JUMO flowTRANS MAG H20

Electromagnetic flowmeter for liquids

Operating manual
SPE variant

40606512T90Z001K000

V1.00/EN/30050670/2023-07-17

Further information and downloads

qr-406065-en.jumo.info

Table of contents

1 About this documentation 6

1.1 Validity 6
1.2 Purpose 6
1.3 Target group 6
1.4 Abbreviations 7
1.5 Definition of terms 8
1.6 Trademark information 8
1.7 Symbols 8

2 Safety 9

2.1 Intended use 9
2.2 Qualification of personnel 9
2.3 Hot media 9
2.4 Hazardous materials 10
2.5 Mechanical load 10

3 Description 11

3.1 Scope of delivery 11
3.2 Structure 11
3.3 Function 11
3.4 Nameplate 12

4 Technical data 13

4.1 Inputs, measurands 13
4.2 Interfaces 14
4.2.1 Bluetooth 14
4.2.2 SPE 14
4.3 Display 15
4.4 Environmental influences 15
4.5 Mechanical features 15
4.5.1 Materials 15
4.5.2 Nominal pressure 16
4.5.3 Pressure loss diagram 16
4.6 Measurement media 16
4.7 Dimensions 17
4.7.1 Thread connection according to DIN EN ISO 228-1 17
4.7.2 Tri-Clamp connection according to DIN 32676, Series A 18

5 Transport and storage 19

5.1 Transport 19
5.2 Storage 19

Table of contents

6 Installation 20

6.1 Preparing for installation 20
6.1.1 Installation site 20
6.1.2 Inlet and outlet sections 20
6.1.3 Installation position 20
6.1.4 Avoid mechanical strain 21
6.1.5 Flow direction 21
6.1.6 Alignment of the housing for electronic components 22
6.2 Installing the device 23

7 Electrical connection 25

7.1 Terminal assignment 25
7.1.1 Terminal assignment, M12 connector, SPE 25
7.2 Connecting the device 26

8 Operation 27

8.1 Startup display 27
8.2 Basic status 27
8.2.1 Process value display 28
8.2.2 Toolbar 29
8.3 Error messages 31

9 Interfaces 32

9.1 Bluetooth 32
9.1.1 App download 32
9.1.2 Authentication 32
9.1.3 Connection 33
9.1.4 Bluetooth settings 33
9.1.5 smartCONNECT app 34
9.2 JUMO Cloud 34
9.2.1 Data exchange 35
9.2.2 Startup 36
9.2.3 Further information 36
9.3 Modbus TCP 36
9.3.1 Transmission 36
9.3.2 Modbus address tables 36

10 Configuration 37

10.1 Display on the device 37
10.2 Interfaces 38
10.2.1 Bluetooth 38
10.2.2 Single Pair Ethernet 38
10.3 Measurands 40

10.3.1 Flow 40
10.3.2 Temperature 41
10.4 Functions 41
10.4.1 Simulation 41
10.4.2 Totalizer 42
10.4.3 Batch function 43
10.4.4 Low flow suppression 44
10.4.5 Fine adjustment 45
10.4.6 Limit value monitoring function 46
10.5 Selectors 51
10.5.1 Analog selector 51

11 Troubleshooting 52

11.1 Process value error 52
11.2 Error messages 52

12 Maintenance and cleaning 54

12.1 Maintenance 54
12.2 Cleaning 54
12.2.1 Cleaning device housing 54
12.2.2 Cleaning meter run 54

13 Shutdown 55

13.1 Dismounting the device 55
13.2 Returns 55
13.3 Disposal 56

14 Open-source software 57

15 Certificates and declarations 58

15.1 Declarations of conformity 58

16 Modbus address tables 59

16.1 Transmission 59
16.2 Version and fabrication number 59
16.3 Configuration 59
16.4 Actions 64
16.5 Process values 65
16.6 Error 67
16.7 Analog selector 67

1 About this documentation

1.1 Validity

This manual is valid for all devices with an SPE interface (Single Pair Ethernet).

1.2 Purpose

This documentation is part of the device and includes all information to ensure that it is used safely and as intended across all phases of the product lifecycle.

If you do not follow the documentation and safety information, this may result in risk to life and damage to property due to improper use.

- Read and follow the documentation and the safety information and warnings.
- Store the document in its entirety, in an easily accessible location, and so that it can be read in full at all times.
- Contact the manufacturer if you have any questions about the device and documentation.

1.3 Target group

This documentation is intended to be used by personnel for plant mechanical systems for sanitary, heating and air-conditioning technology, electrical engineering or mechanical and plant engineering.

1.4 Abbreviations

CE	Conformité Européenne (European Conformity)
DHCP	Dynamic Host Configuration Protocol (communication protocol for automatic assignment of the network configuration)
DMC	Data Matrix Code
DN	Diamètre Nominal (nominal diameter)
DNS	Domain Name System
EMC	Electromagnetic compatibility
FCC	Federal Communications Commission (issues FCC certification for electronic products sold or manufactured in the United States)
FDA	Food and Drug Administration (US-amerikanische Arzneimittelbehörde; zuständig für Zulassung, Kontrolle und Überwachung unter anderem von Medizinprodukten in den Vereinigten Staaten)
LVS	Limit Value Switch
IP	Internet Protocol
MQTT	Message Queuing Telemetry Transport
NFC	Near Field Communication
PDU	Protocol Data Unit (core component of the Modbus telegram; consisting of function code and data)
PELV	Protective Extra Low Voltage
PN	Pressure Nominal (nominal pressure)
PoDL	Power over Data Line (power is supplied in parallel to data transmission via the single-pair Ethernet connection)
RGB	Rot - Grün - Blau (color space formed by the light colors red, green and blue)
SPE	Single Pair Ethernet
SPS	Programmable Logic Controller
TCP	Transmission Control Protocol (standard for network conversation)
TFT	Thin Film Transistor
UKCA	UK Conformity Assessed
URL	Uniform Resource Locator

1 About this documentation

1.5 Definition of terms

Use in the documentation	Definition
Device	Electromagnetic flowmeter for liquids
Medium, measurement medium	Conductive liquid for which flow and temperature are measured
Product lifecycle	Overall consideration of product identification, acceptance of the goods, storage, mounting, connection, operation, troubleshooting, maintenance to disposal
Flow	Totalized flow rate per time span

1.6 Trademark information

All trademarks and trade and company names used are the property of their rightful owners or authors.

1.7 Symbols

NOTE!

This symbol refers to important information about the device or its handling.

REFERENCE!

This symbol refers to **further information** in other sections, chapters, or other manuals.

2.1 Intended use

The device is intended for measuring the flow and temperature of liquid media having a minimum conductivity of 20 µS/cm and a maximum viscosity of 70 mPa·s.

In order to ensure the device's perfect condition, only media may be used to which the materials in contact with the media are sufficiently resistant.

The operator is responsible for compliance with the specifications indicated in the technical data (e.g. operating and ambient temperature).

The device may only be used in a technically perfect condition, in accordance with its intended use, in a safety-conscious and hazard-conscious manner and in compliance with the operating manual.

The following in particular are considered to be improper

- Any structural, technical or electrical modifications to the device.
- Use of the device outside the areas described in this operating manual.
- Use of the device deviating from the technical data.

The manufacturer is not liable for any damage resulting from improper use.

2.2 Qualification of personnel

The personnel deployed must meet the following requirements in all phases of the product lifecycle:

- Members of personnel have at least completed training in the field of plant mechanical systems for sanitary, heating, and air-conditioning technology or have completed a degree in electrical engineering or mechanical and plant engineering.
- Members of personnel are familiar with this documentation and the safety information and warnings it contains.

2.3 Hot media

Hot media may result in the device surfaces becoming hot and presenting a risk of injury.

- Allow the device and plant to cool down.
- Wear suitable protective equipment.
- If required, install contact protection.
- Take into account alignment of the housing for electronic components.

2.4 Hazardous materials

Using hazardous materials as a medium may result in abrasive and corrosive damage to components of the device that come into contact with the medium. The medium may leak and present a fire hazard and a risk to health.

Carry out a risk assessment taking into consideration the safety data sheet for the relevant hazardous substance for mounting, operation, maintenance, cleaning, and disposal:

- Comparison and systematic checking of the durability of the components of the device that come into contact with the medium and the admissible environmental influences.
- Assessment of the risk to people and the environment.
- Assessment of the fire hazard due to the device materials, the admissible environmental influences, and the voltage supply.

2.5 Mechanical load

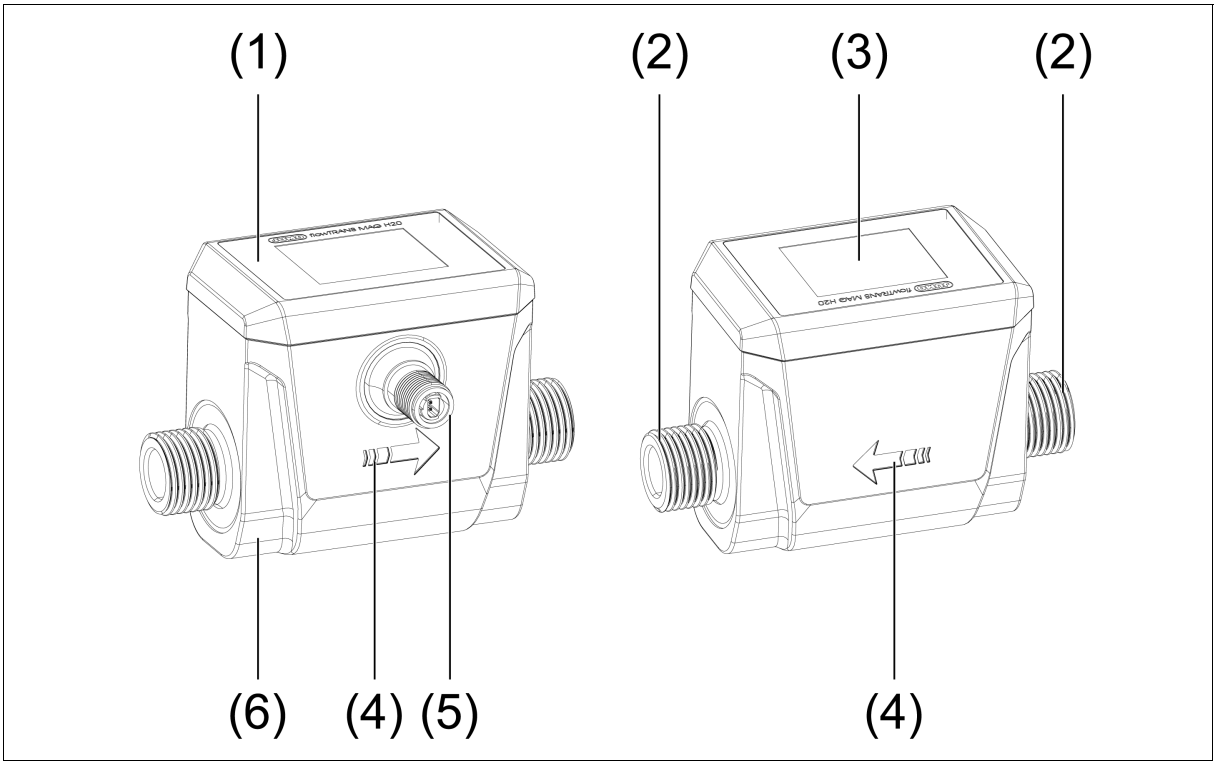
Mechanical load on the device and process connections can lead to leaks.

- Do not place the device and the process connections under mechanical strain.
- Systematically check that the process connections are leak-tight.

3.1 Scope of delivery

Device in the ordered version
Quick start guide
2 × Centellen seals (only for variant with thread connection) → no FDA approval

3.2 Structure



(1) Device cover
(2) Process connection
(3) Display
(4) Flow direction arrow
(5) M12 connector
(6) Stainless steel case

3.3 Function

The device records the flow according to the principle of electromagnetic flow measurement. This principle is based on Faraday's law of induction.

An electrically conductive liquid flows through a measuring pipe. A magnetic field is generated in the measuring pipe perpendicular to the flow direction. The magnetic field is created by current flowing through a pair of field coils.

The magnetic field induces a voltage in the liquid. Two electrodes are located opposite each other on the measuring pipe. The electrodes pick up the generated voltage and transmit the measurement results to the integrated evaluation electronics.

3 Description

3.4 Nameplate

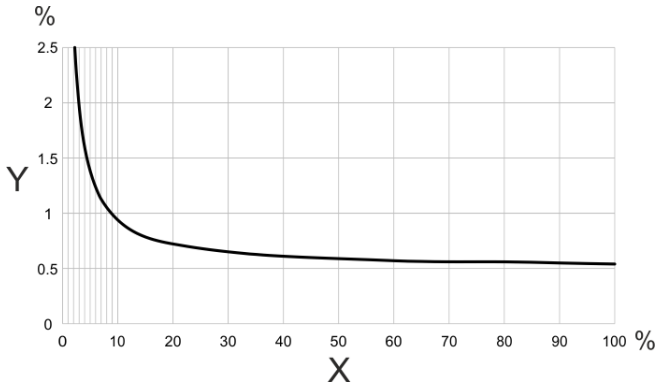
JUMO	Manufacturer and address
flowTRANS MAG H20	Device designation
Typ	Product group number
TN	Part no.
	Input: Flow measuring range
	Eingang: Spannungsart und Spannungsversorgung (⎓ → Zeichen für Gleichspannung)
...W	Maximum power consumption in watts [W]
DN...	Nominal width
PN...	Nominal pressure level
	Output: SPE; with specification of the MAC address
F-Nr.	Fabrication number
CE	CE marking (EU conformity label)
	Fabrication number as Data Matrix Code (DMC)
UK CA	UK conformity label
FC	FCC certification
	The device must be disposed of properly at the end of its service life.
	Note: Read the operating manual

4.1 Inputs, measurands

Reference conditions

Measurement medium	Water
Medium temperature	23 °C ±5 °C
Ambient temperature	23 °C ±5 °C
Medium pressure	1 to 4 bar
Measuring pipe	Horizontal installation

Flow

Maximum measuring range	
DN 6	0.005 to 5.000 l/min
DN 15	0.050 to 35.000 l/min
DN 20	0.100 to 75.000 l/min
DN 25	0.200 to 150.000 l/min
Under reference conditions	
Accuracy	0.5 % of the measured value ±1.5 mm/s
Response time t_{90}	≤ 250 ms
Under application conditions	
Accuracy	0.8 % of the measured value ±1.5 mm/s
Reproducibility	±0.2 % of the measured value
X = maximum measuring range Y = deviation from measured value	

Temperature

Measuring range	-20 to +90 °C
Accuracy	±2.5 K

4 Technical data

4.2 Interfaces

4.2.1 Bluetooth

Communication	Via mobile end device with the "JUMO smartCONNECT" app
Authentication	Via NFC
Connection status (configurable)	Active Inactive Restricted (can be activated via NFC)
Range	10 m (open space)
Radio frequency	
Bluetooth radio module	2.45 GHz
NFC tag	13.56 MHz
Max. transmission power	
Bluetooth radio module	0 dBm
NFC tag	–
App	
Functions	Transfer of configuration data and device information, display of process values
System requirements	
iOS device	Minimum requirement iPhone 7 with iOS 13
Android device	Minimum requirement Android 8.0

4.2.2 SPE

Function	Transfer of process data, configuration data, and device information
Voltage supply	IEEE 802.3cg
Input voltage	DC 18 V to 30 V PELV
Current consumption	≤ 100 mA
Power consumption	≤ 1.8 W
Protection rating	DIN EN 61140, Class III (protective low voltage)
Electrical safety	
Requirements	The device must be equipped with an electrical circuit that meets the requirements of DIN EN 61010-1, DIN EN 61010-2-201, and Low Voltage Directive 2014/35/EU with regard to "Limited-energy circuits".
SPE protocol	Modbus TCP/IP, integrated JUMO Cloud connector
Data transfer rate (10BASE-T1L)	10 Mbit/s
PoDL class	Class 11, IEEE 802.3cg
Plug connectors	IEC 63171-5
Version	M12, 2-pole, shielded
Protection rating	IP67
Connection line	IEC 61156-13, IEC 61156-14
Version	2-core, copper, shielded
Bandwidth	≥ 20 MHz
Line length	≤ 500 m (AWG18)
DC loop resistance	< 25 Ω

4.3 Display

Type	TFT display
Size	
Display range	35.04 × 28.03 mm
Screen size (diagonal)	1.77″
Dissolution	128 × 160 (RGB)
Brightness	10 levels (configurable)

4.4 Environmental influences

Admissible ambient temperature	DIN 60068-2-1, DIN 60068-2-2
At medium temperature ≤ 80 °C	-20 to +60 °C
At medium temperature > 80 °C	-20 to +45 °C
Admissible storage temperature	-20 to +60 °C
Climatic conditions	DIN EN 60721-3-3
Climate class	3K6
Temperature range	-20 to +55 °C
Relative humidity	≤ 100 % – including condensation on device outer shell
Protection type	DIN EN 60529, EN 50102 IP65, IP67, IP69
Electromagnetic compatibility (EMC)	DIN EN 61326-1:2022, DIN EN 61326-2-3:2022
Interference emission	Class B[a]
Interference immunity	Industrial requirements
Vibration resistance[b]	DIN EN 60068-2-6, DIN EN 60068-2-27
Vibration resistance	5 g at 10 Hz to 2000 Hz
Shock resistance	20 g over 11 ms
Pressure Equipment Directive	2014/68/EU
Group 1 fluids - DN ≤ 25	Sound engineering practice according to Art. 4, para. 3 together with Art 4, para. 1c.i
Site altitude	Up to maximum 2000 m above sea level

[a] The product is suitable for industrial use as well as for households and small businesses.

[b] Only guaranteed if the device is fixed properly.

4.5 Mechanical features

4.5.1 Materials

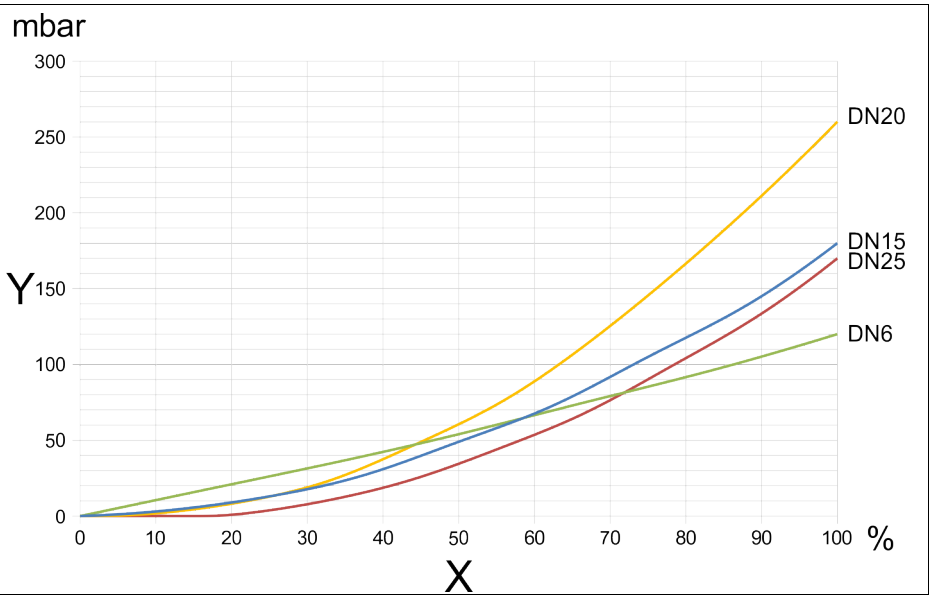
Housing	Stainless steel 304
Housing lid	Plastic PA-GF25 (glass fiber reinforced)
Display cover	Acrylic glass
Components in contact with the medium	
Measuring pipe	PEEK
Electrodes	Carbon fiber
Process connection	Stainless steel 316L
Seals	EPDM or FKM

4 Technical data

4.5.2 Nominal pressure

Nominal pressure level	PN 16

4.5.3 Pressure loss diagram

X = maximum flow (%) Y = pressure loss (mbar)	

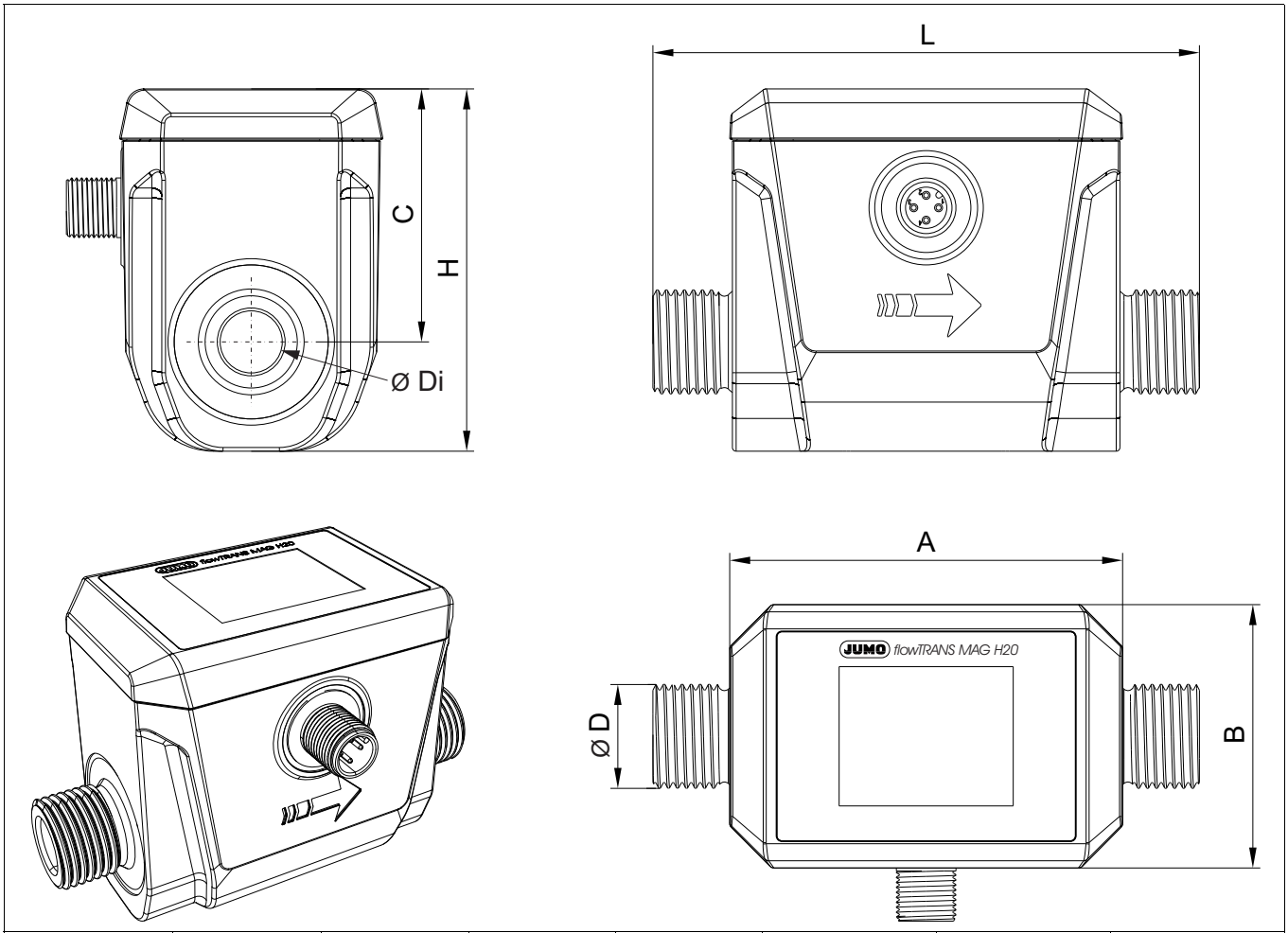
4.6 Measurement media

Medium type	Conductive liquids
Conductivity	≥ 20 µS/cm
Viscosity	≤ 70 mPa·s
Temperature range[a]	-20 °C to +90 °C

[a] Return to the accuracy specifications after cooling down.

4.7 Dimensions

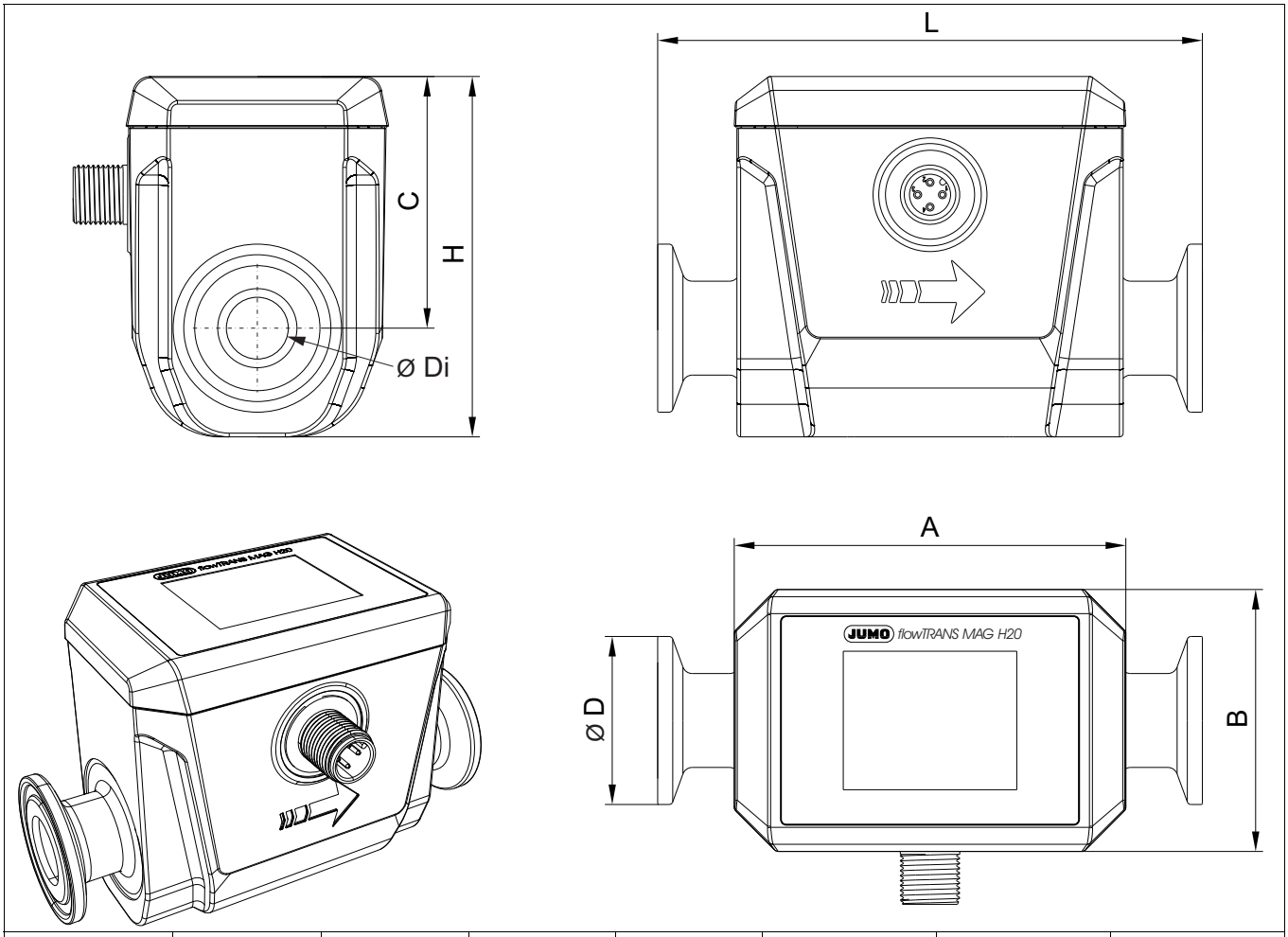
4.7.1 Thread connection according to DIN EN ISO 228-1



Nominal width	Ø Di [mm]	Ø D [″]	A [mm]	B [mm]	C [mm]	L [mm]	H [mm]
DN 6	6.0	1/4	79	53	51	110	73
DN 15	12.5	1/2					
DN 20	15.0	3/4					
DN 25	21.0	1					

4 Technical data

4.7.2 Tri-Clamp connection according to DIN 32676, Series A



Nominal width	Ø Di [mm]	Ø D [mm]	A [mm]	B [mm]	C [mm]	L [mm]	H [mm]
DN 6	6.0	25.0	79	53	51	110	73
DN 15	12.5	34.0					
DN 20	15.0	34.0					
DN 25	26.0	50.5				130	

5.1 Transport

If the device is not protected properly against external influences, it may become damaged during transport.

- Transport the device in an impact-proof packaging solution that protects it against moisture and dirt.
- Also comply with the admissible storage temperatures while the device is being transported.
- Protect all electrical and mechanical connections from damage.

5.2 Storage

Improper storage may result in damage to the device.

- Store the device in a dry and dust-free environment.
- Observe the device storage temperature range.

6 Installation

6.1 Preparing for installation

6.1.1 Installation site

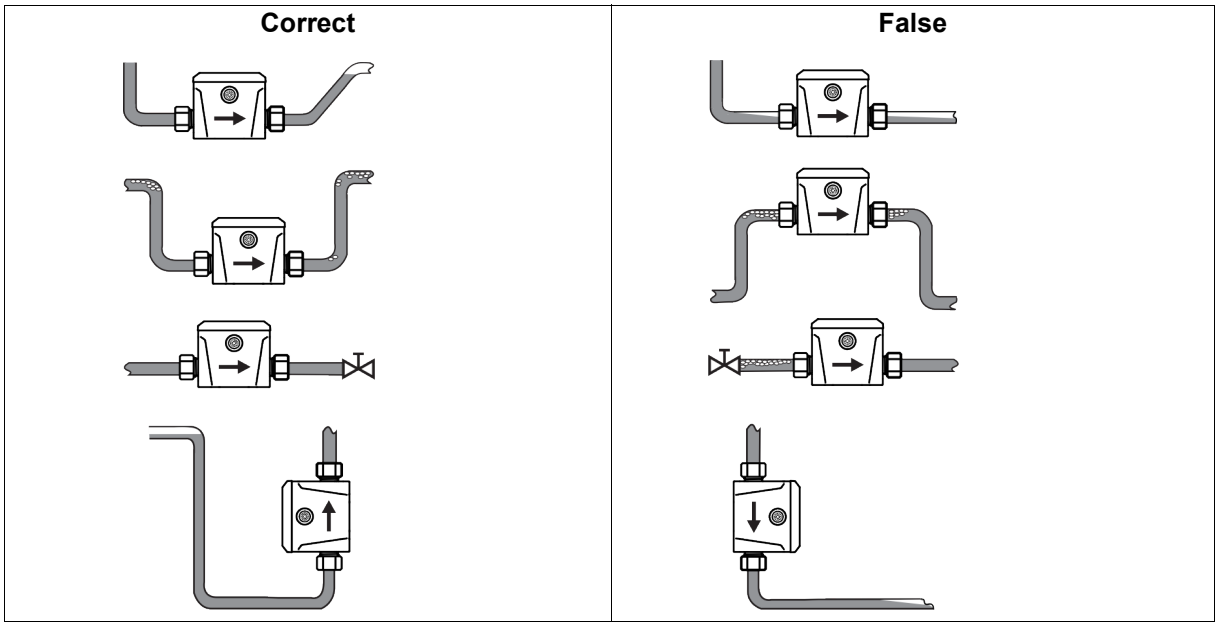
- ✓ The device is protected against electromagnetic interference.
- ✓ The device is protected from UV radiation.
- ✓ The device is protected from the weather when used outside.

6.1.2 Inlet and outlet sections

No straight inlet or outlet sections are required to operate the device.

6.1.3 Installation position

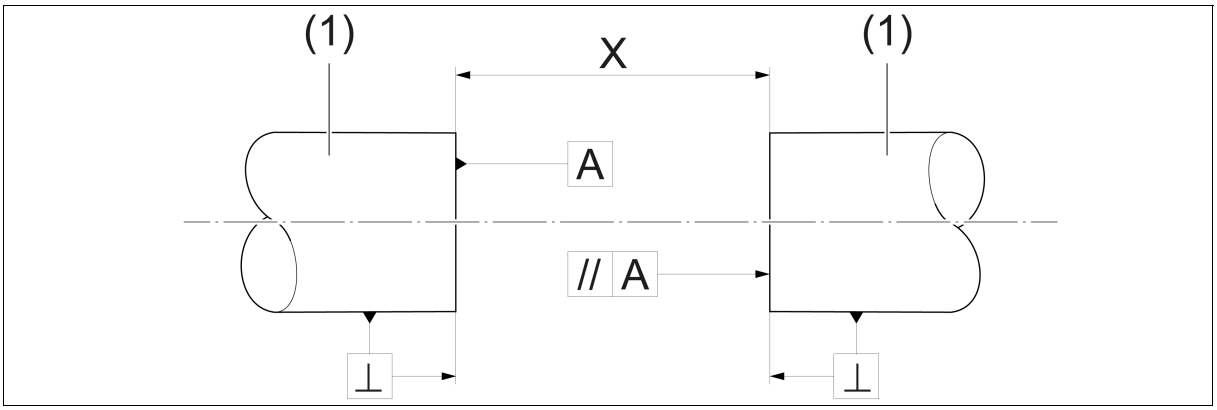
→ Flow direction



6.1.4 Avoid mechanical strain

Install the device free of mechanical stress so that no pipeline forces can be transmitted to the device. Important:

- Take into account the insertion length of the device including the two pipe adapters (X).
- Ensure that the center lines of both ends of the pipes (1) align before installing the device in the pipe.
- The surfaces A must be parallel to each other.
- The ends of the pipe must be perpendicular to the surfaces A.



(1) Ends of the pipe

⊥ Symbol for perpendicular

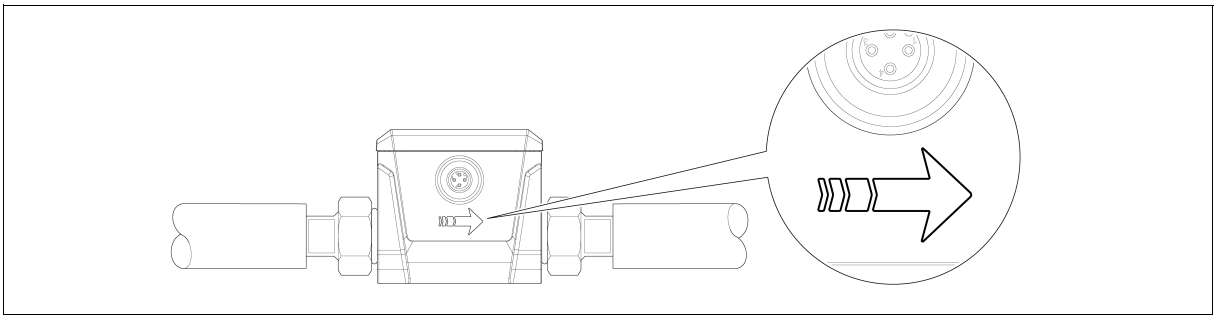
(X) Insertion length L including pipe adapter

// Symbol for parallel

6.1.5 Flow direction

The positive flow direction (⟶) is shown on both sides of the device using an arrow.

The flow direction must be observed when installing the device.

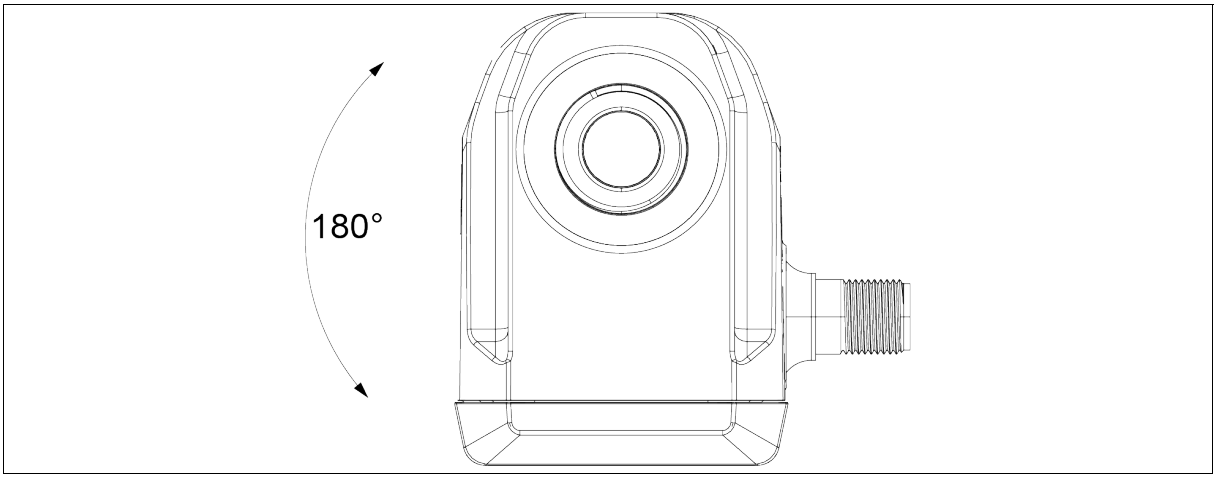


6.1.6 Alignment of the housing for electronic components

The maximum admissible display temperature of 70 °C must not be exceeded.

Appropriate measures must be taken to ensure compliance with the temperature limit.

For this purpose, it can be helpful to install the device rotated by 180°.



6.2 Installing the device

NOTE!

The specified oscillation and vibration resistance can only be guaranteed if the device is fixed properly. It is fixed, for example, through the four drilled holes on the bottom of the device.

Requirements:

✓ Medium circulation in the plant is stopped.

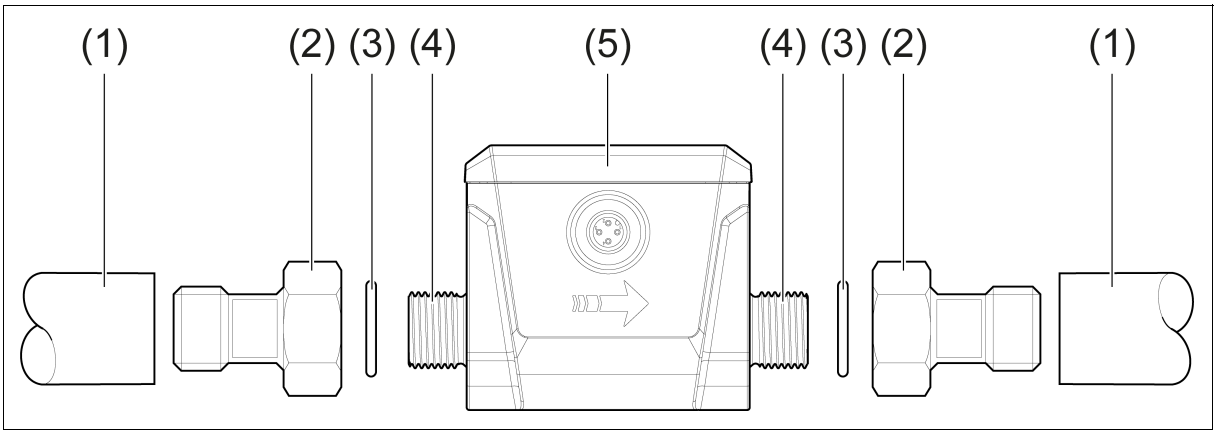
✓ The plant pipeline is emptied and flushed.

Aids:

- Suitable tools
- Lubricating paste
- For thread connections: 2 suitable pipe adapters (pipe adapters are available from JUMO on request)
- For thread connections: suitable sealing material depending on pipe adapter
- For Tri-Clamp connections: 2 Tri-Clamp clamps
- 2 seals (for variant with threaded connection, the seals are included in the scope of delivery)

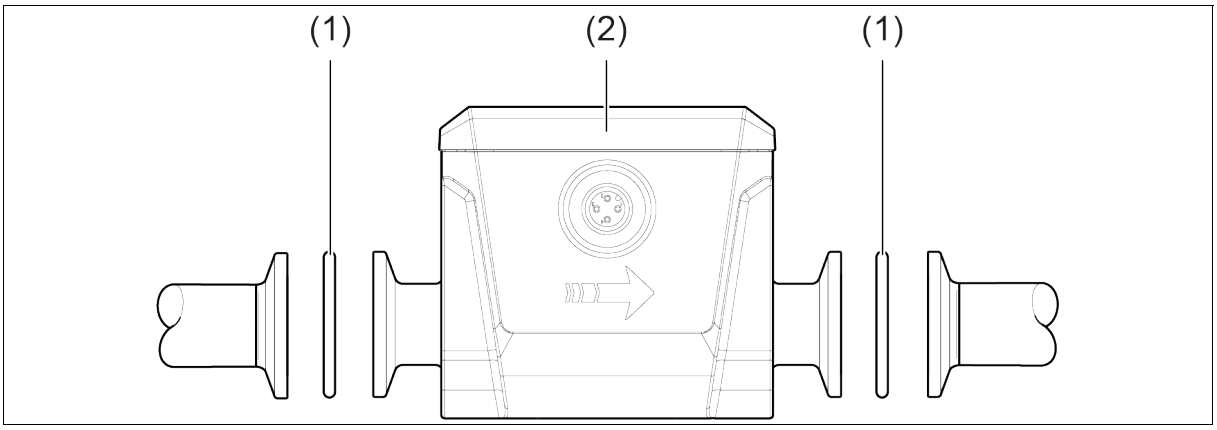
Procedure:

Thread connection (DIN EN ISO 228-1)



1. Lubricate the threads of the process connections (4) and the pipe adapters (2) with lubricating paste.
2. Screw the pipe adapters (2) into the pipelines (1).
3. Make sure that the connections are tight.
4. Insert one seal (3) each into a pipe adapter.
5. Insert the device (5) according to the marked flow direction (→).
6. Screw the pipe adapters (2) hand-tight to the process connections (4).
7. Tighten the two adapters (2) in opposite directions.
   Tightening torque DN 6: 15 Nm
   Tightening torque DN 15 to DN 25: 30 Nm

Tri-Clamp connection (DIN 32676, Series A)

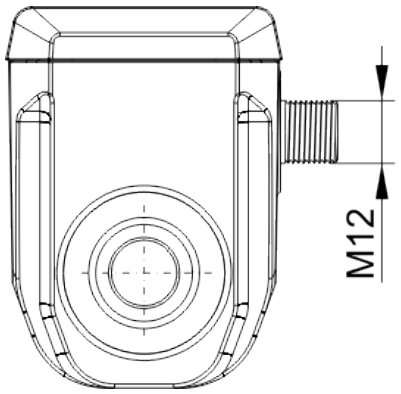
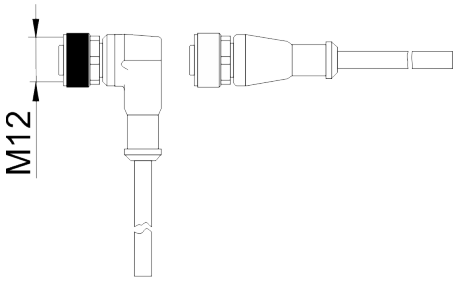
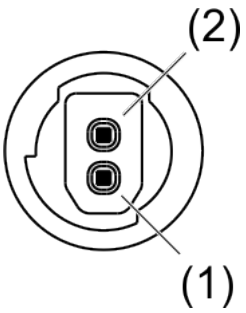
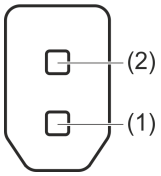


1. Insert the device (2) according to the marked flow direction (→).
2. Insert a suitable seal (1) between the two Tri-Clamp flanges on each side of the device.
3. Position one Tri-Clamp clamp around each of the two Tri-Clamp flanges on both sides of the device.
4. Fix the Tri-Clamp clamps.

Result:
The device is now installed in the pipe.

7.1 Terminal assignment

7.1.1 Terminal assignment, M12 connector, SPE

	Device	M12 connecting cable
		
Terminal assignment and color coding		
RxTx+/PoDL+	(1)	(1) – WH (white)
RxTx-/PoDL-	(2)	(2) – BU (blue)
Connection type	Plug connector M12 according to IEC 63171-5	Plug connector M12 with screw locking

7 Electrical connection

7.2 Connecting the device

Aids:

🛠 M12 connecting cable for SPE

Requirements:

✓ The connections for the voltage supply and signal processing have been prepared.

✓ A heat-resistant cable is used (≥ 80 °C).

✓ Do not lay the cable near power cables, high-voltage cables or high-frequency cables or maintain a minimum gap of 30 cm from them.

Procedure:

1. Insert the connecting cable into the M12 connector.
2. Tighten the knurled screw by hand on the connecting cable (corresponds to a maximum tightening torque of approx. 0.4 Nm).
3. The device must be grounded with ungrounded pipelines (e.g. plastic pipes).

   The device is grounded via the bottom side. There are four drilled holes there. A drilled hole is marked with the ground symbol. A ground wire can be connected there.
4. Connect the connecting cable to the device that is processing the signals and to the voltage supply.
5. Lay the connecting cable so that it is protected from mechanical load.

Result:

The device is ready for use.

8.1 Startup display

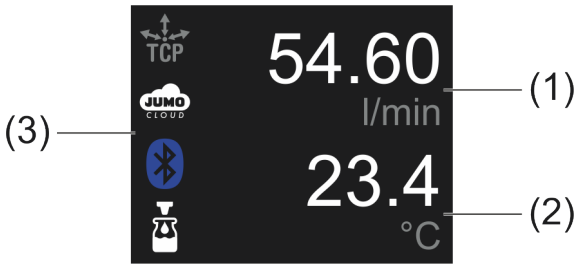
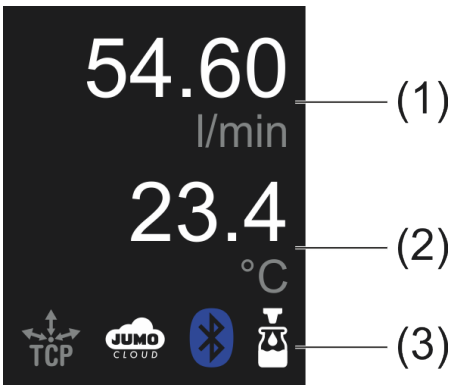
As soon as the device is supplied with voltage, a startup display appears on the display. The startup display contains general information about the device:

- Software version
- Hardware version
- Bluetooth version
- Device TAG number

The display is shown in portrait or landscape format depending on the configured display orientation.

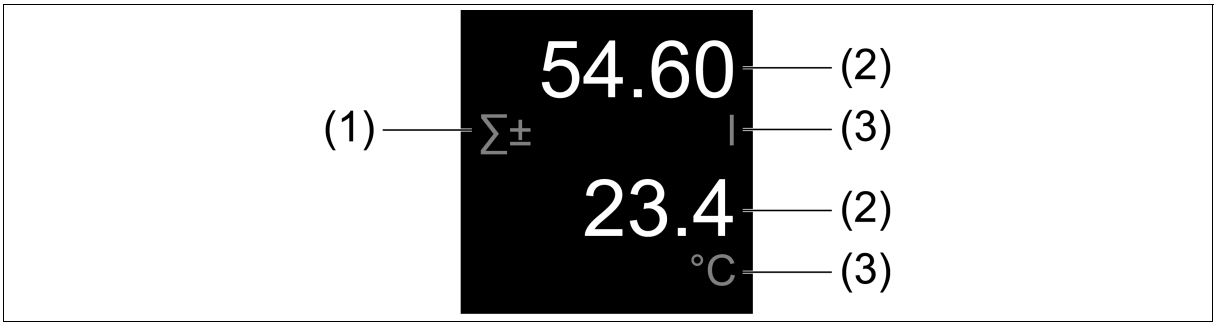
After five seconds, the startup display switches to the basic status.

8.2 Basic status

<table>
<tr>
<td> 
</td>
<td> 
</td>
</tr>
<tr>
<td>Orientation: 0°, 180°</td>
<td>Orientation: 90°, 270°</td>
</tr>
</table>

(1) Process value display 1
(2) Process value display 2
(3) Toolbar with status symbols

8.2.1 Process value display



(1) Symbol for totalizer or batch function
(2) Process value
(3) System unit

Totalizer

Only appears when the totalizer function is active.

Symbol	Description
∑+	Shows positive count mode of the totalizer.
∑-	Shows negative count mode of the totalizer.
∑±	Shows balanced count mode of the totalizer.

Batch

Only appears when the batch function is active.

Symbol	Description
⌶↑	Shows the fill volume.
⌶↓	Shows the remaining volume.

Process value

5 digits plus prefix sign can be displayed.

The larger the process value, the fewer decimal places are displayed.

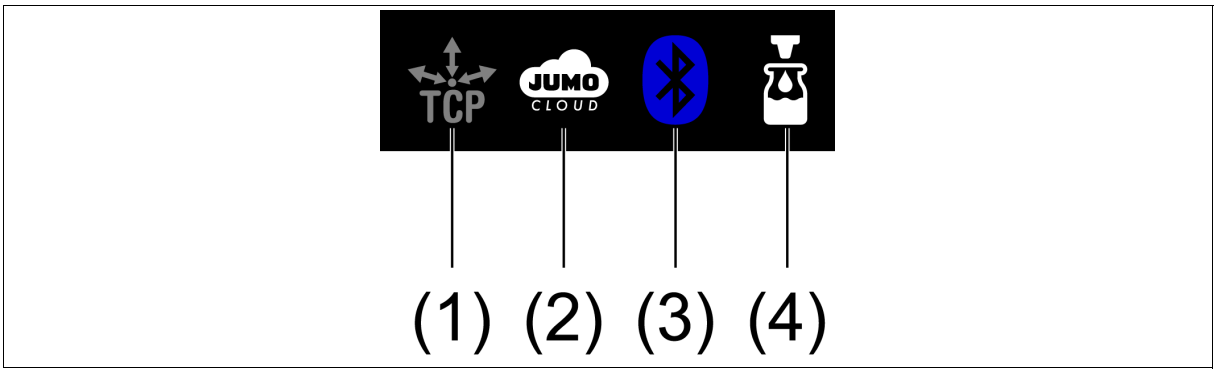
If the value falls below -99999 or exceeds +99999, "-----" is displayed instead of the measured value.

With the totalizer function, the counter is reset and a carry is counted.

System unit

Display	Description
l, °C, ...	Shows the configured system unit.

8.2.2 Toolbar



(1) Modbus TCP connection status
(2) JUMO Cloud connection status
(3) Bluetooth connection status
(4) Status of the batch function

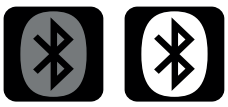
Modbus TCP connection status

Symbol	Description
	Gray icon: no connection
	White icon: connection active

JUMO Cloud connection status

Symbol	Description
	Gray icon: no connection
	White icon: connection is established
	Green icon: there is a connection to the JUMO Cloud
	Red icon: no connection could be established

Bluetooth connection status

Symbol	Description
	Gray icon: the Bluetooth wireless module is in the "Inactive" or "Restricted" operating mode. The device cannot be found during a scan for new devices.
	White, flashing icon: connection is being established
	Blue icon: connection active

Batch function status

Symbol	Description
	Gray icon: batch function inactive
	White icon: batch function active

8.3 Error messages

Error messages and warnings appear alternately with the basic status. Symbols according to NAMUR recommendation NE 107 are predominantly used.

Symbol	Designation
	F: Failure (according to NAMUR NE 107)
	C: Functional check (according to NAMUR NE 107)
	M: Maintenance required (according to NAMUR NE 107)
	S: Outside the specification (according to NAMUR NE 107)
	Alarm
	Event

The display shows a two-line text below the symbol. It describes the error in more detail. If there are several errors, the error with the highest priority is displayed.

9 Interfaces

9.1 Bluetooth

The device can be operated and configured via the JUMO smartCONNECT app. The connection is established via Bluetooth. Authentication takes place via NFC.

9.1.1 App download

The "JUMO smartCONNECT" app is available as a free download for Android smartphones (via Google Play) and Apple smartphones (via App Store).

Android smartphones

The app is automatically displayed in the Play Store when the Android smartphone is placed on the device's display so that the NFC antennas are on top of each other.

Alternatively, the QR code below leads directly to the Google Play Store.

Apple smartphones

The app must be installed manually for Apple smartphones. The QR code below leads directly to the Apple App Store.

9.1.2 Authentication

In order to operate the device via Bluetooth, authentication is required beforehand. Authentication takes place via an NFC tag that is installed under the device's display.

The following requirements must be met for authentication to take place:

- ✓ The device is switched on.
- ✓ The Bluetooth wireless module is in the "Active" or "Restricted" operating mode.
- ✓ NFC is activated on the smartphone.
- ✓ The app is installed.
- ✓ No other smartphone is connected to the device.

Android smartphones

The smartphone must be placed on the device's display so that the NFC antennas are on top of each other. Authentication then takes place automatically.

Apple smartphones

Click "Add new device" in the open app. The smartphone must then be placed on the device's display so that the NFC antennas are on top of each other.

NOTE!

If authentication is not successful, the NFC antennas of the smartphone and device may be too far apart. The position of the smartphone must be corrected.

The smartphone settings show where the NFC antenna is located.

9.1.3 Connection

If the smartphone has been successfully authenticated, there is a Bluetooth connection between the device and the smartphone.

The device stores the authentication key. If the smartphone is within Bluetooth range, a new connection can be established without NFC – as long as no other smartphone is connected.

The device stores a maximum of 8 authentication keys. If another smartphone is authenticated, the smartphone that has not been connected to the device for the longest time will be deleted from the memory.

If this smartphone is to be connected to the device again, authentication via NFC tag is required again.

9.1.4 Bluetooth settings

Active

By default, Bluetooth is configured as permanently "active".

Restricted

Alternatively, Bluetooth can be configured as "restricted".

In that case, Bluetooth is activated as soon as a smartphone with the NFC antenna switched on is placed on the device's display. If no smartphone connects to the device within 10 seconds, Bluetooth is switched off again.

If the existing Bluetooth connection is lost, a new connection can be established within one minute. After the time has elapsed, Bluetooth turns off again.

Inactive

The Bluetooth connection can also be configured as permanently "inactive". However, this setting is not available in the app.

Bluetooth can be deactivated via Modbus TCP.

9.1.5 smartCONNECT app

Start screen

- The current connection status is displayed.
- Under "Demo", the app can be tested even if no suitable device is available.
- Under "Known devices", all devices are displayed for which authentication via NFC tag was successfully performed.
- The x symbol can be used to delete the authentication key on the smartphone.

Establish a connection

The connection between the smartphone and device is established by clicking on the corresponding device name under "Known devices" or "Nearby".

Once the connection to a device is established, the device name must be clicked again. Then the display opens in the app.

Display

After successful connection, information about the device is displayed, such as the name or serial number.

Some process values are also shown.

At the bottom of the screen you will find the following icons:

Configuration menu

Device is removed from the "Known devices" list and the authentication key on the smartphone is deleted

Connection between smartphone and device is terminated

9.2 JUMO Cloud

The device can be connected to the JUMO Cloud or any instance of the audako Cloud. Values can be read out and the device configured via the cloud. However, not all parameters are available.

The prerequisite for connecting to the cloud is configuring the device appropriately. This can be performed on the app or via Modbus TCP.

The gateway required to connect to the cloud is integrated into the device. The device is connected to the network via an SPE switch and the data packets are forwarded accordingly.

The MQTT protocol is used.

9.2.1 Data exchange

Data is transferred from the device to the cloud through the cloud gateway.

The data is buffered before transmission. This allows network failures to be bridged without immediately losing data. The buffer is designed as a ring buffer that can store a total of 100 values.

The device sends its data to the cloud ("Historical data") via the ring buffer at the configured interval.

If the live mode is activated, the data is also sent directly – without buffering – to the device ("live data"). The interval for live mode can be configured.

NOTE!

All process values are always transmitted to the cloud in JUMO base units. This happens regardless of what is configured as the unit for the display or for Modbus TCP.

The relevant JUMO base units are:

°C	Temperature
m^3	Volume
m^3/s	Flow

9.2.2 Startup

In order for the cloud gateway to work, the following things must be set up in the cloud and then transferred to the device.

1. The device must be assigned to a tenant.
2. A data source must be created. This automatically generates the access data – consisting of device ID and password
3. A data connection must be set up.
4. A signal must be created in the cloud for each value to be sent from the device to the cloud.

   The following information is relevant:

   a) Signal type (analog or binary)
   b) Average value / last value
   c) Interval
   d) Address

The Smart Device Wizard in the cloud simplifies startup.

9.2.3 Further information

A detailed description of the JUMO Cloud can be found in the help center.

9.3 Modbus TCP

The device can be accessed via Modbus TCP using a tool or directly via PLC.

9.3.1 Transmission

All data types are transmitted in big-endian format according to Modbus standard.

9.3.2 Modbus address tables

The Modbus address tables are in the annex ⇨ "Modbus address tables ", Page 59.

The device has several interfaces and thus several operating options. The configuration parameters are mostly identical. Since the menu structure differs depending on the interface, the configuration parameters are listed sorted by function.

10.1 Display on the device

Parameter	Value	Default setting	Description
Signal selection line 1	*Various signals* ⇨ "Analog selector ", Page 51	Flow	Process value display 1
Signal selection line 2	*Various signals* ⇨ "Analog selector ", Page 51	Temperature	Process value display 2
Brightness	0 to 10	5	Backlight brightness **0:** Display is switched off
Language	German English French Spanish	deutsch	–
Flow unit	l/s l/min l/h cm³/s m³/h ft³/min ft³/h usgal/min usgal/h impgal/min impgal/h	l/min	–
Volume unit	m³ cm³ l ft³ usgal impgal	l	–
Temperature unit	°C °F	°C	–
Display orientation	0 degrees 90 degrees 180 degrees 270 degrees	0 degrees	–

10 Configuration

10.2 Interfaces

10.2.1 Bluetooth

Parameter	Value	Default setting	Description
Bluetooth mode	Inactive Restricted Active	Active	**Inactive:** Bluetooth permanently switched off **Restricted:** Bluetooth is temporarily activated by NFC tag **Active:** Bluetooth permanently switched on

10.2.2 Single Pair Ethernet

Network settings

Parameter	Value	Default setting	Description
Method	Manual Automatic (DHCP)	Automatic (DHCP)	**Manual:** IP address is permanently set in the device **Automatic (DHCP):** IP address is assigned automatically by DHCP server
IP address	–	0.0.0.0	Only if "Method" = "Manual"
Subnet mask	–	255.255.0.0	Only if "Method" = "Manual"
Standard gateway	–	0.0.0.0	Only if "Method" = "Manual"
DNS server IP automatic	Yes No	Yes	Only if "Method" = "Automatic (DHCP)"
DNS server	–	0.0.0.0	Only if "Method" = "Manual" and "DNS server IP automatic" = "No"

Connection to the JUMO cloud

Parameter	Value	Default setting	Description
Connection to the cloud	Active Inactive	Inactive	–
Cloud server	JUMO Cloud Individual	JUMO Cloud	**JUMO Cloud:** The JUMO Cloud is used. **Individual:** The cloud server is determined by an individual URL.
Server URL (device)	–	–	Only if "Cloud Server" = "individual"
Server URL (config)	–	–	Only if "Cloud Server" = "individual"
Device ID	–	–	Access data to the cloud (generated by the cloud)
Password	–	–	Access data to the cloud (generated by the cloud)
Permanenter live mode	Active Inactive	Active	If live mode is activated, live data is also transmitted to the cloud in addition to the historical values (for interval, see "Cycle time for live data").
Cycle time for live data	1000 ms to 25000 ms	1000 ms	Time for how often the live data is sent from the device to the cloud. Only if "Permanent Live Mode" = "active"

Modbus TCP

Parameter	Value	Default setting	Description
Port	1 to 1024	502	TCP port of the device
Flow unit	l/s l/min l/h cm³/s m³/h ft³/min ft³/h usgal/min usgal/h impgal/min impgal/h	l/min	The unit configured here is independent of the unit used for the device display.
Counter volume unit	m³ cm³ l ft³ usgal impgal	l	The unit configured here is independent of the unit used for the device display.
Temperature unit	°C °F	°C	The unit configured here is independent of the unit used for the device display.
Interface activated	Active Inactive	Active	Cannot be set via Modbus TCP.

10.3 Measurands

10.3.1 Flow

Parameter	Value	Default setting	Description
Filter time constant	0 s to 25 s	1 s	The process value can be attenuated by a 2nd order filter. The larger the filter time constant, the slower the change in measured value at the output. Response time t_{90} with default setting: ≤ 250 ms
Inversion	No inversion Signal inverted	No inversion	Inverts the flow signal, e.g. if the device has been installed in negative flow direction.

10.3.2 Temperature

Parameter	Value	Default setting	Description
Temperature input unit	°C °F	°C	–
Filter time constant	0 s to 25 s	1 s	The process value can be attenuated by a 2nd order filter. The larger the filter time constant, the slower the change in measured value at the output.
Offset	-10 °C to +10 °C	0 °C	Offset correction to eliminate detected deviation.

10.4 Functions

NOTE!

The units for the display are configurable.

In the following, typical units for flow measurement technology are used as example units. The values only apply to the correspondingly configured unit.

If the unit is changed, the adjustable value range also changes. This ensures that device-specific limit values are not exceeded.

10.4.1 Simulation

Parameter	Value	Default setting	Description
Flow simulation	Inactive Active	Inactive	–
Simulation value	-165 l/min to +165 l/min	0 l/min	Simulation value for "Flow simulation" Unit depending on the configuration of "Volume unit" (limit values are converted if necessary)
Temperature simulation	Inactive Active	Inactive	–
Simulation value	-22 °C to +99 °C	0 °C	Simulation value for "Temperature simulation" Unit depending on the configuration of "Temperature unit" (limit values are converted if necessary)

As an aid to startup the device, the flow and temperature inputs can be simulated.

10.4.2 Totalizer

Parameter	Value	Default setting	Description
Counting mode totalizer 1	Balanced Positive Negative	Positive	When the counting mode is changed, the added volume is not reset. **Balanced:** all flow components are taken into account regardless of the flow direction **Positive:** only positive flow components (corresponding to the marked flow direction on the device) are taken into account **Negative:** only negative flow components (opposite to the marked flow direction on the device) are taken into account
Counting mode totalizer 2	Balanced Positive Negative	Balanced	

The totalizer determines the volume quantity that has flowed through the device since a certain point in time. Two counters are available.

It is possible to configure whether only positive flow components – corresponding to the marked flow direction on the device – are taken into account, only negative flow components or all flow components.

Since the device has a 5-digit display, the volume is added up to the counter reading of 99,999. For larger values, a carry is counted and the totalizer is reset. Each carry thus corresponds to a value of 100,000

The totalized volumes are saved at 15-minute intervals. After a voltage interruption, the last saved counter reading is retained and continued. Therefore, the totalized volume may differ slightly from the actual volume due to a voltage interruption.

The totalizers can be reset by command via the SPE interface.

Both totalizers are always reset at the same time.

10.4.3 Batch function

Parameter	Value	Default setting	Description
BatchVolume	0 m³ to 99999 m³	0 m³	Specified batch volume
MaxBatchTime	0 s to 9999 s	0 s	If the input value is exceeded, the batch function is aborted. **0 s:** The time limit of the batch function is deactivated.

The batch function is used to signal volume quantities that have flowed through. The function subtracts the volume flowing through in the positive and negative flow direction from a specified batch volume.

Power off

If an active batch is interrupted by a power-off event, corresponding filling and residual volume values are lost.

Batch error

A batch error is present if a process value shows an error when the batch function is active or if the maximum batch time has been exceeded. The error is reset when the function is restarted.

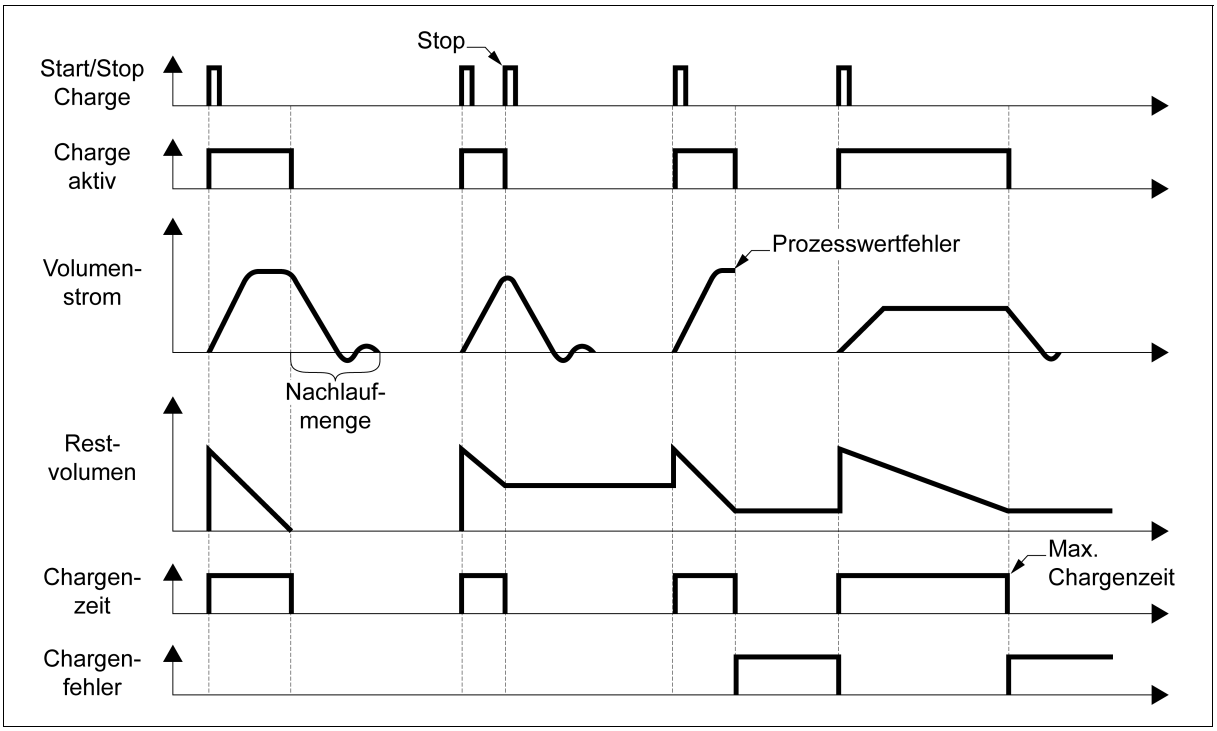
Further information about error ⇨ "Error messages ", Page 52

Start/stop command

The batch function can be started or stopped by command via the SPE interface.

This is a common start/stop signal.

Example



The activated batch function can be terminated in various ways:

- The batch function is actively terminated ("start/stop batch").
- An error ("process value error") occurs.
- The specified batch volume has been used up ("residual volume").
- The maximum batch time has been reached ("batch time"). A batch error is output.

10.4.4 Low flow suppression

Parameter	Value	Default setting	Description
Low flow suppression switching threshold	0 % to 10 %	0.15 %	If the flow falls below the switching threshold, the flow is not measured. Input value as a percentage of the maximum flow measuring range.

Low flow suppression can be used to suppress low flow values in the zero flow range to eliminate noise in the measurement signal.

A switching threshold can be configured to suppress the low flow. If this flow falls below the switching threshold, the flow is not measured. If the switching threshold is set too high, incorrect measurements may occur.

10.4.5 Fine adjustment

Parameter	Value	Default setting	Description
Fine adjustment Activation	Inactive Active	Inactive	–
Fine adjustment Target start	-165 l/min to +165 l/min	0 l/min	Unit depending on the configuration of "Volume unit" (limit values are converted if necessary)
Fine adjustment Target end	-165 l/min to +165 l/min	100 l/min	
Fine adjustment Actual start	-165 l/min to +165 l/min	0 l/min	
Adjustment Actual end	-165 l/min to +165 l/min	100 l/min	

The measured values can be corrected by the fine adjustment. This allows the device to be adapted to the conditions of the customer's plant or medium.

The fine adjustment is not a calibration, but a subsequent adjustment. The calibration data remains unaffected, so that the fine adjustment can be reset at any time.

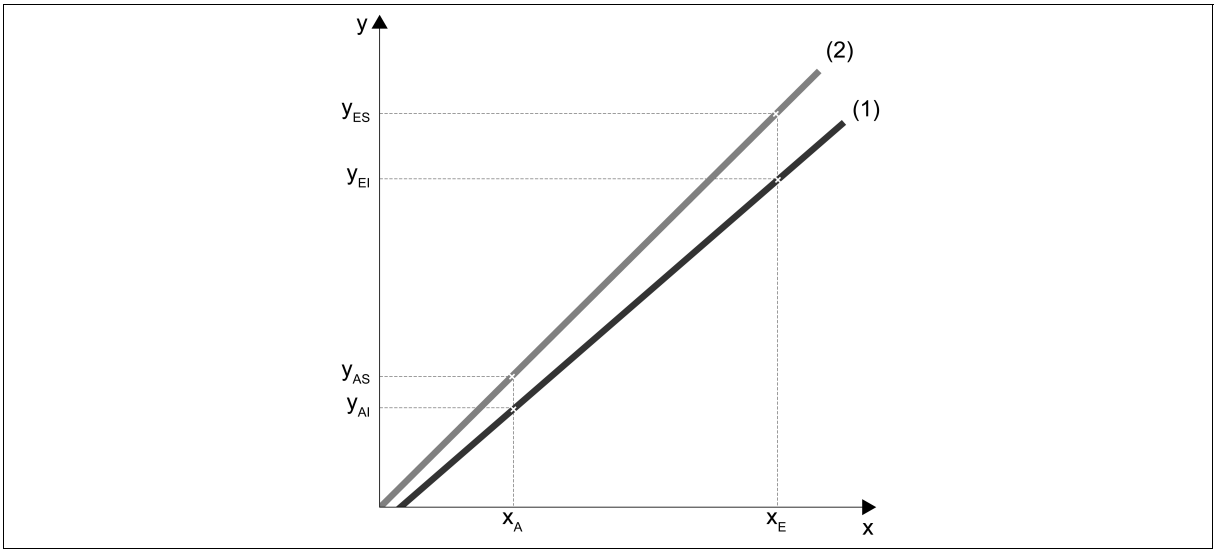
The fine adjustment is a linearization in the two-point form. It influences the slope of the characteristic lines and its intersection with the x-axis.

Reset

To reset the fine adjustment, "Target start value" = "Actual start value" and "Target end value" = "Actual end value" must be configured. Alternatively, the function can be deactivated.

Example

The measured value deviates from the reference value. The deviation at the lower measuring point x_A (=start value) and at the upper measuring point x_E (=end value) is different. A correction by a measurement offset is thus not suitable.



(1) Characteristic line before fine adjustment
(2) Characteristic line after fine adjustment
(x) Measuring point
(x_A) Lower measuring point (start value)
(x_E) Upper measuring point (end value)
(y) Measured value
(y_{AI}) Actual start value
(y_{AS}) Target start value
(y_{EI}) Actual end value
(y_{ES}) Target end value

10.4.6 Limit value monitoring function

Parameter	Value	Default setting	Description
Switching function	Deactivated SinglePointMode WindowMode TwoPointMode	Deactivated	**Deactivated:** Limit value switch inactive **SinglePointMode:** Hysteresis mode ("Switching point SP1" and "Hysteresis") **WindowMode:** Window mode ("Switching point SP1", "Release point SP2" and "Hysteresis") **TwoPointMode:** Two-point mode ("Switching point SP1" and "Release point SP2")
Inversion	HighActive LowActive	HighActive	The limit value logic can be inverted. **HighActive:** An active limit value switch corresponds to the High signal (logic 1). **LowActive:** An active limit value switch corresponds to the Low signal (logic 0).
Switching point SP1	-150 l/min to +150 l/min -20 °C to 90 °C	75 l/min 75 °C	Temperature: Absolute temperature
Switching point SP2	-150 l/min to +150 l/min -20 °C to 90 °C	50 l/min 50 °C	Only for "Switching function" = "WindowMode" and "TwoPointMode" Temperature: Absolute temperature

Parameter	Value	Default setting	Description
Hysteresis	0 l/min to 150 l/min 0 °C to 90 °C	0 l/min 0 °C	Only for "Switching function" = "SinglePointMode" and "WindowMode" Temperature: Relative temperature
Switch-on delay	0 s to 100 s	0 s	State is not given to the limit value switch output until after the time has elapsed.
Switch-off delay	0 s to 100 s	0 s	State is not given to the limit value switch output until after the time has elapsed.
Response at error	Low High Frozen	Low	Behavior of the limit value switch output signal when there is a process value error. **Low:** Low signal (logical 0) **High:** High signal (logical 1) **Frozen:** Last valid value

Two limit value switches are available for each measurand. All limit value switches can be configured independently of each other.

Different switching modes are selectable, all of which can be inverted. In addition, the limit value switches have a switching delay.

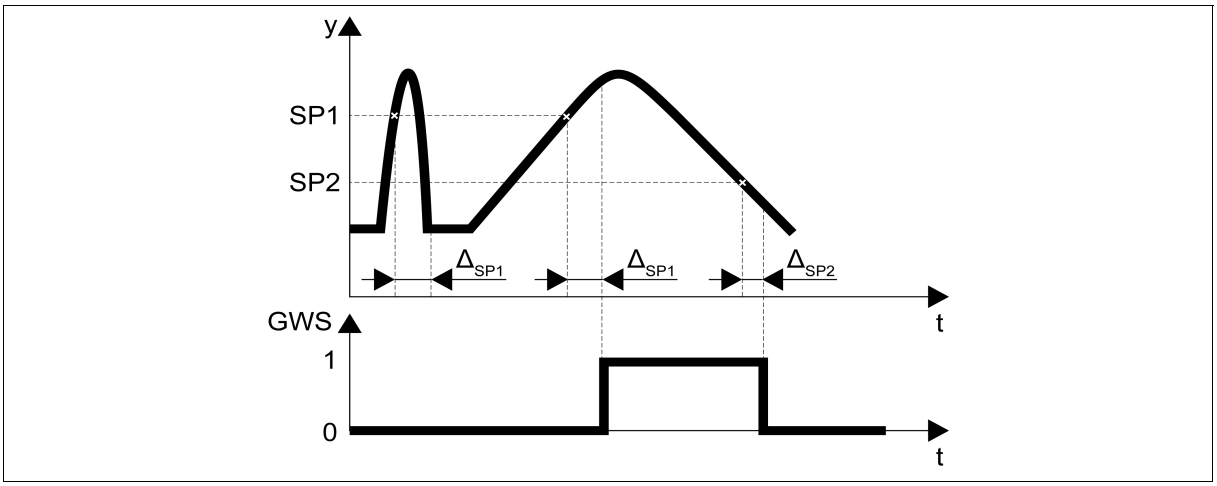
Switching delay

A switching delay for switching on and / or switching off can be configured.

If the switching condition is fulfilled, the set timer for the switch-on delay (Δ_{SP1}) starts to run. The state is only given to the output after the time has elapsed. If the switching condition is no longer fulfilled before the time has elapsed, the timer is restarted.

The switch-off delay (Δ_{SP2}) works analogously.

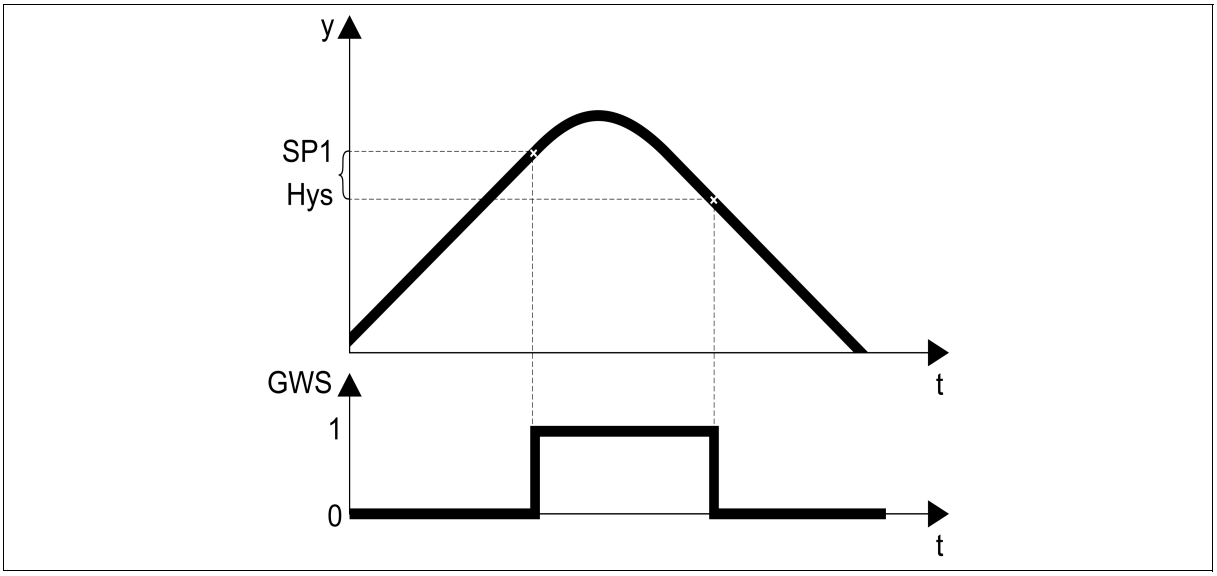
The delay times prevent the output from being switched by measured value peaks or by measured value dips.



(Δ_{SP1}) Switch-on delay
(Δ_{SP2}) Switch-off delay
(LVS) Limit value switch output signal
(SP1) Switching point
(SP2) Release point
(t) Time
(y) Measured value

Hysteresis mode

If the process value exceeds the switching point SP1, the output of the limit value switch becomes active. If the switching point SP1 reduced by the amount of the hysteresis is undershot again, the output of the limit value switch becomes inactive again.

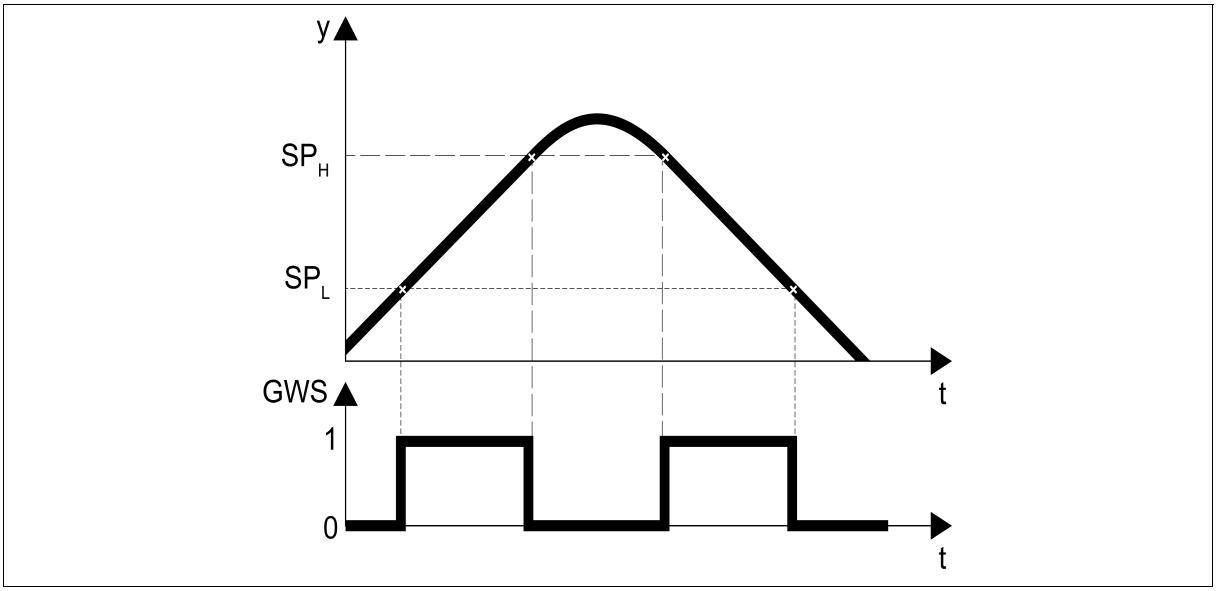


(LVS) Limit value switch output signal
(Hys) Hysteresis
(SP1) Switching point
(t) Time
(y) Measured value

Window mode

Window mode checks whether the process value is within a certain range. SP_L is defined as the smaller value of switching points SP1 and SP2. SP_H is defined as the larger value of switching point SP1 and SP2.

The hysteresis of the switching points is adjustable.

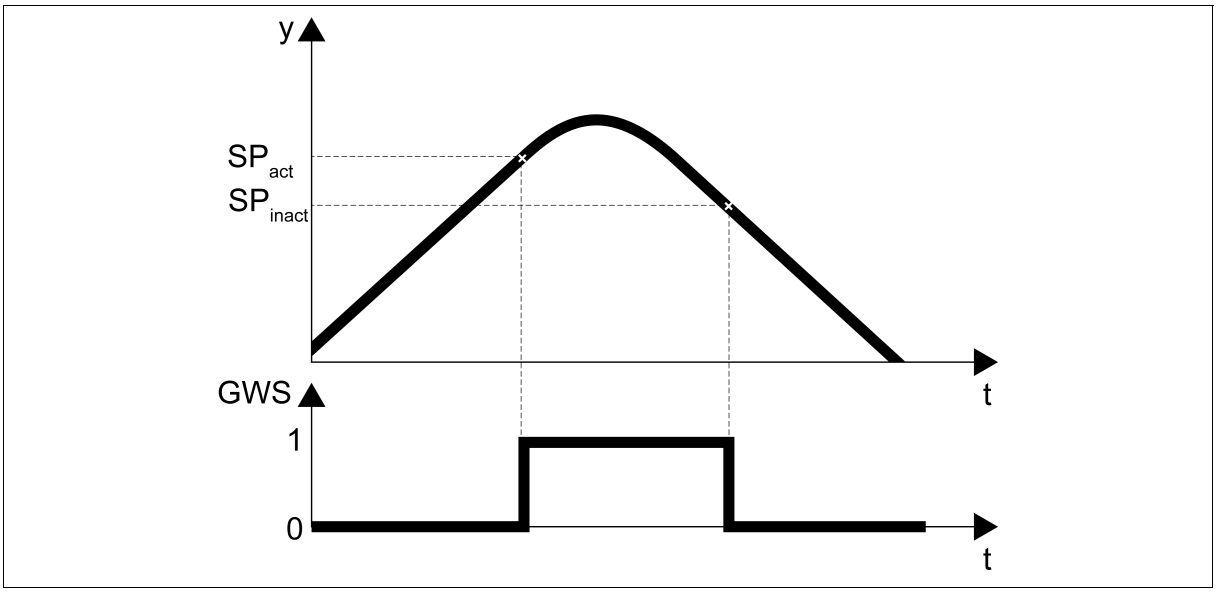


(LVS) Limit value switch output signal
(SP_H) High switching point
(SP_L) Low switching point
(t) Time
(y) Measured value

Two-point mode

In two-point mode, two switching points are defined. If the process value exceeds the SP_{act} switching point, the limit value switch output becomes active. If the process value falls below the SP_{inact} switching point, the output becomes inactive.

SP_{act} is defined as the larger value of switching points SP1 and SP2, SP_{inact} is correspondingly the smaller of the two values.



(LVS)	Limit value switch output signal	(t)	Time
(SP_{act})	Active switching point	(y)	Measured value
(SP_{inact})	Inactive switching point		

10.5 Selectors

10.5.1 Analog selector

Designation	Note
Flow	Flow input
Temperature	Temperature input
Totalizer 1 volume	Volume of totalizer 1
Totalizer 1 carry	Carry of totalizer 1[a]
Totalizer 2 volume	Volume of totalizer 2
Totalizer 2 carry	Carry of totalizer 2[a]
Expired quantity	Filling volume of the batch function
Residual quantity	Residual volume of the batch function

[a] For values above 99999 to be displayed, a carry is counted and the totalizer is reset.

11 Troubleshooting

11.1 Process value error

Process value errors are displayed flashing instead of the process value. In part, process value errors are supplemented with error messages by symbols and a two-line message – always alternating with the basic status.

Error message	Cause	Remedy
-----	The input value is invalid. The sensor is defective or communication to the sensor is impaired.	Contact the manufacturer.
	There is an internal device error.	Contact the manufacturer.
<<<<<	The measuring range was undershot.	Operate the device within the device specifications. If necessary, contact the manufacturer.
>>>>>	The measuring range was exceeded.	Operate the device within the device specifications. If necessary, contact the manufacturer.

11.2 Error messages

Error messages and warnings appear alternately with the basic status. Symbols according to NAMUR recommendation NE 107 are predominantly used.

The display shows a two-line text below the symbol. It describes the error in more detail. If there are several errors, the error with the highest priority is displayed.

Failure (F)

Error message	Cause	Remedy
Configuration faulty	The checksum of the configuration data is faulty.	Transfer the configuration data to the device again.
Service data faulty	The process data partition is faulty.	Transfer the configuration data to the device again.
Calibration data faulty	The checksum of the calibration data is faulty.	Contact the manufacturer.
Device not calibrated	There is no calibration data.	Contact the manufacturer.
Sensor communication	The communication to the sensor is impaired.	Contact the manufacturer.
Flow faulty	The flow sensor has failed. Either the flow is too high or the sensor is defective.	Contact the manufacturer.
Temperature faulty	The temperature sensor has failed. There may be a short circuit.	Contact the manufacturer.
The sensor is faulty	The device is faulty.	Contact the manufacturer.

Functional check (C)

Error message	Cause	Remedy
Simulation active	Simulation mode is active.	Deactivate simulation mode or restart the device.

Outside the specification (S)

Error message	Cause	Remedy
Device operating conditions	The device is operated outside the device specifications.	Operate the device within the device specifications.
Temperature accuracy	The device is operated outside the specified range.	Operate the device within the device specifications.
Flow accuracy	The device is operated outside the specified range.	Operate the device within the device specifications.

Event

Error message	Cause	Remedy
Restart the device	The device must be restarted.	Restart the device.

Alarm

Error message	Cause	Remedy
Batch error	The maximum batch time has been exceeded or there is a process value error.	Check the filling volume of the batch and restart the function.

12 Maintenance and cleaning

12.1 Maintenance

The device is maintenance-free.

12.2 Cleaning

12.2.1 Cleaning device housing

The device housing can be cleaned when the device has been installed.

Clean the device with a cloth dampened with water.

12.2.2 Cleaning meter run

Requirements:

- ✓ The device is disassembled.
- ✓ A cleaning station for rinsing all parts in contact with the medium is prepared.

Procedure:

1. If present: Remove seals.
2. Flush all parts that come into contact with the media thoroughly with water.
3. Check the seals for damage and replace if necessary.

Result:

The meter run is cleaned. The device can now be installed, disposed of or returned.

13.1 Dismounting the device

Requirements:

✓ Medium circulation in the plant is stopped.
✓ The plant pipeline is emptied and flushed.
✓ The device has cooled down.

Procedure:

1. Loosen the knurled screw on the connecting cable by hand.
2. Pull the connecting cable out of the M12 connector.
3. Thread connection: Loosen both union nuts of the pipe adapters.
   Tri-Clamp connection: Dismantle both Tri-Clamp clamps.
4. Carefully remove the device from the plant and put in a clean and dry place.

Result:

The device is disassembled and can be used elsewhere.

13.2 Returns

Requirements:

✓ The device housing is cleaned.
✓ The meter run is cleaned.

Procedure:

1. Correctly fill out the supplementary sheet for product returns and sign.
2. Pack the device securely in the original packaging or another suitable shipping container.
3. Attach the supplementary sheet with the other shipping documents to the packaging, ideally on the outside.
4. Send the device to the address noted on the supplementary sheet.

13 Shutdown

13.3 Disposal

Requirements:

✓ The device housing is cleaned.

✓ The meter run is cleaned.

DISPOSAL

- Do not dispose of the device or replaced parts in the trash after use.
- Delete programs and data stored on the device.
- Remove batteries, if any, if this can be done without damaging the device.
- Dispose of the device and the packaging material in a responsible and environmentally friendly manner.
- Observe the country-specific laws and regulations for waste treatment and disposal.

In accordance with Directive 2012/19/EU on Waste from Electrical and Electronic Equipment, manufacturers are obliged to offer the option of returning waste equipment. Request the return from the manufacturer.

14 Open-source software

The device software and/or components of the device were developed using open-source software.

Insofar as the respectively applicable license terms justify a claim on the provision of source code or other information, JUMO GmbH & Co. KG will provide the source code and the license texts on a conventional data carrier at the cost incurred for the provision of the data carrier.

This offer is valid for three years after the software is made available. This offer is valid beyond that time to the extent specified in the license terms.

For questions related to open-source software, please contact:

Address JUMO GmbH & Co. KG
License Compliance
Moritz-Juchheim-Straße 1
36039 Fulda, Germany

Email licensecompliance@jumo.net

15 Certificates and declarations

All certificates and declarations listed below can be viewed on the JUMO website.

qr-406065-en.jumo.info

15.1 Declarations of conformity

Radio Equipment Directive 2014/53/EU

JUMO GmbH & Co. KG hereby states that the flowTRANS MAG H20 device complies with the Directive 2014/53/EU. The full text of the EU Declaration of Conformity can be viewed on the JUMO website.

Federal Communications Commission (FCC)

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions.

(1) This device may not cause harmful interference.

(2) This device must accept any interference received, including interference that may cause undesired operation.

Caution: Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Radio equipment regulations S.I. 2017 No. 1206

JUMO GmbH & Co. KG hereby declares that the flowTRANS MAG H20 corresponds to S.I. 2017 No. 1206. The full text of the UK declaration of conformity can be found on the JUMO website.

16.1 Transmission

All data types are transmitted in big-endian format according to Modbus standard.

16.2 Version and fabrication number

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
21	15	string	19	r/-	Software version number	–
70	46	string	11	r/-	Hardware version number	–
110	6E	string	10	r/-	Fabrication number	–

[a] r/-: Read access

16.3 Configuration

Display

The following settings of the units concern the display on the device. For the Modbus interface the units can be set separately ⇨ "Modbus TCP ", Page 61.

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
1000	3E8	selection	1	r/w	Language	0: German 1: English 2: French 3: Spanish
1001	3E9	selection	1	r/w	Temperature unit	0: °C 1: °F
1002	3EA	selection	1	r/w	Volume unit	0: m³ 1: l 2: cm³ 3: ft³ 4: usgal 5: impgal

16 Modbus address tables

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
1003	3EB	selection	1	r/w	Flow unit	0: m³/h 1: cm³/s 2: l/s 3: l/min 4: l/h 5: ft³/min 6: ft³/h 7: usgal/min 8: usgal/h 9: impgal/min 10: impgal/h
1004	3EC	string	10	r/w	Device name	–
1014	3F6	string	18	r/w	DNS name	Name to access the device in the Ethernet network – instead of the IP address
1100	44C	selector	6	r/w	Process value 1	⇨ "Analog selector ", Page 67
1106	452	selector	6	r/w	Process value 2	⇨ "Analog selector ", Page 67
1112	458	selection	1	r/w	Display orientation	0: 0° 1: 90° 2: 180° 3: 270°
1113	459	integer	2	r/w	Display brightness	0 to 10

[a] r/w: Read and write access

Analog input

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
1200	4B0	float	2	r/w	Flow: Low flow suppression	0 % to 10 % (Input value as a percentage of the maximum flow measuring range)
1211	4BB	float	2	r/w	Flow: Filter time constant	0 s to 25 s
1213	4BD	float	2	r/w	Flow: Simulation value	-0.00275 m³/s to +0.00275 m³/s
1217	4C1	boolean	1	r/w	Flow: Inversion	–
1225	4C9	float	2	r/w	Temperature: Offset	-10 °C to +10 °C
1227	4CB	float	2	r/w	Temperature: Filter time constant	0 s to 25 s
1229	4CD	float	2	r/w	Temperature: Simulation value	-22 °C to +99 °C

[a] r/w: Read and write access

Modbus TCP

The following settings of the units concern the Modbus interface. For the display on the device, the units can be set separately ⇨ "Display ", Page 59.

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
1600	640	integer	2	r/w	Port gateway	1 to 1024
1602	642	selection	1	r/w	Temperature unit	0: °C 1: °F
1603	643	selection	1	r/w	Volume unit	0: m³ 1: l 2: cm³ 3: ft³ 4: usgal 5: impgal
1604	644	selection	1	r/w	Flow unit	0: m³/h 1: cm³/s 2: l/s 3: l/min 4: l/h 5: ft³/min 6: ft³/h 7: usgal/min 8: usgal/h 9: impgal/min 10: impgal/h

[a] r/w: Read and write access

Network settings

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
1700	6A5	selection	1	r/w	Method	0: Manual 1: Automatic
1701	6A6	string	8	r/w	IP address	–
1709	6AD	string	8	r/w	Subnet mask	–
1717	6B5	string	8	r/w	Standard gateway	–
1725	6BD	boolean	1	r/w	Assign DNS server IP automatically	–
1726	6BE	string	8	r/w	DNS server	–

[a] r/w: Read and write access

16 Modbus address tables

Bluetooth

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
2100	834	selection	1	r/w	Bluetooth mode	0: Inactive 1: Restricted 2: Active

[a] r/w: Read and write access

Totalizer

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
2250	8CA	selection	1	r/w	Counting mode totalizer 1	0: Positive 1: Negative 2: Balanced
2251	8CB	selection	1	r/w	Counting mode totalizer 2	0: Positive 1: Negative 2: Balanced

[a] r/w: Read and write access

Batch function

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
2300	8FC	integer	2	r/w	Maximum batch time	0 s to 9999 s
2302	8FE	float	2	r/w	Specified batch volume	0 s to 99999 s

[a] r/w: Read and write access

Limit value function

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
2350	92E	float	2	r/w	LVS 1: Switching point SP1	-0.0025 m³/s to +0.0025 m³/s
2352	930	float	2	r/w	LVS 1: Switching point SP2	-0.0025 m³/s to +0.0025 m³/s
2354	932	selection	1	r/w	LVS 1: Inversion	0: HighActive 1: LowActive
2355	933	float	1	r/w	LVS 1: Switching function	0: Deactivated 1: Hysteresis mode 2: Window mode 3: Two-point mode
2356	934	float	2	r/w	LVS 1: Hysteresis	0 m³/s to 0.0025 m³/s
2358	936	selection	2	r/w	LVS 1: Error behavior	0: Inactive 1: Active 2: Frozen

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
2359	937	float	1	r/w	LVS 1: Switch-on delay	0 s to 100 s
2361	939	float	1	r/w	LVS 1: Switch-off delay	0 s to 100 s

[a] r/w: Read and write access

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
2375	947	float	2	r/w	LVS 2: Switching point SP1	-0.0025 m³/s to +0.0025 m³/s
2377	949	float	2	r/w	LVS 2: Switching point SP2	-0.0025 m³/s to +0.0025 m³/s
2379	94B	selection	1	r/w	LVS 2: Inversion	0: HighActive 1: LowActive
2380	94C	float	1	r/w	LVS 2: Switching function	0: Deactivated 1: Hysteresis mode 2: Window mode 3: Two-point mode
2381	94D	float	2	r/w	LVS 2: Hysteresis	0 m³/s to 0.0025 m³/s
2383	94F	selection	2	r/w	LVS 2: Error behavior	0: Inactive 1: Active 2: Frozen
2384	950	float	1	r/w	LVS 2: Switch-on delay	0 s to 100 s
2386	952	float	1	r/w	LVS 2: Switch-off delay	0 s to 100 s

[a] r/w: Read and write access

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
2400	960	float	2	r/w	LVS 3: Switching point SP1	-20 °C to +90 °C
2402	962	float	2	r/w	LVS 3: Switching point SP2	-20 °C to +90 °C
2404	964	selection	1	r/w	LVS 3: Inversion	0: HighActive 1: LowActive
2405	965	float	1	r/w	LVS 3: Switching function	0: Deactivated 1: Hysteresis mode 2: Window mode 3: Two-point mode
2406	966	float	2	r/w	LVS 3: Hysteresis	-20 °C to +90 °C
2408	968	selection	2	r/w	LVS 3: Error behavior	0: Inactive 1: Active 2: Frozen
2409	969	float	1	r/w	LVS 3: Switch-on delay	0 s to 100 s
2411	96B	float	1	r/w	LVS 3: Switch-off delay	0 s to 100 s

[a] r/w: Read and write access

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
2425	979	float	2	r/w	LVS 4: Switching point SP1	-20 °C to +90 °C
2427	97B	float	2	r/w	LVS 4: Switching point SP2	-20 °C to +90 °C
2429	97D	selection	1	r/w	LVS 4: Inversion	0: HighActive 1: LowActive
2430	97E	float	1	r/w	LVS 4: Switching function	0: Deactivated 1: Hysteresis mode 2: Window mode 3: Two-point mode
2431	97F	float	2	r/w	LVS 4: Hysteresis	-20 °C to +90 °C
2433	981	selection	2	r/w	LVS 4: Error behavior	0: Inactive 1: Active 2: Frozen
2334	982	float	1	r/w	LVS 4: Switch-on delay	0 s to 100 s
2336	984	float	1	r/w	LVS 4: Switch-off delay	0 s to 100 s

[a] r/w: Read and write access

16.4 Actions

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
3000	BB8	action	2	r/w	Save configuration	Save (0xc7e7bc2e) Discard (0xf0864181) Default setting (0x34bfe138)
3100	C1C	action	2	r/w	Reset totalizer	Reset (0x650d33c0)
3150	C4E	action	2	r/w	Start / stop batch function	Start / stop (0x1c9e3727)
3627	E2B	action	2	r/w	Teach function	Teach SP1 (0x57fbe8) Teach SP2 (0x35800a1)

[a] r/w: Read and write access

16.5 Process values

Measured values

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
6000	1770	float	2	r/-	Flow	–
6002	1772	float	2	r/-	Temperature	–

[a] r/-: Read access

Transfer of configuration

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
6450	1932	boolean	1	r/-	Restart required after transfer of configuration?	–

[a] r/-: Read access

Totalizer

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
6750	1A5E	float	2	r/-	Totalizer 1 volume quantity absolute value	–
6752	1A60	float	2	r/-	Totalizer 2 volume quantity absolute value	–

[a] r/-: Read access

Batch function

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
6800	1A90	boolean	1	r/-	Alarm signal	–
6801	1A91	float	2	r/-	Residual volume	–
6803	1A93	boolean	1	r/-	Status	Active / inactive
6804	1A94	float	2	r/-	Filled volume	–

[a] r/-: Read access

16 Modbus address tables

Limit value monitoring function

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
3625	E29	unsigned short integer	1	r/-	Measuring channel for which teach process is to be executed	1: Measuring channel 1 (limit value switch 1 - flow) 2: Measuring channel 1 (limit value switch 2 - flow) 11: Measuring channel 2 (limit value switch 3 - temperature) 12: Measuring channel 2 (limit value switch 4 - temperature)
3626	E2A	unsigned short integer	1	r/-	Result of the teach process	0: Inactive 1: SP1 successful 2: SP2 successful 7: Error
6900	1AF4	boolean	1	r/-	Limit value switch 1 output	–
6901	1AF5	boolean	1	r/-	Limit value switch 2 output	–
6902	1AF6	boolean	1	r/-	Limit value switch 3 output	–
6903	1AF7	boolean	1	r/-	Limit value switch 4 output	–

[a] r/-: Read access

Simulation

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
1216	4C0	selection	1	r/-	Flow	0: Inactive 1: Active
1232	4D0	selection	1	r/-	Temperature	0: Inactive 1: Active

[a] r/-: Read access

16.6 Error

Modbus PDU address		Data type	Number of Modbus registers	Access[a]	Data	Encoding
dec	hex					
6400	1900	boolean	1	r/w	General error	–
6401	1901	boolean	1	r/w	Configuration faulty	–
6402	1902	boolean	1	r/w	Calibration faulty	–
6403	1903	boolean	1	r/w	Device not calibrated	–
6404	1904	boolean	1	r/w	Sensor communication	–
6405	1905	boolean	1	r/w	Flow faulty	–
6406	1906	boolean	1	r/w	Temperature faulty	–
6412	190C	boolean	1	r/w	Simulation active	–
6413	190D	boolean	1	r/w	Sensor module faulty	–
6414	190E	boolean	1	r/w	Flow accuracy	–
6415	190F	boolean	1	r/w	Temperature accuracy	–
6417	1911	boolean	1	r/w	Batch error	–
6418	1912	boolean	1	r/w	Sensor outside the specification	–
6419	1913	boolean	1	r/w	Process data error	–

[a] r/w: Read and write access

16.7 Analog selector

The three-part hash values must be transmitted together with a Modbus message.

Selector	Hash value	
	hex	dec
No signal	0x0 – 0x0 – 0x0	0 – 0 – 0
Flow input	0x4e27a4cc – 0xffc2981 – 0x8c1c81c3	1311220940 – 268183937 – 2350678467
Temperature input	0x4e27a4cc – 0xa21479f2 – 0x8c1c81c3	1311220940 – 2719250930 – 2350678467
Volume of totalizer 1	0x3cf02b8b – 0x9b43558a – 0xd147f96a	1022372747 – 2604881290 – 3511155050
Carry of totalizer 1[a]	0x3cf02b8b – 0x9b43558a – 0xfbe698a1	1022372747 – 2604881290 – 4226193569
Volume of totalizer 2	0x3cf02b8b – 0x99435264 – 0xd147f96a	1022372747 – 2571326052 – 3511155050
Carry of totalizer 2[a]	0x3cf02b8b – 0x99435264 – 0xfbe698a1	1022372747 – 2571326052 – 4226193569
Filling volume of the batch function	0xebfe629b – 0x7f486986 – 0xf1aed197	3959317147 – 2135452038 – 4054765975
Residual volume of the batch function	0xebfe629b – 0x7f486986 – 0x3cdb5c23	3959317147 – 2135452038 – 1021008931

[a] For values above 99,999 to be displayed, a carry is counted and the totalizer is reset. This mean each carry corresponds to a value of 100,000

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