up continuously and the Ready contact is closed. Only then will the signal contact have a defined state.
The sensor housing may be earthed according to regulations.
We recommend using a shielded cable with a large enough cross section and an appropriate insulation class as the connection cable.

8 Settings (general)

The sensor is adjusted using a rotary multi-step switch, two buttons and a potentiometer. By removing the metallic cover the board cover with all control and display elements are available.
Removing the board cover is prohibited to prevent affecting the functionality of the sensor. Unauthorized modification of the device will void the user's authority to operate the equipment and any warranty.

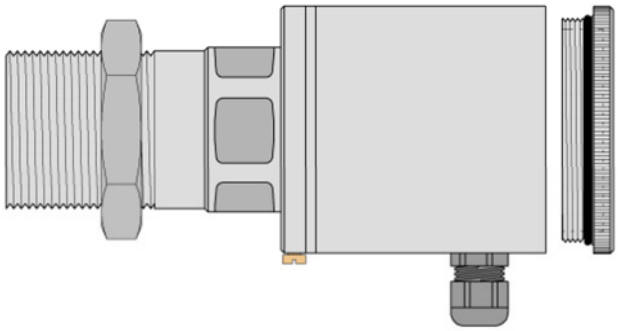


Fig. 8 Housing with open cover

8.1 Sensor parameterization

The sensor features a rotary selection switch, two buttons, one level control, one bar graph, two LEDs and two relay outputs.

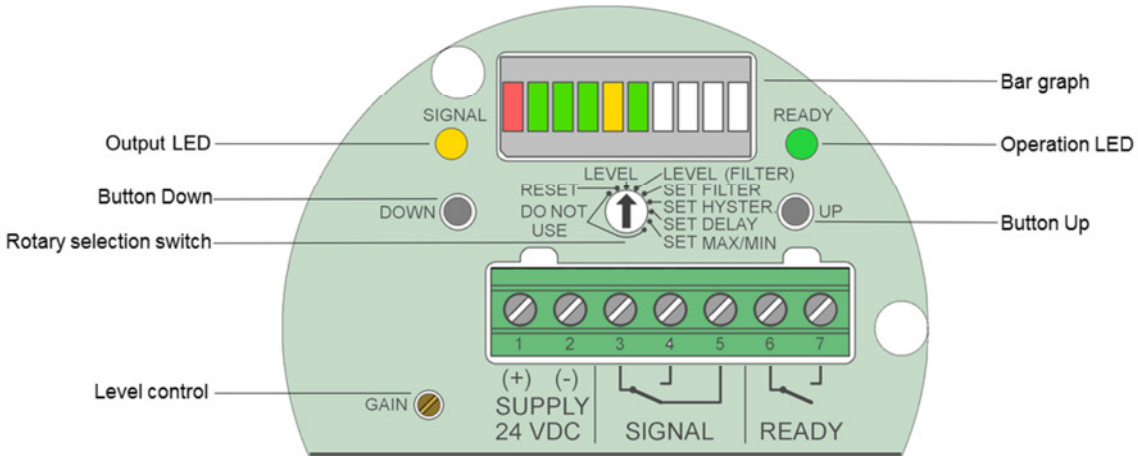


Fig. 9 Controls and display elements

Bar graph:	The bar graph is used for analogue depiction of different parameters, e.g. field intensity resp. flow rate.	
Output LED:	this LED indicates the status of the signal relay.	
Operation LED:	this device has an internal error detector. The status of the device is displayed via this LED.	
Rotary selection switch:	**Reset**:	restore factory default
	Level:	field intensity during operation
	Level (Filter):	averaged value of field intensity during operation
	Set Filter:	filter settings
	Set Hysteresis:	hysteresis settings
	Set Delay:	switching delay setting
	Set MAX/MIN:	signal output type setting

Buttons Down & Up:	these buttons are used to change parameters chose by rotary selection switch.
Level control:	in operating mode the bar graph indicates the field intensity of the signal received. This level control is used to adjust the amplification.

The following section explains the receiver settings. Therefor rotary selection switch and buttons will be used. Bar graph and LEDs are intended for visualized support.

8.1.1 Reset - restore factory default

1. Set the rotary selection switch to **RESET**.
2. For identification READY-LED and right, green LED of bar graph flash.
3. To restore the factory defaults, simultaneously press the device buttons (Down & Up) for approx. 10 seconds.
   The settings have been successfully restored when the entire bar graph display flashes.

After performing a Reset, all settings must be checked and adjusted

8.1.2 Level – current field intensity during operation

1. Set the rotary selection switch to **Level**.
2. The conveying process must be set to the target volume.
3. The amplification (field intensity) is adjusted via the Level Control

Fig. 10 Field intensity

4. Conveyed material amount should be changed to control field intensity on bar graph

The switching threshold is displayed with an orange/yellow LED in 5th position of bar graph.

8.1.3 Level (Filter) – average value of current field intensity during operation

1. Set the rotary selection switch to **Level (Filter)**.
2. The operation mode by using the average field strength.
   The flow rate must be equal to the target quantity flow at the MIN or MAX monitoring.
3. The settings for the field strength will be changed by using the level control (potentiometer).
   MIN-monitoring: field strength should be min. 6 LEDs at the bar graph.
   MAX-monitoring: field strength should be max. 4 LEDs at the bar graph.

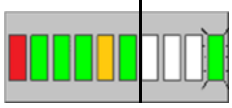


Fig. 11 MIN-monitoring

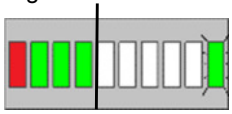


Fig. 12 MAX- monitoring

Example: MIN-monitoring: decrease the flow rate; after dropping below the fifth element (yellow LED), the switching process is performed.

The switching process uses the averaged field intensity.
The switching point is determined in the 5th LED in the bar graph (yellow LED).
The field intensity must be adjusted according to the type of monitoring (Min. or Max.) (see item “Setting”).

8.1.4 SET Filter

1. Set the rotary selection switch to **SET Filter**.
2. Change the period using the Up and Down buttons.

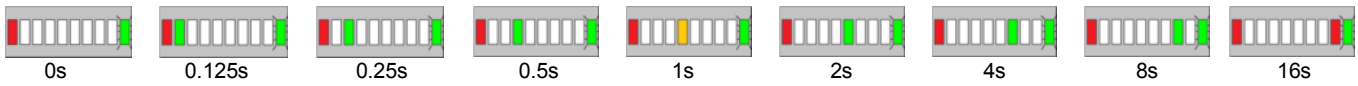


Fig. 13 Illustration of filter time setting

The optimal filter time selection depends on the respective process and should be adjusted to them.
Choosing too small of a period can result in the **Level (Filter)** display flickering due to rapidly pulsing transport.
Choosing too large of a period can result in a brief material stoppage during transport not being recognized due to the long averaged period.

8.1.5 SET Hysteresis

1. Set the rotary selection switch to **SET Hysteresis**.
2. The hysteresis is adjusted using the Up and Down button.
3. The switching threshold is figuratively at the middle of the display. The green LEDs and the figurative threshold indicate the factor of the value selected.

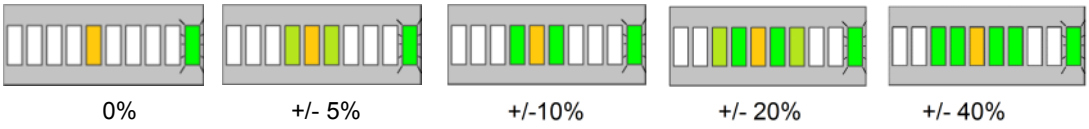


Fig. 14 Hysteresis

Selecting too low of a hysteresis can result in the output tending to switch flicker.
Selecting too high of a hysteresis can result in a change in the flow no longer being detected.

8.1.6 SET Delay – Delay for the signal relay

1. Set the rotary selection switch to **SET Delay**.
2. Change the period using the Up and Down buttons.

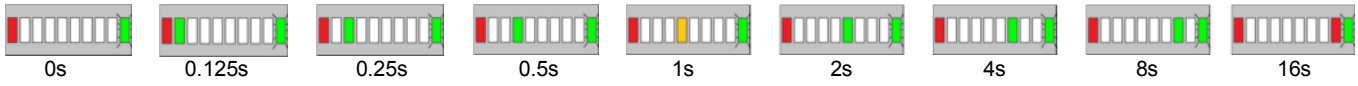


Fig. 15 Illustration of time setting

The optimal switching delay selection depends on the respective process and should be adjusted to them.
Selecting too short of a period can result in relay flickering due to rapidly pulsing transport.
Selecting to long of a period can result in a brief material stoppage during transport not being recognized due to the long switching delay.

8.1.7 MAX/MIN-Setting

1. Set the rotary selection switch to **SET MAX/MIN**.
2. The relay will open / close accordingly.
3. Use the Up and Down buttons to change the operating mode.

State / Selection	Display in menu	Threshold	Output LED	Signal output	Operating LED	Ready output
Min. value		shortfall			 permanently	
		exceeded			 permanently	
Max. value		shortfall			 permanently	
		exceeded			 permanent	
fault or malfunction	not applicable	not relevant	undefined	undefined	 flashing	
no power supply						

Tab. 1 Table of states

In the event of an error or a malfunction, the output relay does not necessarily drop and the LED goes out.

In the event of a maintenance error an alarm is shown by the READY contact of the relay operated in a closed current principle. In good condition the relay is closed. Because of that it can be connected with other devices in series and used as a collective alarm.
If there is no checksum error circuit in the installation, the standby contact can be used to suspend signal.

The standby circuit has a one second delay. Activation can therefore occur no less than one second after switching on.

9 Technical specifications

Housing material:	stainless steel
Sensor surface:	plastic (ceramic optional for abrasive media)
Protection class:	IP65
Weight transmitter / receiver:	1.3 kg
Storage temperature:	-20°C to +60°C (non-condensing)
Operating temperature:	-20°C to +60°C (non-condensing)
Process temperature:	-20°C to +90°C
Process pressure:	0 to 2 bar (optionally to 25 bar with ceramic sensor surface)
Supply voltage:	24 VDC (18 VDC – 30 VDC)
Current draw:	max. 80 mA
Output:	< 2 W
Transmission frequency:	24.125 GHz (24.00 GHz - 24.25 GHz)
Transmission power:	10 dBm
Hysteresis:	adjustable
Filtration period:	adjustable up to 16 sec
Relay output:	1x make contact and 1x changeover contact
Switching voltage:	35 VAC or 45 VDC
Switching current:	min. 10 µA & max. 1 A
Switching power:	35 VA or 30 W
Cable inlets:	M16 (2 count)
Connection:	plug-in screw terminals

Exceeding the maximum temperature will void the warranty.

Dimensions:

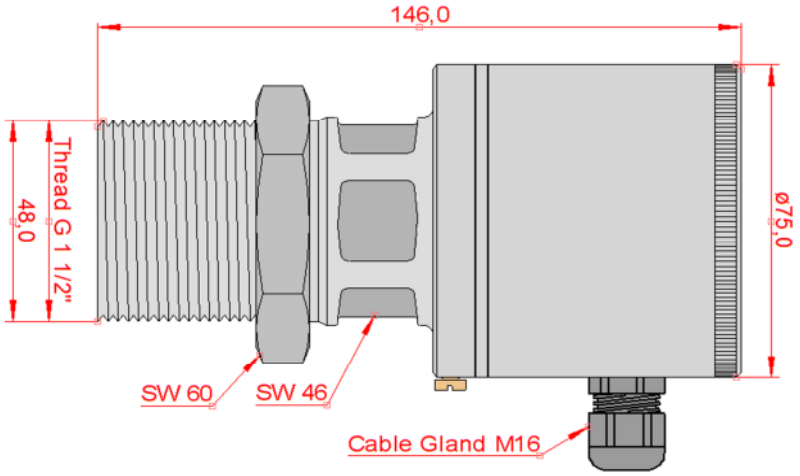


Fig. 16 Dimensions

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10 Contact

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