HONSBERG
Member of GHM GROUP

Operating manual

EN

OMNIPLUS-F

IO-Link

Thermal flow sensor

Table of contents

1 About this documentation

1.1 Foreword

Read this document carefully and familiarize yourself with the operation of the product before using it. Keep this document within easy reach and preferably in the immediate vicinity of the product so that you or the /users can refer to it or read it up at any time in case of doubt.

The product has been developed according to the current state of the art and meets the requirements of the applicable European and national directives. All corresponding documents are deposited with the manufacturer.

Installation, commissioning, operation, maintenance, and decommissioning may only be carried out by technically qualified personnel. The qualified personnel must have carefully read and understood the operating instructions before starting any work.

1.2 Purpose of the document

- This document describes the assembly as well as the installation, operation and maintenance of the product.
- This document provides important information for safe and efficient handling of the product.
- In addition to the Quick Start Guide, this document serves as a detailed reference guide to the product.

1.3 Legal notice

The manufacturer's liability and warranty for damage and consequential damage expire in the event of improper use, non-observance of this document, non-observance of safety instructions, general safety regulations, use of insufficiently qualified personnel as well as unauthorized modifications to the product.

Only perform maintenance and servicing work on this product that is described in this documentation. Adhere to the specified action steps. For your own safety, only use original spare parts and accessories from the manufacturer. We accept no liability for the use of other products and any resulting damage.

This document is entrusted to the recipient for personal use only. Any unauthorized transmission, reproduction, translation into other languages or excerpts from this operating manual are prohibited.

The manufacturer assumes no liability for printing errors.

1.4 Correctness of content

The contents of this document have been checked for accuracy and are subject to a continuous correction and maintenance process. This does not exclude possible errors. Should you nevertheless find errors or have suggestions for improvement, please inform us immediately using the contact information provided in order to make this document increasingly user-friendly.

1.5 Additional information

HINWEIS

All documentation for the sensor can be found on the product page online at:

www.ghm-group.de/en/info-desk/

The following information can be downloaded from this page:

- these operating instructions in English and German
- online data sheet
- dimensional drawings, 3D PDF and 3D CAD models
- further publications related to the sensors described here (e.g. IO-Link, IODD)

2 Security

2.1 Explanation of the safety symbols

DANGER

Symbol warns of imminent danger, death, serious bodily injury or serious damage to property in case of non-observance.

CAUTION

Symbol warns of possible dangers or harmful situations which, if not avoided, will cause damage to the device or the environment.

CAUTION

Symbol warns of electrical voltage.

NOTE

Symbol indicates procedures which, if not followed, may have an indirect effect on operation or cause an unforeseen reaction.

2.2 Predictable misapplications

The proper functioning and operational safety of the product can only be guaranteed if the generally applicable safety precautions and the device-specific safety instructions in this document are followed during use. Failure to observe any of these instructions may result in personal injury or death, as well as material damage.

DANGER

Wrong application area!

To prevent misuse of the product, injury to persons and material damage, the product must be used exclusively as described in chapters "2.4 - Intended use" and "3 - Description" of the operating instructions.

- The product is not suitable for use in potentially explosive atmospheres!
- The product must not be used for diagnostic or other medical purposes on humans or animals!
- The product is not suitable for use with functional safety requirements!

2.3 Safety instructions

The product must be used in accordance with the technical data and the notes in these operating instructions. Technical data can be found in the respective valid product data sheet (product information).

CAUTION

Functional impairment

Errors during installation, assembly or configuration of GHM products may impair the proper functioning of the subsequent process or lead to damage. However, serious hazards do not necessarily result directly from our products.

- Ensure proper and correct installation, assembly as well as programming and configuration of the product!
- Provide independent safety measures!
- Only allow settings to be carried out by qualified personnel!

CAUTION

Misbehavior!

If it can be anticipated that the product can no longer be operated safely, it must be taken out of service and secured against further use by labeling. The safety of the user may be impaired by the device if, for example, it exhibits visible damage, no longer operates as specified or has been stored for a long time under unsuitable conditions.

- Visual inspection!
- If in doubt, send the product to the manufacturer for repair or maintenance!

CAUTION

Temperature damage!

Exposure of the product to a temperature not specified in the Technical Data chapter may cause errors, defects, or heat/frost damage.

- Take note of the temperature range!

CAUTION

Overstressing!

Failure to properly install and operate the product will result in a defect.

- Observe the tightening torque!
- Do not use as a fixed point!
- Use filters for contaminated media!

NOTE

This product does not belong in children's hands!

2.4 Intended use

For reasons of safety and warranty, only personnel authorized by the manufacturer may carry out interventions beyond those described in the operating instructions.

Unauthorized alterations or modifications are explicitly prohibited.
If used improperly or not as intended, this product may present application-specific hazards.

The products are generally used for measuring and monitoring the volume flow in pipelines. A number of different sensor forms are available for this purpose, which allow adaptation to different installation situations. The suitability of the sensor for media other than water and the operating conditions must be ensured by the operator, in compliance with the technical limits specified in the data sheet.

This product is intended for use in machines and systems and for the use of media of fluid group II according to directive 2014/68/EU. Specified technical limit values according to the respective valid product data sheet must not be exceeded.

2.5 Qualified personnel

For commissioning, operation and maintenance, the personnel concerned must have a sufficient level of knowledge of the measurement procedure and the significance of the measured values. This document makes a valuable contribution to this. The instructions in this document must be understood, observed and followed.

To ensure that no risks arise from the interpretation of the measured values in the actual application, the user should obtain further expertise in case of doubt. The user is liable for damage/hazards resulting from misinterpretation due to insufficient expertise.

This document contains the information required for the intended use of the product described therein. It is intended for technically qualified personnel who have been specially trained or have relevant knowledge in the field of automation technology or measurement and control technology. Knowledge and technically correct implementation of the safety instructions and warnings contained in these instructions are prerequisites for safe assembly, installation and commissioning as well as for safety during operation of the device described.

Only qualified personnel have the necessary expertise to correctly interpret the safety instructions and warnings used in these instructions in specific individual cases and to put them into practice.

2.6 Standards

OMNIPLUS-F complies with the following standards and directives

Harmonized standards:

DIN EN 61326-1: 2013	General EMC requirements
DIN EN 61326-2-3:2013	Special EMC requirements
EN IEC 6300:2019	Restriction of hazardous substances

Guidelines:

2014/30/EU	EMC Directive
2011/65/EU	RoHS
2015/863/EU	RoHS
1907/2006/EU	REACH

3 Description

3.1 Scope of delivery

Please check the completeness of your product after opening the package.

You should find the following components:
- OMNIPLUS-F
- Quick guide to installation and commissioning

3.2 Product description

The products of the OMNIPLUS-F series are thermal flow sensors. They measure the flow velocity and temperature of liquid media by means of a probe immersed in the liquid.

The products are generally used for measurement in pipelines. A number of different sensor forms are available for this purpose, which allow adaptation to different installation situations. In principle, immersion in open channels is also possible.

The products are adjusted for water ex works. Adjustment to other media is possible on site. It must be ensured that the media to be measured have sufficient thermal conductivity. The suitability of the sensor for the media and the operating conditions must also be ensured.

The integrated OMNIPLUS electronics are capable of calculating and displaying the flowing volumetric flow using additional parameters such as the nominal pipe size. The OMNIPLUS electronics are equipped with one analog output and two digital outputs. These can be programmed in a variety of ways. In addition, the electronics have an IO-Link interface. This allows digital communication with the sensor.

3.3 Functional description

For the measurement, a pressure-resistant and hermetically sealed stainless-steel probe is immersed in the liquid. The sensor has no moving parts and is therefore practically wear-free. It contains two temperature sensors inside, one of which is heated. The heating power is controlled so that the temperature difference between the two sensors remains constant. The fluid flowing around the sensor dissipates heat energy. The higher its flow velocity, the greater the heating power that must be applied to keep the temperature difference constant. The heating power is thus a measure from which the flow velocity can be derived. At the same time, the temperature sensors allow the medium temperature to be measured.

4 Product at a glance

4.1 The OMNIPLUS-F

- Stainless steel housing, protection class IP65 / IP67
- Multifunction ring, rotatable and axially shiftable
- Graphic LCD display, with white backlight, switching to red to signal alarm conditions
- Connector M12x1, electrical connection
- Measuring probe available in different versions

5 Mounting

5.1 General notes

- The installation location of the sensor should be chosen in such a way that no air bubbles can gather at the sensor. Air bubbles do not damage the sensor but can cause incorrect measurements.

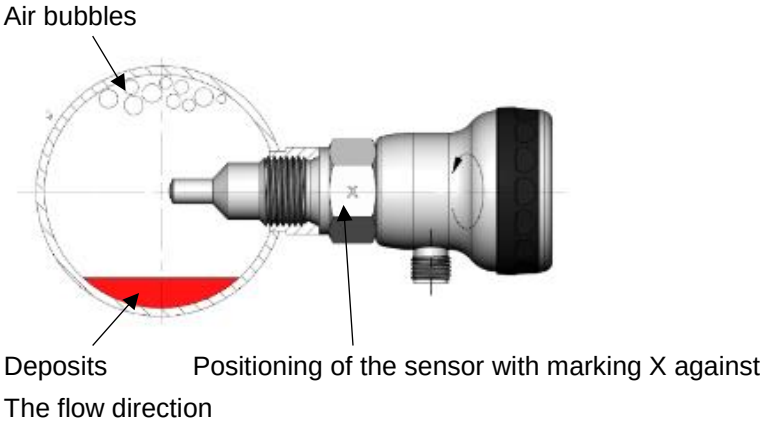


Fig. 1: Air bubbles on probe

- The installation location must be selected in such a way that possible sediments in the pipeline do not cover the sensor. It must be possible to freely flow around the sensor tip at any time.
- Installation in vertical pipelines with flow direction from bottom to top is ideal.
- A calming distance of at least 10xd must be provided upstream of the sensor, and 5xd downstream of the sensor (d= inner diameter of the pipeline).
- These values apply as guidelines. Longer calming sections may be required in individual cases. The calming sections should ensure reproducible flow conditions. A straight pipeline without edges, lateral outlets or interfering bodies in the flow chamber is considered to be a calming section. In particular, pipelines screwed into tees can also form such interfering edges. However, conical tapers with an angle of 4° have proved favorable in practice and can even contribute advantageously to reducing the required calming section.
- Valves directly in front of the measuring point must be avoided at all costs.
- If possible, the installation position should be selected so that the sensor tip protrudes ≥ 15 mm into the pipeline. In any case, the medium must flow completely around the cylindrical part of the sensor with a diameter of 7.4 mm.
- If there is a risk of deposits on the sensor tip due to contaminated media, adequate filtration should be provided at a sufficient distance in front of the sensor. If this is not possible, the sensor should be checked and cleaned regularly. Here, the selection of an easily demountable design can be advantageous.

NOTE

All sensor designs have in common that the X-marking on the sensor must be aligned against the flow direction during operation.

5.2 Threaded probe

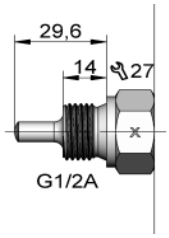
- **OMNIPLUS-F-008**
- **OMNIPLUS-F-015**

Threaded sensors have an external thread as process connection, with which they are screwed into a T-piece or a welding socket of the pipeline. The sealing is done e.g. with PTFE tape or with liquid seal. Sealing with the aid of a flat gasket is generally not possible, as the correct alignment of the X-marking is not guaranteed when screwing in as far as it will go.

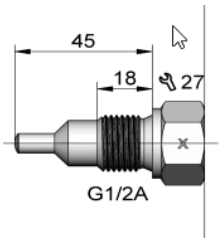
Due to the relatively short lengths of the available threaded probes, the range of application is limited to nominal diameters from about DN15 to DN50.

The following variants are available:

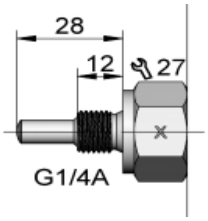
- Male thread G1/2", length 29.6 mm (type OMNIPLUS-F-015HK029)



- Male thread G1/2", length 45 mm (type OMNIPLUS-F-015HK045)

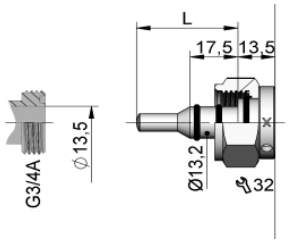


- External thread G1/4", length 28 mm (type OMNIPLUS-F-008HK028)



5.3 Push-in probe with system mounting

- **OMNIPLUS-F-013TK031**
- **OMNIPLUS-F-013TK037**

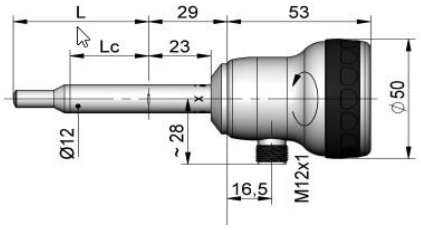


Push-in sensors with system mounting are mounted in the pipeline using a system T-piece (accessory) or a system welding or soldering socket provided for this purpose.

They have a double O-ring seal and are fixed in the system piece with a union nut. The alignment of the X-marking is done without changing the immersion depth. Removal and reassembly in the application is easy, which facilitates inspection and cleaning of the sensors. An auxiliary tool is available as an accessory for correct alignment of the X mark even under difficult installation conditions.

5.4 Push-in probe with 12 mm outer diameter and variable immersion depth

- **OMNIPLUS-F-012VK100**
- **OMNIPLUS-F-012VK150**
- **OMNIPLUS-F-012VKxxx**



Push-in sensors with variable immersion depth are mounted in the pipeline using mounting fittings provided for this purpose.

The following mounting fittings are available for this purpose:

Weld-in adapter ADG-015GS026K, PN 40

Pinch fitting with weld-in spigot
ADQ-012S021K, PN 40

Cutting ring fitting, stainless steel, order code ADQ012G015A, PN 40

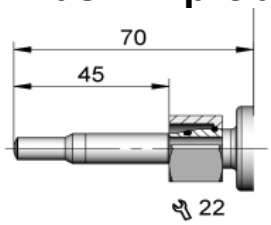
Available in the versions:

K	Stainless steel cutting ring
K1	PTFE clamping ring

Stainless steel cutting/clamping fittings are screwed into a G ½ threaded hole. A G ½ weld-in spigot (ADG- 015GS026K) is available for this purpose. This arrangement can accommodate pressures up to 40 bar. The screw fitting is first tightened by hand and then further tightened by ¼ turn with the aid of a wrench. The clamping ring of the screw fitting can then no longer be removed from the sensor, so the immersion depth can no longer be changed.

When mounting the push-in sensors, it must also be ensured that the sensors have a directional dependency (observe marking X on the housing)

5.5 Push-in probe with union nut and sealing cone



Insertion probe with defined immersion depth. The M18x 1.5 union nut is screwed onto a suitable socket on the pipe side. Torque max. 40 Nm. Sealing is achieved via the 24° sealing cone. Depending on the T-piece used, this type of mounting allows a pressure load of up to 100 bar.

5.6 Mounting position

Arbitrary, as long as the sensor is sufficiently flushed with medium. However, preferably vertical with flow from bottom to top. Gas bubbles and / or sediment formation lead to measurement errors and must be avoided. See also chapter 5.1 General notes.

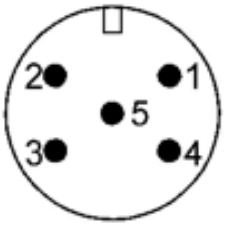
5.7 Electrical installation

The product may only be installed by a qualified electrician. The national and international regulations for the installation of electrotechnical systems of the respective country of operation apply.

5.8 Electrical connection

The product has a 5-pin circular connector. A suitable connection cable with matching mating connector must be used for the electrical connection (available as an accessory - see separate product information).

Pin assignment



1 - auxiliary voltage
2 - analog output
3 - 0 V
4 - switch signal 1 and IO Link
5 - switch signal 2

6 Operation

6.1 Commissioning

6.1.1 Control element

The OMNIPLUS head has a rotating ring as an operating element, the *multifunction ring* has a tactile raster in 15° steps (24 positions). It can be rotated to the left or right as far as desired without a stop. In this way, it allows you to scroll through menus or change values, for example.

In addition, the ring can be moved away from the viewer in the axial direction by approx. 2.5 mm against the force of a spring and returns to its initial position when released. This implements a touch function which is used, for example, to select menu items or to confirm entries.

Movement	Meaning
RING LEFT	Rotation of the *multifunction ring* by one position to the left
RING RIGHT	Rotation of the *multifunction ring* by one position to the right
RING TURN	Rotation of the *multifunction ring* by one/several position(s) to the left or right
RING SHIFT	Axial displacement of the *multifunction ring* against the force of a spring

6.1.2 Explanation of commissioning

The following describes how to put the product into operation.

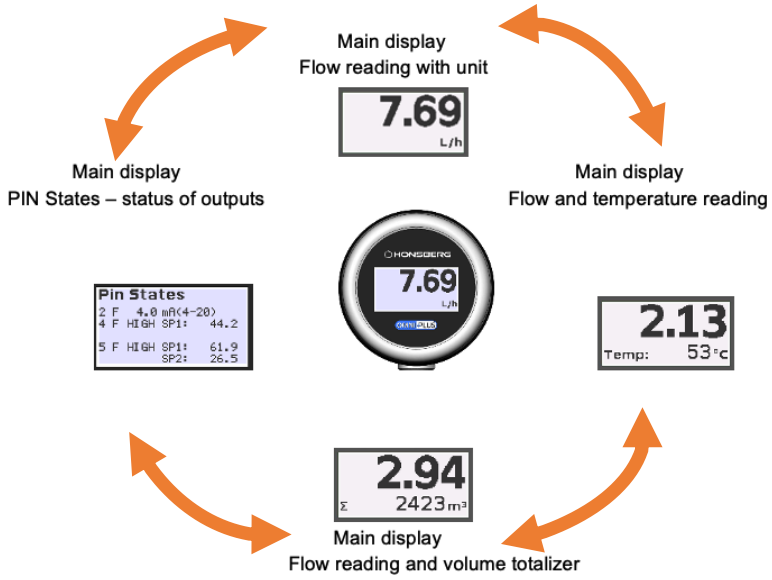
Prerequisite: the product is correctly installed - see chapter 5 Installation.

Electrical connection is established

NOTE - Start

The product is preset at the factory with a default setting. It is necessary to select and set parameters for the desired operation. The individual setting is made by the operator.

Switch on your plant or apply the auxiliary voltage for the OMNIPLUS-F on.
You will receive a display indication:



1. The "Flow reading with unit" display is used as the start display. displayed.

2. With a rotation of the multifunction ring by one position to the right *"Ring right"* the display for the flow and temperature reading appears

3. With a rotation of the multifunction ring by one position to the left "*Ring left*" The "*Pin States*" display appears with a status display of the existing pin *status.* of outputs

These three displays are **main displays.** Each main display takes you to a submenu with further parameters. The operation is described in the following chapters.

4. another **fourth main display** "Flow reading and volume totalizer" will be with a *RING TURN is* only visible if the configurable volume counter "*Volume totalizer*" has previously been set to ON. See also the note under chapter 6.1.3 Menu structure

6.1.3 Menu structure

This chapter explains the general menu structure of the product.

To obtain information about the product or to be able to configure it, you must first call up the ***main menu*** :

Auxiliary voltage is applied. You are in the main display for the Flow reading.
By a *RING-SHIFT* for 2 seconds, the ***Main menu*** is called. The possible submenus ***Configuration, Simulation*** and ***Information*** as well as **<<<** appear in the display.

Another submenu ***Reset Totalizer*** is offered if the *Volume Totalizer* is previously configured to *ON* and *Reset is* configured via *RING*

In general:

By a *RING Turn you* make a selection. *RING SHIFT* confirms the selection.
Selecting <<< and Ring Shift will *return you* to the previous menu level.

NOTE - The submenus

In the ***Configuration*** submenu, you can configure the OMNIPLUS-F for your individual application. All the parameters required for this are available under this menu item.

The ***Simulation*** submenu offers the possibility of recording flow and temperature measured values as set point values and simulating the output values via two digital and one analog output. These output values can then be compared with the higher-level control system. The process functionality can thus already be tested before the actual commissioning.

The simulation mode is indicated by a color change of the display RED / WHITE in alternation of approx. 2 sec.

In the submenu ***Information you will*** find all important information about the product (e.g. Product name, Product ident no, serial no. Firmware etc.).

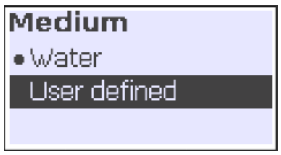
Submenu ***Reset Totalizer****:* This menu item offers the possibility to configure the volume totalizer with the ring setting. Prerequisite is to activate the volume totalizer with ON before and to set the reset mode to ring, then select *Reset Totalizer*. With *Ring Shift* you reach the query *YES* and *NO:*

YES - ring shift sets the volume counter to zero and restarts it.
You receive the acceptance by the information *Reset Done.* You return automatically to the previous main display.

NO - by *Ring Shift you return to* the previous main display.

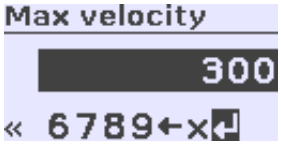
In the list selection, the respective active parameter is marked with a dot. The selected parameter is displayed inversely. It is not possible to exit the editing mode without making a selection.

Example:



For numeric values, the following additional selections are available.

Example:



Symbol	Name	Meaning
←	Back symbol	Delete the last entered character
X	Cancel symbol	ESC. Exit the input without changing the previous value.
<↵	Input symbol	Confirm and end the input

6.1.4 Locking of product parameters

The product offers the possibility of locking. Existing parameter settings become unchangeable by locking. For this purpose, a *RING SHIFT* must be executed for > 7 seconds in the start display. After *2 sec. of RING SHIFT,* the configuration level appears. Keep the *RING SHIFT* pressed until the text display YES | NO appears. If YES and *RING SHIFT are* selected, the text display "Locked" appears.

Parameters are now no longer configurable and not visible. With the multifunctional ring, only the main pages are selectable and visible.

Unlocking is achieved in the same way as locking. In the "Locked" state, a *RING SHIFT* for > 7 sec. causes the query YES | NO. If YES is selected, the text "Unlocked" appears.

If no selection is made for both queries, there is a "timeout". The device returns to the existing state.

In addition, blocking can also be triggered via an IO-Link command.

6.2 Configuration

6.3 Description

The following action steps describe how to configure the OMNIPLUS-F for your purposes.

NOTE

Slide's *Configuration* submenu offers a variety of different parameters that you can change and adapt to your desired conditions using the multifunction ring.

Depending on the menu or parameter selection, subsequent menu items may be invisible if they are not required for further configuration.

Example:

Volume totalizer

Totalizer is ON. With *Ring Turn* further menu items are offered
(Reset Mode ⇒ Preset counter ⇒ Preset unit ⇒ Preset value).

Totalizer is set to OFF. With *Ring Turn* no further menu item is offered. Display shows << < . *With Ring* Shift you return to the previous configuration level Volume *totalizer.*

6.4 The submenus

The configuration in the submenus is explained below.

1. ***Configuration*** submenu is selected.
2. The display shows the configuration options on the first level. Navigate through this level with a *RING TURN.* Confirm your selection with a *RING SHIFT.*

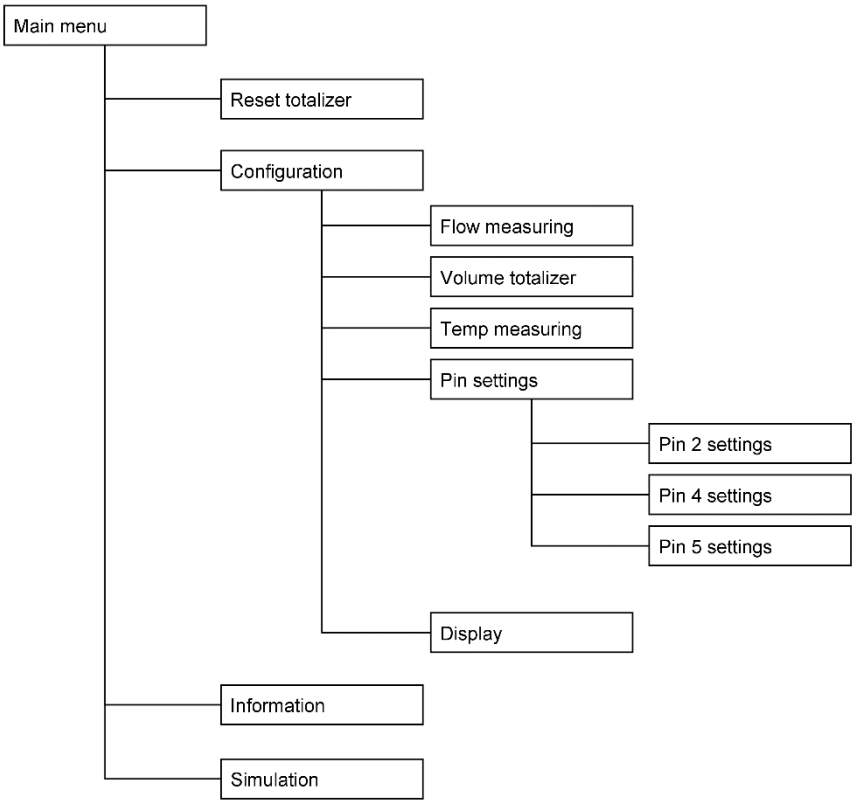
NOTE

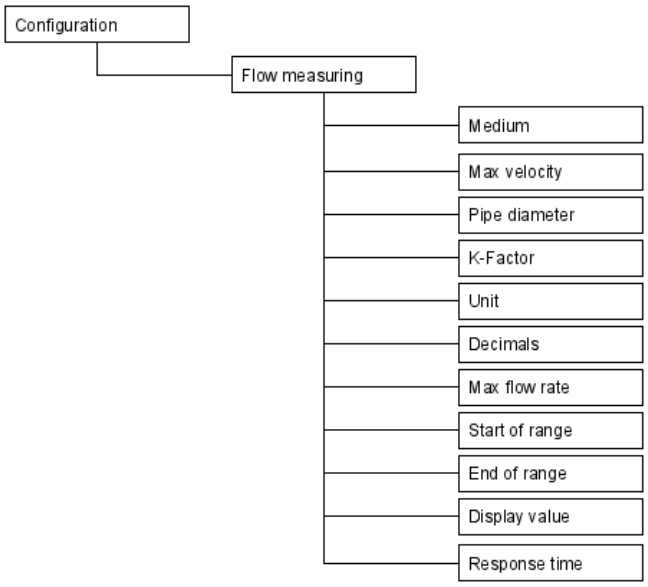
Only the Pin Settings submenu has another configuration level. Here, one input and several outputs can be configured separately with the respective parameters.

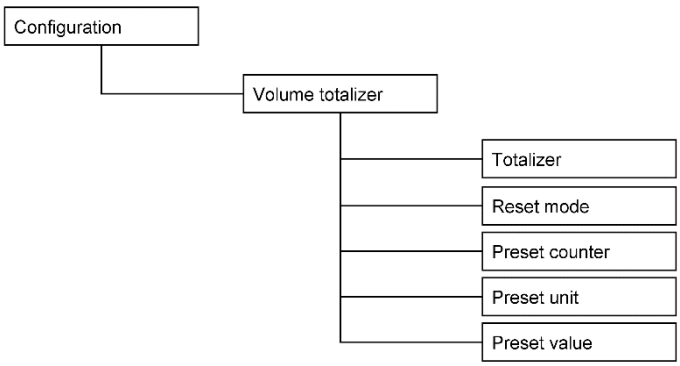
3. The display shows the first parameter. With a *RING SHIFT* you reach the page for setting a value. This is now displayed either as a list selection or via numerical values.
4. You can change the selection with a *RING TURN. The* selection is confirmed by a *RING SHIFT.*

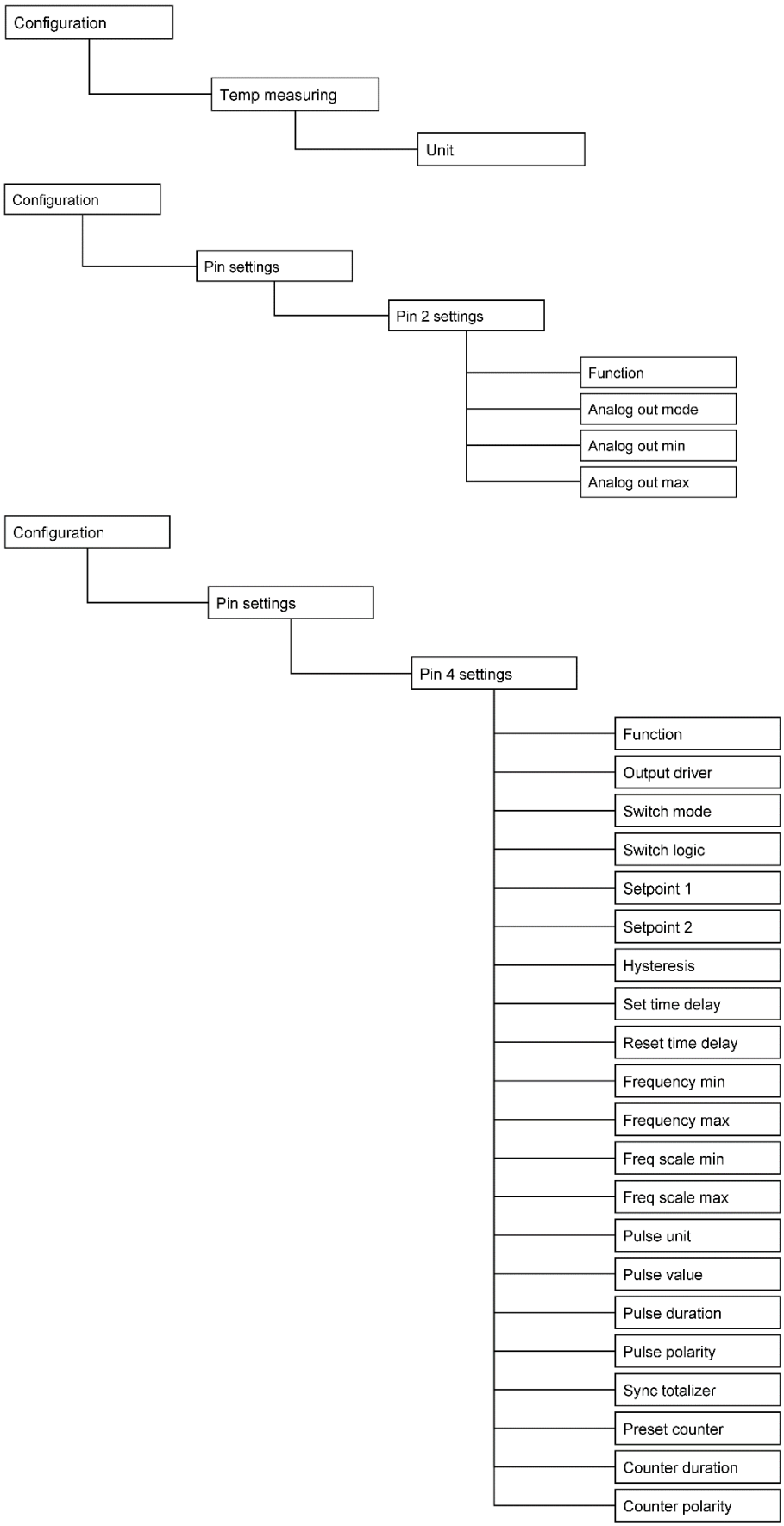
The selected and confirmed value is saved. The display returns to the previous page. The selected value is displayed.

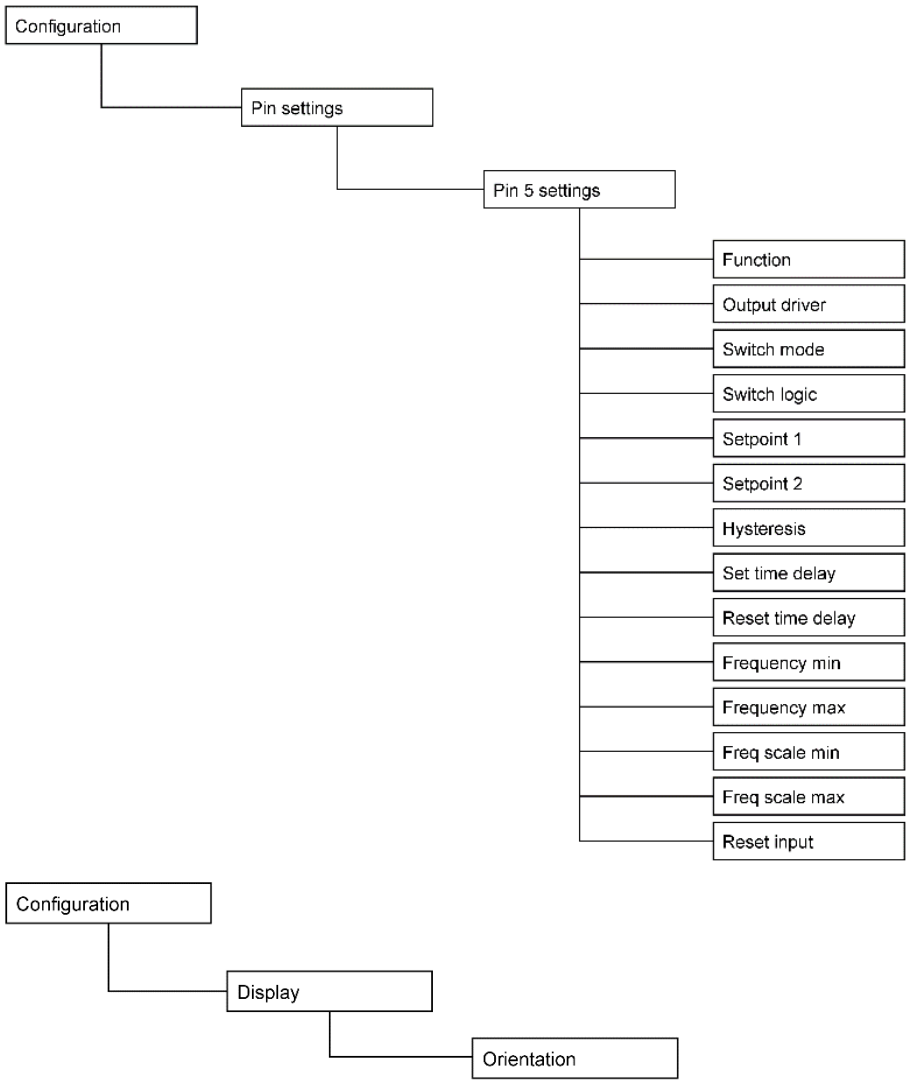
Overview of the parameters of the submenus








Configuration
Temp measuring
Unit
Configuration
Pin settings
Pin 2 settings
Function
Analog out mode
Analog out min
Analog out max
Configuration
Pin settings
Pin 4 settings
Function
Output driver
Switch mode
Switch logic
Setpoint 1
Setpoint 2
Hysteresis
Set time delay
Reset time delay
Frequency min
Frequency max
Freq scale min
Freq scale max
Pulse unit
Pulse value
Pulse duration
Pulse polarity
Sync totalizer
Preset counter
Counter duration
Counter polarity


Configuration
Pin settings
Pin 5 settings
Function
Output driver
Switch mode
Switch logic
Setpoint 1
Setpoint 2
Hysteresis
Set time delay
Reset time delay
Frequency min
Frequency max
Freq scale min
Freq scale max
Reset input
Configuration
Display
Orientation

6.5 Submenu "Flow measuring"

Here you will find all parameters which influence the flow measurement on the input side.

6.5.1 "Medium" parameter

OMNIPLUS-F is prepared at the factory for flow measurement in water. Configuration for measurement in other liquids is possible on site.

Setting values:

Water	Uses the factory setting for water
User defined	Allows use with liquids other than water. See also 6.2.2.1.8 Start of range / End of range/ Display value and 6.2.2.6 - Medium adjustment.

6.5.2 "Max velocity" parameter

Limits the measuring range of the flow velocity to the set value in cm/s. If the measured value is displayed as a percentage (see "Unit" parameter), the value set here corresponds to 100%. "Max velocity" is converted to "Max flow rate" using "Pipe diameter", "Unit" and "Decimals", so that this value also changes.

Setting range: from 2 ... 30 cm/s (final value) to 2 ... 300 cm/s (final value)

NOTE

If changing "Max velocity" would result in values for "Max flow rate" that cannot be displayed with the settings for "Unit" and "Decimals", an error message is displayed.

6.5.3 "Pipe diameter" parameter

The pipe diameter is needed to convert the measured flow velocity into a flow rate (volume per unit time). In addition, the pipe diameter is used to correct the measurement result obtained at the sensor tip so that it corresponds to the average flow velocity in the pipe cross-section. This is necessary because, on one hand, the flow velocity is not the same in the entire pipe cross-section and, on the other hand, immersion of the sensor increases the flow velocity locally by narrowing the cross-section. The correction assumes that the sensor has been installed in accordance with the installation instructions.

Adjustment range: 15.0 ... 500.0 mm

NOTE

If a change of "Pipe diameter" would result in values for "Max flow rate" which cannot be displayed with the settings for "Unit" and "Decimals", an error message is displayed.

6.5.4 Parameter "K-Factor"

In principle, thermal flow measurement does not record the flow conditions in the entire flow cross-section but draws conclusions about the conditions in the remaining cross-section from a point measurement in the flow space under the assumption that ideal flow conditions exist. However, since the real flow conditions are usually not ideal, the measurement results may deviate to a greater or lesser extent.

The correction factor offers the possibility to influence the measurement result. It is multiplied by the set "K-Factor" for this purpose.

Setting range: 0.10 ... 2.00 (1.00 = no influence)

6.5.5 "Unit" parameter

The flow measured value and some related parameters are displayed in the unit set here.

% FS	All representations are relative to "Max flow speed".
cm/s	Flow velocity in cm/s
l/min	Flow rate in l/min
m³/h	Flow rate in m³/h
m/s	Flow velocity in m/s
l/h	Flow rate in l/h

6.5.6 Bargraph Display

The bargraph display is a compact process display used to visualize the flow value in the range from 0 to 100% with a 16-segment display. The bar graph displays the current flow (segments 0 to 16 represent the range between flow standstill and maximum flow).

NOTE

If a selected flow unit requires a numerical value greater than 9999, an error message is displayed. If necessary, the decimal places are reduced automatically.

6.5.7 "Decimals" parameter

Sets the number of decimal places for "Max flow rate".

Setting values:

0,	No decimal place
0,0	One decimal place
0,00	Two decimal places
0,000	Three decimal places
variable	Depending on the display value (max. 4 digits), the decimal point can shift automatically. For display values from 0 to 9.999, three decimal places are used; for display values from 10.00 to 99.99, two decimal places are used; for display values 100.0 to 999.9, one decimal place is used. Display values from 1000 to 9999 are displayed without decimal places.

NOTE

With fixed setting of e.g. 2 decimal places and the display value is up to 999, the display is automatically switched to 1 decimal place, for display values above 1000 no decimal place is displayed.

6.5.8 "Max flow rate" parameter

"Max flow rate" is the maximum measurable flow rate. The value is calculated from the "Max velocity" and "Pipe diameter" parameters and is only for the user's information. It cannot be edited directly and therefore has no setting range. It is displayed in the unit set under "Unit" with the number of decimal places set under "Decimals".

Display value: 4 digits with the decimal number set in "Decimals

6.5.9 Parameter "Start of range | End of range | Display value"

Only visible and configurable if "Medium" was previously set to "User defined Is set.

These three parameters are used to adapt the instrument to liquids other than water. They are only visible if "Medium" has been set to "user defined". The factory adjustment then has no function. With the help of the three parameters, a new characteristic curve can be defined.

For the procedure for setting the parameters, see **chapter 6.2.2.6 Medium setting.**

Setting values:

Start of range 0 ... 1.0000

End of range 0 ... 1.0000

Display value 0 ... 100 %

6.5.10 "Response time" parameter

"Response time" defines the response time of the flow measurement. This is the time that elapses after a sudden change in the flow velocity until the display has approached the new value.

Setting values: 0.1 ... 99.9 sec

6.6 "Volume totalizer" submenu

The OMNIPLUS-F has a volume totalizer that can add up the flowed volume depending on the flow velocity and the set pipe diameter. The flow measurement does not have to be displayed in a flow unit for this purpose. However, the correct setting of the pipe diameter is a prerequisite for a meaningful summation.

If the volume counter is activated, it can be displayed in the measured value display of the main display by *RING-TURN* together with the instantaneous value.

At the same time, a switching signal can be output on pin 4. For this purpose, pin 4 must be configured accordingly (see "Pin 4 settings").

6.6.1 "Totalizer" parameter

Enable or disable the volume totalizer.

Setting values:

ON - activates the volume totalizer display

OFF - turns off the volume totalizer (**the parameters described below will be not displayed)**

6.6.2 "Reset Mode" parameter

To reset the volume counter to zero, various methods are available for selection. Only one method can be used at a time.

Setting values:

None	No reset possible
Preset counter	The reset occurs when the preset value is reached and counting starts again (cycle operation)
External (Pin 5)	The reset is performed by an external signal at pin 5, which must be configured accordingly for this purpose (see "Pin5 settings") The type of signal can be defined in "Pin 5 settings
Ring	The reset is done by going to the main menu using the multifunction ring and selecting the "Totalizer reset" entry there

6.6.3 "Preset counter" parameter

Enable or disable the preset value.

Setting values:

ON - activates the preset counter

OFF - turns off the preset counter (**the parameters described below will be not displayed)**

6.6.4 "Preset unit" parameter

Displayable units of the preset value:

Liter

m^3

6.6.5 "Preset value" parameter

The preset counter is displayed in the previously set unit.

Setting values: 1 ... 999999

6.7 "Temp measuring" submenu

In addition to the flow velocity, the instrument always also measures and displays the temperature (by *RING-TURN* in the measured value display). The displayed unit can be selected here. The temperature can be indicated in the same way as the flow velocity. The settings for this are made in the Pin Settings.

6.7.1 "Unit" parameter

Displayable units of the preset value.

Setting values:

°C
°F
K

6.8 "Pin settings" submenu

In addition to its IO-Link functionality, the OMNIPLUS-F has an analog output (pin 2) and two digital inputs and outputs (pins 4 and 5) that can be programmed in a variety of ways.

Pin 2 can be configured both as a current output (e.g. 4-20 mA) and as a voltage output (e.g. 0-10 V). Either the flow or the temperature measured value can be provided.

Pins 4 and 5 can be used as limit switches or frequency output. Pin 4 can also be configured as pulse output or signal output of the preset counter. Pin 5, on the other hand, can be reset input of the volume counter or inverse the output signal of pin 4.

For each pin a separate settings menu is available. However, because the parameters of pins 4 and 5 are largely the same, they will be displayed together.

6.8.1 Submenu "Pin 2 settings"

6.8.1.1 "Function" parameter

Setting values of pin 2:

6.8.1.2 Parameter "Analog out mode“

OFF	Turns off pin 2
Analog out flow	Analog output for flow
Analog out temp	Analog output for temperature

Type of analog output.

Setting values:

Current output 4 ... 20 mA

Current output 0 ... 20 mA

Voltage output 0 ... 10 V

Voltage output 2 ... 10 V

Voltage output 0 ... 5 V

Voltage output 1 ... 5 V

Voltage output 0.5 ... 4,5 V

6.8.1.3 “Analog out min / Analog out max" parameter

These two parameters define the range of the measured value to correspond to the output range of the analog output. Setting range, resolution and unit correspond to display range and settings of the assigned measurand (flow or temperature).

See also parameters "Max velocity", "Unit" (configuration level "Flow measuring"), "Decimals", "Max flow rate" and "Unit" (configuration level Temp measuring).

Parameter "Analog out min”

Assignment of the measured value MIN for flow or temperature to the analog output

Parameter "Analog out max”

Assignment of the measured value MAX for flow or temperature to the analog output

6.8.2 "Pin 4 settings" and "Pin 5 settings" submenus

6.8.2.1 "Function" parameter

Setting values:

OFF	Turns off pin 4 or pin 5
Flow switch output	The flow switch allows monitoring of flow velocities or flow rates for exceeding or falling below adjustable limit values
Temp switch output	The temperature switch allows monitoring of the medium temperature for exceeding or falling below adjustable limit values
Flow freq output	The frequency output for flow is an output of the flow velocity or flow rate with an adjustable frequency
Temp freq output	The frequency output for temperature is an output of the medium temperature with an adjustable frequency
Only for pin 4 Flow pulse output	The pulse output is an output of one pulse each after passing an adjustable volume
Only for pin 4 Flow preset counter	The output for preselection counter is an output of a signal after reaching the preselected volume counter reading
Only for pin 5 Totalizer reset input	Reset input for volume counter
Only for pin 5 Inverted pin 4	Inverse signal from pin 4. If pin 4 shows low signal, pin 5 shows high signal and vice versa. Can be used for line break detection, because pin 4 and 5 must always show different signals.

Note: For operation with IO-Link, observe chapter 6.12.

6.8.2.2 "Output Driver" parameter

Push-pull or NPN o.c.

NOTE

If the Reset Input function has been selected for pin 5, this parameter is not visible for pin 5.

Setting values:

Push-pull: In terms of circuitry, a push-pull output consists of a Combination of an NPN and a PNP transistor. Through this it is possible to configure the output either as an NPN or a PNP output, i.e. a load can be connected both between the output and 0 V as well as between the output and supply Voltage can be switched.
The output shows either Low-Potential (< approx. 1 V) or High-Potential (> supply voltage - approx. 1 V)

NPN o.c.: An output of the NPN o.c. type. (open collector) consists of a Transistor whose open collector is connected to the output pin. It either shows low potential at the output or leaves it open. An NPN o.c. output therefore requires the wiring with a load (e.g. a resistor) between output and supply Voltage or an external voltage. The parallel connection of several NPN o.c. outputs are permissible, in order to achieve a OR function: As soon as at least one of the parallel connected NPN o.c. outputs show low signal, the Output Signal Low

NOTE

The following parameters are only visible if the function "Flow switch" or "Temp switch" has been selected!

6.8.2.3 "Switch mode" parameter

Limit switch type

Setting values:

Single point max - The measured value is compared with a limit value. If the limit value is exceeded, an alarm event is triggered.

Single point min - The measured value is compared with a limit value. If the limit value is undercut, an alarm event is triggered.

Window - The measured value is compared with two limit values. If the limit value is either exceeding or undercut an alarm event is triggered.

6.8.2.4 "Switch logic" parameter

Switching logic

Setting values:

Alarm low: When an alarm event occurs, the output status changes from High to Low signal

Alarm high: When an alarm event occurs, the output status changes from Low to High signal

6.8.2.5 "Setpoint 1" / "Setpoint 2" parameter

Limit value for flow or temperature, display depends on selection under "Function" and "Switch mode".

Setting values:

The setting range corresponds to the measuring range of the measurand selected for the output (flow or temperature). The display shows the selected unit and number of decimal places.

Setpoint 1" is used in the two single point modes.

In Window mode "Setpoint 1" and "Setpoint 2" are used.

In the "Single point max" mode, an alarm is triggered when "Setpoint 1" is exceeded. The alarm is reset when "Setpoint 1" - "Hysteresis" is not reached.

In the "Single point min" mode, an alarm is triggered when "Setpoint 1" is not reached. The alarm is reset when "Setpoint 1" + "Hysteresis" is exceeded.

In Window mode, an alarm message is issued when "Setpoint 1" is exceeded, or Falling below "Setpoint 2". If the value of "Setpoint 1" is smaller than that of "Setpoint 2" an alarm message occurs in the window between the two values. Outside the window, the alarm is reset.

6.8.2.6 "Hysteresis" parameter

Hysteresis for the limit value(s).

The hysteresis is the amount of measured value change required to reset a limit alarm. The setting is made with the unit and number of decimal places selected for the measured variable.

Settings example 1:

Switching Mode: Single point min mode

Setpoint 1: 5.0 l/min

Hysteresis: 0.5 l/min

An alarm is triggered when the flow rate falls below 5.0 l/min. If 5.5 l/min is exceeded (5 + 0.5 l/min), the alarm is reset.

Settings example 2:

Switching Mode: Single point max mode

Setpoint 1: 5.0 l/min

Hysteresis: 0.5 l/min

If 5.0 l/min is exceeded, alarm is triggered. When falling below 4.5 l/min (5 - 0.5 l/min) the alarm is reset.

In Windows mode, the hysteresis acts accordingly on both limit values.

6.8.2.7 "Set time delay" parameter

Switching delay.

Time after the occurrence of an alarm event until the output is switched.

Setting values:

0 ... 99 sec.

6.8.2.8 "Reset time delay" parameter

Reset delay.

Time after an alarm event is reset until the output is switched back.

Setting values:

0 ... 99 sec.

NOTE

The following parameters are only visible if function "Flow freq out" or "Temp freq out" has been selected!

6.8.2.9 Parameter "Frequency min“

Minimum frequency. Smallest frequency to be transmitted at the output.

Setting values:

0 ... 2000.0 Hz

6.8.2.10 "Frequency max" parameter

Maximum frequency. Highest frequency to be transmitted at the output.

Setting values:

0 ... 2000 Hz

6.8.2.11 Parameter "Freq scale min“

Scale start. Measured value at which the smallest frequency "Frequency min" is to be transmitted. The setting is made with the unit and number of decimal places selected for the measured variable.

6.8.2.12 Parameter "Freq scale max"

End of scale. Measured value at which the highest frequency "Frequency max" is to be transmitted. The setting is made with the unit and number of decimal places selected for the measurand.

NOTE

The following parameters are only visible if function "Flow Pulse output" has been selected!

6.8.2.13 “Pulse unit" parameter

Unit of pulse volume. Unit for setting the volume to flow per pulse.

Setting values:

Liter

m^3

6.8.2.14 „Pulse value" parameter

Size of the pulse volume. Numerical value of the volume to flow per pulse in the unit set under "Pulse unit".

Setting values:

0,0 ... 20000.0

6.8.2.15 "Pulse duration" parameter

Pulse duration. Duration of the pulse to be output after the set pulse volume has flowed.

Setting values:

10 - 1000 ms

NOTE

Pulse volume and pulse duration must be selected so that there is a pulse pause between pulses even at the highest flow rate.

Examples of pulse volume and pulse duration

Example 1:

Pulse volume: 0.1 liter

Pulse duration: 50 ms - this results to: less than 20 pulses per second can be displayed

Largest occurring flow rate: 6 l/min = 0.1 L/s

This results to: a pulse is transmitted after every 1 second

Example 2:

Pulse volume: 0.2 liters

Pulse duration: 100 ms - this results to: less than 10 pulses per second can be displayed

Largest occurring flow rate: 300 l/min = 5.0 L/s

This results to: in 1 second 25 pulses would have to be transmitted, i.e. all

40 ms a pulse. This is not possible with a pulse width of 100 ms!

6.8.2.16 Parameter "Pulse polarity“

Pulse polarity

Setting values:

Positive	Pulse has High level
Negative	Pulse has Low level

6.8.2.17 Parameter "Sync to totalizer“

Synchronization of output pulses with volume counter.

Setting values:

Yes	The counting of the pulse volume is started again (at zero) synchronously with the reset of the volume counter.
No	A reset of the volume counter has no influence on the Pulse output. Volume counter and pulses are independent of each other

Example 1:
Pulse volume: 1 m³
Sync to totalizer: No

A pulse is transmitted each time a cubic meter has flowed.

For example, if 0.3 ^{m3} has flowed after the last pulse and then the volume counter is set to zero, a pulse would be issued after another 0.7 ^{m3}, i.e. when the counter reads 0.7 ^{m3,} then after 1.7 m3, 2.7 ^{m3,} and so on.

Example 2:

Pulse volume: 1 m³
Sync to totalizer: Yes

Here, if 0.3 ^{m3} has flowed after the last pulse and then the volume counter is set to zero, a pulse will only be issued again after another cubic meter, i.e. with counter readings of 1 ^{m3}, 2 m3, 3 ^{m3}, etc.

A pulse delivery occurs whenever the volume counter indicates a multiple of the pulse volume.

NOTE

The following parameters are only visible if function Flow preset counter has been selected! This option is only available for pin 4.

6.8.2.18 Parameter "Flow preset counter“

Preset counter.

Setting values:

Output signal static	The output changes its state when the preset counter is reached and remains there until the preset counter is reset
Output pulse	The output signal changes its state when the preselection value is reached and falls back after an adjustable time

6.8.2.19 "Counter duration" parameter

Signal duration. Only visible when Output pulse is selected in the "Preset counter" parameter.

Setting values: 0.1 ... 100.0 sec.

6.8.2.20 Parameter "Pulse polarity“

Signal polarity.

Setting values:

Positive	Signal has High level, idle state is low
Negative	Signal has Low level, idle state is high

NOTE

The following parameters are only visible if function Reset input has been selected! This option is only available for pin 5.

6.8.2.21 "Reset input mode" parameter

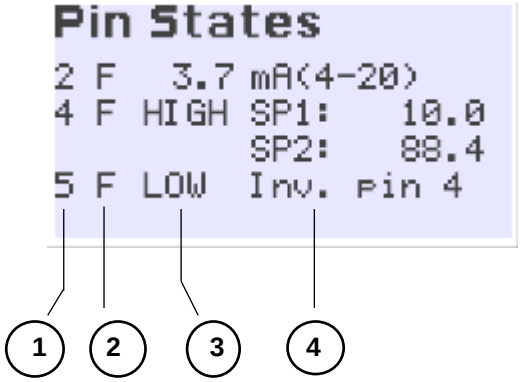
Reset input for preset counter.

Setting values:

Edge Low-High	The counter is reset to 0 at a signal flank low-high and continues to run immediately
Edge High-Low	The counter is reset to 0 on a signal flank high-low and continues to run immediately
Static High	The counter is set to 0 at high signal at the input and continues to run only at low signal
Static Low	The counter is set to 0 at low signal at the input and continues to run only at high signal

6.9 Representation Pin States

The Pin States screen shows the current state of the three pins of the circular connector that can be used as input or output. (Pin 2, 4 and 5, see also pin assignment).



1	2	3	4
Pin - number	Selected variable F = Flow / Flow rate T = temperature	Pin - state	Function

Pin 2

Condition and function	Representation	Comment
Current output 4 ... 20 mA	xx.xx mA (4-20)	xx.xx = actual current output value
Current output 0 ... 20 mA	xx.xx mA (0-20)	xx.xx = actual current output value
Voltage output 0 ... 10 V	xx.xx V (0-10)	xx.xx = actual voltage output value
Voltage output 2 ... 10 V	xx.xx V (2-10)	xx.xx = actual voltage output value
Voltage output 0 ... 5 V	xx.xx V (0-5)	xx.xx = actual voltage output value
Voltage output 1 ... 5 V	xx.xx V (1-5)	xx.xx = actual voltage output value
Voltage output 0.5 ... 4,5 V	xx.xx V (0.5-4.5)	xx.xx = actual voltage output value
No analog output active	OFF	

Pin 4 and 5

Function	Representation	Comment
Limit switch (single point)	HIGH S1: 2.50	The switching state of the output is displayed (HIGH in the example). This indicates that the switch is a minimum switch whose limit value is set to 2.50. A falling below the limit value would be indicated by flashing Min:2.50.
Limit switch (window mode)	LOW S1:2.50 LOW S2:7.50	The switching state of the output is displayed (LOW in the example). This indicates that the limits of the monitored window can be seen. Leaving the window would be indicated by flashing of the undercut or exceeded value.
Frequency output	xxx.x Hz	The currently output frequency is displayed immediately.
Pulse output	HIGH xxxx l/pls t=50 ms	The switching state of the output is displayed (HIGH in the example). This indicates that the set pulse valency and the pulse duration are noted.

Pin 4

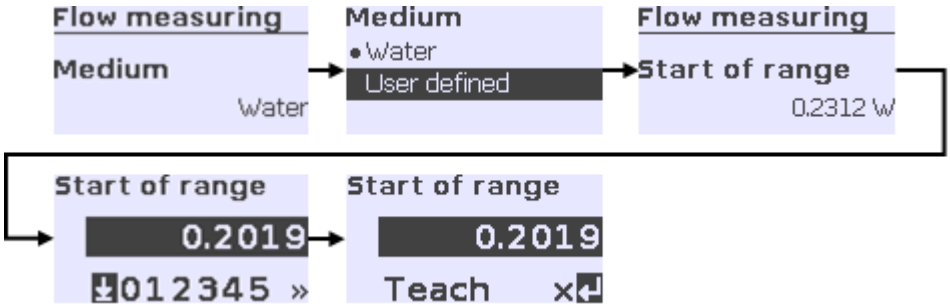
Function	Representation	Comment
Preset counter output	LOW Preset cntr	The switching state of the output is displayed (LOW in the example). The preset cntr function is indicated.
Pin 4 = OFF	IO-Link only!	If no special function is assigned to pin 4, only the always present IO-Link function is displayed.

Pin 5

Function	Representation	Comment
Totalizer reset input	LOW Σ Reset In	Only for pin 5! The state of the input is displayed (LOW in the example). The "Σ Reset In" function is indicated.
Inverted pin 4	HIGH Inv. pin 4	Only for pin 5! The state of the output is displayed (HIGH in the example). The function as inversion of pin 4 is indicated
Pin 5 = OFF	OFF	Indicates that no function is assigned to pin 5.

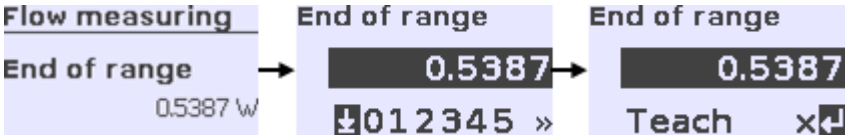
6.10 Medium setting

For this purpose, dimensionless primary measured values are assigned to the "Start of range" and "End of range" parameters, which are measured by the instrument at standstill of the medium (0 cm/s)

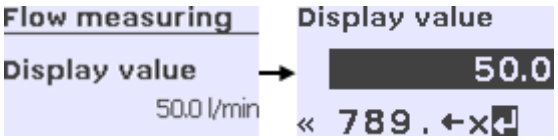


and maximum value of the flow (adjustable with "Max velocity" or "Max flow rate"). Since the characteristic curve between these two points

is generally not a straight line, the curvature of the characteristic curve can be set with the "Curve" parameter.



For "Start of range" the value is recorded when the flow stops (0 cm/s) and for "End of range" the value is recorded when the flow equals the value = "Display value". Then the value "Display value" must be entered manually. The device adjustment characteristic is automatically adjusted with the help of these parameters.



6.11 Display

By selecting the "Display" configuration, the positioning of the display can be changed.

Setting values:

Orientation 0°

Orientation 180°

6.12 IO-Link operation

If the device is operated in IO-Link mode, the parameterizations are made via the IO-Link interface or manual configurations made are overridden.

For IO-Link operation, the parameter information is available for download at

www.ghm-group.de/en/info-desk/ available.

Note:

In IO-Link operation, PIN 4 is used as the IO-Link communication interface, so it cannot be used as described in section 6.8.2 or 6.8.2.1

In some IO-Link masters, PIN 5 is not wired or is connected to ground. In this case, the device outputs the error message: "Short circ".

Before initiating IO-Link communication, PIN 4 must be set to push-pull. See chapter 6.8.2.2 "Output Driver" parameter.

7 Maintenance

7.1 Operating and maintenance instructions

Depending on the application or medium, contamination can form on the sensor and influence the measurement result. In this case, we recommend dismantling the device and cleaning the sensor. For removal and installation, the installation instructions must be observed. The sealing material must be replaced after each removal and installation.

7.2 Repair

It is not possible for the operator to repair or overhaul the OMNIPLUS-F on site. Should a defect occur, we recommend returning the device to the manufacturer for analysis or repair/repair.

7.3 Fault repair

Display	Type	Description	Troubleshooting
No display	Error	• Supply voltage too low • Device faulty	• Check the supply voltage • Device exchange
Hw fault	Error	Device hardware fault	Device exchange
Temp overr	Error	• Medium and/or ambient temperature too high • Device faulty	• Identify and eliminate the source of heat • Device exchange
Short circ	Error	Short circuit on pin 4 or pin 5	Check installation
Simulation	Warning	Simulation active	Check operational mode (P. 6.1.3)
Flow low	Warning	Flow value falls below "Setpoint" value at pins 4 or 5	See P. 6.8.2.5
Flow high	Warning	Flow value exceeds "Setpoint" value at pins 4 or 5	See P. 6.8.2.5
Temp low	Warning	Medium temperature falls below "Setpoint" value at pins 4 or 5	See P. 6.8.2.5
Temp high	Warning	Medium temperature exceeds "Setpoint" value at pins 4 or 5	See P. 6.8.2.5

8 Disposal

During disposal, care must be taken to ensure that the product components and the packaging are separated and recycled. The legal regulations and guidelines valid at the time must be observed.

NOTE

The product must not be disposed of in the residual waste garbage can. If the product needs to be disposed, take it to a municipal collection point where it will be transported safely to the disposal company in accordance with the requirements of hazardous goods legislation. Otherwise, send it back to us with sufficient postage. We will then take care of the proper and professional disposal in an environmentally friendly manner.

9 Technical data

Measuring principle	calorimetric / thermal	
Measuring materials	Liquids Media configurable on the device	
Measuring range	Flow: 0,02...3 m/s (water) Temperature: -20..+90 °C (100°C)	
Measurement uncertainty	Flow: ± (7 % MW + 2 % FS) Temperature: ±2 °C (flow velocity >2 cm/s)	
Response time	in water (25 °C) at medium flow speed approx. 1-2 s	
Temperature drift (flow)	≤ 0,5 cm/(s*K)[1]	
Operating pressure	**Connection type**	**PN**
	008, 015	PN100 (PN200 on request)
	013, 018	up to PN100 (depending on T-piece)
	012	up to PN40 (depending on asembly material)
Media temperature	Connection types 008; 013; 015 and 018: -20...+ 90°C Connection type 012: -20...+100°C	
Ambient temperature	-20..+70 °C	
Storage temperature	-30..+80 °C	
Wetted Materials	Stainless steel 1.4571 FKM (O-ring for connection type 013)	
Other Materials	Housing	Stainless steel 1.4305
	Glass	Mineral glass hardened
	Magnet	NeFeB
	Ring	POM
Supply voltage	18..30 V DC	
Current consumption	< 130 mA (SIO mode, unloaded outputs)	
IO-Link-Specification	IO-Link revision	V1.1
	Bitrate	COM2 (38400 bit/s)
	Minimum cycle time	20 ms
	SIO mode	yes
	Port class	A compatible
	Block parameterization	yes
	Data storage	yes
Analog output	Applicable for flow or temperature output type configurable on the device: **Current:** 4...20 mA / 0...20 mA **Voltage:** 0...10 V / 2...10 V / 0....5 V / 1...5 V / 0.5...4.5 V	
Switching outputs	2 Push-pull transistor outputs, parameterizable as NPN o. c. resistant to short circuits and polarity reversal I_{out} = 100 mA max. per output Configurable on the device as ● Limit switch ● Frequency output ● Pulse output ● Signal output for preset counter	
Signal input	Reset input for volume counter (alternative to switching output on pin 5)	
Display	graphic 1.2 inch LCD (transflective) 128 x 64 pixels White backlight, red for alarm notification	
Electrical connection	Round plug connector M12x1 / 5-pole	
Protection rating[2]	IP65 / IP67	
Weight	approx. 0,30 kg	
Conformity	CE	

[1] *Reference conditions: pipe diameter DN25 (DIN 2448), water, vertical installation in the pipe, Sensors tip ≥ 15mm from pipe inner diameter, probe alignment to the flow as per 5.1, fully filled pipe without air bubbles, velocity from 10 cm/s to 300 cm/s, inlet zone > 10 DN, outlet zone > 5 DN, 23 °C ± 1 °C, 2 bar ± 1 bar; Accuracy may deviate for other media and installation positions*

[2] *Only with M12 circular metric connectors connected*

10 Accessories

Below you will find a selection of accessories for this product.

Accessories for plug-in probe with system mounting Ø 13.2 mm OMNIPLUS-F-013TK031 and OMNIPLUS-F-013TK037 See also chapter 5.3

T-piece Brass or stainless steel	Order code: TS-2-M/K010...050 DN 10 to DN 50
Assembly tool	Order no. 482656
Welding/soldering spigots Brass / Stainless steel	Order code SL2-M/K

Accessories for insertion probe with 12 mm outer diameter and variable immersion depth See also chapter 5.4

T-piece Brass / Stainless steel	Order code: TS-3-M/K015...050 DN 15 to DN 50
Welding/soldering nozzle Brass / Stainless steel	Order code SL3-M/K
Cutting/clamping screw connection	Order code ADQ-012G015A... K Stainless steel, cutting ring stainless steel K1 Stainless steel, clamping ring PTFE
Welding adapter for Cutting/clamping screw connection	Order code ADG-015GS026K Stainless steel
Pinch fitting with Weld-in socket	Order code ADQ-012S021K Stainless steel

Accessories for all versions OMNIPLUS-F

Connection cable, 5-pin	Order code K05PU-02/05/10... Cable length 2 m; 5 m; 10 m

11 Service

11.1 Manufacturer

If you ever have any questions, please do not hesitate to contact us:

GHM Messtechnik GmbH
GHM GROUP – Honsberg
Tenter Weg 2-8
42897 Remscheid | GERMANY
Mail: info@ghm-group.de
Fon: +49 2191 9672-0
Fax: +49 2191 9672-40

11.2 Repair processing

Defective products are repaired competently and quickly in our service center.

GHM Messtechnik GmbH
GHM GROUP – Honsberg
Tenter Weg 2-8
Service Center
42897 Remscheid | GERMANY
Fon: +49 2191 9672-0
Fax: +49 2191 9672 40
Mail: rma@ghm-messtechnik.de

NOTE

Please enclose the completed return form with the product, which you can find in the Infothek of the website www.ghm-group.de.