

FTMg

Thermal gas flow sensor

SICK
Sensor Intelligence.

en



Described product

FTMg

Manufacturer

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Legal notes

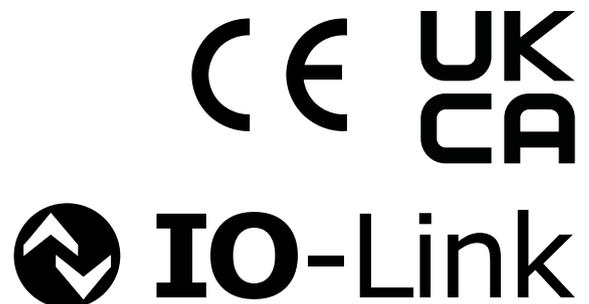
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Original document

This document is a translation of an original document of SICK AG.



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1 About this document

1.1 Information on the operating instructions

These operating instructions provide important information on how to use sensors from SICK AG.

Prerequisites for safe work are:

- Compliance with all safety notes and handling instructions supplied
- Compliance with local work safety regulations and general safety regulations for sensor fields of application

The operating instructions are intended to be used by qualified personnel and electrical specialists.



Note:

Read these operating instructions carefully before starting any work on the device in order to familiarize yourself with the device and its functions.

The instructions constitute an integral part of the product and are to be stored in the immediate vicinity of the device so they remain accessible to staff at all times. Should the device be passed on to a third party, these operating instructions should be handed over with it.

These operating instructions do not provide information on operating any system in which the sensor may be integrated. For information about this, refer to the operating instructions of the particular system.

1.2 Scope

These operating instructions explain how to incorporate a sensor into a customer system.

Step-by-step instructions are given for all required actions.

These instructions apply to all available device variants of the sensor. For more detailed information on identifying your device type, see “3.1.2 Type code”.

Available device variants are listed on the online product page:

➤ www.sick.com

A number of device variants are used as examples for commissioning, based on the default parameter settings for the relevant device.

In the following, the sensor is referred to in simplified form as FTMg (Flow Thermal Meter for Gases). Except in cases where it is necessary to make a distinction between device variants due to different technical features or functions. In such cases, the complete type designation is used.

1.3 Explanation of symbols

Warnings and important information in this document are labeled with symbols. The warnings are introduced by signal words that indicate the extent of the danger. These warnings must be observed at all times and care must be taken to avoid accidents, personal injury, and material damage.



DANGER

... indicates a situation of imminent danger, which will lead to a fatality or serious injuries if not prevented.

**WARNING**

... indicates a potentially dangerous situation, which may lead to a fatality or serious injuries if not prevented.

**CAUTION**

... indicates a potentially dangerous situation, which may lead to minor/slight injuries if not prevented.

**IMPORTANT**

... indicates a potentially harmful situation, which may lead to material damage if not prevented.

**NOTE**

... highlights useful tips and recommendations as well as information for efficient and trouble-free operation.

1.4 Further information

**CONFORMITIES AND CERTIFICATES**

At www.sick.com you will find declarations of conformity, certificates, and the current operating instructions for the product. To do so, enter the product part number in the search field (part number: see the entry in the “P/N” or “Ident. no.” field on the type label).

Additional information:

- Model-specific online data sheets for device versions with technical data, dimensional drawings, and diagrams
- Dimensional drawings and 3D CAD dimension models in various electronic formats
- Additional publications relating to the sensors described here (e.g., IO-Link)
- Publications about accessories

1.5 Customer service

If you require any technical information, our customer service department will be happy to help. To find your agency, see the final page of this document.

**NOTE**

Before calling, make a note of all sensor data such as type code, serial number, etc., to ensure faster processing.

2 For your safety

2.1 Intended use

FTMg (Flow Thermal Meter for gases) measures the flow, pressure and temperature of compressed air as well as argon (Ar), helium (He), carbon dioxide (CO₂) and nitrogen (N₂) and provides the following measured variables:

- Mass
- Mass flow rate
- Volume
- Volume flow
- Energy
- Flow velocity
- Pressure
- Temperature

The measurement principle is based on the calorimetric principle.

FTMg meets the requirements of EN 61326-2-3 for industrial applications.

2.2 Improper use

FTMg is not a safety component as per the Machinery Directive (2006/42 / EC). The sensor must not be used in explosion-hazardous locations. Do not open the housing of the FTMg.

Any use outside of the stated areas, in particular use outside of the technical specifications and the requirements for intended use, will be deemed to be incorrect use.

If the sensor is to be used under other conditions or in different environments, the manufacturer's service department may issue an operating license in consultation with the customer and in exceptional cases.

2.3 Limitation of liability

Applicable standards and regulations, the latest technological developments, and our many years of knowledge and experience have all been taken into account when assembling the data and information contained in these operating instructions.

The manufacturer accepts no liability for damage caused by:

- Failure to observe the operating instructions
- Improper use
- Use by untrained personnel
- Unauthorized conversions
- Technical modifications
- Use of unauthorized spare parts, wear and tear parts, and accessories

The actual scope of delivery may differ from the features and illustrations shown here where special variants are involved, if optional extras have been ordered, or as a result of the latest technical changes.

2.4 Modifications and conversions



IMPORTANT

Modifications and conversions to the sensor and/or the installation may result in unforeseeable dangers.

Interfering with or modifying the sensor or SICK software will invalidate any warranty claims against SICK AG. This applies in particular to opening the housing, even as part of mounting and electrical installation work.

Before making technical modifications to or expanding the sensor, the prior written approval of the manufacturer must be obtained.

Accessories that do not have clearly specified sizes and compositions or that have not been checked by SICK AG may not be installed or connected.

2.5 Requirements for skilled persons and operating personnel



WARNING

Risk of injury due to insufficient training!

Improper handling of the sensor may result in considerable personal injury and material damage.

- All work must only ever be carried out by the stipulated persons.

The operating instructions state the following qualification requirements for the various areas of work:

- Instructed personnel have been briefed by the operating entity about the tasks assigned to them and about potential dangers arising from improper action.
- Skilled personnels have the specialist training, skills, and experience as well as knowledge of the relevant regulations to be able to perform tasks assigned to them and to recognize and avoid any potential dangers independently.
- Electricians have the specialist training, skills, and experience, as well as knowledge of the relevant standards and provisions, to be able to carry out work on electrical systems and to recognize and avoid any potential dangers independently.
In Germany, electricians must meet the specifications of the BGV A3 Work Safety Regulations (e.g., Master Electrician). Other relevant regulations applicable in other countries must be observed.

The following qualifications are required for various activities:

Activities	Qualification
Mounting, maintenance	<ul style="list-style-type: none"> • Basic practical technical training • Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	<ul style="list-style-type: none"> • Practical electrical training • Knowledge of current electrical safety regulations • Knowledge of the operation and control of the devices in their particular application
Commissioning, configuration	<ul style="list-style-type: none"> • Basic knowledge of the control system used • Basic knowledge of the design and setup of the described connections and interfaces • Basic knowledge of data transmission

Activities	Qualification
Operation of the device for the specific application	<ul style="list-style-type: none">• Knowledge of the operation and control of the devices in their particular application• Knowledge of the software and hardware environment for the particular application concerned

2.6 Operational safety and specific hazards

Please observe the safety notes and the warnings listed here and in other sections of these operating instructions to reduce the possibility of risks to health and avoid dangerous situations.

2.7 General safety notes

- Read the operating instructions prior to commissioning.
- Observe national safety and work safety regulations.
- These operating instructions apply to the following variants:
 - Industrial variant with firmware version V1.x or V2.x
 - Ethernet variant with firmware version V3.x
- The FTMg is not a safety component under the EU Machinery Directive.
- Wiring work and the opening and closing of electrical connections may only be carried out when the power is switched off.
- The FTMg must be installed in the gas line system as described in [“5 Mounting”](#).

2.8 Repair

Repair work on the sensor may only be performed by qualified and authorized personnel from SICK AG. Interference with or modifications to the sensor on the part of the customer will invalidate any warranty claims against SICK AG.

3 Product description

3.1 Product identification

3.1.1 Information on the housing

Information for identifying the sensor (serial number, part number, and type code) and its electrical connection are printed on the type label on the housing.

3.1.2 Type code

FTMg	-	I	S	D15	A	X	X
1		2	3	4	5	6	7

Position	Description
1	Product group FTMg (flow sensors)
2	Variant I: IO-Link M12-5 A-coded E: Ethernet M12-8 X-coded
3	Application S: Standard (compressed air)
4	Nominal size D15: G 1/2 female thread DIN EN ISO 228-1 ø16.1 mm D20: G 3/4 female thread DIN EN ISO 228-1 ø21.7 mm D25: G 1 female thread DIN EN ISO 228-1 ø27.3 mm R40: R 1 1/2 male thread DIN EN 10226-1 ø41.1 mm N40: 1 1/2" NPT male thread ø41.1 mm R50: R 2 male thread DIN EN 10226-1 ø53.1 mm N50: 2" NPT male thread ø53.1 mm
5	Measurement channel A: Aluminum measurement channel S: Stainless steel pipe
6	Installation X: Stand alone
7	Additional options X: Without

3.2 Product characteristics

3.2.1 Device view

The FTMg is available in two variants:

- Industrial variant
- Ethernet variant

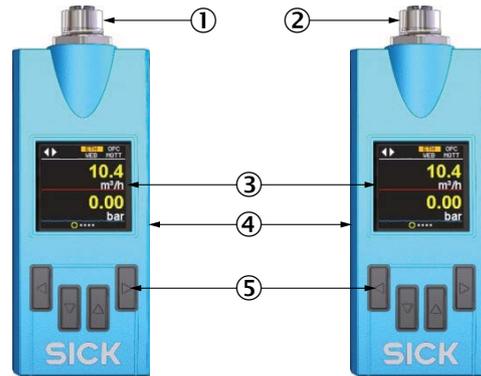


Fig. 1: FTMg overview

- ① Industrial variant, M12 x 1, 5-pin, A-coded
- ② Ethernet variant, M12 x 1, 8-pin, X-coded
- ③ Display
- ④ Housing
- ⑤ Operating buttons

3.2.2 Operating buttons

The sensor is operated using the display and the operating buttons.



Note:

The industrial variant can be parameterized via SICK SOPAS ET, among other means.

The Ethernet variant has its own web server and can also be parameterized with an Internet browser.

For the Ethernet variant, the sensor can also be parameterized via OPC UA.

3.3 Product features and functions

3.3.1 Principle of operation

The FTMg uses the calorimetric measurement principle. The sensor measures the cooling effect of the medium flowing over the heated probe. The higher the flow speed of the medium, the higher the cooling effect of the heated probe.

In the industrial variant, the sensor has three configurable outputs Qa, Q1 and Q2 for flow, pressure or temperature.

The switching output (Q1) also features an IO-Link interface.

In the Ethernet variant, the sensor has an Ethernet interface with OPC UA server and a MQTT client, as well as an integrated web server. The sensor draws power via PoE.

3.3.2 Fields of application

The FTMg is mainly suited for:

- Measuring compressed air as well as argon (Ar), helium (He), carbon dioxide (O₂), nitrogen (N₂)
- Controlling the energy consumption of compressed air on machines and in pressure distribution
- Flow, pressure and temperature monitoring in compressed air systems and pneumatic applications

4 Transport and storage

4.1 Transport

For your own safety, please read and observe the following notes:



IMPORTANT

Damage to the sensor due to improper transport!

- The device must be packaged for transport with protection against shock and damp.
 - Recommendation: Use the original packaging as it provides the best protection.
 - Transport should be performed by specialist staff only.
 - The utmost care and attention is required at all times during unloading and transportation on company premises.
 - Note the symbols on the packaging.
 - Do not remove packaging until immediately before starting installation work.
-

4.2 Transport inspection

Immediately upon receipt in incoming goods, check the delivery for completeness and for any damage that may have occurred in transit. In the case of transit damage that is visible externally, proceed as follows:

- Do not accept the delivery or only do so conditionally.
 - Note the extent of damage on the transport documents or on the transport company's delivery note.
 - File a complaint.
-



Note:

Complaints regarding defects should be filed as soon as these are detected. Damage claims are only valid before the applicable complaint deadlines.

4.3 Storage

Store the device under the following conditions:

- Recommendation: Use the original packaging.
- Do not store outdoors.
- Store in a dry area that is protected from dust.
- Do not store in an airtight container: this is so that any residual moisture present can escape.
- Do not expose to any aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature: “14 Technical data”
- For storage periods of longer than 3 months, check the general condition of all components and packaging on a regular basis.

5 Mounting

5.1 Installation conditions

When mounting/removing the sensor, the sample gas line must be depressurized.

- Keep the mounting location easily accessible and free of vibrations.
- Ensure a minimum space of 150 mm to the FTMg.
- Observe the ambient temperature (“14 Technical data”).
- The measurement gas must correspond to purity class 3:4:4 or better, as per ISO 8573-1:2010.
- The measurement gas and the ambient air are not allowed to condense.
- Mount the FTMg downstream of the air dryer in the compressed-air network. If the dryer is missing, install the FTMg downstream of the condensate separator and install suitable filters.

5.2 Installation direction

Correct mounting is important for the measurement accuracy of the FTMg. The measurement medium must flow through the measurement channel in the direction of the arrow (preferred direction).

The sensor has been calibrated in the direction of the arrow and only displays accurate and reproducible measured values when the flow is in this direction.



IMPORTANT

Note that the sensor also shows measured values in the opposite direction. The accuracy and reproducibility of the values are limited and not clearly predictable in this case.

The sensor cannot distinguish between the flow directions. The summed quantities (mass, volume, energy) always count in the positive direction both in the direction of the arrow and against the direction of the arrow.

For this reason, it is recommended to mount the sensor as close as possible to the consumer to avoid backflow.

Note the following also:

- Place the FTMg as far as possible away from flow disturbances (for example, different pipe diameters, curves, T-connectors, valves, or pushers).
- Mount the FTMg upstream of valves or pushers.
- Observe the prescribed lengths of the inlet and outlet zones
- Select longer inlet zones for gases with lower densities.

Suitable flow conditioning pipes are available for the FTMg with nominal diameters DN15, DN20 and DN25 (“Accessories for DN15, DN20, DN25 flow conditioning pipes”).

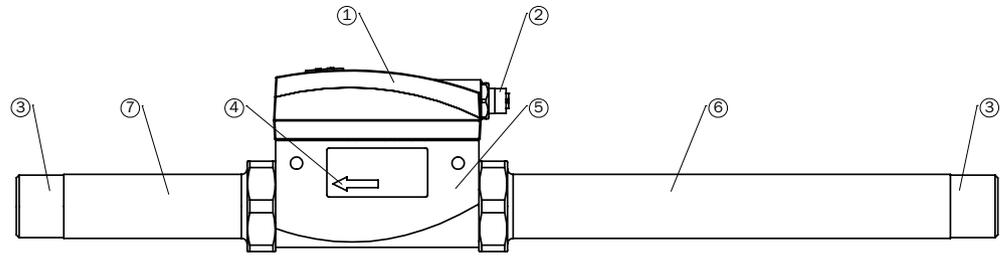


Fig. 2: FTMg DN15, DN20, DN25 with inlet and outlet zone

- ① Sensor head
- ② Electrical connection (industrial or Ethernet variant)
- ③ Process connection (G-type male thread or NPT-type female thread)
- ④ Flow direction
- ⑤ Measurement channel (DN15, DN20, DN25)
- ⑥ Inlet pipe
- ⑦ Outlet pipe

The FTMg with normal diameters DN40 and DN50 is supplied together with the measuring pipe.

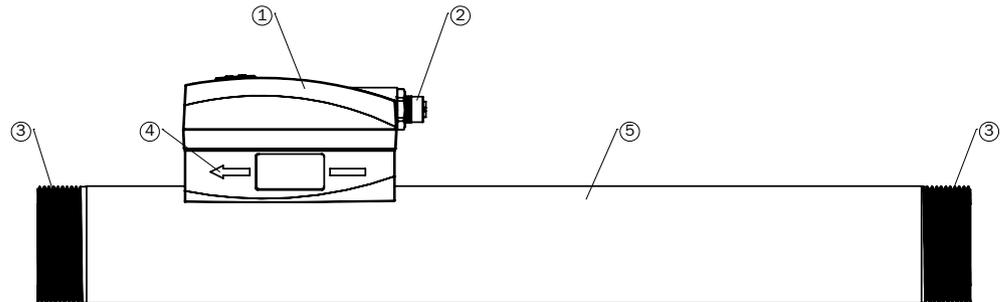
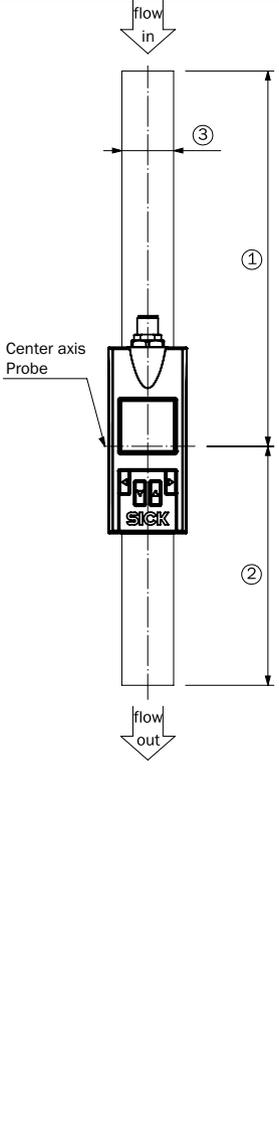


Fig. 3: FTMg DN40, DN50 with measuring pipe

- ① Sensor head
- ② Electrical connection (industrial or Ethernet variant)
- ③ Process connection (R-type male thread or NPT-type female thread)
- ④ Direction of flow
- ⑤ Measuring pipe (DN40, DN50)

If flow disturbances are present, for example due to different pipe diameters, curves, T-connectors, valves or pushers, the following inlet and outlet zones must be adhered to.



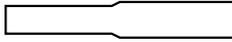
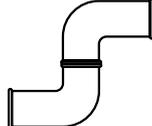
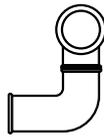
	Type	(DN = pipe diameter) ③	
		Inlet zone ①	Outlet zone ②
	Expansion	10 x DN	3 x DN
	Constriction	10 x DN	3 x DN
	90° angle	20 x DN	5 x DN
	Two 90° angles on one level	25 x DN	5 x DN
	Two 90° angles on one level, T-connector	30 x DN	5 x DN
	Valve, pusher	50 x DN	5 x DN

Fig. 4: Recommended inlet and outlet zones with sources of interference

The inlet and outlet zones shown are minimum requirements for reproducible measurements. The inlet zones can be reduced by additional installed flow conditioners. Flow conditioners create an additional pressure loss that can reduce the flow quantity.



IMPORTANT

Observe the specified minimum values to ensure reproducible measurements. If it is not possible to comply with the specified inlet zones, then considerable deviations to the measured values are to be expected. To measure with the specified accuracy, 100 x DN inlet conditions are recommended to enable an optimum flow profile to form.

We recommend using SICK flow conditioning pipes (for the DN15, DN20, DN25 variants) directly in front of the sensor as they connect to the measuring channel without a shoulder.

6 Electrical installation

6.1 Safety

6.1.1 Notes on electrical installation



IMPORTANT

Equipment damage due to incorrect supply voltage.

An incorrect supply voltage may result in damage to the equipment.

- Only operate the device using a protected low voltage and safe electrical insulation as per protection class III.
-



IMPORTANT

Equipment damage or unpredictable operation due to working with live parts.

Working with live parts may result in unpredictable operation.

- Only carry out wiring work when the power is off.
 - Only connect and disconnect electrical connections when the power is off.
-
- The electrical installation must only be performed by electrically qualified personnel.
 - Standard safety requirements must be observed when working on electrical systems!
 - Only switch on the supply voltage for the device when the connection tasks have been completed and the wiring has been thoroughly checked.
 - When using extension cables with open ends, ensure that bare wire ends do not come into contact with each other (risk of short-circuit when supply voltage is switched on!). Wires must be properly insulated from each other.
 - Wire cross-sections in the supply cable from the user's power system must be designed in accordance with the applicable standards. In Germany, observe the following standards:
DIN VDE 0100 (Part 430) and DIN VDE 0298 (Part 4) or DIN VDE 0891 (Part 1).
 - Circuits connected to the device must be designed as SELV and PELV circuits (SELV = Safety Extra-Low Voltage; PELV = Protected Extra-Low Voltage).
 - Protect the device with a separate fuse at the start of the supply circuit.
-



Notes on layout of data cables

- To avoid interference, e.g., from switching power supplies, motors, clocked drives, and contactors, always use suitable EMC cables and layouts.
 - Do not lay cables over long distances in parallel with voltage supply cables and motor cables in cable ducts.
-

The IP65 + IP67 protection class for the device is only achieved under the following conditions:

- The cable attached to the M12 connection is screwed in place.
- If this is not done, the device does not fulfill any specified IP enclosure rating.

6.2 Electrical connection

- Only operate the FTMg via a power supply with safe separation from the mains (PELV according to DIN VDE 0100-410, IEC 60364-4-41, HD 60364.4.41, EN 60079-14). The electrical circuit must be volt-free (not grounded).
- Carefully mount the M12 plug connection to ensure the IP67 enclosure rating.
- Observe the pin assignment (see below).
- The flow sensor has three signal outputs that can be wired according to the pin assignment, see [“14 Technical data”](#).
- Ethernet variant: The sensor is supplied directly via the Ethernet connection. Carefully mount the M12 plug connection to ensure the IP67 enclosure rating. Observe the pin assignment ([“6.2.1 Electrical connection of the flow sensor”](#)).

6.2.1 Electrical connection of the flow sensor

Screw M12 x 1 plug connection to the connection of the flow sensor. After switching on the supply voltage and the power-up time has elapsed, the device is in run mode (normal operation) and display the current measured value.

6.2.2 Pin assignment, M12 plug connector, 5-pin (industrial variant)

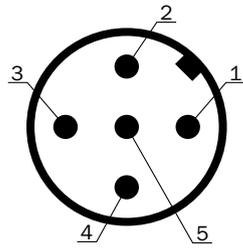
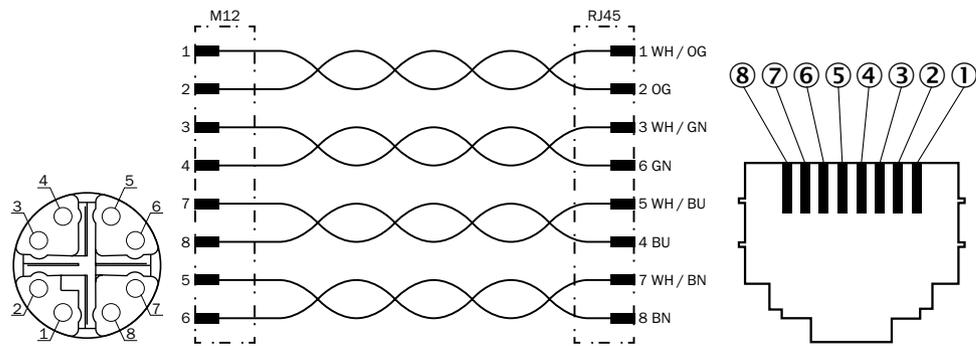


Fig. 5: M12 x 1 plug connector, 5-pin

Contact	Signs	Wire color	Description
1	L+	Brown	Supply voltage
2	Q _A	White	Analog current output 4 ... 20 mA (scalable)
3	M	Blue	Ground, reference potential for current output
4	C/Q ₁	Black	IO-Link communication or digital switching output 1: NO/NC programmable
5	Q ₂	Gray	Digital switching output 2: NO/NC programmable or current output B 4 ... 20 mA, frequency or pulse output

6.2.3 Pin assignment, M12 plug connector, 8-pin (Ethernet variant only)



M12 x 1, 8-pin, x-coded

Connection diagram between M12 and RJ45

RJ45

Contact	RJ45	Color	Signs	10/100 MBit
1	1	WH/OG	TX (+) + POE	TxData+
2	2	OG	TX (-) + POE	TxData -
3	3	WH/GN	RX (+) - POE	RxData+
4	6	GN	RX (-) - POE	RxData-
7	5	WH/BU	PoE+	
8	4	BU	PoE+	
5	7	WH/BN	PoE-	
6	8	BN	PoE-	

7 Commissioning

7.1 Commissioning

1. Mount the sensor as appropriate to the installation conditions, “5 Mounting”.
2. Apply the supply voltage or create Ethernet connection (PoE).
3. The sensor performs a self-test and is then ready for operation. The factory-set measured value is displayed.

In the event of problems during commissioning, “11 Troubleshooting”.

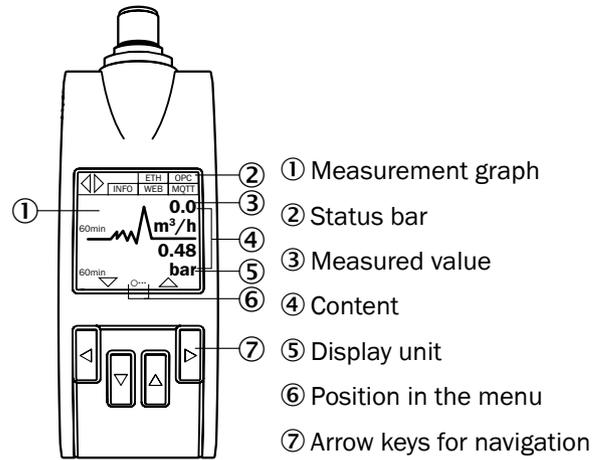


Fig. 6: FTMg display and operation

8 Operating the industrial variant

Applies to all FTMg with the type code FTMg-lxxxxxx.

The display shows the measured value menu with the default setting.

Press and hold any arrow key (min. 2 seconds) and then select menu Q1, menu Q2, or menu Qa.

In the following, the recommended settings are listed in each submenu from top to bottom, “17.1 Industrial variant”.

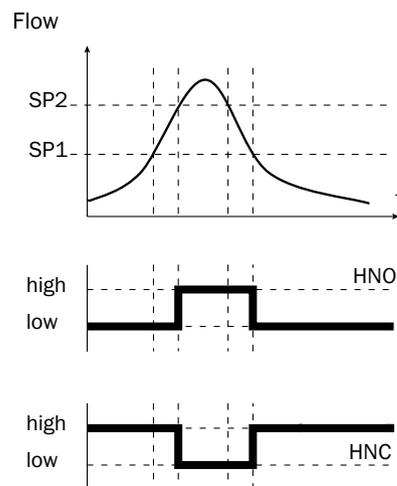
- The switching output can be set in the Q1 menu.
- In the Q2 menu, the output can be set as a switching output, pulse output, frequency output, or analog output.
- The analog output can be set in the Qa menu.

8.1 Q1 menu

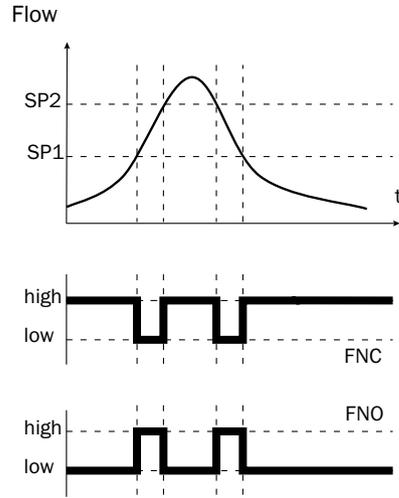
This menu contains the settings of switching output 1.

Setting the hysteresis or window function

- In the “Mode” menu, set the mode for hysteresis or window function with the accompanying measurand.



If the flow is fluctuating around the set value, the hysteresis keeps the output state of the outputs stable. When the flow is increasing, the output switches when the respective switching point (SP2) is reached; if the flow sinks again, the output switches back only after the reset switching point (SP1) has been reached.



Window (example Switch Window Volumetric Flow Rate) allows for the monitoring of a defined area. If the flow is between the SetPoint2 and SetPoint1, the output will be active (normally open) or inactive (normally closed).

The error status of the measuring device reflects the cable break monitoring. During an error status, the measuring device switches to a safe state; i.e. the switching outputs become inactive.

As far as the downstream signal evaluation is concerned, this corresponds to a cable break.

Setting the switching point

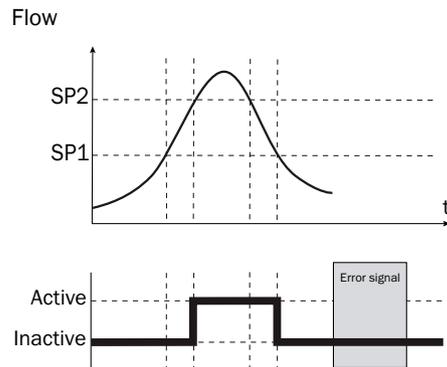
- Set the switching point in the “SetPoint1” submenu.

Setting the reset point/hysteresis or lower window limit

- Set the “SetPoint2” submenu reset point/hysteresis or lower window limit.

Setting the switching behavior of the normally open or normally closed contact

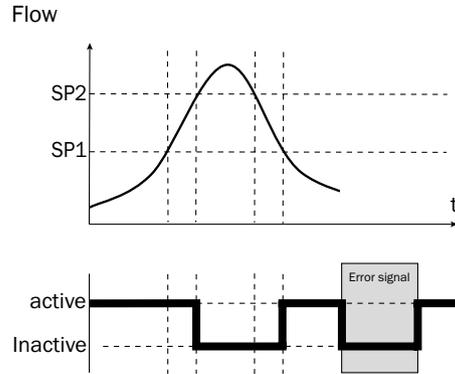
- Select the “Polarity” submenu and select between “normally closed” and “normally open”.



Switching output		PNP	NPN	DRV	Error status
Normally open/HNO	Active	U_v	0 V	U_v (PNP switched)	Inactive
	Inactive	0 V ¹⁾	U_v ²⁾	0 V (NPN switched)	

¹⁾ Pulldown only.

²⁾ Pullup only.



Switching output		PNP	NPN	DRV	Error status
Normally closed/ HNC	Active	U_v	0 V	U_v (PNP switched)	Inactive
	Inactive	0 V ¹⁾	U_v ²⁾	0 V (NPN switched)	

¹⁾ Pulldown only.

²⁾ Pullup only.

Simulating the digital output

- Select the “Simulate” submenu and select “active”, “inactive”, or “normal” (measuring operation). You can use this function to simulate an active or inactive digital output. For standard operation, you must select “normal”.

Setting the PNP/NPN or DRV (push-pull)

- Select the “DriverType” submenu and set PNP/NPN or DRV (push-pull). IO-Link communication is available when PNP or push-pull is selected.

8.2 Q2 menu

This menu contains the settings of switching output 2.

8.2.1 Set Q2 as switching output

- Select the “Function” submenu and activate the “Switch” function.

Setting the mode for hysteresis or window function

- In the “Mode” menu, set the mode for hysteresis or window function with the accompanying measurand.

Setting the switching point

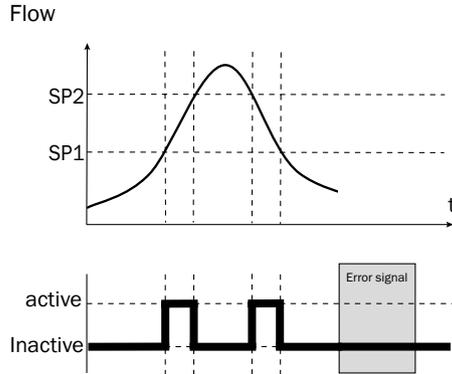
- Set the switching point in the “SetPoint1” submenu.

Setting the reset point/hysteresis or lower window limit

- Set the “SetPoint2” submenu reset point/hysteresis or lower window limit.

Setting the switching behavior of the normally open or normally closed contact

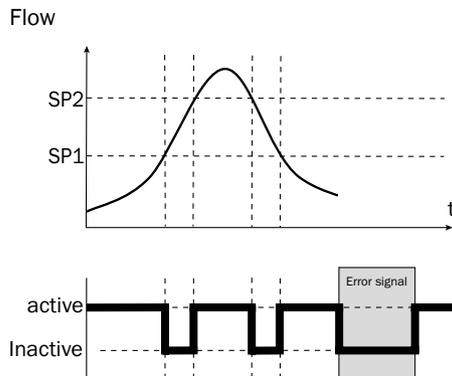
- Select the “Polarity” submenu and select between “normally closed” and “normally open”.



Switching output		PNP	NPN	DRV	Error status
Normally open/FNO	Active	U_v	0 V	U_v (PNP switched)	Inactive
	Inactive	0 V ¹⁾	U_v ²⁾	0 V (NPN switched)	

¹⁾ Pulldown only.

²⁾ Pullup only.



Switching output		PNP	NPN	DRV	Error status
Normally closed/FNC	Active	U_v	0 V	U_v (PNP switched)	Inactive
	Inactive	0 V ¹⁾	U_v ²⁾	0 V (NPN switched)	

¹⁾ Pulldown only.

²⁾ Pullup only.

Simulating the digital output

- Select the “Simulate” submenu and select between “active”, “inactive”, and “normal” (measuring operation). You can use this function to simulate an active or inactive digital output. For standard operation, you must select “normal”.

Setting the PNP/NPN or DRV (push-pull)

- Select the “DriverType” submenu and set PNP/NPN or DRV (push-pull). IO-Link communication is available when PNP or push-pull is selected.

8.2.2 Set Q2 as analog output

This menu contains the settings of the analog output.

- Select “Analog” in the Q2 function menu and set accordingly.

Assigning the current output measurement parameters

- In the “Mode” submenu, assign the current output the measurand such as flow, temperature, or pressure.

Assigning the measuring range limit value

- In the “High” submenu, enter the measuring range limit value (20 mA).

Assigning the lower limit of the measuring range

- In the “Low” submenu, enter the lower limit of the measuring range (4 mA).

Setting the inversion of the current output

- In the “Polarity” submenu, set whether the current output should be inverted.

Setting the behavior of the current output in the event of an error on the device

- In the “Fail” submenu, set how the current output should behave in the event of an error.

Setting the predefined current value

- In the “Simulate” submenu, set a predefined current value.

8.2.3 Set Q2 as a frequency output

- In the Q2 function menu, select “Frequency” and make the settings accordingly.

Selecting the process size (VolumetricFlowRate)

- In the “Mode” submenu, set the process size.

Defining the measuring range lower limit and limit value

- The frequency can be entered in the range 0 to 10 kHz under “MaxFreq” and “MinFreq”.

Overwriting the output using the simulation function

- Select the corresponding values under “Simfreq”.

Setting the PNP/NPN or DRV (push-pull)

- Select the “DriverType” submenu and set PNP/NPN or DRV (push-pull).

8.2.4 Set Q2 as the pulse output

- Select the “Pulse” submenu and make the settings accordingly.

Selecting the process size

- Select volume or energy under “Mode”.

Specifying pulse valence

- Enter the pulse valence under “Valency” and “Width”. If output of the pulse is not possible, the device outputs a warning message.

Setting the PNP/NPN or DRV (push-pull)

- Select the “DriverType” submenu and set PNP/NPN or DRV (push-pull).

8.3 Qa menu

This menu contains the settings of the analog output.

Assigning the current output measurement parameters

- In the “Mode” submenu, assign the current output the measurand such as flow, temperature, or pressure.

Assigning the measuring range limit value

- In the “High” submenu, enter the measuring range limit value (20 mA).

Assigning the lower limit of the measuring range

- In the “Low” submenu, enter the lower limit of the measuring range (4 mA).

Setting the inversion of the current output

- In the “Polarity” submenu, set whether the current output should be inverted.

Setting the behavior of the current output in the event of an error on the device

- In the “Fail” submenu, set how the current output should behave in the event of an error.

Setting the predefined current value

- In the “Simulate” submenu, set a predefined current value.

9 Operating the Ethernet variant

The Ethernet variant applies to all FTMg devices with the type code FTMg-Exxxx and firmware version V3.x.

9.1 Ethernet configuration

The Ethernet settings can be configured on the display or via the web server.

- When configured on the display, they are applied immediately.
- When parameterizing the device via the web server, run the “Save Ethernet Settings...” function.

To operate the FTMg in a network, you must assign it a unique IP address. There are 2 options for this:

1. In the “DHCP Mode” submenu, select dynamic IP assignment via the DHCP client, [“9.1.1 DHCP client”](#).
2. Or assign a static IP address to the sensor, [“9.1.2 Static IP”](#).

9.1.1 DHCP client

Dynamic IP assignment requires that a DHCP server be present on the network.

The sensor sends a DHCP request during PowerUp and is assigned an IP address by a DHCP server on the network.

The sensor can be reached via IP address or hostname.

The hostname can be freely selected.



NOTE

The hostname must be unique on the network.

The automatically assigned IP address can be read on the display.

Parameter	Example	Function
Hostname	FTMg-<SerialNumber>	Unique identifier for the network node

9.1.2 Static IP

If no DHCP server is available on the network or a static IP is desired, a static IP address can be assigned manually in the “IP Address” submenu.

The sensor can be reached via this IP address.



NOTE

The IP address must be unique on the network.

Parameter	Example	Function
IP address	192.168.0.10	Unique identifier for the network node
SubNetMask	255.255.255.0	All devices on the same network have the same subnet mask and a different IP address. All requests within the same network can be delivered directly

Parameter	Example	Function
Gateway	192.168.0.1	The gateway establishes the connections to other networks. Requests outside the local network are sent to the gateway
DNS server	192.168.0.1	Domain name server: Required for name resolution at the SNMP server and MQTT broker, if the servers were specified via a domain name

9.2 Web server

Every FTMg has an integrated web server that can be used to display the measurement data and configure settings directly in its own browser.

9.2.1 Web interface (user)

The sensor can be accessed via the web interface, for example to parameterize the device or to visualize the process data.

- Open a web browser.
- In the address bar, enter the sensor IP address or the sensor hostname.
 - `http://<sensor-ip>` (for static IP or DHCP client)
 - or `http://<sensor-hostname>` (when using DHCP client)



NOTE

If the default web server port 80 has been changed, the port must be explicitly specified in the URL.

- `http://<sensor-ip>:<webserver-port>` (for static IP or DHCP client)
- or `http://<sensor-hostname>:<webserver-port>` (when using DHCP client)

9.2.2 Web server authorization

To see the full functionality of the web interface and to parameterize the device, it is necessary to log in.

- To do so, click “Run” in the web interface.
A login window opens.
Select “Maintenance” as the username and enter the default password “airflowsensor”.



NOTE

After logging in for the first time, change the password and assign a secure password:

- The password must be at least 10 characters long and contain uppercase and lowercase letters, numbers, and special characters.
- Change the password in the web interface on the “Webserver” “ChangePassword” page.

The web server password can only be changed via the web server.

The password is not stored as plain text in the sensor, but can be reset to the original password “airflowsensor” via the sensor display.



IMPORTANT

Automatic change of endpoints

The REST API endpoints under the path <sensor-ip>/api/* are subject to change without notice and are therefore not suitable for machine integration.

- Use the REST API interface (machine) [9.2.3 “REST API interface \(machine\)”](#) .

9.2.3 REST API interface (machine)

A REST API interface is available as a machine interface.

This is defined via an OpenAPI specification that was delivered with the sensor (<http://<sensor-ip>/openapi.yaml>).

The OpenAPI specification can be downloaded after logging in on the “Webserver” “OpenAPI REST Interface Description” page.

The OpenAPI specification can be viewed using an OpenAPI editor (e.g. <https://editor.swagger.io/>).



NOTE

The REST API interface is available to any user and does not require authorization.

The supported REST API endpoints can be found in the OpenAPI specification or in the web interface on the “Webserver” page.



NOTE

The **profile/processdata/multiarray** and **profile/processdata/multiobject** endpoints are affected by the **MQTT parameter MQTT/MQTT ProcessData Multi Update Interval**.

9.2.4 Settings

The following web server settings can be configured:

Parameter	Example	Function
Webserver Service	active/ inactive	Switches the web server on or off
		IMPORTANT When the web server is switched off via the web interface, the connection to the web interface is terminated. In this case, the web server can only be activated again via the sensor display
Webserver Port	80	Sets the web server port Default: 80

9.2.5 Firmware update

The sensor firmware can be updated via the web interface.

A firmware update file (ZIP format) is uploaded and checked via the web interface.

- If the check is successful, the update file is transmitted to the sensor.

- After the transmission, the sensor is restarted and the update is checked and then installed in the sensor.
This process takes about 2 minutes.
- The sensor then restarts.

The configuration of the sensor is retained during the firmware update.



IMPORTANT

Possible device damage

If the voltage supply is interrupted, the sensor may be damaged.

- Do not interrupt the voltage supply to the sensor during the update process.

9.2.6 Logger

Process data can be recorded via the web interface and downloaded as a .csv file.

The duration of the logging is limited and depends on the selected logging interval and the logger content. Depending on the configuration, it can vary from 60 minutes to up to 7 days.

The logging interval can be set to 1 second, 2 seconds, 5 seconds, 10 seconds, 30 seconds or 60 seconds.

The last value per logging interval is always saved.

The larger the selected logging interval, the longer the data can be recorded.

Either the 2 process variables “volume flow” and “pressure” only, or all 8 process variables can be recorded as logger content.

If all 8 process variables are recorded simultaneously, the duration of recording is shortened accordingly.

Recording can either be stopped manually (“Stop recording”) or is stopped automatically when the memory is full.

The .csv file can be downloaded using the “Download Last Logfile” button.



NOTE

When recording is restarted, the previous log file is overwritten.

9.3 Simple Network Time Protocol (SNTP)

9.3.1 Overview

The sensor has 2 internal times/time stamps:

- localtime: milliseconds since PowerUp
- time stamp: milliseconds since 1/01/1970 (UnixTime)

The UnixTime can be synchronized with a time server on the network via SNTP (Simple Network Time Protocol).

The data format of the time is “UInt64” with a resolution of milliseconds.

9.3.2 Settings

The following SNTP settings can be configured:

Parameter	Example	Function
SNTP Client	active/ inactive	Switches the integrated SNTP client on or off
SNTP Server (IP or hostname)	0.de.pool.ntp.org	IP address or hostname of a time server on the network

Localtime/time stamp is output/used for:

- HTTP REST API interface
- MQTT
- OPC UA
- Display
- Logger



NOTE

The UnixTime starts at 0 ms after PowerUp. This corresponds to 1/01/1970. Thus UnixTime and LocalTime run synchronously until the UnixTime has been synchronized for the first time.



NOTE

The UnixTime is synchronized with the SNTP client every 60 minutes (if active).



NOTE

The UnixTime outputs the time in UTC+00.

9.3.3 Troubleshooting (SNTP)

Problem	Cause	Solution
Time is not synchronized	Wrong NTP server specified	Parameterize the correct NTP server
	NTP server specified via DNS, DNS not parameterized correctly	Parameterize the correct DNS or parameterize the NTP server via IP
	SNTP client deactivated	Activate the SNTP client
Time does not match the local time	The time is output as UTC+00	/

9.4 MQTT

9.4.1 Overview

Every FTMg includes an MQTT client through which it can connect to an MQTT broker. The FTMg periodically sends (publishes) messages to the MQTT broker under a topic. Any MQTT client can connect to the MQTT broker and subscribe to a topic. The MQTT broker notifies all MQTT clients with an active subscription when a message has been sent.

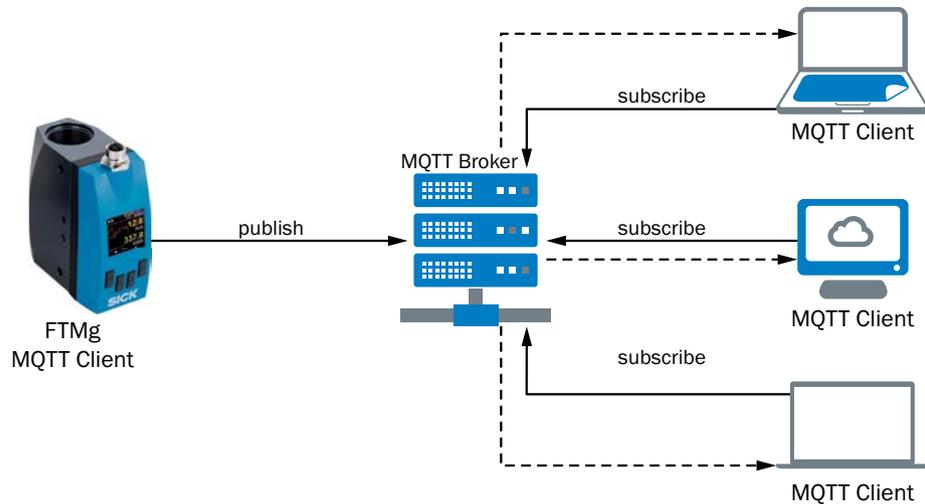


Fig. 7: MQTT communication

9.4.2 Settings: MQTT broker

Configure the following settings to establish the connection to the MQTT broker:

Parameter	Example	Function
MQTT Service	active	<ul style="list-style-type: none"> Active: MQTT client activated Inactive: MQTT client deactivated
		<p>NOTE We recommend deactivating the service if you are not using MQTT.</p>
MQTT broker	myMQTT Broker. company.com	Enter the IP or hostname of the MQTT broker
MQTT port	1883	Set the port of the MQTT broker. Default: 1883
MQTT Broker Username		These settings are optional. Here you can specify access data (username and password) for accessing the MQTT broker.
MQTT broker Password		<p>NOTE If no username and password have been assigned, then no authorization occurs, i.e. no login to the MQTT broker is required. The password is not readable via the web server. If a password was assigned, then *** is returned. The communication to the MQTT broker is not encrypted! The username and password can potentially be read.</p>

Parameter	Example	Function
MQTT QoS level QoS-	QoS-0	<p>The Quality of Service level of the MQTT data transmission can be selected here:</p> <ul style="list-style-type: none"> • QoS-0: “At most once” At level zero, message delivery is not guaranteed. There is no acknowledgment of receipt by the recipient, and the message is not saved or transmitted again by the sender. • QoS-1: “At least once” At level 1, the message is guaranteed to arrive at the recipient at least once. The sender stores the message until it receives an acknowledgment of receipt from the recipient. A message may be sent or delivered multiple times. • QoS-2: “Exactly once” Level 2 guarantees that each message is received only once by the intended recipients. QoS-2 is the most secure and slowest Quality of Service class. This is ensured by at least 2 request/response streams (a four-part handshake) between the sender and the receiver. <p>NOTE The different QoS levels generate different traffic on the network; the higher the QoS the greater the load on the network.</p>
MQTT Topic	FTMG_ <Serno>	<p>Under this topic, the MQTT client of the FTMg sends the selected data to the MQTT broker at the specified update interval.</p> <p>NOTE Recommendation: Each sensor should be given its own topic to distinguish it.</p>

9.4.3 Settings: Process data

The process data can be transmitted in a different process data format and update interval. The following settings are available:

Parameter	Example	Function
MQTT ProcessData Format	Single (1 Element)	<p>Here you can select in which process data format the data will be transmitted:</p> <ul style="list-style-type: none"> • Single (1 element): The process data are transmitted as one JSON object with one value per process parameter. • MultiArray (10 Elements): The process data are provided as one JSON object with one array for each process parameter. • MultiObject (10 elements): The process data are provided as an array of JSON objects (with one value per process parameter). • UserDefined (Legacy v1 / v2): You can set which process data are sent. The unit as well as statistics values can also be sent. <p>NOTE By selecting a suitable process data format:</p> <ul style="list-style-type: none"> • The communication in the network can be reduced (MultiArray, MultiObject, UserDefined). • Data can be transmitted at a higher frequency (up to 10 ms for MultiArray and MultiObject with a parameter update interval of 100 ms and $\Delta t = 10$ ms). • The compatibility with existing applications can be ensured (UserDefined).

Parameter	Example	Function
MQTT Update Interval	500 ms	The update interval for the “Single” or “UserDefined” MQTT ProcessData format can be set here: <ul style="list-style-type: none"> • 100 ... 30,000 ms
MQTT ProcessData Multi Update Interval (t)	100 ms	The update interval for the “MultiArray” or “MultiObject” MQTT ProcessData format can be set here <ul style="list-style-type: none"> • 100 ms: Transmission of 10 elements every 100 ms with $\Delta t = 10$ ms • 1 s: Transmission of 10 elements every 1 s with $\Delta t = 100$ ms • 2 s: Transmission of 10 elements every 2 s with $\Delta t = 200$ ms • 5 s: Transmission of 10 elements every 5 s with $\Delta t = 500$ ms • 10 s: Transmission of 10 elements every 10 s with $\Delta t = 1$ s • 30 s: Transmission of 10 elements every 30 s with $\Delta t = 3$ s
Send Unit (complex) Send Mass Flow Rate Send Flow Velocity Send Volumetric Flow Rate Send Volume Send Mass Send Energy Send Temperature Send Pressure Send Additional Information Send App Statistics (complex)	Off/On	Here you can select, on a user-defined basis, which process data should be sent as a JSON object. This is only possible if the “UserDefined” MQTT ProcessData format is selected.

9.4.4 MQTT JSON responses

Single
<pre>{ "massFlowRate":0, "flowVelocity":0, "volume":0.015, "volumetricFlowRate":0, "mass":0.02, "energy":0, "temperature":39.4, "pressure":0, "timestamp":1656673414493, "localtime":70743946, "deviceState": "ok" }</pre>

Further responses can be found in the OpenAPI specification (see section [9.2.3 “REST API interface \(machine\)”](#)) or the AsyncAPI specification (see section [“9.4.5 Settings: SubTopics”](#))

9.4.5 Settings: SubTopics

In addition to the process parameters, subtopics such as the firmware version, signal status, etc. can be sent as a JSON object.

Parameter	Example	Function
MQTT SubTopics	enabled	<ul style="list-style-type: none"> Disabled: Deactivated - The subtopics can be deactivated to reduce the load on the network. Enabled: Activated - When the subtopic is activated, additional information such as the firmware version, signal status, etc. are sent in addition to the 8 process parameters.

SubTopics

The MQTT subtopics are documented in the AsyncAPI specification.

- The specification can be loaded from the sensor at the URL <http://<sensor-ip>/asyncapi.yaml>
- or from the web interface on the “MQTT” page under “AsyncAPI MQTT Interface Description”.

You can, for example, use <https://studio.asyncapi.com/> as an editor.

Endpoint	Web server	MQTT Broker	MQTT Retain	MQTT Publish Interval	Description
ProcessData UserDefined (Legacy v1 / v2)	-	<MQTT Topic>	Configurable interval for cyclical output	Configurable 9.4.3 “Settings: Process data”	-
ProcessData Single	profile /processdata /single	<MQTT Topic>	Configurable interval for cyclical output	Configurable 9.4.3 “Settings: Process data”	Process data are provided as 1 object with 1 value per process parameter
ProcessData Descriptor	profile /processdata /desc	<MQTT Topic> /processdata Desc	On connection, one-time output as a retained message ✓	On connection	Details of the process data (units and measuring ranges)
ProcessData MultiArray	profile /processdata /multiarray	<MQTT Topic>	Configurable interval for cyclical output	Configurable 9.4.3 “Settings: Process data”	Process data are provided as one object with one array for each process parameter
ProcessData MultiObject	profile /processdata /multiobject	<MQTT Topic>	Configurable interval for cyclical output	Configurable 9.4.3 “Settings: Process data”	Process data are provided as an array of objects (with one value for each process parameter)
Identification	profile /identification	<MQTT Topic> /identification	On connection, one-time output as a retained message ✓	On connection	Sensor specific identification
DigitalNameplate	profile /digitalnameplate	<MQTT Topic> /digitalNameplate	On connection, one-time output as a retained message ✓	On connection	Digital identifier of the device

Endpoint	Web server	MQTT Broker	MQTT Retain	MQTT Publish Interval	Description
Tags	profile /tags	<MQTT Topic>/ tags	On connection, one-time output as a retained message ✓	On connection	Tags for more detailed description
State	profile /state	<MQTT Topic>/ state	Output every 5 minutes as retained message ✓	Every 5 minutes	Full device status including SignalQuality, monitoring services (SNTP client, web server, MQTT client, OPC UA Server) and Ethernet
Statistics	profile /statistics	<MQTT Topic> /statistics	Output every 5 minutes as retained message ✓	Every 5 minutes	Statistics on flow, flow velocity, volumetric flow rate, temperature, and pressure since last reset
Counter	profile /counter	<MQTT Topic> /counter	Output every 5 minutes as retained message ✓	Every 5 minutes	Summed quantities (volume, mass, energy) since last reset
Events Info	profile /events/info	<MQTT Topic> /events/info	On occurrence, one-time output as a retained message ✓	On occurrence	List of all pending messages
Events Warning	profile /events /warning	<MQTT. Topic> /events /warning	On occurrence, one-time output as a retained message ✓	On occurrence	List of all pending warnings
Events Error	profile /events /error	<MQTTTopic> /events /error	On occurrence, one-time output as a retained message ✓	On occurrence	List of all pending errors
ProductID	/productid	/	/	/	Requests the Product ID (product identifier)

9.4.6 MQTT troubleshooting

To troubleshoot, check the status of **MQTT State** and **MQTT Detailed State**.

Problem	Cause	Solution
MQTT connection is not working	Wrong broker specified	Parameterize the correct broker (see section 9.4.2 “Settings: MQTT broker”)
	MQTT broker specified via DNS, DNS not parameterized correctly	Parameterize the correct DNS or parameterize the NTP broker via IP (see section 9.4.2 “Settings: MQTT broker”)
	Incorrect port specified	Set the correct MQTT port Default: 1883 (see section 9.4.2 “Settings: MQTT broker”)
	Incorrect MQTT broker configuration	Enter the correct MQTT broker IP address or hostname (see section 9.4.2 “Settings: MQTT broker”)
	MQTT service deactivated	Activate the MQTT service (see section 9.4.2 “Settings: MQTT broker”)
Subtopics are not arriving	Subtopics are deactivated	Activate the subtopics (see section 9.4.5 “Settings: SubTopics”)
Process data are being transmitted too slowly	MQTT update interval is too high	Reduce the MQTT update interval (see section 9.4.3 “Settings: Process data”)

9.5 OPC UA

The OPC UA (Open Platform Communications - Unified Architecture) protocol is an open standard for horizontal communication from machine to machine and for vertical communication from the machine to the cloud. It is vendor and platform independent, thereby enabling easy integration.

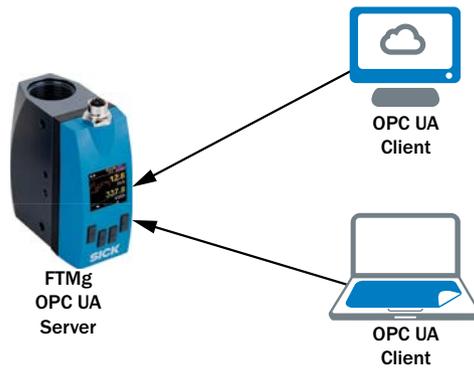


Fig. 8: OPC UA communication

OPC UA operates according to the server-client model, where each FTMg has an integrated OPC UA server. Up to two OPC UA clients can connect to this at the same time. The OPC UA server offers a service oriented architecture (SoA).

The OPC UA client connects to the OPC UA server. It does not require a special device description file from the server, but instead can autonomously navigate through the address space of the server (FTMg) and read the data made available by the server.

9.5.1 Sensor

All parameters described in the OpenAPI are also accessible via the OPC UA address space.

The following data of the FTMg can be accessed via the address space:

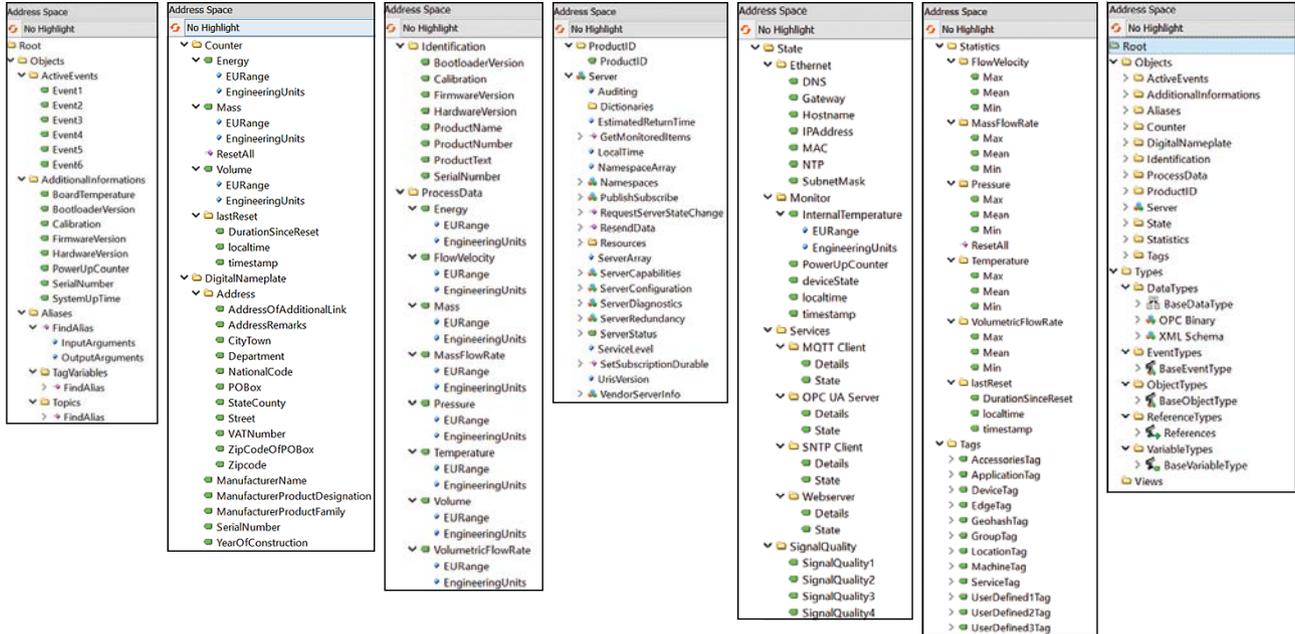


Fig. 9: OPC UA address space

The sensor has an integrated OPC UA server.

Features	Quantity
Number of simultaneous connections	2
Max. number of subscriptions	4
Number of monitored items per subscription	20

9.5.2 Settings

The following settings can be configured:

Parameter	Example	Function
OPC UA Service	Active	Inactive: Deactivated Active: Activated
		NOTE We recommend deactivating the service if you are not using OPC UA.
OPC UA Port	4840	Sets the OPC UA port: The default port for the OPC UA server in the FTMg is port 4840. Default: 4840

Parameter	Example	Function
OPC UA Username	-	These settings are optional. Here you can specify access data (username and password) for accessing the OPC UA server.
OPC UA Password	-	 NOTE If no username and password have been assigned, then no authorization occurs, i.e. no login to the OPC UA-Server is required. The password is not readable via the web server. If a password was assigned, then *** is returned. The communication is not encrypted! The username and password can potentially be read.

Using the UaExpert client from Unified Automation (<https://www.unified-automation.com/>) as an example, the following steps need to be performed in order to operate the sensor via OPC UA:

1. Press “Plus” to add a new server (FTMg).
2. Assign a configuration name (name is freely selectable).
3. On the “Add Server” screen, select the “Advanced” tab and enter the IP address of the FTMg with port (example: opc.tcp://<sensor-ip>:<OPCUA-port>).
4. Click “OK” to confirm the input.
5. Click “Connect”.
6. The FTMg appears in the Servers area of the “Project” field.
7. The address space of the FTMg is displayed in the “Address Space” field.
8. The attributes can be read in the “Attributes” field.
9. Drag and drop the desired parameters from the address space into the “Data Access View” field.

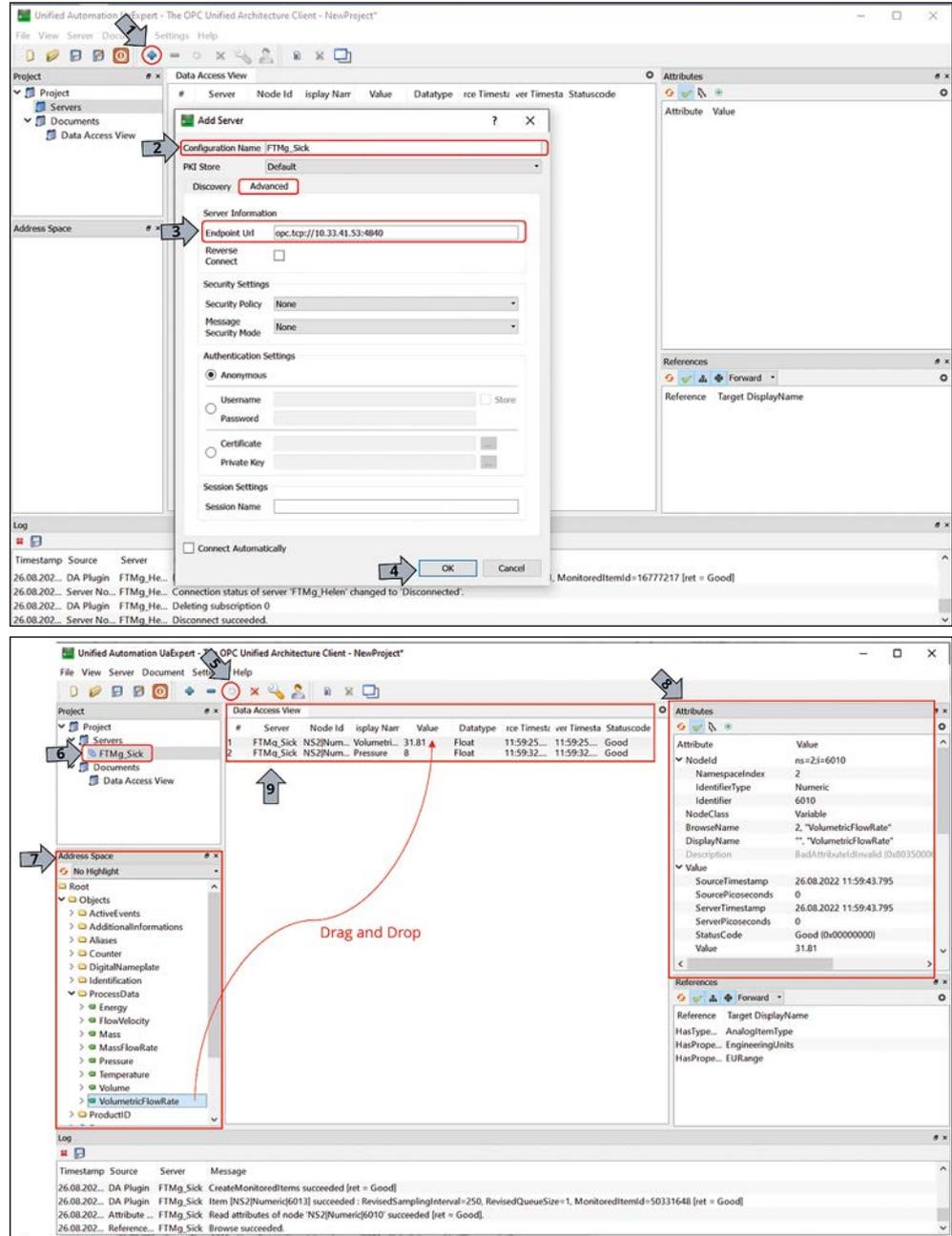


Fig. 10: Example: Operation of the sensor via OPC UA using the UaExpert client from Unified Automation

9.6 OPC UA troubleshooting

Check the statuses of OPC UA State and OPC UA Detailed State:

Problem	Cause	Solution
OPC UA connection is not working	The OPC UA service is deactivated	Activate the OPC UA service
	Incorrect port specified	Set the OPC UA port: The default port for the OPC UA server in the FTMg is port 4840. Default: 4840
	Incorrect IP address specified	Enter the correct IP address of the sensor
	Username and password have been assigned	Enter the username and password
	There are already two OPC UA clients connected to the OPC UA server	Terminate the connection of an OPC UA client
No more subscriptions can be made	The number of subscriptions per connection has been exceeded	Delete unnecessary subscriptions

10 Operating the industrial and Ethernet variant

This section applies to all FTMg variants.

10.1 Display



Fig. 11: FTMg display

10.1.1 Status bar

The display has a status bar. This shows icons with three different statuses:

Ethernet variant

Icon	Not present	Black background	Color background
Info	No information message active	/	Information message active See display page 3 for description
Warn/Err	No warning/error message active	/	Warning/error message active See display page 3 for description
Eth	/	No Ethernet link available	Ethernet link available
Web	Web server deactivated	Web server activated	Web server with active connections
MQTT	MQTT deactivated	MQTT client not connected	MQTT client successfully connected to MQTT broker
OPC	OPC UA deactivated	OPC UA server activated	OPC UA server with active connections

Industrial variant

Icon	Not present	Black background	Color background
Info	No information message active	/	Information message active See display page 3 for description
Warn/Err	No warning/error message active	/	Warning/error message active See display page 3 for description
Q1	/	/	Q1 active
IO-Link	IO-Link deactivated	/	IO-Link active
Q2 / a	/	/	Q2 / a active
Qa	/	/	Qa active

10.1.2 Display units

The units for the different measurands can be selected in the “Units” submenu:

Process variable	Units
MassFlowRate	kg/h , g/s, kg/min
FlowVelocity	m/s , fps
Volume	m³ , L, ft ³
VolumetricFlowRate	m³/h , m ³ /min, L/s, L/min, ft ³ /s, ft ³ /min
Mass	kg
Energy	kWh
Temperature	°C, °F
Pressure	bar , psi



Note

The change of units only affects the display and the web server. For MQTT and OPC UA, the measurands are always transmitted in their base units (marked in bold).

10.1.3 Display pages

The display has 4 different pages at the horizontal level. Which page the user is on is shown on the bottom of the display.

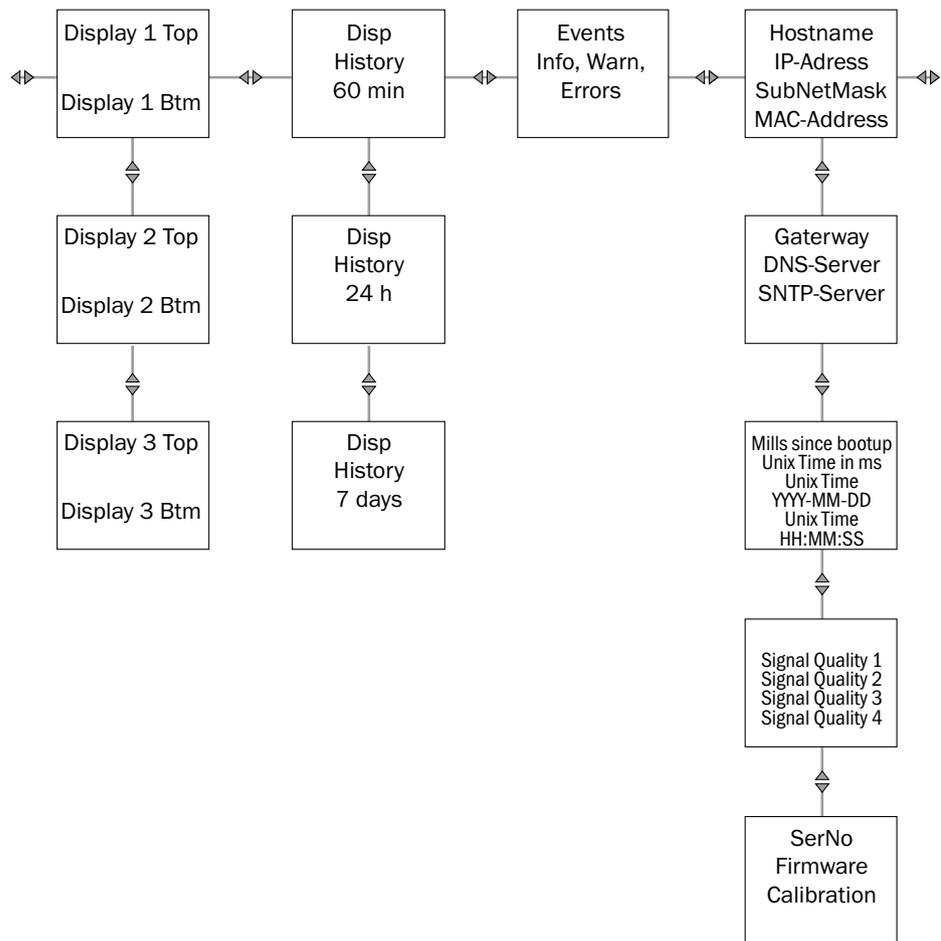


Fig. 12: Display page (example for Ethernet variant)

Page 1: Display of the current measured values.

- Up to 6 different measured values can be displayed at the vertical level (Disp1, Disp2, Disp3).
- Which measured values are displayed at which position is freely configurable.
- Example:

Setting start screen display “Screen 1.1”

- In the “Pages” submenu Disp1Top (top half of the screen), select the measured value to be displayed.
- In the “Pages” submenu Disp1Btm (bottom half of the screen), select the parameter to be displayed.

Page 2: Display of the history of a measured value.

- The different time spans (60 minutes, 24 hours, 7 days) are displayed at the vertical level.
- In the “DispHistory” submenu, select the measured value to be displayed.

Page 3: Display of current information, warning and error messages.

Page 4: Additional information, e.g. signal quality, IP address, firmware version, etc.

10.1.4 Other display configurations

Optimizing readability

- In the “Rotation” submenu, set display 0°, 90°, 180° or 270° to ensure optimal readability.

Time until screensaver is activated

- In the “Screensaver” submenu, set the activation time for the screensaver.

Time until display is switched off

- In the “AutoOff” submenu, set the time for switching off the display to ensure a longer service life of the display.

Brightness in %

- In the “Brightness” submenu, set the brightness in %.

Assigning a 4-digit pin for operation and/or manipulation protection

- In the “Display Pin” submenu, assign a 4-digit pin.

10.2 Simulation

Simulating flow

- The flow rate in % can be simulated in predefined steps in the “Flow” submenu.

Simulating temperature

- A temperature value in % (-20 ... +60 °C) can be simulated in predefined steps in the “Temperature” submenu.

Simulating pressure

- A pressure value in % (0 ... 16 bar) can be simulated in predefined steps in the “Pressure” submenu.

10.3 Measure

10.3.1 Setting the medium

- In the “Flow” submenu, select “Medium” and set a medium such as air, argon, helium, carbon dioxide (O₂) or nitrogen.



Note

The FTMg is calibrated with compressed air at the following reference conditions:

Media conditions	Air	ISO 8573-1:2010 [3:4:4] or better
	Static pressure	7 ± 0.2 bar (abs.)
	Temperature of medium	22 ± 3 °C
	Straight inlet zone	> 250xDN
	Customer-parameterizable average filter	10 seconds
Ambient conditions	Ambient temperature	+15 ... +25 °C
	Ambient pressure	1,013 mbar
Measured value via digital interface	-	-

For the other gases, adjustment curves are stored in the sensor.

10.3.2 Setting the reference standard

- In the “Flow” submenu, select “RefCond”.
Set a reference standard such as ISO2533, ISO1217, DIN1945-1, DIN1343, IOS6358, ISO8778 or user defined (UserDefined):

Standard	Pressure bar (abs.)	Temperature °C	Temperature K	Note
DIN 1343	1.01325	0	273.15	-
DIN 1945-1	1	20	293.15	for air only
ISO 1217	1	20	293.15	for air only
ISO 2533	1.01325	15	288.15	for air only
ISO 6358	1	20	293.15	for air only
ISO 8778	1	20	293.15	for air only
User-defined	Set an application-specific reference pressure	Set an application-specific temperature	-	-

- To set an application-specific reference pressure, select “RefPress” in the “Flow” submenu.
- To set an application-specific reference temperature, select “RefTemp” in the “Flow” submenu.

10.3.3 Flow configuration

Setting the zero point offset

- In the “Flow” submenu, select “0-FlowOff” and set the zero point offset. The zero point offset is needed if the sensor displays a value at zero flow. The zero point offset can be used to correct the value to zero.

Setting the leak flow volume suppression

- In the “Flow” submenu, select “0-FlowCut” and set the leak flow volume suppression. The volume flow is lowered to the value 0 m³/h when the value falls below the set value.

Setting the average filter to filter (smooth) measured values to the display and at the output

- In the “Flow” submenu, select “Filter” to filter all measured flow values on the display and at the output using predefined time units.

10.3.4 Pressure configuration

Setting the offset/zero point offset

- In the “Pressure” submenu, select “Offset” to set the offset/zero point offset.

Setting the average filter to filter (smooth) measured values on the display and at the output

- In the “Pressure” submenu, select “Filter” to filter measured values on the display and at the output using predefined time units.

10.3.5 Temperature configuration

Setting the average filter to filter (smooth) measured values on the display and at the output

- In the “Temperature” submenu, select “Filter” to filter measured values on the display and at the output using predefined time units.

10.3.6 Signal quality

- The sensor calculates various signal quality parameters that make it easier to evaluate the installation situation as well as the sensor status.

The “SigQua1”, “SigQua2”, “SigQua3” and “SigQua4” can be read in the “Sigquality” submenu. “SigQua3” and “SigQua4” are currently placeholders only and are always set to 100%.

	Signal Quality 1	Signal Quality 2
Meaning	Indicator for the quality of measurement	Indicator for the robustness of the measurement with regard to electromagnetic radiation
Value range	Value range: 0% ... 100% Good signal: > 90%	Value range: 0% ... 100% Good signal: > 70%

	Signal Quality 1	Signal Quality 2
Exceptions	May indicate < 100% for a short time during very dynamic processes with large temperature or flow variations	
Recognizing problems	If the value is permanently < 90%, this may indicate that the process is subject to excessive temperature fluctuations or the probe is contaminated	If the value is permanently < 70%, this may indicate that there is too much interference due to the proximity to sources of electromagnetic interference
Measures	Do not place the sensor too close to valves, as expansion cooling can limit the measurement accuracy. Check the probe for contamination	Do not place the sensor near sources of electromagnetic interference (electric motors, transformers)

10.4 History

The FTMg records all process variables for the last 7 days in a cascaded memory. Older data are aggregated and stored in long-term memory at a lower resolution.

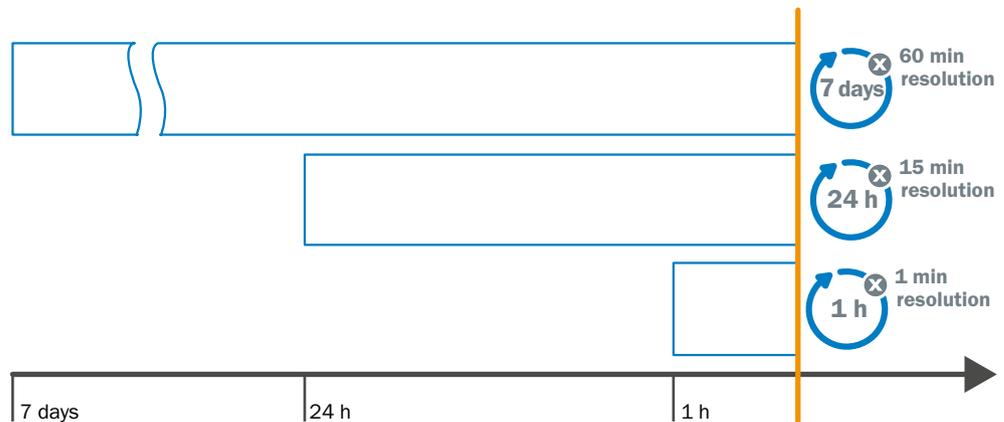


Fig. 13: Memory of the FTMg

A graph of the measured values for the last 60 minutes, the last 24 hours or the last 7 days can be displayed in the “History” submenu.



Note

The memory can be read via the display, the web server, and OPC UA.



Note

The memory cannot be reset.

10.5 Statistics

The max, min and average values of the mass and volume flow as well as the flow rate, temperature and pressure since the last reset can be displayed in the “Statistics” submenu.

The FTMg stores the elapsed time since the last reset of the statistics values. This can be accessed via the “LastReset” menu item.

The statistics values can be manually reset to “0” in the “Reset” menu item.

For the Ethernet variant, there is also the option to perform an automatic reset of the statistics values.

The “Auto Reset” menu item is used to configure an automatic reset of the statistics values either after a certain time (10 s, 30 s, 1 min, 10 min, 30 min, 1 h, 6 h, 12 h, 24 h) or after an event (HTTP Read or MQTT Publish).



Note

The statistics values:

- are permanently stored in flash memory.
- can only be reset together.
- can be accessed via the display, web server, MQTT, and OPC UA.

10.6 Counter

The three integrated process variables mass, volume and energy since the last reset can be displayed in the “Counter” submenu.

The FTMg stores the elapsed time since the last counter reset. This can be accessed via the “LastReset” menu item.

The counter can be manually reset to “0” in the “Reset” menu item.

For the Ethernet variant, there is also the option to perform an automatic reset of the counter.

The “Auto Reset” menu item is used to configure an automatic reset of the counter either after a certain time (10 sec, 30 sec, 1 min, 10 min, 30 min, 1 h, 6 h, 12 h, 24 h) or after an event (HTTP Read or MQTT Publish).



Note

The 3 integrated process variables mass, volume and energy can only be reset together.

10.7 System

Service login

- In the “Service” submenu, carry out the service login for authorized users.

Resetting to factory settings

- In the “FactReset” submenu, reset to the factory settings (defaults).

Serial number (read only)

- You can display the serial number in the “SerialNumber” submenu.

FWVersion (read only)

- You can display the firmware version in the “FWVersion” submenu.

BLVersion (read only)

- You can display the bootload version in the “BLVersion” submenu.

HWVersion (read only)

- You can display the hardware version in the “HWVersion” submenu.

10.7.1 Tags

The following tags are available in the industrial and Ethernet variants:

Device tag

- Set the “DevTag” device tag in the submenu.
The device tag is assigned to the sensor.

Application tag

- Set the application tag in the “AppTag” submenu.
The application tag is assigned to the application/measuring point and is taken into account during data retention.

The following tags are only available in the Ethernet variant:

Accessories tag

- In the “Accessories” submenu, set Accessories Tag.

Location tag

- In the “Location” submenu, set Location Tag.

Machine tag

- In the “Machine” submenu, set Machine Tag.

Group tag

- In the “Group” submenu, set Group Tag.

Edge tag

- In the “Edge” submenu, set Edge Tag.

Geohash tag

- In the “Geohash” submenu, set Geohash Tag.

Service tag

- In the “Service” submenu, set Service Tag.

User def tag

- In the “User Def 1/2/3” submenu, set user def tags.

11 Troubleshooting

Error messages are shown on the display if the relevant error status is caused by a certain condition.

There are three classifications: info, warning, and error.

If the sensor goes into the error state (safe state), then:

- all non-integrated process variables except pressure are set to 0.
- the process variable pressure is set to 888 bar. This makes it clear that the pressure value is currently not known (888 bar = unrealistic pressure value) and is intended to prevent the gas line, which may still be under pressure, from being opened.
- an ERROR icon appears in the status bar on the display.
- the active events (Info/Warning/Failures) can be read on the display of the third page. This will indicate the cause of the error state.

In the following table all error messages are listed with their relevant error level indicated.

Message	Classification	Description
Memory Invalid	Error	The memory of the sensor is damaged. Contact support.
No MQTT Connection	Warning	No connection to the MQTT broker possible.
Simulation active	Info	Simulation active (output signal or process size)
Q1/2 Overtemp	Warning	Driver for switching output Q1 / Q2 overloaded.
Q1 Shortcut	Warning	Short-circuit on Q1
Q2 Shortcut	Warning	Short-circuit on Q2
Q2 / a: Overload	Warning	Q2 / a: current not flowing. - Cable not connected? - Load impedance too high?
Q2 / a OverTemp	Warning	Q2 / a: Overtemperature of the output driver - Ideal: load of 500 Ohm - Ambient temperature too high?
Q2 PulseConfig	Warning	Implausible configuration of the Q2 pulse output
Qa Overload	Warning	See Q2 / a: Overload
Qa OverTemp	Warning	See Q2 / a: OverTemp
Flow low Info	Info	Info: MBE - 5%
Flow high Info/Warning	Info/Warning	Info: Standard ULR + 5% Warning: Extended MBE + 5%
Pressure low	Warning	Pressure outside the measuring range
Pressure high	Warning	Pressure outside the measuring range
Temperature low	Warning	Temperature outside the measuring range
Temperature high	Warning	Temperature outside the measuring range
Pressure low/high Error	Error	Process pressure outside the permissible pressure range
Temperature low/high Error	Error	Temperature of the process medium outside the permissible temperature range

Message	Classification	Description
Energy Counter off - Air only	Info	Medium != Air => Formula for energy counter only stored for air, therefore no function
Q1 Config out of Range	Info	Switching points parameterized outside measuring range
Q2 Config out of Range	Info	Switching points parameterized outside measuring range
Qa Config out of Range	Info	Current output parameterized outside the measuring range
Invalid Medium + RefCond	Warning	The selected reference conditions are not permissible in combination with the medium
Supply Voltage too low/high!	Warning	Industrial variant only: Voltage supply outside the specifications
Internal Temperature too low/high!	Warning	Internal temperature too high. Check ambient conditions.

12 Repair

12.1 Maintenance

The FTMg is maintenance-free. Check the fittings and plug connectors at regular intervals.

12.2 Return

Clean removed devices before returning them in order to protect our employees and the environment from dangers posed by residue from measured materials. Faulty devices can only be examined when accompanied by a completed return form. This form includes information about all materials which have come into contact with the device, including those which were used for testing purposes, operation, or cleaning. The return form is available from our website (www.sick.com).

13 Disposal

Dispose of device components and packaging materials in compliance with applicable country-specific waste treatment and disposal regulations for the region of use.

14 Technical data

14.1 Features

Measurement principle	Calorimetric (flow, temperature) Piezoresistive (pressure)
Medium	Pressure (air quality ISO 8573-1:2010 [3:4:4]) Helium, argon, nitrogen, carbon dioxide
Measurands	Ground, mass flow, volume, volume flow, energy, flow speed, pressure, temperature
Measuring pipe nominal diameter	DN15, DN20, DN25, DN40, DN50
Process temperature	-20 °C ... + 60 °C
Process pressure	0 bar ... 16 bar
Communication interface	IO-Link V1.1 COM3/230K4 baud (industrial variant only) OPC UA, MQTT, web server (Ethernet variant only)
Temperature measurement	✓
Pressure measurement	✓
Display	128 x 128 pixels, adjustable rotary OLED display (90° rotations) and 4 pushbuttons

14.2 Performance

Measuring range ¹⁾	Standard measuring range: 0.5 m/s....100 m/s DN15: 5.3 ... 1,060.3 l/min DN20: 9.4 ... 1,884.9 l/min DN25: 14.7 ... 2,945.2 l/min DN40: 37.7...7,539.8 l/min DN50: 58.9 ... 11,780.9 l/min Extended measuring range: 100 m/s ... 150 m/s DN15: 1,060.3 ... 1,590.4 l/min DN20: 1,884.9 ... 2,827.4 l/min DN25: 2,945.2 ... 4,417.9 l/min DN40: 7,539.8 l/min ...11,309.7 l/min DN50: 11,780.9 l/min ... 17,671.5 l/min
Measurement accuracy (flow) ²⁾	Standard measuring range DN15, DN20, DN25: ± (3% of the measured value + 0.3% of the measuring range limit value (extended measuring range)) Extended measuring range DN15, DN20, DN25: ± (8% of measured value + 1% of the measuring range limit (extended measuring range)) Standard measuring range DN40, DN50: ± (6% of measured value + 0.6% of the measuring range limit (extended measuring range)) Extended measuring range DN40, DN50: ± (8% of measured value + 0.8% of the measuring range limit (extended measuring range))
Repeatability (flow) ²⁾	± 1.5% of the measured value
Response time	< 0.3 s

Measurement accuracy (temperature) ³⁾	± 2 °C
Repeatability (temperature) ³⁾	± 0.5 °C
Measurement accuracy (pressure) ⁴⁾	± 1.5% of the measuring range end value (in the range 10 °C... 30 °C)
Non-linearity (pressure) ⁴⁾	± 0.5% of the measuring range (including temperature drift)
Repeatability (pressure) ⁴⁾	± 0.2% of the measuring range
MTTF	> 100 years

¹⁾ Reference conditions according to DIN 1343: atmospheric pressure 1.01325 bar abs, compressed air temperature 0 °C

²⁾ Reference conditions during measurement:

Media conditions: Air according to ISO 8573-1:2010 [3:4:4] or better; static pressure = 7 ± 0.2 bar (abs.); medium temperature 22 ± 3 °C; straight inlet zone > 250xDN; customer-parameterizable average filter: 10 seconds

Ambient conditions: Ambient temperature 15 ... 25 °C; ambient pressure: 1,013 mbar

Measured value via digital interface

Sensor warm-up time 30 min

Horizontal orientation of the direction of flow, flow through the measurement channel in the direction of the arrow (see marking on the measurement channel), alignment of the sensor so that the flow is from left to right when looking at the display.

³⁾ If flow $\geq 10\%$ of the measuring range limit value (standard measuring range)

⁴⁾ Evaluation according to DIN EN 61298-2 best fit straight line

14.3 Electrical connection values for industrial variant

Supply voltage U_v ¹⁾	17 V DC ... 30 V DC
Power consumption	< 4.5 W at 24 V DC without output load
Power-up time	≤ 10 s
Protection class	III
Connection type	M12 round connector x 1.5-pin, A-coded
Output signals	1x analog output 4 mA ... 20 mA 1x digital/analog output (PNP, NPN, push-pull, 4 mA ... 20 mA/switchable), frequency/pulse output 1 x digital output (PNP, NPN, push-pull switchable), IO-Link
Output load of analog output	4 mA ... 20 mA, max. 500 Ohm
Lower signal level of analog output	3.5 mA ... 3.8 mA
Upper signal level of analog output	20.5 mA ... 21.5 mA
Inaccuracy of analog output	QA Pin 2: < 0.5% Full-range (20 mA) Q2 Pin 5: < 0.5% Full-range (20 mA)
Digital output	≤ 100 mA
Signal voltage HIGH	> $U_v - 2$ V
Signal voltage LOW	≤ 2 V
Inductive load	< 1 H
Capacitive load	< 100 nF (2,5 nF, IO-Link mode)

¹⁾ All connections are reverse polarity and overload protected. Q1 and Q2 are short-circuit protected. Use an energy-limited circuit for the voltage supply as per UL61010-1 3. Outp.

14.4 Electrical connection values for Ethernet variant

Power consumption	< 5 W
Power-up time	≤ 10 s
Protection class	III
Connection type	1 x M12 round connector, 8-pin, X-coded
Output signal	OPC UA, MQTT, integrated web server
Standard communication	IEEE802.3 Clause 25 (100BaseTx); 100 Mbit/sec
Standard supply	Power over Ethernet according to IEEE802.3af
Performance class	Class 0; corresponds to IEEE802.3af Powered Device < 13 W
Power supply unit	Mode A and Mode B

14.5 Mechanics/materials

Process connection	DN15: G1/2 (according to DIN EN ISO 228-1) DN20: G3/4 (according to DIN EN ISO 228-1) DN25: G1 (according to DIN EN ISO 228-1) DN40: R 1 1/2 (according to DIN EN 10226-1) or 1 1/2" NPT DN50: R 2 (according to DIN EN 10226-1) or 2" NPT
Materials in contact with the media	Probe: 1.4305 PA6 stainless steel Seal: FKM (Viton®) Measurement channel DN15, DN20, DN25: aluminum Measuring tube DN40, DN50: stainless steel 1.4301
Housing material	PC+ABS, PA66+PA6I GF50, PC, TPE, stainless steel 1.4301
Enclosure rating ¹⁾	IP65 / IP67 (according to IEC 60529)
Weight	DN15: approx. 805 g DN20: approx. 755 g DN25: approx. 685 g DN40: approx. 2.3 kg DN50: approx. 2.8 kg

¹⁾ Not UL tested

14.6 Ambient conditions

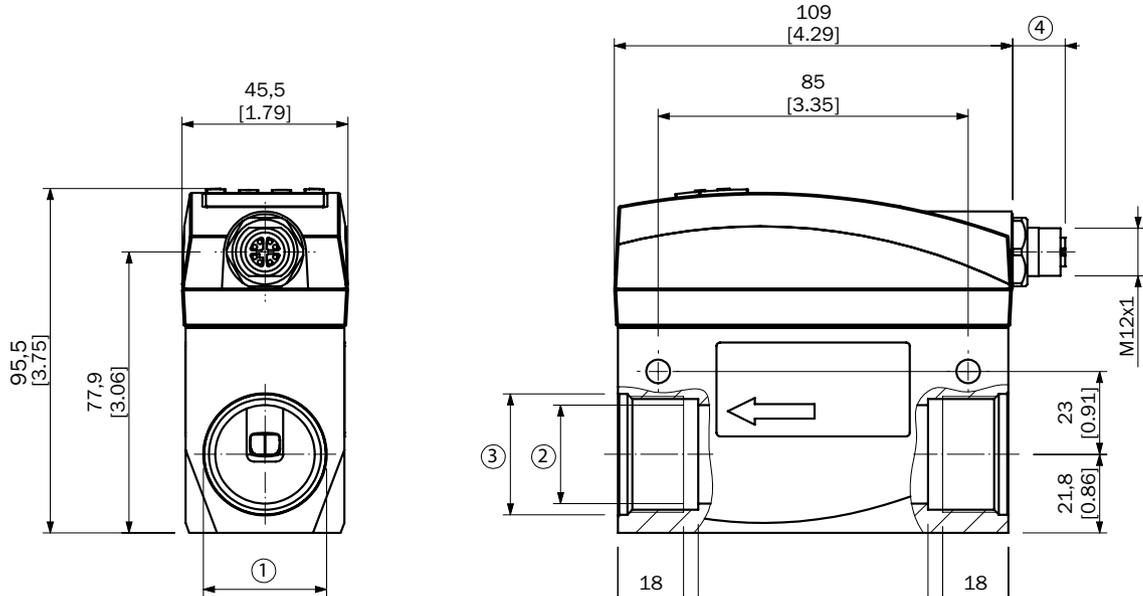
Ambient temperature, operation ¹⁾	-20 °C ... +60 °C
Ambient temperature, storage	-40 °C ... +85 °C

¹⁾ According to the UL approval: degree of contamination 3 (UL61010-1: 2012-05); air humidity: 80% at temperatures up to 31 °C; installation altitude: max. 3,000 m above sea level.

15 Dimensional drawings

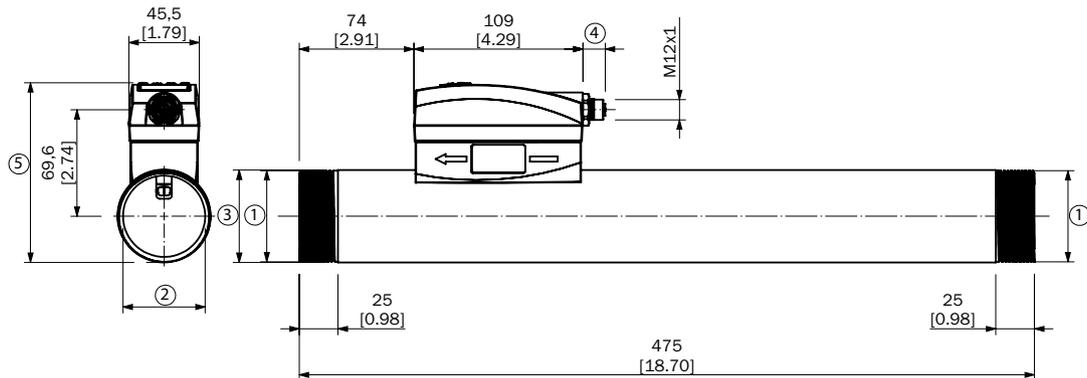
All dimensions in mm [inch]

15.1 FTMg DN15, DN20, DN25



Type	DN	①	②	③	④
FTMG-ISD15AXX	15	G 1/2	Ø 16.1 [Ø 0.63]	Ø 16.1 [Ø 0.63]	18.5 [0.73]
FTMG-ESD15AXX	15	G 1/2	Ø 16.1 [Ø 0.63]	Ø 16.1 [Ø 0.63]	13.4 [0.53]
FTMG-ISD20AXX	20	G 3/4	Ø 21.7 [Ø 0.85]	Ø 27.5 [Ø 1.08]	18.5 [0.73]
FTMG-ESD20AXX	20	G 3/4	Ø 21.7 [Ø 0.85]	Ø 27.5 [Ø 1.08]	13.4 [0.53]
FTMG-ISD25AXX	25	G 1	Ø 27.3 [Ø 1.07]	Ø 33.5 [Ø 1.32]	18.5 [0.73]
FTMG-ESD25AXX	25	G 1	Ø 27.3 [Ø 1.07]	Ø 33.5 [Ø 1.32]	13.4 [0.53]

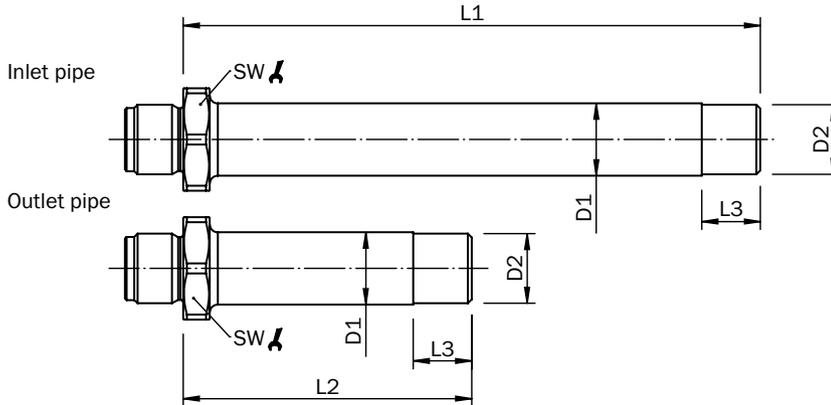
15.2 FTMg DN40, DN50



Type	DN	①	②	③	④	⑤
FTMG-ISR40SXX	40	R 1 1/2	Ø 41.1 [Ø 1.62]	Ø 48.3 [Ø 1.90]	18.5 [0.73]	105.1 [4.14]
FTMG-ESR40SXX	40	R 1 1/2	Ø 41.1 [Ø 1.62]	Ø 48.3 [Ø 1.90]	13.4 [0.53]	105.1 [4.14]
FTMG-ISN40SXX	40	1 1/2" NPT	Ø 41.1 [Ø 1.62]	Ø 48.3 [Ø 1.90]	18.5 [0.73]	105.1 [4.14]
FTMG-ESN40SXX	40	1 1/2" NPT	Ø 41.1 [Ø 1.62]	Ø 48.3 [Ø 1.90]	13.4 [0.53]	105.1 [4.14]

Type	DN	①	②	③	④	⑤
FTMG-ISR50SXX	50	R 2	∅ 54.1 [∅ 2.13]	∅ 60.3 [∅ 2.37]	18.5 [0.73]	117.1 [4.61]
FTMG-ESR50SXX	50	R 2	∅ 54.1 [∅ 2.13]	∅ 60.3 [∅ 2.37]	13.4 [0.53]	117.1 [4.61]
FTMG-ISN50SXX	50	2" NPT	∅ 54.1 [∅ 2.13]	∅ 60.3 [∅ 2.37]	18.5 [0.73]	117.1 [4.61]
FTMG-ESN50SXX	50	2" NPT	∅ 54.1 [∅ 2.13]	∅ 60.3 [∅ 2.37]	13.4 [0.53]	117.1 [4.61]

Accessories for DN15, DN20, DN25 flow conditioning pipes



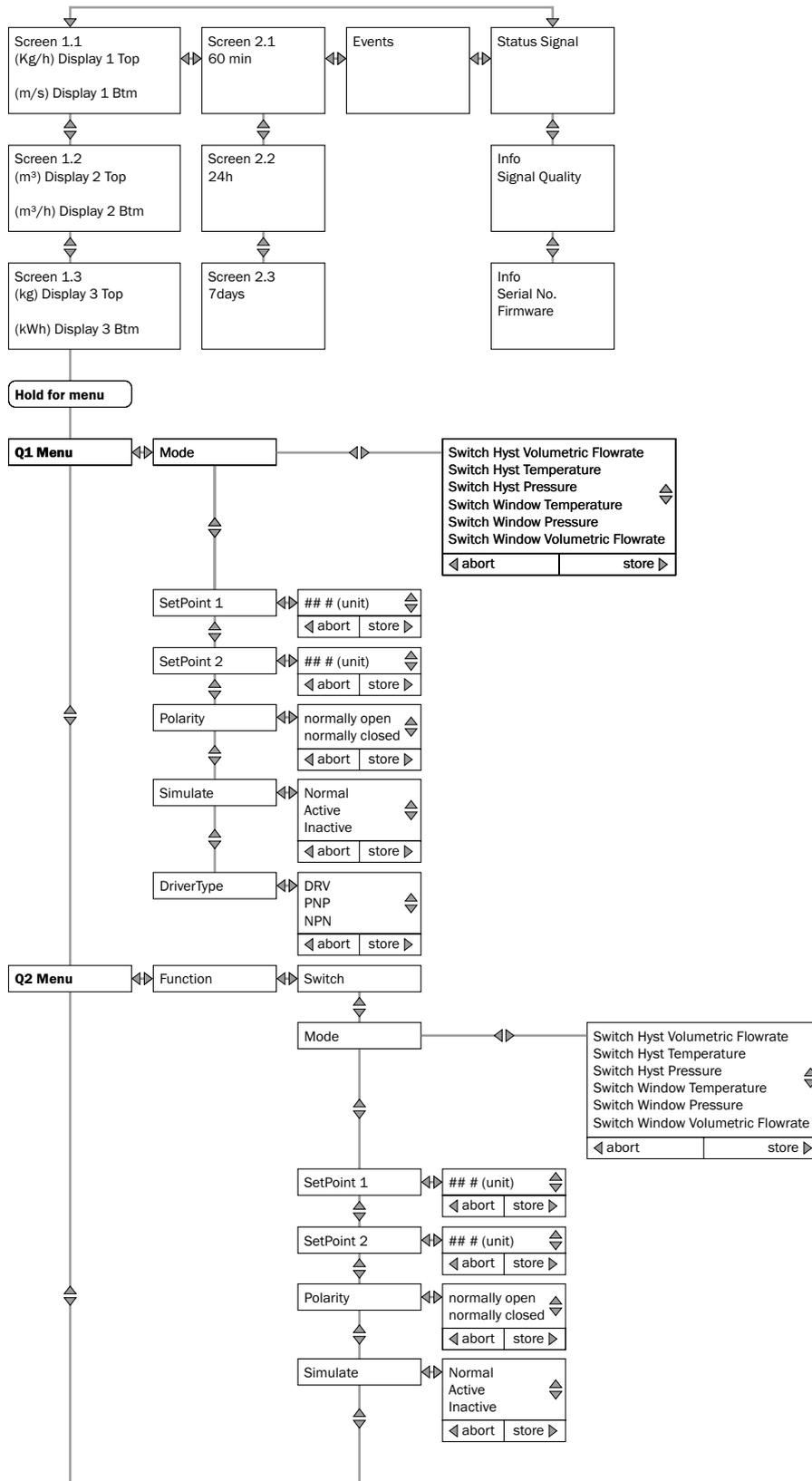
Type	L1	L2	L3		D1	D2	Software
			G	NPT			
2111050	161.0	80.5	22.0	24.1	∅ 22.2	G 1/ 2	32
2111051	161.0	80.5	22.0	24.1	∅ 22.2	1/ 2" NPT	32
2111052	217.0	108.5	22.0	24.1	∅ 27.5	G 3/ 4	39
2111053	217.0	108.5	22.0	24.1	∅ 27.5	3/ 4" NPT	39
2111054	273.0	136.5	25.0	24.1	∅ 34.0	G1	48
2111055	273.0	136.5	25.0	24.1	∅ 34.0	1" NPT	48

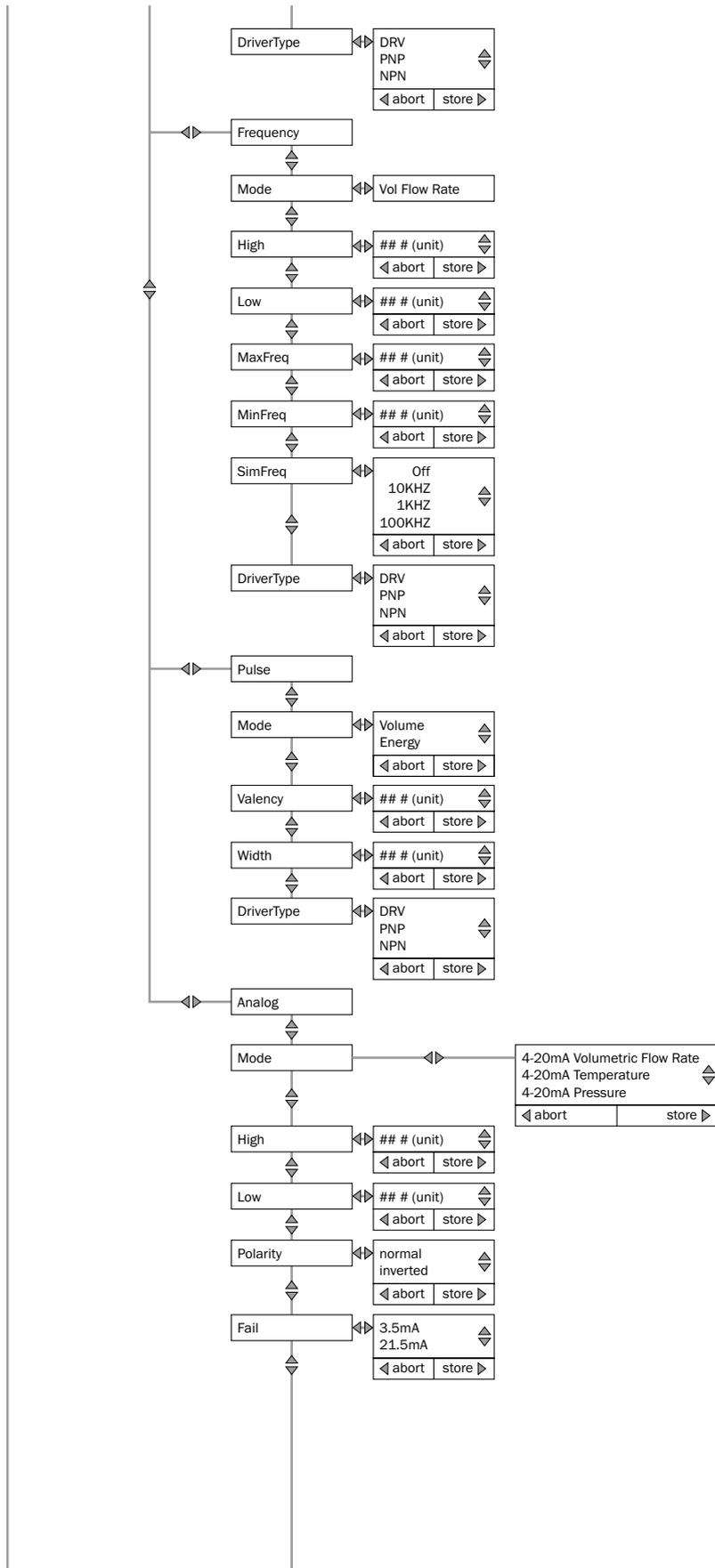
16 Accessories

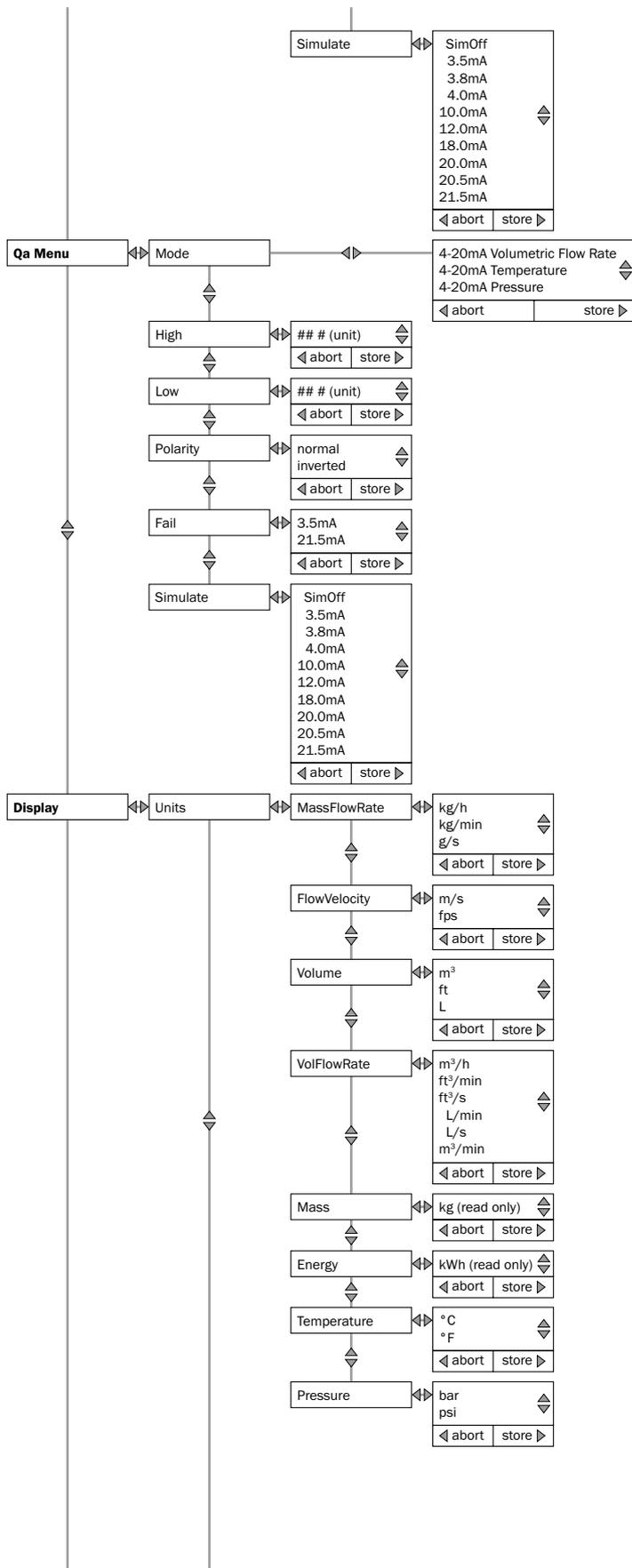
For accessories, visit www.sick.com/FTMg.

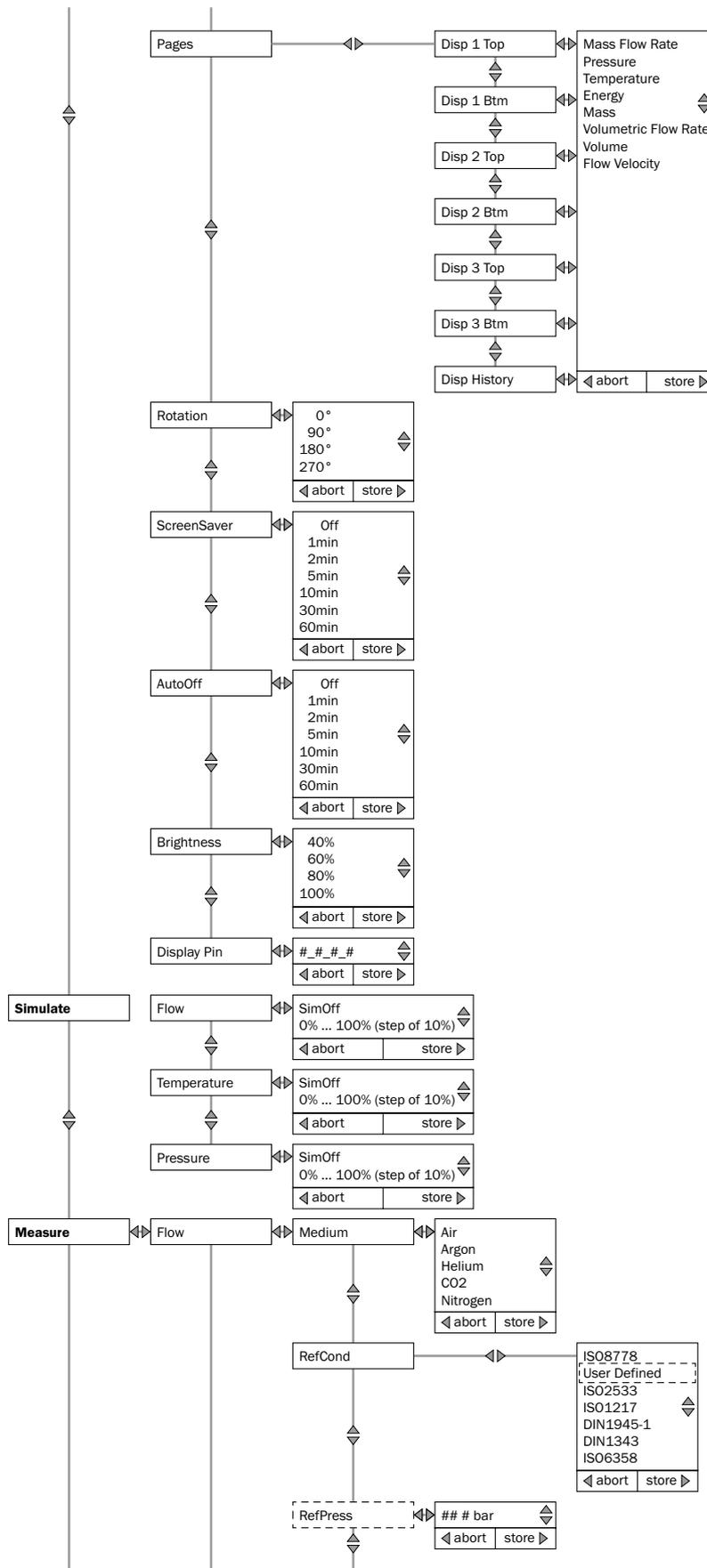
17 Menu overview

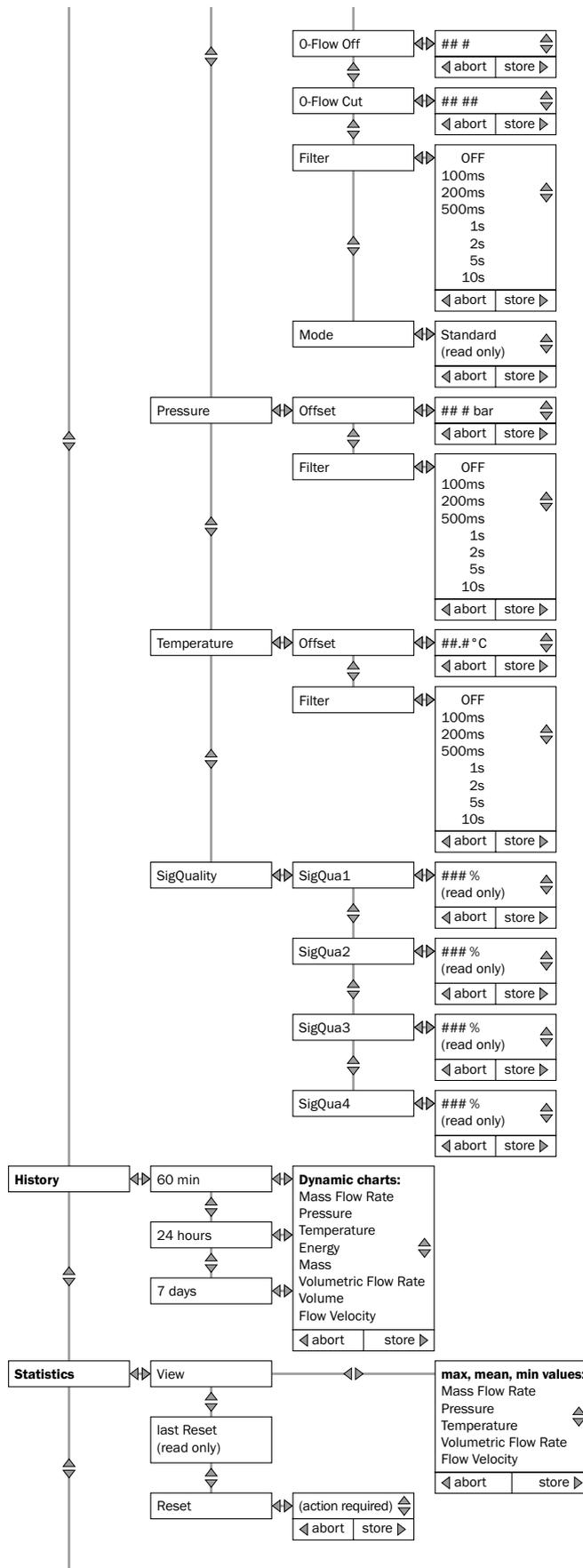
17.1 Industrial variant

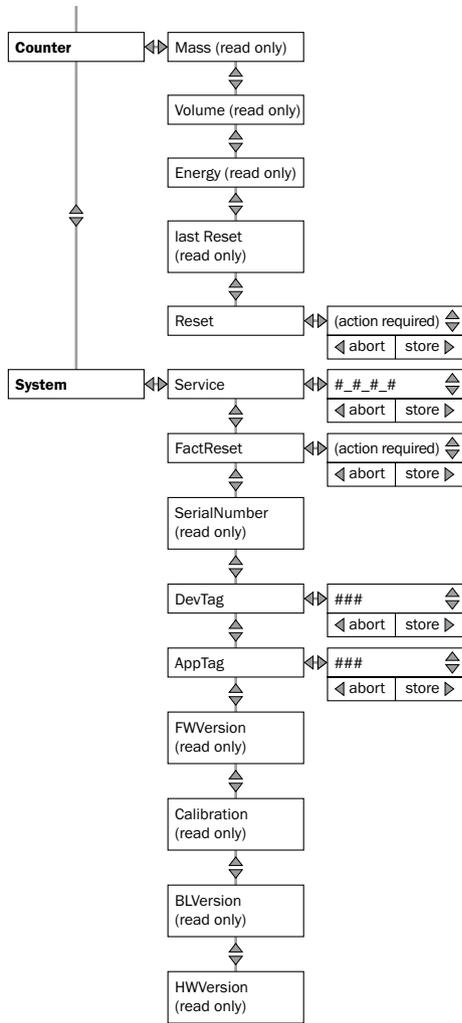




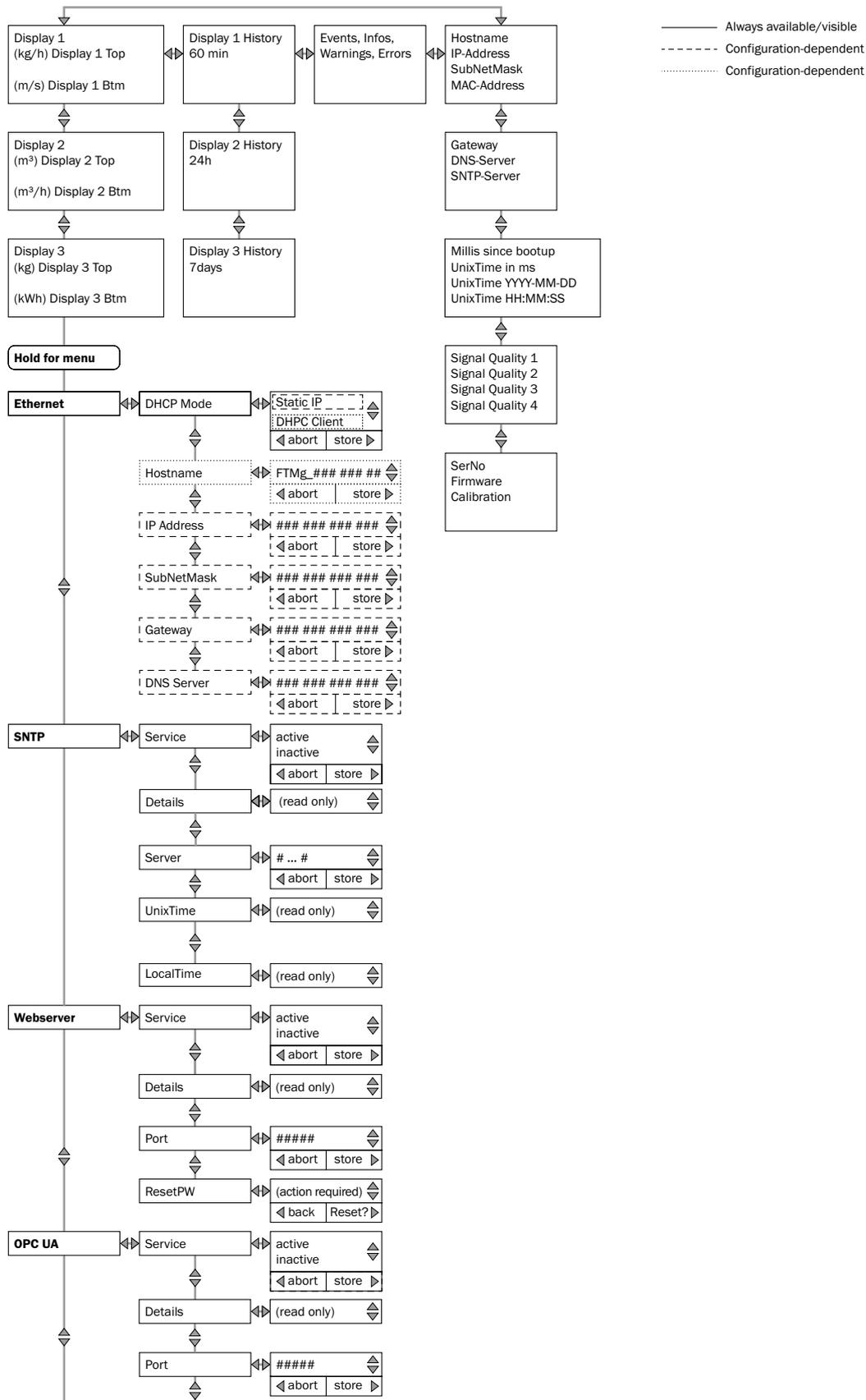


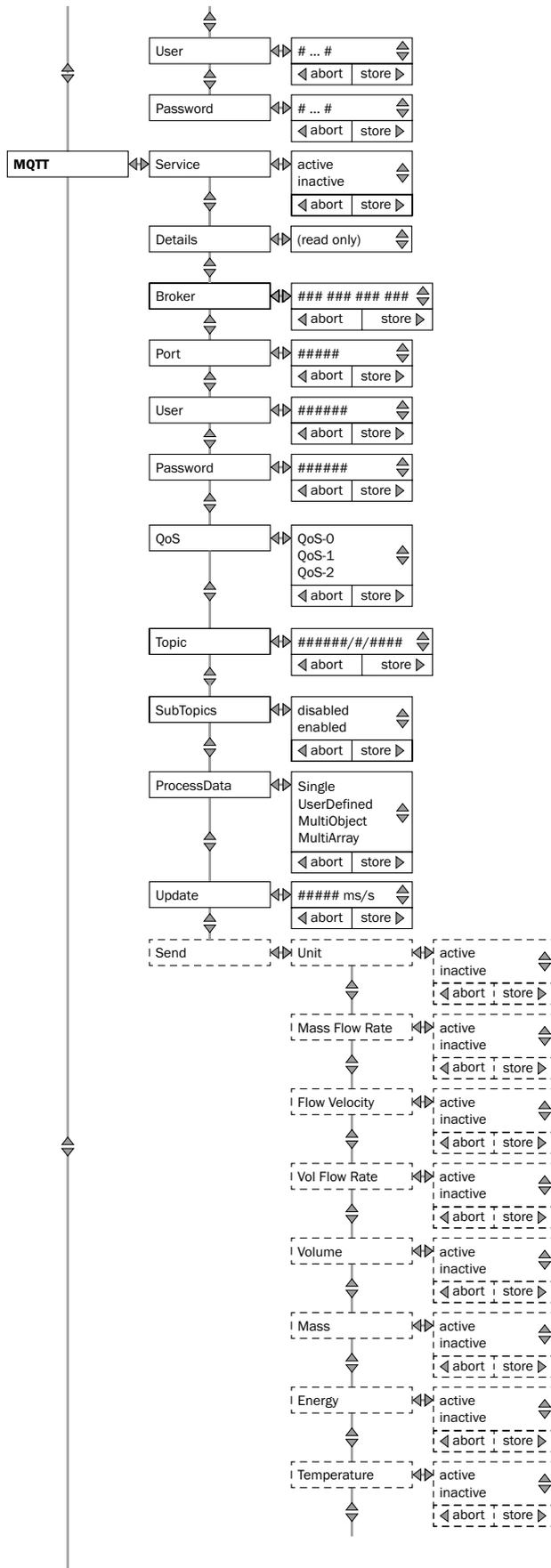


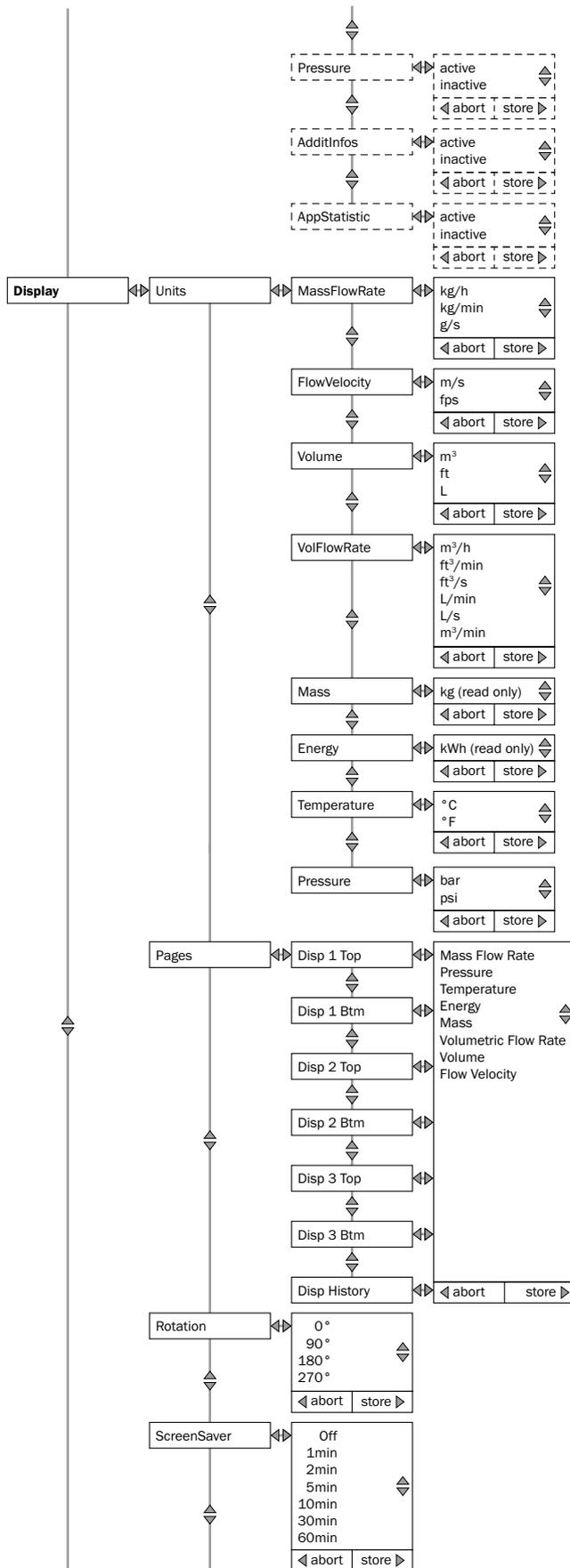


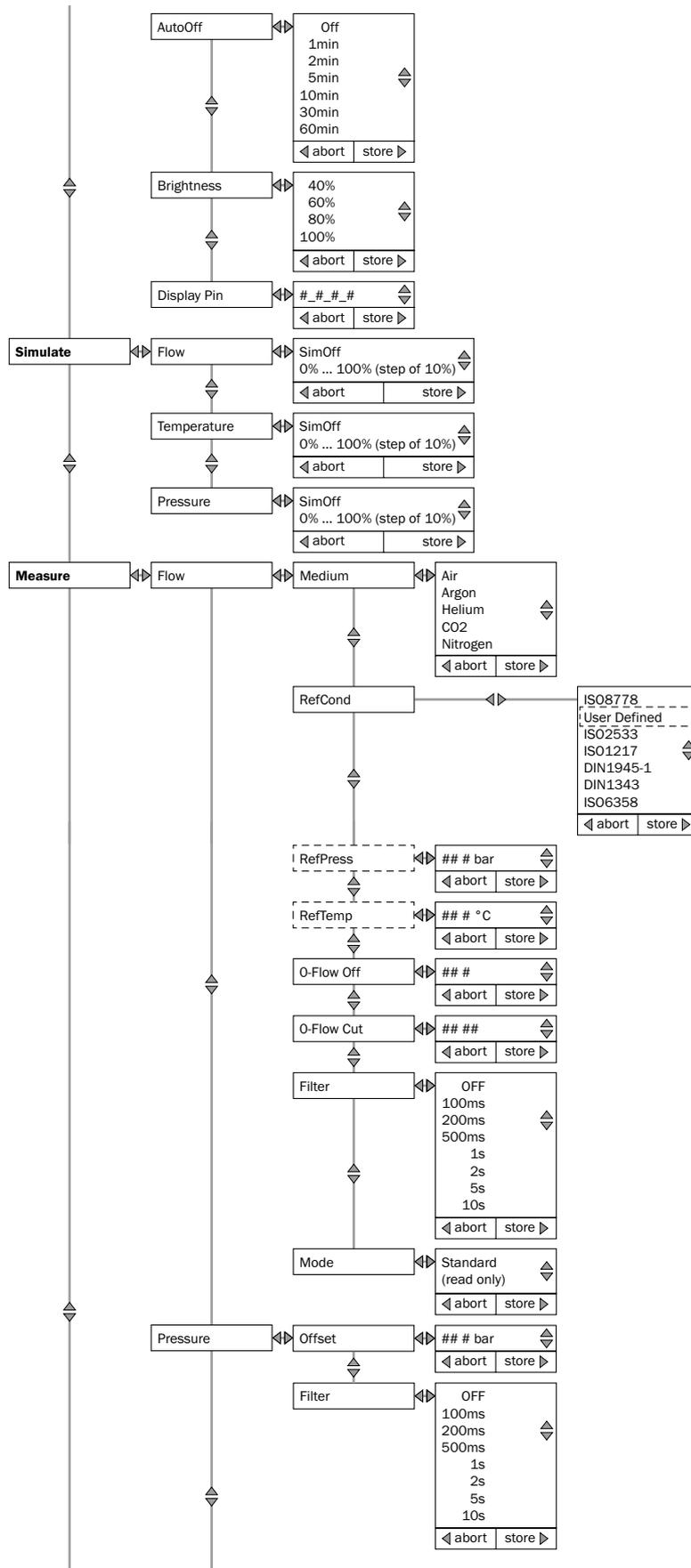


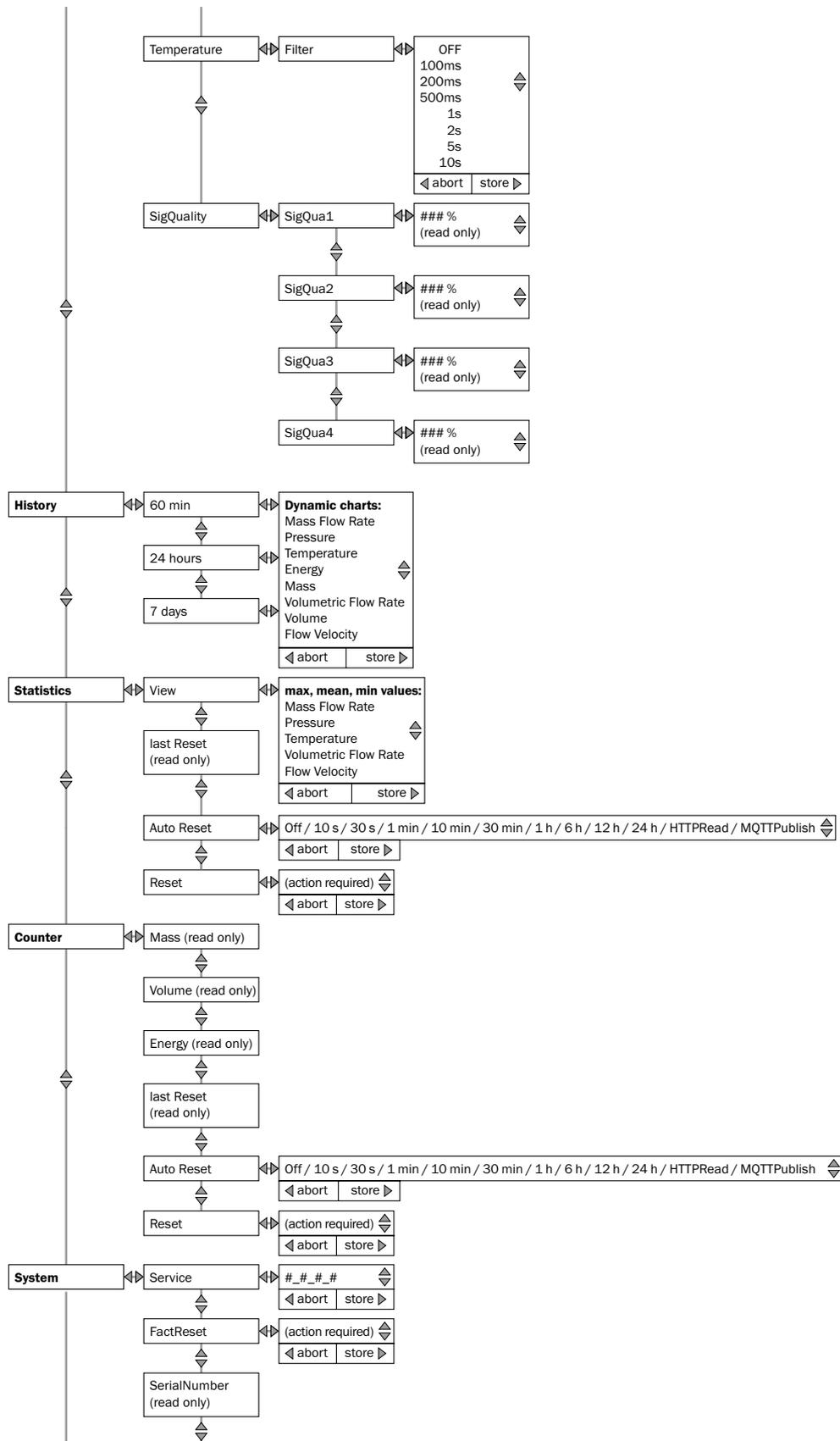
17.2 Ethernet variant

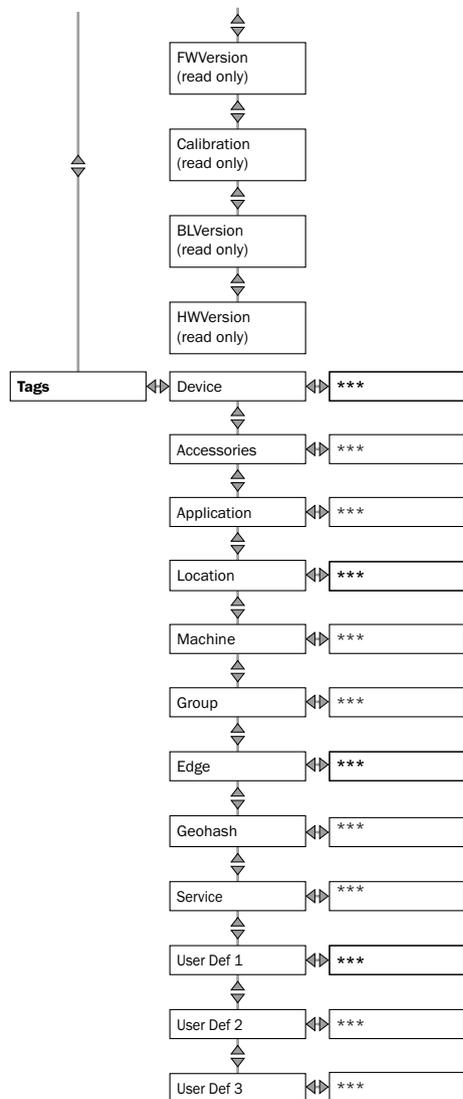












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