

# T-EASIC FTS

Flow sensor

**SICK**  
Sensor Intelligence.

en



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**Described product**

T-Easic FTS

**Manufacturer**

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[sick.com/T-Easic\\_FTS](https://sick.com/T-Easic_FTS)

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**Translation of the original document**

This document is a translation of the original document published by SICK AG.



**IO-Link**

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## 1 About this document

### 1.1 About the operating instructions

These operating instructions contain important information on the use of sensors from SICK AG.

Conditions for safe work:

- Adherence to all safety instructions and handling instructions.
- Adherence to all locally applicable accident prevention regulations and general safety regulations for sensor applications.

The operating instructions are intended specifically for qualified personnel and electricians.



#### NOTE

Please read these operating instructions carefully before starting work with the device in order to familiarize yourself with the device and its functions.

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These operating instructions must be kept in the immediate vicinity of the device at all times for easy access. If the device is passed on to third parties, these operating instructions must also be handed over.

These operating instructions do not contain any information on the operation of the system in which the sensor is integrated. Information on this can be found in the operating instructions of the corresponding system.

### 1.2 Scope

These operating instructions explain how to install a sensor in a customer system. It provides step by step instructions for all required actions.

These instructions apply to all available versions of the sensor.

For more detailed information on how to identify your device type, see “3.1.2 Type code”.

The available device versions are listed online on the product page:

► [www.sick.com/T-Easic\\_FTS](http://www.sick.com/T-Easic_FTS)

Different device versions serve as examples for commissioning, whereby the default parameter settings are used for each respective device.

In this document, the T-Easic® FTS (Flow Thermal Switch) is referred to in simplified form as T-Easic® or FTS, except in cases where a distinction must be made between the device versions due to different technical features or functions. In such cases, the full type designation is used.

### 1.3 Definition of the symbols used

Warnings and important information contained in this document are marked with symbols. Warnings are always introduced by signal words describing the severity of the particular hazard. These warnings must be heeded at all times. Likewise, special care must always be taken to prevent accidents, injuries and material damage.



#### DANGER

... indicates a situation of imminent danger that will result in life-threatening or serious injury if not prevented.

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**WARNING**

... indicates a potentially hazardous situation which, if not prevented, will result in death or serious injury.

**CAUTION**

... indicates a potentially hazardous situation that will result in minor/mild injury if not prevented.

**IMPORTANT**

... indicates a potentially harmful situation that may result in material damage if not prevented.

**NOTE**

... highlights valuable tips and recommendations, as well as information for effective and smooth operation.

## 1.4 Further information

**CONFORMITIES AND CERTIFICATES**

At [www.sick.com](http://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).

More 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
- further publications relating to the sensors described here (e.g., IO-Link)
- Publications about accessories

## 1.5 Customer service

If you require technical support, our customer service department will be happy to assist you. You can find the representative responsible for you on the last page of this document.

**NOTE**

To ensure a quick response to your questions, please note down all sensor details (e.g., type code and serial number, etc.) before calling.

## 2 Safety information

### 2.1 Intended use

The T-Easic® is a flow sensor for liquids (defined in “11 Technical data”) which operates on the basis of the calorimetric measurement principle. It converts the flow rate and temperature of the medium into an electrical signal, thereby providing the following measurands:

- Velocity (absolute)
- Velocity (relative)
- Volume flow
- Volume
- Temperature

The information about the flow rate and average temperature of the liquid is shown on the OLED display (industrial version only). In addition, flow and temperature data are also available via IO-Link. Two switching output elements or the pulse output can be configured to control the flow and temperature. Some variants also have an additional analog output.

The sensor meets the requirements of EN 61326-2-3 for industrial environments.

### 2.2 Improper use

The sensor is not a safety component under the meaning of the EU Machinery Directive (2006/42/EC).

The sensor must not be used in potentially explosive atmospheres.

It is not permitted to open the housing of the T-Easic®.

Any use outside the specified areas, in particular use outside the technical specifications and in contradiction to the requirements related to the intended use, is considered improper use.

If the device is not used according to the specifications in this document, the protection provided by the device may be impaired.

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

### 2.3 Limitation of liability

In compiling the data and information in these operating instructions, which are based on our many years of knowledge and experience, the applicable standards and regulations as well as the latest state of technical development have been taken into account. The manufacturer assumes no liability for any damage due to:

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

In the case of special variants for which special features have been ordered, or due to recent technical changes, the scope of delivery may differ from the features described here and shown in the illustrations.

## 2.4 Modifications and conversions



### IMPORTANT

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

Tampering with or modifying the sensor or the SICK software will void any warranty claims against SICK AG. This applies in particular to opening the housing, including during mounting and electrical installation.

The prior written consent of the manufacturer must be obtained before making any technical modifications or conversions to the sensor.

Never install or connect accessories if their scope and makeup are not clearly described or if they have not been approved by SICK AG.

## 2.5 Requirements on technical and operating personnel



### WARNING

#### Risk of injury due to inadequate training.

Improper handling of the sensor can lead to significant personal injury and damage to property.

- All work must be carried out exclusively by the designated persons.

The operating instructions list the qualification requirements for the various fields of work:

- **Instructed personnel** have been instructed by the operator in the tasks assigned to them, and have been informed about the potential hazards resulting from incorrect procedures.
- **Skilled personnel** have the specialized training, skills and experience, as well as knowledge of the relevant regulations, to perform the tasks assigned to them and to recognize potential hazards independently.
- **Skilled electricians** have the specialized training, technical skills and experience, as well as knowledge of the relevant standards and regulations, to be able to perform work on electrical systems and recognize potential hazards independently. In Germany, qualified electricians must meet the requirements of the BGV A3 Ordinance on Industrial Safety and Health (e.g., master electricians). Other applicable regulations in other countries must be observed.

The following qualifications are necessary for the various tasks:

Activities	Qualification
Mounting, maintenance	<ul style="list-style-type: none"><li>• Basic practical technical training</li><li>• Knowledge of the current workplace safety regulations</li></ul>
Electrical installation, device replacement	<ul style="list-style-type: none"><li>• Practical electrical training</li><li>• Knowledge of current electrical safety guidelines</li><li>• Knowledge of device control and device operation in the relevant application (e.g., conveyor line)</li></ul>
Commissioning, configuration	<ul style="list-style-type: none"><li>• Basic knowledge of the control system used</li><li>• Basic knowledge of the design and setup of the described connections and interfaces</li><li>• Basic knowledge of data transmission</li></ul>
Operating the device in the relevant application	<ul style="list-style-type: none"><li>• Knowledge of device control and device operation in the relevant application (e.g., CIP/SIP system)</li><li>• Knowledge of the software and hardware environment in the relevant application (e.g., CIP/SIP system)</li></ul>

### 2.6 Operational safety and specific hazards

- Observe the safety information and warnings given here and in other chapters of these operating instructions to reduce the risk of health hazards and to avoid dangerous situations.

### 2.7 Use at high operating temperatures

At a process temperature above 50 °C, the sensor housing may become hot.



#### CAUTION

##### Danger of burns on the sensor housing

- Only touch the hot housing if you are wearing safety gloves.
- Avoid contact of the sensor with flammable substances.

### 2.8 Basic safety instructions

- Read these operating instructions before commissioning the device.
- These operating instructions are valid for devices with a firmware version of 2.0.0 or higher.
- The T-Easic® is not a safety component under the meaning of the EU Machinery Directive.
- Observe the national accident prevention regulations/safety rules.
- Wiring work and the opening and closing of electrical connections must only be carried out in a de-energized state.
- The sensor must not be connected to the voltage supply until it has been installed in the pipeline system as described in [“5 Mounting”](#).
- The radiated power is significantly lower than that of telecommunications equipment.  
According to current scientific knowledge, the operation of this device can be classified as safe and non-hazardous.

### 3 Product description

#### 3.1 Product identification

##### 3.1.1 Information about the housing

Information identifying the sensor (serial number, part number, and type code) and the electrical connection are provided on the housing (see label) of the sensor.

##### 3.1.2 Type code

T-Easic FTS	-	I	10	0	F	1	4	A
1		2	3	4	5	6	7	8

Position	Description
1	<b>Product group</b> T-Easic® FTS (flow sensors)
2	<b>Type</b> I: Industrial version H: Hygienic version
3	<b>Probe length</b> 06: 60 mm 10: 100 mm 20: 200 mm
4	<b>Process connection</b> 0: without process connection 1: Clamping ring
5	<b>Media</b> F: Liquids
6	<b>Display</b> 0: No 1: Yes (OLED +3 status LEDs)
7	<b>Electrical connection</b> 4: M12, 4-pin
8	<b>Electrical power</b> A: 1 digital output +1 digital input/output B: 1 digital output + 1 digital input/ output/ analog output



#### NOTE

Not all versions with the type code can be combined

### 3.2 Product characteristics

#### 3.2.1 Device view

The T-Easic® is offered in two versions:

- Industrial version with display, operating buttons and VISTAL® housing
- Hygienic version with 1.4404 stainless steel housing (316L).

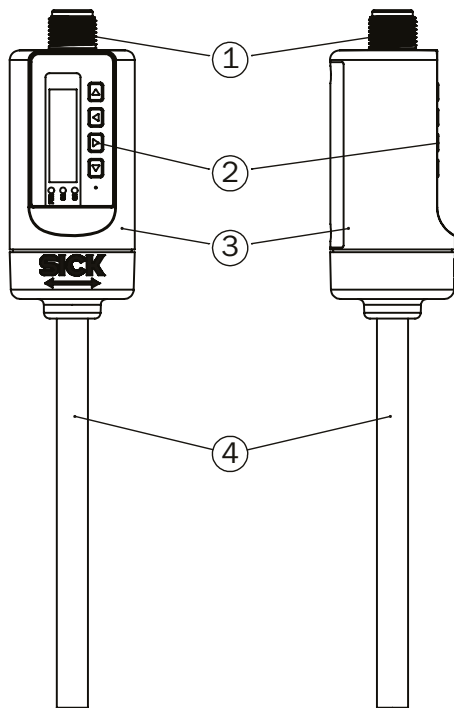


Fig. 1: View of the industrial version T-Easic®

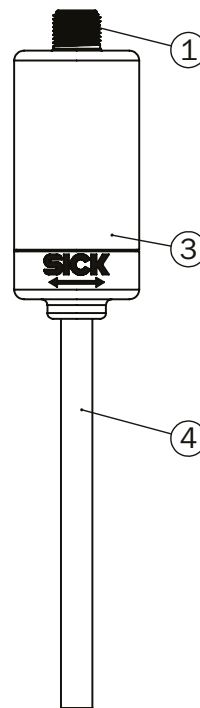


Fig. 2: View of the hygienic version T-Easic®

- ① M12 electrical connection
- ② Display with operating buttons and LEDs
- ③ Housing
- ④ Measurement probe

#### 3.2.2 Operating buttons (industrial version only)

The sensor is controlled using the display and the operating buttons (industrial version only).

A detailed description of the buttons and their functions can be found in [“7.2.1 Display, LEDs and operating buttons \(industrial version only\)”](#).



#### NOTE

Both versions of the T-Easic® can be programmed using SICK SOPAS-ET via the IO-Link 1.1 communication interface.

Information on IO-Link can be found in [“7.2.4 IO-Link”](#).

### 3.3 Product features and functions

#### 3.3.1 Principle of operation

The T-Easic® FTS (Flow Thermal Switch) monitors the flow rate of liquids (e.g., water, aqueous media, oil, etc.).

This measurement method is based on the calorimetric principle. The sensor measures the cooling effect of the liquid flowing past the heated measurement probe. The higher the flow rate of the liquid, the greater the cooling effect on the heated probe.

The sensor has two configurable switching outputs (Q1 and Q2) for flow and temperature. Q1 can also be used for empty pipe detection. The sensor can detect whether there is medium at the sensor tip and thereby detect an empty pipe.

The Q1 switching output also has an IO-Link interface (see “7.2.4 IO-Link”).

Q2 can also be used as a pulse output or digital input.

Depending on the electrical version (“3.1.2 Type code”), Q2 can also be used as an analog output.

#### Fields of application

The T-Easic® is particularly suitable for measurement tasks relating to coolant circuits, pumps, heat exchangers, leak monitoring for process lines, dry-running protection for pumps, as well as monitoring the oil in hydraulic systems, the lubrication of wind turbines, and hydraulic circuits. Due to its high temperature resistance, the T-Easic® is also suitable for use in SIP (Sterilization in Place) processes.

### 4 Transport and storage

#### 4.1 Transport

For your own safety, read and observe the following instructions:



##### IMPORTANT

##### Damage to the sensor due to improper transport.

- When being transported, the device must be packed in a shockproof manner and protected against moisture.
- Recommendation: Use the original packaging as it offers optimal protection.
- Transport should only be carried out by qualified personnel.
- Always exercise the utmost care and caution when unloading and transporting the sensor within your company.
- Pay attention to the symbols on the packaging.
- Do not remove the packaging until immediately before starting the installation.

#### 4.2 Transport inspection

Immediately after receipt of the goods, check the delivery for completeness and any damage that may have occurred during transport. Proceed as follows in the event of externally visible transport damage:

- Do not accept the delivery, or only with reservations.
- Note the extent of damage on the transport documents or on the carrier's delivery bill.
- Submit a complaint.



##### NOTE:

Defect complaints should be submitted immediately after they are noticed. Claims for damages can only be made prior to expiry of the relevant complaint period.

#### 4.3 Storage

Store the device under the following conditions:

- Recommendation: Use the original packaging.
- Do not store outdoors.
- Store in a dry and dust-protected place.
- Do not store in an airtight container: This does not allow any residual moisture to escape.
- Do not expose to aggressive substances.
- Protect from sunlight.
- Avoid mechanical shocks.
- Storage temperature range: see ["11 Technical data"](#).
- For storage periods longer than 3 months, regularly check the general condition of all components and the packaging.

## 5 Mounting

### 5.1 Installation conditions

When installing the sensor, the system must be de-pressurized and the pipe in which the sensor is to be installed must be empty.

For flow and temperature measurement, the inserted probe must always be completely enclosed by the medium. If the sensor is used for empty pipe detection, the sensor detects whether there is medium at the sensor tip and can thereby detect an empty pipe.

The minimum insertion depth ③ of  $\geq 12$  mm must be adhered to.

The cutting ring of the process connection adapter ① must be  $\geq 25$  mm away from the probe tip ② to avoid damage to the sensor element.

The sensor probe should be positioned in the middle of the pipe and must not be in contact with the pipe wall.

A minimum distance of  $\geq 10$  mm from the tip of the probe to the pipe wall must be maintained ④.

For medium temperatures above  $100^\circ\text{C}$ , the distance between the bottom of the housing and the top of the process connection adapter must be at least 25 mm ⑤.



#### NOTE:

If a Sick process connection adapter is used (see “14 Accessories”), the 60 mm probe cannot be used at process temperatures above  $100^\circ\text{C}$  as the distances cannot be maintained.

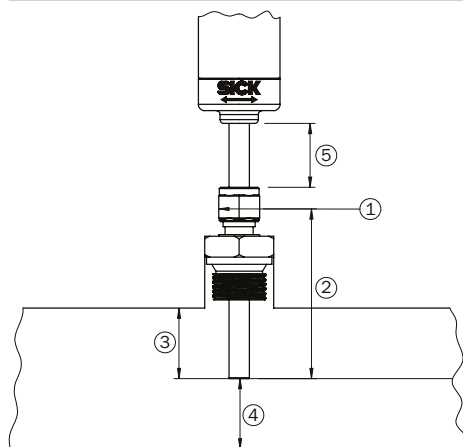


Fig. 3: Minimum lengths during installation

- ① Clamping area of the cutting ring
- ② Distance between the cutting ring threaded connection and probe tip  $\geq 25$  mm
- ③ Insertion depth  $\geq 12$  mm
- ④ Distance from the probe tip to pipe wall  $\geq 10$  mm
- ⑤ Distance between the bottom of the housing and the top of the process connection adapter at temperatures above  $100^\circ\text{C}$ :  $\geq 25$  mm

The inlet zone before the sensor should be at least 5 to 10 times the pipe diameter. The outlet zone after the sensor should be at least 3 to 5 times the pipe diameter.

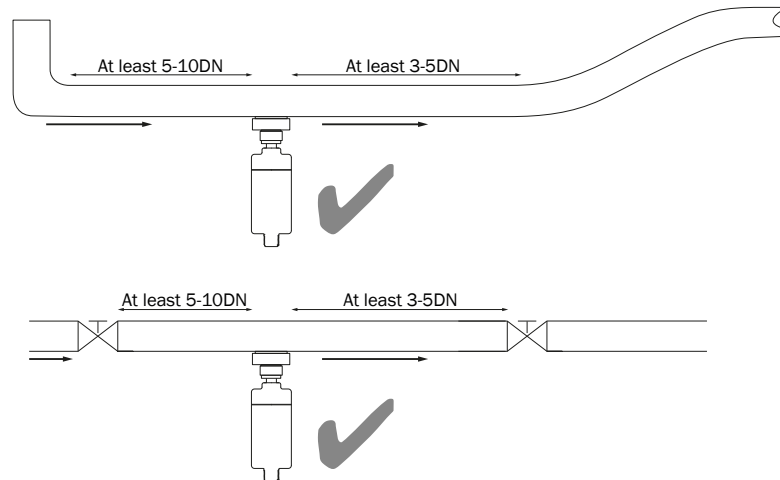


Fig. 4: Recommended inlet and outlet zones

For vertically installed pipes, installation in the riser is recommended. The sensor must not be installed in front of or in a downpipe, or in an open downpipe.

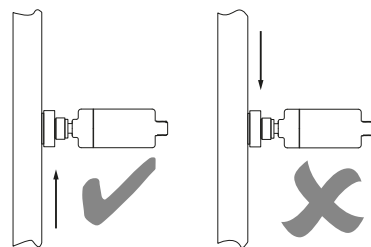


Fig. 5: Vertical installation position

For horizontal pipes, side mounting or mounting from below is possible (only applies if the pipe is free of deposits).

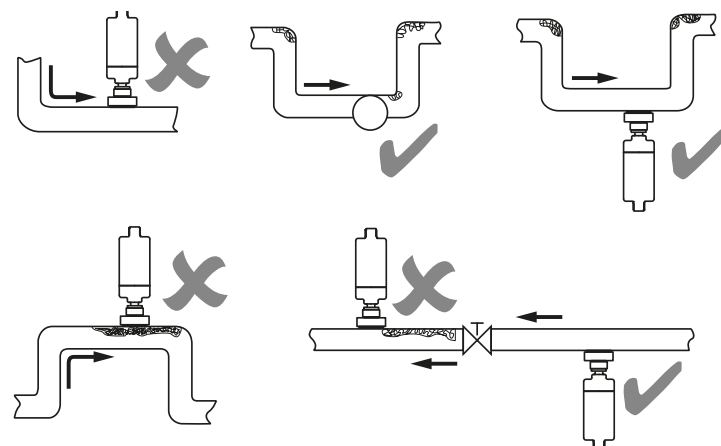


Fig. 6: Horizontal installation position

Mounting from above is only possible if the pipeline is completely filled with medium.

## 5.2 Probe alignment to flow direction

For optimum measurement accuracy, make sure that the arrow on the bottom shell of the sensor is aligned in the direction of flow.

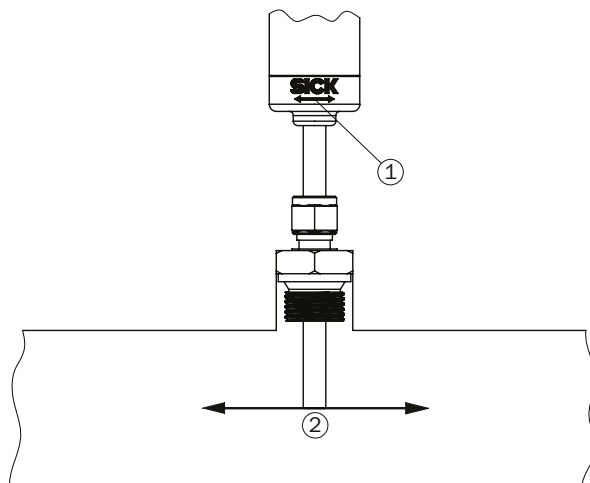


Fig. 7: Probe alignment to the flow direction

- ① Arrow on the bottom shell of the housing
- ② Flow direction



### NOTE

For different installation conditions or a different probe alignment, the measurement accuracy cannot be maintained.

## 5.3 Probe alignment for empty pipe detection

For optimum empty pipe detection, make sure that the sensor is installed laterally in the pipeline and that the medium can flow off the sensor tip well. The pipe will only be detected as empty if the probe is uncovered and free of debris.

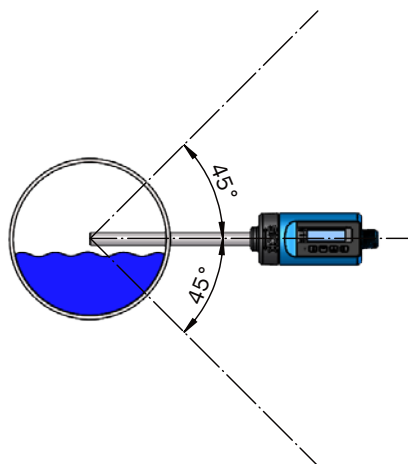


Fig. 8: Alignment of the T-Easic® for empty pipe detection.

### 5.4 Mounting the sensor

1. Stop the flow.
2. Depressurize the system.
3. Empty the pipe in which the sensor is to be installed.
4. Install the process connection adapter or T-piece at the desired installation location and ensure that the interfaces are sealed.
5. Install the sensor in the process connection adapter or in the T-piece (see [“5.5 Mounting the process connection adapter”](#) and [“5.7 Mounting in a T-piece”](#)).



#### IMPORTANT

##### Leak

- When sealing the process connection and pipe, take into account the operating pressure so as to select the correct sealing method.

### 5.5 Mounting the process connection adapter

Only use original adapters from SICK. These are available as accessories (see [“14 Accessories”](#) on page 66).

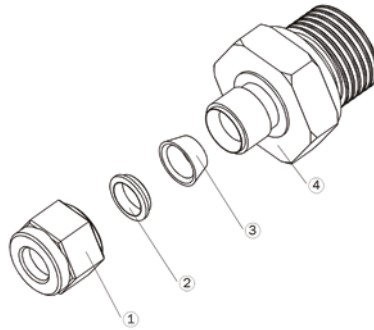


Fig. 9: Parts of the process connection adapter

- ① Coupling nut
- ② Rear clamping ring
- ③ Front clamping ring
- ④ Process connection

1. Insert the probe of the sensor into the process connection adapter and adjust the adapter to the correct height (see [“5.1 Installation conditions”](#)).
2. Hand tighten the coupling nut until the probe can no longer be turned by hand or moved axially in the connection.
3. Mark the coupling nut in the 6 o'clock position.
4. Hold the process connection with an open-end wrench (width across flats 27) and tighten the coupling nut 1 1/4 turns to the 9 o'clock position. For this purpose, use an open-end wrench with a width across flats of 16.

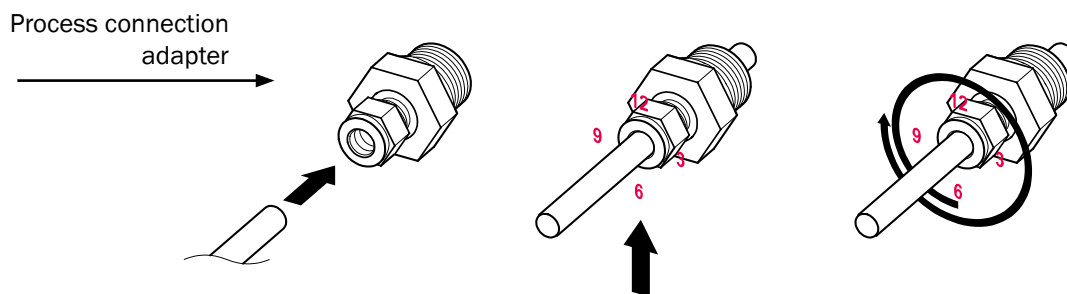


Fig. 10: Mounting a process connection adapter on the sensor probe

## 5.6 Removing the process connection adapter



### CAUTION

#### Print

Always depressurize the system. Stop the flow and drain the pipe before removing the sensor.

To remove the process connection adapter from the sensor probe:

1. Before removing the adapter, mark the pipe on the outer edge of the coupling nut. Draw a line across the flat surface of the coupling nut and the union body.
2. Use this mark to reattach the coupling nut to the original position when remounting the adapter.
3. Insert the probe with the assembled cutting ring into the fitting body until the front cutting ring is seated on the fitting body.
4. Hold the fitting body while tightening the coupling nut to the old position (marked on the pipe and flat surface) with a wrench. At this point, the resistance increases noticeably. Tighten the coupling nut slightly.

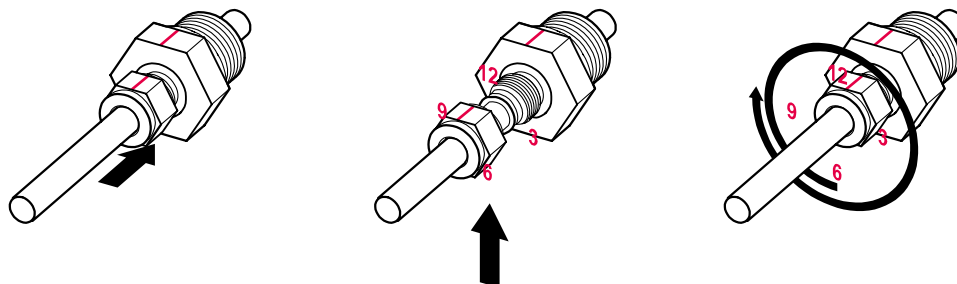


Fig. 11: Removing a process connection adapter from the sensor probe

## 5.7 Mounting in a T-piece

Use only original T-pieces from SICK. These are available as accessories (see [“14 Accessories”](#)).

When mounting in these T-pieces, use the sensor variants with a permanently pre-mounted clamping ring (see [“3.1.2 Type code”](#) position 4).

During installation, insert the sensor with pre-assembled clamping ring into the T-piece until the clamping ring is seated in the nozzle. Align the sensor so that the arrow on the bottom shell of the sensor points in the direction of flow. Hold the T-piece in place while tightening the coupling nut until there is noticeable resistance. Slightly tighten the coupling nut at this point using an open-end wrench with a width across flats of 16.

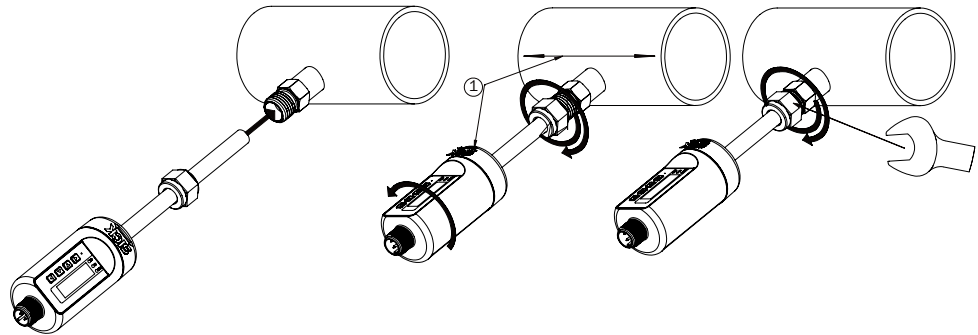


Fig. 12: Mounting the T-Easic® with permanently pre-mounted clamping ring in a T-piece



### NOTE

Removal of the sensor with pre-assembled clamping ring from the T-piece is carried out in the same way as described in [“5.6 Removing the process connection adapter”](#).

## 6 Electrical installation

### 6.1 Safety

#### 6.1.1 Notes on electrical installation



##### IMPORTANT

##### Device damage due to incorrect supply voltage!

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

- 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 the wiring when the power is off.
- The voltage supply must be disconnected when attaching and detaching electrical connections.

- Only qualified electricians are allowed to perform the electrical installation work.
- Always comply with standard safety requirements when working on electrical systems.
- Only switch on the supply voltage for the device when all connections have been established and the wiring has been thoroughly checked.
- When using extension cables with flying leads, make sure the bare wire ends do not touch (risk of short-circuit when the supply voltage is switched on). All cables must be properly insulated from each other.
- The wire cross-section of the supply cable from the user's voltage supply system must be designed in accordance with the applicable standards. In Germany, the following standards must be observed:  
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 circuits with safety extra-low voltage (SELV) and protective extra-low voltage (PELV).
- Protect the device with a separate fuse at the input of the supply circuit.



##### NOTES REGARDING the layout of data cables:

- Use only shielded data cables with twisted wires.
- Make sure that the shielding is correct and complete.
- 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 in cable ducts in parallel with voltage supply cables or motor cables over longer distances.

The IP67 and/or IP69 enclosure rating of the device is only achieved under the following conditions:

- The cable connected to the M12 connection is screwed tight.

If this is not the case, the device will not meet the specified IP enclosure rating.

## 6.2 Electrical connection

### 6.2.1 Overview of the electrical connections

The sensor is connected using a pre-assembled female cable connector with an M12 x 1 (4-pin) plug connector. For more information on the available cables, please refer to “14 Accessories”.

In the de-energized state, plug the female cable connector into the sensor and screw it tight.

Connect the cables according to their function. After the supply voltage has been switched on, the display (industrial version only) shows the current measured values.



#### IMPORTANT

All connections are reverse polarity protected, however, in the event of incorrect connection of the supply voltage, the sensor might appear to be operating correctly but this may not be the case.

The T-Easic® FTS is available in two different electrical versions: A and B (see “3.1.2 Type code” position 8).

The electrical version B differs from version A only by having an additional analog output on Q2.

### 6.2.2 Pin assignment, M12 plug connection, 4-pin, version A

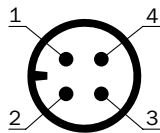


Fig. 13: M12 x 1 plug connection, 4-pin

Contact	Identification	Wire color	Description
1	L+	Brown	Supply voltage
2	Q2	White	Switching output/push-pull/pulse output/digital input
3	M	Blue	Weight
4	C/Q1	Black	Switching output/push-pull/IO-Link communication

The above table shows only the standard pin assignment. Other pin assignments are possible.

### 6.2.3 Pin assignment, M12 plug connection, 4-pin, version B

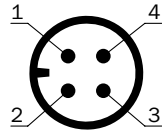


Fig. 14: M12 x 1 plug connection, 4-pin

Contact	Identification	Wire color	Description
1	L+	Brown	Supply voltage
2	Q2 /Qa	White	Switching output/push-pull/pulse output/ digital input/analog output (4...20mA scalable)
3	M	Blue	Weight
4	C/Q1	Black	Switching output/push-pull/IO-Link communication

The above table shows only the standard pin assignment. Other pin assignments are possible.

## 7 Commissioning

### 7.1 Quick commissioning (with factory settings)

Quick commissioning is used when operating under reference conditions (see [“5.1 Installation conditions”](#)).

#### Commissioning

1. Install the sensor according to the installation conditions as described in [“5 Mounting”](#). While installing the T-Easic®, the pipe system must be empty and pressure-free.
2. Switch on the supply voltage.  
The sensor performs a self-test and is then ready for operation (with default settings: see [“13 Factory settings”](#)).

The display (industrial version only) shows the current measured values.

Should any problems arise during commissioning, you will find information under [“8 Troubleshooting”](#).

### 7.2 Operation

The industrial version of the T-Easic® is controlled via the display using the operating buttons.

A detailed description of the operating buttons and their functions can be found under [“7.2.1 Display, LEDs and operating buttons \(industrial version only\)”](#).

The T-Easic® (hygienic and industrial variant) can be configured via the IO-Link 1.1 communication interface (see [“7.2.4 IO-Link”](#)).

#### 7.2.1 Display, LEDs and operating buttons (industrial version only)

The OLED display shows settings, values, information, and error messages. The OLED display turns off automatically after 10 minutes of non-use. It can be turned on again by pressing any key.

The display is aligned horizontally to the axis of the measurement probe. It can be rotated (figures shown) by 180° (see [“7.4.17 Display Rotation \(industrial version only\)”](#) on page 47).



Fig. 15: Display (industrial version only)

Use the arrow keys and the display to navigate through the menu structure.

Use the right and left arrow keys to navigate between the individual menu items.

Use the up and down arrow keys to select between the different options within a menu and to change values. Your selection will be applied immediately.

You can also use the down arrow key to open a submenu.

### 7.2.2 Information shown on the display (industrial version only)

The display shows the current values for flow and temperature. Which value is shown in the upper or lower part of the display is configurable (see “7.4.16 Display Mode (industrial version only)”). If there is an additional information or warning, the display alternates between this message and the current values every 3.5 seconds.

If there is more than one information (or warning/error message; up to three are possible), the display alternates between the messages and the current values every 2 seconds. For more information on the messages shown on the display, see “8.1 Error message shown on the display (industrial version only)”.

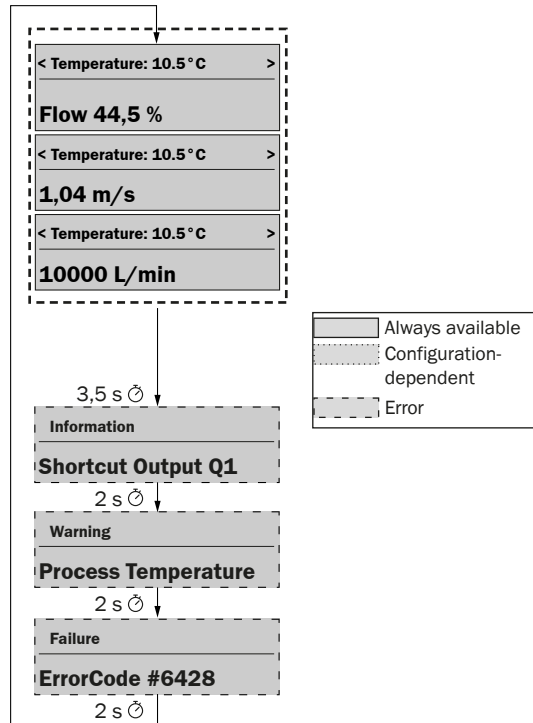


Fig. 16: Home screen and error messages

### 7.2.3 LEDs (industrial version only)

To the left of the display there are three LEDs that indicate the following:

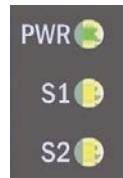


Fig. 17: LEDs for industrial version

LED	Status on	Status off	Status flashing
PWR	Supply voltage is on	Supply voltage is not on	Flashes during IO-Link communication
S1	Switching output Q1 active	Switching output Q1 inactive	Device in error state (see displayed message)
S2	Switching output Q2 active or High signal applied at switching input Q2	Switching output Q2 inactive or Low signal applied at switching input Q2 or pulse output active or analog output active	Device in error state (see displayed message)

**IMPORTANT**

If the device is in the error state, S1 and S2 flash simultaneously (check displayed message).

#### 7.2.4 IO-Link

To operate the device via IO-Link, an IODD file, function blocks for common PLCs, and a description of the available telegram parameters can be downloaded from [www.sick.com](http://www.sick.com).

### 7.3 Measurement configuration

The sensor can be configured by means of various measurement parameters.

First of all, you need specify whether the sensor is to be operated in **Velocity (relative or absolute)** or **Volume ( volume flow or counter)** mode, or whether it is to be taught-in (**Teach**).

Secondly, you can select from three different medium options (water, oil A, oil B).

There are several ways to configure **Measurement Mode**:

- **Velocity relative (%)**: The velocity is displayed as a percentage of the full scale value.
- **Velocity absolute**: The velocity is displayed as an absolute measured value in the unit selected for **Unit Velocity** (see “7.4.2 Unit Velocity”).
- **Volume flow**: The volume flow is displayed as an absolute measured value in the unit selected for **Unit Volume Flow** (see “7.4.3 Unit Volume Flow”).
- **Volume counter**: The volume counter is displayed as an absolute measured value in the unit selected for **Unit Volume** (see 7.4.4 “Unit Volume”). If this measurement mode is set, there is an option in the display to reset the volume counter (Reset Volume). The volume counter is automatically reset each time the device is restarted. To output the volume counter, pulse output must be selected in Q2.
- **Teach relative (%)**: If the medium to be measured differs from the available preset media (water, oil A or oil B), a teach-in operation can be performed to optimize the performance of the sensor. The flow rate is then displayed as a percentage of the flow range between the taught-in maximum and minimum flow. The sensor gives you the option to teach-in three different media and to store them in the sensor (see 7.3.2 “Configuring the measurement mode based on the “Teach relative” mode (example)”).

If the sensor is operated in Velocity (relative or absolute) or Volume (volume flow or counter) mode, the medium can be selected from three different options (water, oil A, oil B). The closer the actual medium is to the selected type, the better the performance of the sensor.

**Oil A** and **oil B** have the following specifications:

- **Oil A:** Viscosity 5 cSt at 26 °C
- **Oil B:** Viscosity 49 cSt at 26 °C

If the sensor continuously displays 0% or 100% even though the correct medium has been selected, then the selected medium does not fit. Please teach in the medium via the **Teach relative** menu item (see 7.3.2 “Configuring the measurement mode based on the “Teach relative” mode (example)”).



#### NOTE

The T-Easic® FTS is calibrated with water at the reference conditions (inner pipe diameter 25 mm, vertical installation in the pipe, tip in the middle of the pipe, probe oriented in the pipe as described in section “5.2 Probe alignment to flow direction”, completely filled pipe without air bubbles, velocity between 10 cm/s and 100 cm/s, inlet zone > 30 cm, outlet zone > 30 cm, 26 °C ± 1 °C, 2 bar ± 1 bar). The media OIL A and OIL B are taught-in. If you are using different medium, this can result in deviations in the measurement accuracy.

### 7.3.1 Configuring the measurement mode based on the volume (volume flow and counter) (example)

1. Use the arrow keys (left/right) to select the **Measurement Mode** menu.
2. Use the arrow keys (up/down) to select the **Volume (flow and counter)** parameter.
3. Use the right arrow key to select the **Medium** parameter.
4. Use the arrow keys (up/down) to select **Water, Oil A** or **Oil B**.
5. Use the right arrow key to select **Pipe Diameter**. (The pipe inner diameter only needs to be entered in Volume measurement mode and is only visible in this mode. The unit for the diameter can be selected in the advanced menu settings, see “7.4.1 Unit Pipe Diameter”).
6. Increase or decrease the value using the arrow keys (up/down).
7. To output the volume counter, pulse output must be selected in Q2. The pulse width and pulse valency can be entered here in the “Pulse Width” and “Pulse Valency” fields.  
The volume flow can be output via the switching outputs Q1 and/or Q2 or, depending on the electrical version, via the analog output.

### 7.3.2 Configuring the measurement mode based on the “Teach relative” mode (example)

1. Use the arrow keys (left/right) to select the **Measurement Mode** menu.
2. Use the arrow keys (up/down) to select the **Teach relative (%)** parameter.
3. Use the right arrow key to open the **Teach select** menu.
4. Use the down arrow key to select Teach 1, Teach 2, or Teach 3, depending on whether you already have taught-in media that you do not want to overwrite.
5. Start the system and make sure that the maximum flow rate is reached.

6. Use the right/down arrow keys to select the **Teach max?** parameter.  
The message **run ...** is displayed during the teach-in cycle.  
If the teach-in completed successfully, the message **Teach OK** is displayed. If an error occurred during teach-in, the message **Teach not OK** is displayed and the steps described above must be repeated.
7. Reduce the flow rate to the minimum flow rate.
8. Use the arrow keys (up/down) to select the **Teach min?** parameter. (Parameter is displayed only after the **Teach max?** step has been successfully performed.)  
The message **run ...** is displayed during the teach-in cycle.  
If the teach-in completed successfully, the message **Teach OK** is displayed. If an error occurred during teach-in, the message **Teach not OK** is displayed and the steps described above must be repeated.

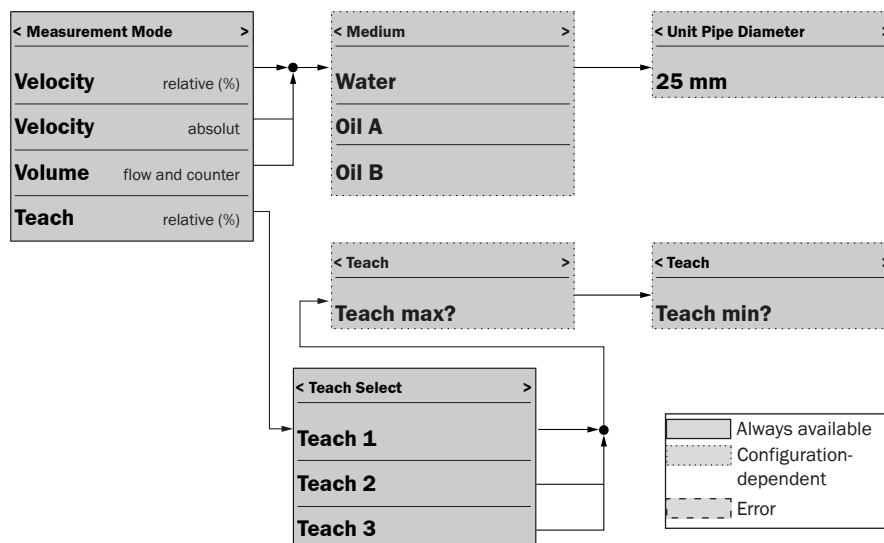


Fig. 18: Menu structure for configuring the measurement mode



#### NOTE

For optimum measurement accuracy, make sure that the medium teach-in is only performed when  
the medium temperature of the system has reached the steady state.

### 7.3.3 Configuration options for Q1 and Q2

Q1 and Q2 can be configured as a hysteresis output for flow (normally open or normally closed), window output for flow (normally open or normally closed), hysteresis output for temperature (normally open or normally closed) and window output for temperature (normally open or normally closed). Q1 can be configured as an empty pipe detection output (normally open or normally closed). Q2 can be configured as a pulse output or disabled (by selecting **Off Pin Q2 inactive**).

Q2 can be linked to Q1 as an input using Boolean logic (AND or OR). In the electrical version B with analog output, Q2 can additionally be configured as an analog output.

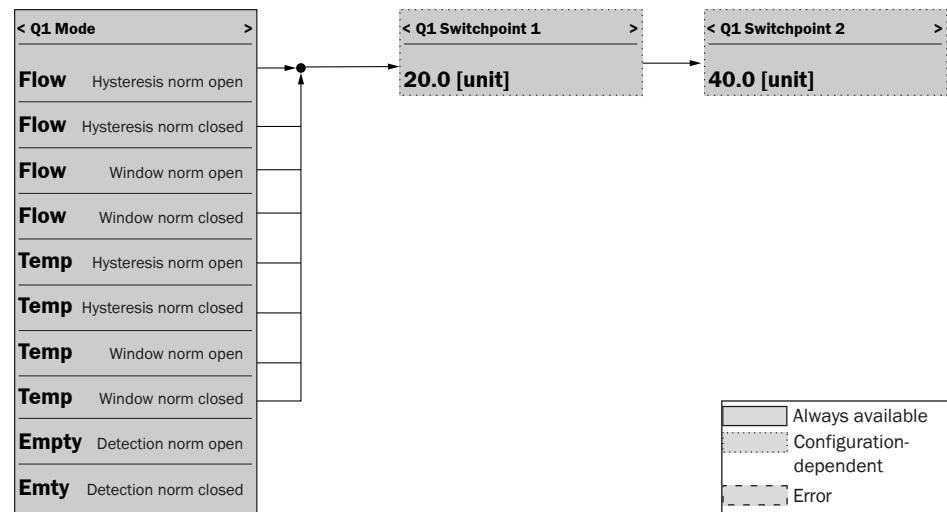


Fig. 19: Menu structure for Q1 mode

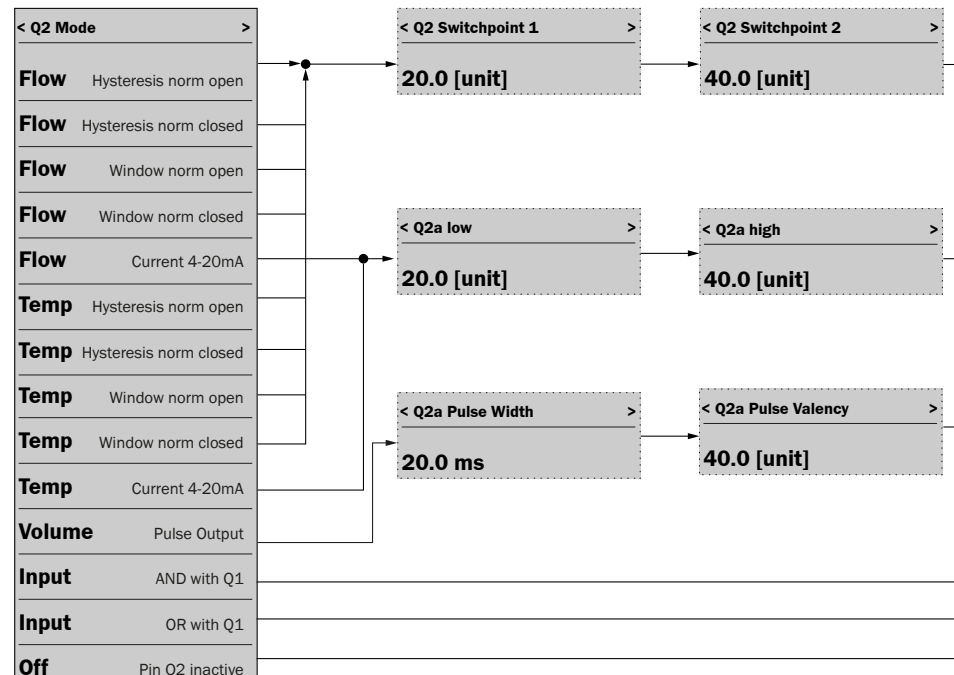


Fig. 20: Menu structure for Q2 mode



### NOTE

Pulse output can only be selected if Volume (flow and counter) measurement mode has been selected.

The Flow Current 4-20mA and Temp Current 4-20mA selections are only shown in the electrical version B with an analog output.

---

#### 7.3.4 Configuring the switching output Q1 and Q2

When the flow (or temperature) varies by the configured value, the hysteresis keeps the switching state of the outputs stable.

When the flow (or temperature) increases, the output switches when the respective switchpoint (SP1) is reached. When the flow (or temperature) drops again, the output does not switch back until the reset switchpoint (SP2) is reached.

The window function allows you to control a specified range. When the flow (or temperature) is between window high (SP1) and window low (SP2), the output is active (normally open) and/or inactive (normally closed).

The cable break monitoring indicates the error status of the measuring device. When in error status, the measuring device switches to the safe state. The safe state of the electronics is in the pull-down configuration.

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

#### 7.3.5 Normally open with configurable hysteresis

##### Configuration based on Q1 for flow (as an example)

1. Use the arrow keys (left/right) to select **Q1 Mode**.
2. Use the arrow keys (up/down) to select **Flow Hysteresis norm open**.
3. Use the right arrow key to select **Q1 Switchpoint 1 (SP1)**.
4. Increase or decrease the value using the arrow keys (up/down).
5. Use the right arrow key to select **Q1 Switchpoint 2 (SP2)**.
6. Increase or decrease the value using the arrow keys (up/down).
7. The sensor uses the larger switchpoint as the upper switching threshold, and the smaller switchpoint as the lower switching threshold.
8. If required, configure the delay mode and time (see [“7.4.10 Delay Mode Q1”](#)).

### Switching output behavior

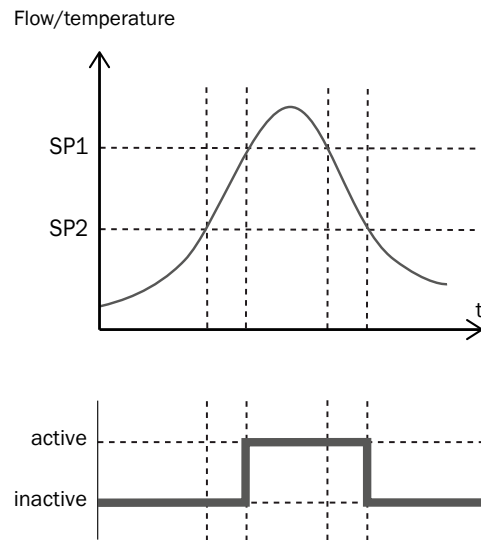


Fig. 21: Normally open with configurable hysteresis

#### 7.3.6 Normally closed with configurable hysteresis

##### Configuration based on Q1 for flow (example)

1. Use the arrow keys (left/right) to select **Q1 Mode**.
2. Use the arrow keys (up/down) to select **Flow Hysteresis norm closed**.
3. Use the right arrow key to select **Q1 Switchpoint 1 (SP1)**.
4. Increase or decrease the value using the arrow keys (up/down).
5. Use the right arrow key to select **Q1 Switchpoint 2 (SP2)**.
6. Increase or decrease the value using the arrow keys (up/down).
7. The sensor uses the larger switchpoint as the upper switching threshold, and the smaller switchpoint as the lower switching threshold.
8. If required, configure the delay mode and time (see [“7.4.10 Delay Mode Q1”](#)).

## Switching output behavior

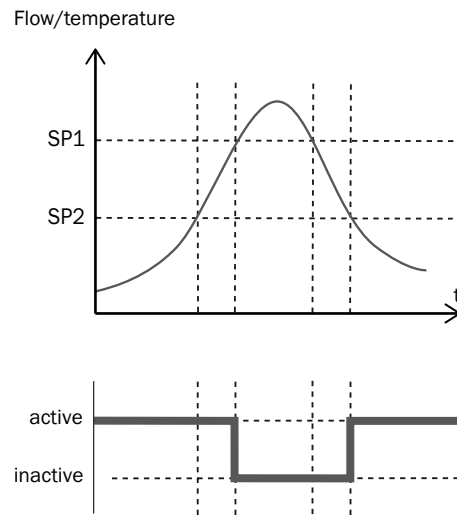


Fig. 22: Normally closed with configurable hysteresis

### 7.3.7 Normally open with window function

#### Configuration based on Q1 for flow (example)

1. Use the arrow keys (left/right) to select **Q1 Mode**.
2. Use the arrow keys (up/down) to select **Flow window norm open**.
3. Use the right arrow key to select **Q1 Switchpoint 1 (SP1)**.
4. Increase or decrease the value using the arrow keys (up/down).
5. Use the right arrow key to select **Q1 Switchpoint 2 (SP2)**.
6. Increase or decrease the value using the arrow keys (up/down).
7. The sensor uses the larger switchpoint as the upper switching threshold, and the smaller switchpoint as the lower switching threshold.
8. If required, configure the delay mode and time (see [“7.4.10 Delay Mode Q1”](#)).

### Switching output behavior

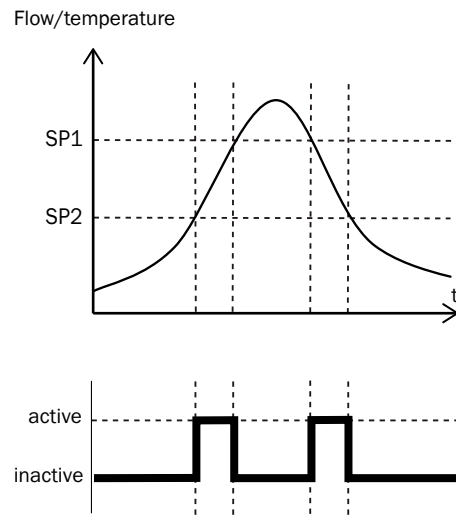


Fig. 23: Normally open with window function

#### 7.3.8 Normally closed with window function

##### Configuration based on Q1 for flow (example)

1. Use the arrow keys (left/right) to select **Q1 Mode**.
2. Use the arrow keys (up/down) to select **Flow window norm closed**.
3. Use the right arrow key to select **Q1 Switchpoint 1 (SP1)**.
4. Increase or decrease the value using the arrow keys (up/down).
5. Use the right arrow key to select **Q1 Switchpoint 2 (SP2)**.
6. Increase or decrease the value using the arrow keys (up/down).
7. The sensor uses the larger switchpoint as the upper switching threshold, and the smaller switchpoint as the lower switching threshold.
8. If required, configure the delay mode and time (see [“7.4.10 Delay Mode Q1”](#)).

### Switching output behavior

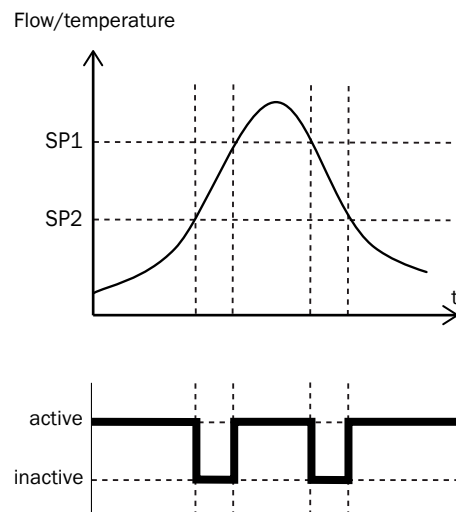


Fig. 24: Normally closed with window function

### 7.3.9 Configuring the switching output Q1 for empty pipe detection

Q1 can be used for empty pipe detection. The sensor can detect whether there is medium at the sensor tip and thereby detect an empty pipe. The pipe is detected as full as soon as the probe tip touches the medium.

#### Configuration – normally open with empty pipe detection

1. Use the arrow keys (left/right) to select **Q1 Mode**.
2. Use the arrow keys (up/down) to select **Empty norm open**.
3. If required, configure the empty detect factor (see [“7.4.8 Empty Detect Factor” on page 42](#)).

The status LED S1 is off when the pipe is full and switches on as soon as the probe tip is no longer covered with medium.

#### Switching output behavior

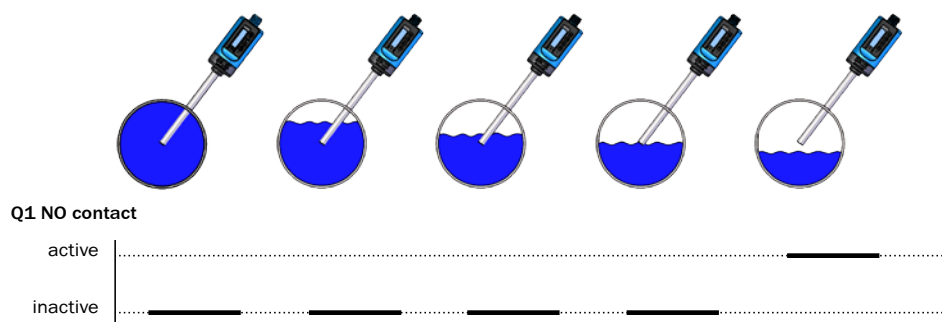


Fig. 25: Normally open with empty pipe detection

#### Configuration – normally closed with empty pipe detection

1. Use the arrow keys (left/right) to select **Q1 Mode**.
2. Use the arrow keys (up/down) to select **Empty norm closed** (empty pipe normally closed) off.
3. Configure the empty detect factor (see [“7.4.8 Empty Detect Factor” on page 42](#)) if required.

The status LED S1 lights up when the pipe is full and switches off as soon as the probe tip is no longer covered with medium.

#### Switching output behavior

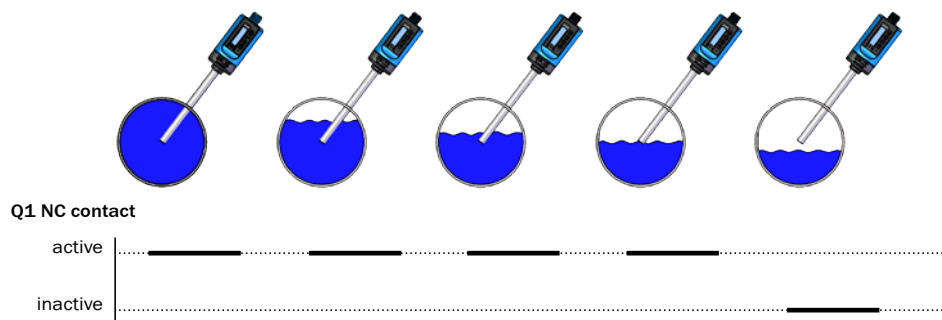


Fig. 26: Normally closed with empty tube detection

### 7.3.10 Configuration of pulse output Q2

The pulse output is used to specify the flow rate for which an output pulse is issued.

The pulse width can be specified in the "Pulse Width" field (duration of a pulse in ms).

The pulse valency can be specified in the "Pulse Valency" field (definition of the volume that generates a pulse in 0.1L).

**Example:**

Pulse Width = 50 ms

Pulse Valency = 1 L

When the volume reaches 1 L, a pulse with a duration of 50 ms is generated.

The pulse width should be set as short as possible and as long as necessary so that the device/controller connected to the digital output still recognizes the pulse. When the configured pulse valency is reached, a pulse is output at the digital output.

If the pulse valency specified by the user is too low, the pulse repetition rate may increase too much, thereby causing the sensor to output too few pulses. In this case, the sensor shows the warning "Q2 PulseConfig" on the display.

**Example:**

Parameterization: Pulse Valency = 0.1 L

Pulse Width = 1,000 ms

Measured Flow Rate = 60 L/min

Result: 600 pulses/min, but since one pulse needs 2,000 ms (1,000 ms pulse +1,000 ms pause), max. 30 pulses per minute are possible. A warning message appears.

**Configuration**

1. Use the arrow keys (left/right) to select **Q2 Mode**.
2. Use the arrow keys (up/down) to select **Volume Pulse output**.
3. Use the right arrow key to select **Q2 Pulse Width**.
4. Increase or decrease the value using the arrow keys (up/down).
5. Use the right arrow key to select **Q2 Pulse Valency**.
6. Increase or decrease the value using the arrow keys (up/down).

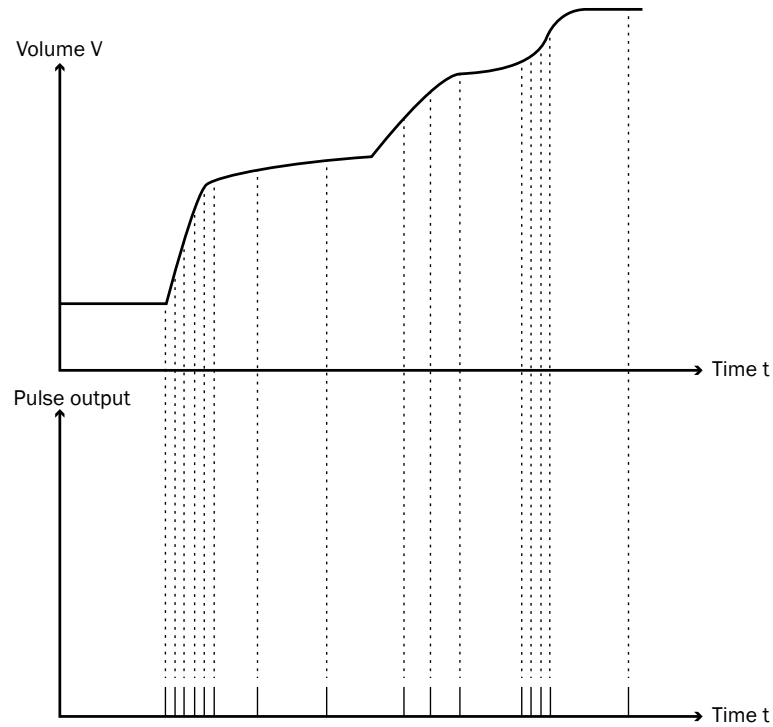


Fig. 27: Example behavior of the pulse output (the larger the slope of the volume, the more pulses are output)

### 7.3.11 Configuring the Q2 digital input

There are two selectable logic variants for the Q2 input in the **Q2 Mode** menu:

- **Input AND with Q1**
- **Input OR with Q1**

This function can be used, for example, to create a control logic using the signals from two T-Easic® devices and using only one digital PLC input. In this case, the Q1 output of the T-Easic® B serves as the Q2 digital input of the T-Easic® A, and the Q1 output of the T-Easic® A is connected to the PLC.

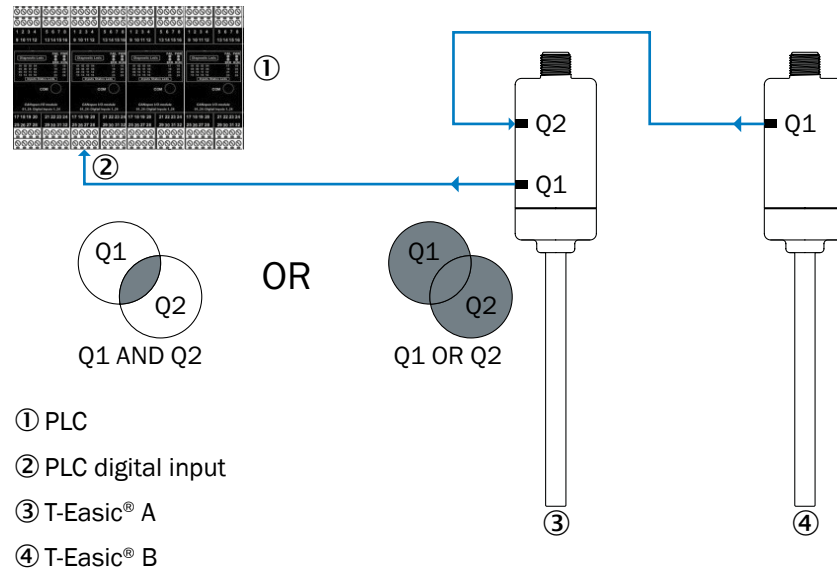


Fig. 28: Example application where the digital input is used with the digital using Boolean logic

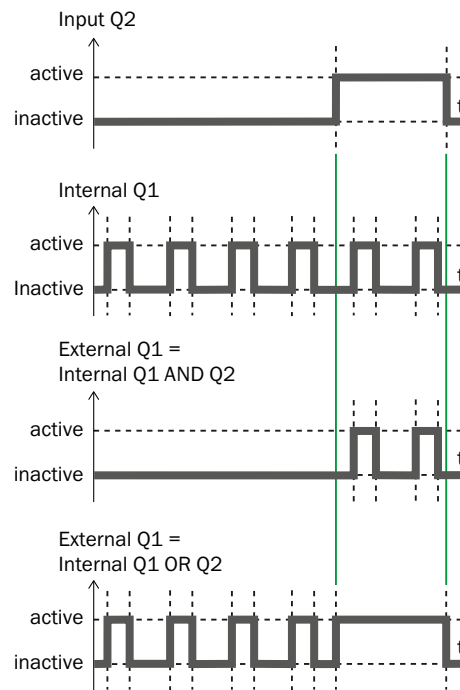


Fig. 29: Explanation of the Q2 digital input and Boolean logic

### 7.3.12 Configuring the Q2 analog output

In the electrical version B, the T-Easic® FTS has an analog output on Q2. The analog output is available as an active current output with 4...20mA. The analog output can be parameterized with regard to flow (flow rate, volume flow) and temp (temperature).

#### Configuration based on Q2 for flow (example)

1. Use the arrow keys (left/right) to select **Q2 Mode**.
2. Use the arrow keys (up/down) to select **Flow Current 4-20mA**.
3. Use the right arrow key to select **Q2a low**.
4. Increase or decrease the value using the arrow keys (up/down).
5. Use the right arrow key to select **Q2a high**.
6. Increase or decrease the value using the arrow keys (up/down).
7. If required, configure the Q2a error mode (see [“7.4.14 Error Current Q2a” on page 46](#)).

Inversion of the analog output can be achieved by setting the lower threshold as Q2a high and the higher threshold as Q2a low.

The Error Current Q2a submenu defines how the analog output behaves in the event of a critical device error. You can select whether to output 3.5mA or 21.5mA as a signal in the event of an error.

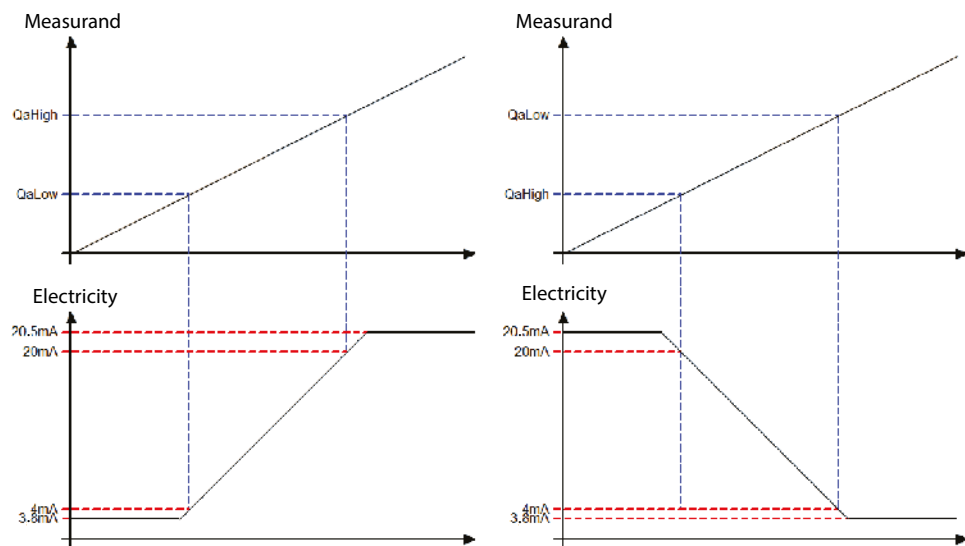


Fig. 30: Behavior of the analog output

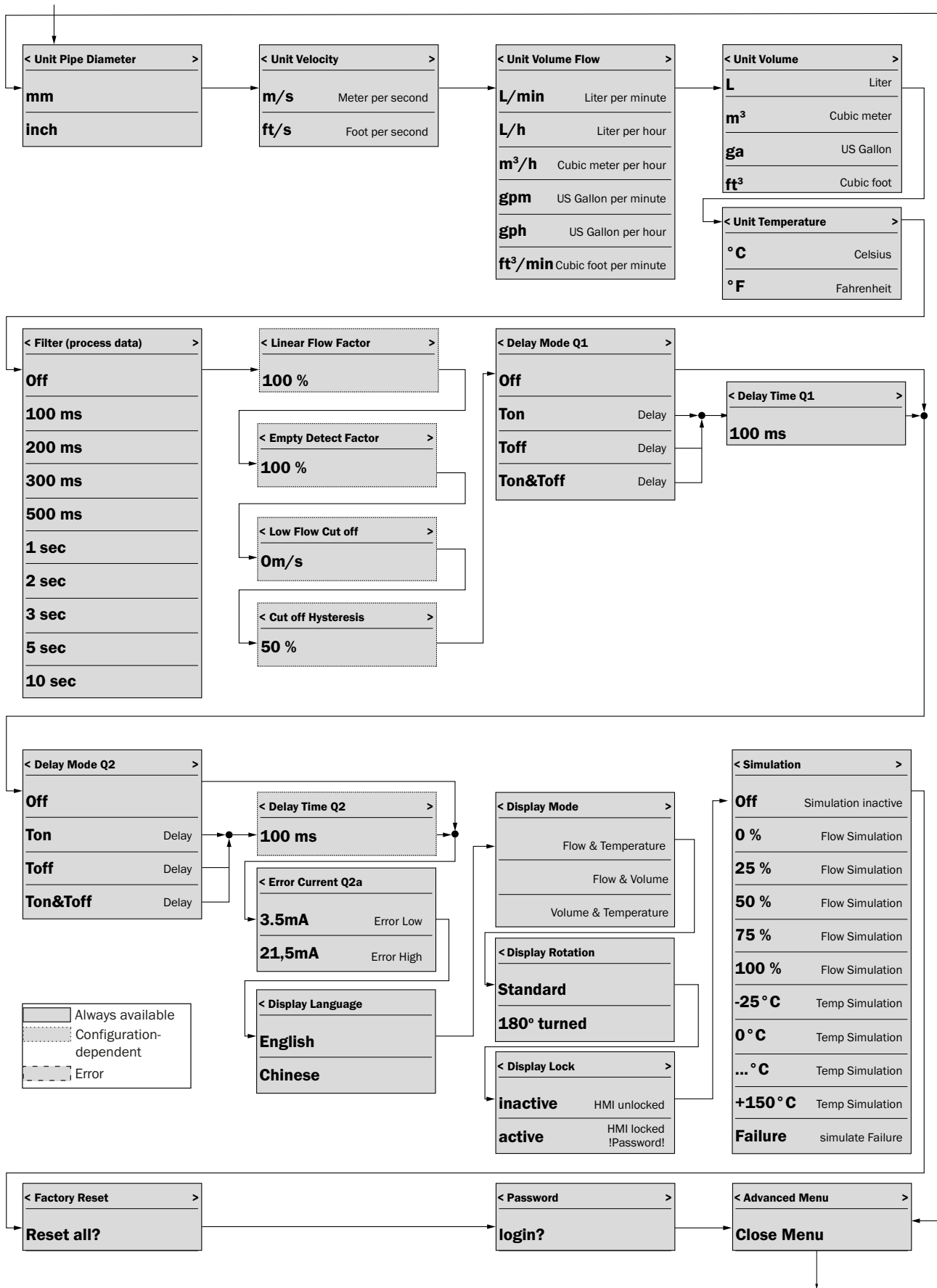
## 7.4 Advanced menu (advanced settings)

The **Advanced Menu** allows you to access the advanced settings.

1. Use the arrow keys (left/right) to select **Advanced Menu**.
2. Use the arrow keys (up/down) to select **Open menu**.
3. Use the arrow keys (left/right) to select the desired parameter.

You can access the following parameters:

- **Unit Pipe Diameter**
- **Unit Velocity**
- **Unit Volume Flow**
- **Unit Volume**
- **Unit Temperature**
- **Filter (process data)**
- **Linear Flow Factor**
- **Empty Detect Factor**
- **Low Flow Cutoff & Cutoff Hysteresis**
- **Delay Mode Q1**
- **Delay Time Q1**
- **Delay Mode Q2**
- **Delay Time Q2**
- **Error Current Q2a**
- **Display Language**
- **Display Mode**
- **Display Rotation**
- **Display Lock**
- **Simulation**
- **Factory Reset (reset to factory settings)**
- **Password**
- **Close Menu (close extended menu)**



**7.4.1 Unit Pipe Diameter**

In this submenu, you can configure the unit of the pipe inner diameter. This value is required to calculate the correct volume flow and count.

You can configure the unit of the diameter.

The following units are available for selection:

- mm
- Customs fees

**7.4.2 Unit Velocity**

In this submenu, you can set the unit of measurement for the velocity. The following units are available for selection:

- m/s
- ft/s

**7.4.3 Unit Volume Flow**

In this submenu, you can set the unit of measurement for the volume flow.

The following units are available for selection:

- L/min
- L/h
- m<sup>3</sup>/h
- gpm
- gph
- ft<sup>3</sup>/min

**7.4.4 Unit Volume**

In this submenu, you can set the unit of measurement for the volume.

The following units are available for selection:

- L
- m<sup>3</sup>
- ga
- ft<sup>3</sup>

**7.4.5 Unit Temperature**

In this submenu, you can set the unit of measurement for the temperature.

The following units are available for selection:

- °C
- °F

**7.4.6 Filter (process data)**

Smoothing of the measured value, e.g., when the flow is irregular (e.g., when pumps start and stop). If the values are changing rapidly, the average of the measured values over a specified number of seconds is output.

The following values are available for selection:

- 100 ms
- 200 ms
- 300 ms
- 500 ms

- 1 s
- 2 s
- 3 s
- 5 s
- 10 s
- Off

If the **Off** value is selected, the filter function is disabled.

### 7.4.7 Linear Flow Factor

The **Linear Flow Factor** enables the sensor to be matched to a reference flow in the application.

This menu is only available when **Velocity relative (%)**, **Velocity absolute** or **Volume flow and counter** is selected in the **Measurement Mode** menu.

You can use the special adjustment to change the curve slope of measured values. The slope is specified as a percent. You can select a value between 50% and 150% for this factor. The factory setting is 100%.

The **Linear Flow Factor** affects the process data. This option is not available after a teach-in has been performed for flow.

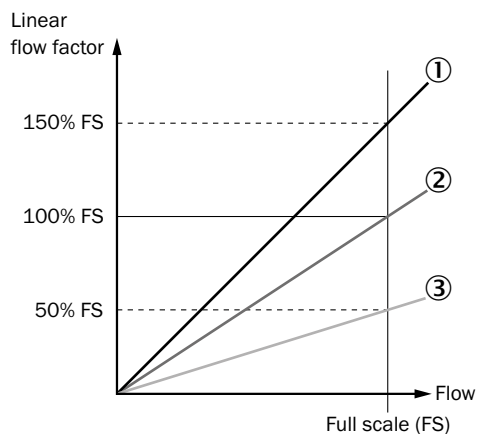


Fig. 31: Examples of the linear flow factor

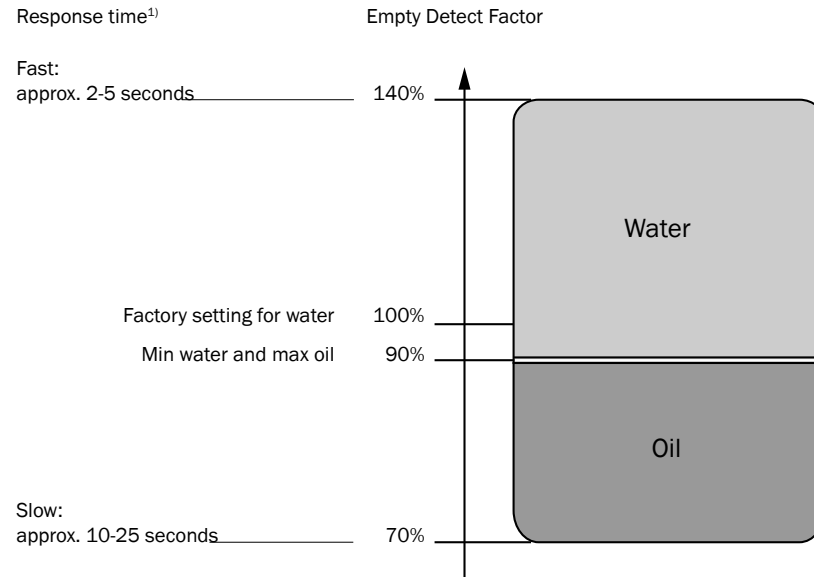
- ① Curve with adjustment 1
- ② Curve at factory setting
- ③ Curve with adjustment 2

### 7.4.8 Empty Detect Factor

The **Empty Detect Factor** can be used to adjust the response time of the empty pipe detection. You can select a value between 70% and 140% for this factor. The factory setting is 100%. The higher the empty detect factor, the faster the response time. This means that the empty pipe detection will react more sensitively to any level fluctuations in the pipe and Q1 will also switch if the sensor tip is only uncovered for a short time. To avoid this, the response time can be increased by reducing the empty detection factor.

For applications with **water**, an empty detection factor in the range of 90-140% is useful. For **oils and oil-like media**, the empty detection factor should be between 70-90% to ensure reliable detection.

### Empty detection factor



<sup>1)</sup> For reference conditions: Pipe inner diameter 25 mm, water, vertical installation in the pipe, tip in the middle of the pipe, probe oriented in the pipe as described in section 5.2 "Probe alignment to flow direction", completely filled pipe without air bubbles, velocity between 10 cm/s and 100 cm/s, inlet zone > 30 cm, outlet zone > 30 cm, 26 °C ± 1 °C, 2 bar ± 1 bar

Fig. 32: Configuring the empty detect factor

#### 7.4.9 Low Flow Cutoff & Cutoff Hysteresis

Even when the valve is closed, convection or vibration of the pipeline can result in very low flow rates. If the flow rate of a medium is zero, this can result in inaccurate measurements. To ensure these measurements do not lead to undesired switching behaviors or a wrong meter reading, the **Low flow cutoff** option can be used.

When enabled, flows that are within a narrow range around zero are treated by the sensor as if the flow were at zero.

When the flow falls below a specified "**cutoff**" value, the display and output are set to zero (switch-on point). When the flow exceeds the set "**Cutoff+Hysteresis**" value again, the measurements are continued (switch-off point).

If a value greater than 0 is entered as the "Cutoff" value, low flow cutoff becomes active. In the factory setting, low flow cutoff is deactivated ("Cutoff" value = 0).

The switch-off point is specified as a positive hysteresis value as a percentage of the switch-on point of the selected low flow rate. You can select values between 5% and 300% for the hysteresis. The factory setting is 50%.

**NOTE**

The analog output outputs the current that was parameterized for  $Q=0\text{L}/\text{min}$ .  
The pulse output does not output any pulses at  $Q=0\text{L}/\text{min}$ .

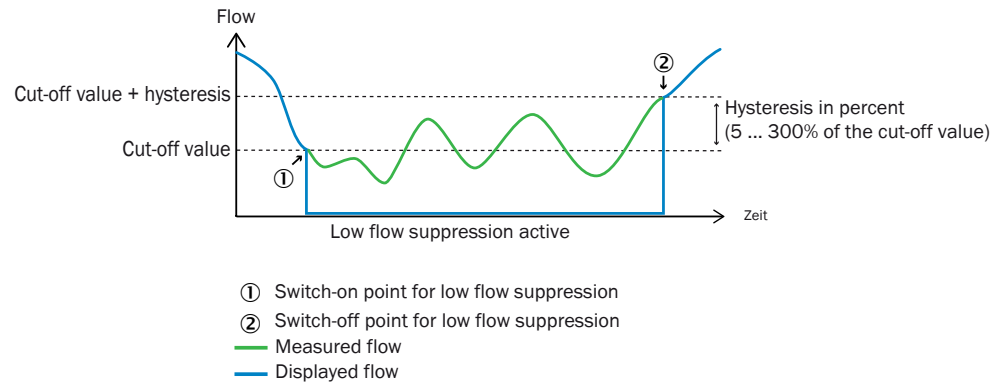


Fig. 33: Low flow cutoff function

#### 7.4.10 Delay Mode Q1

This parameter is used to define the delay mode for Q1. The following parameters are available for selection:

Parameter	Function
Off	No delay on Q1 status change.
Ton Delay	When <b>Q1 Switchpoint 1</b> is reached, the status of Q1 does not change until <b>Delay time Q1</b> (see “7.4.11 Delay Time Q1”) has elapsed.
Toff Delay	When <b>Q1 Switchpoint 2</b> is reached, the status of Q1 does not change until <b>Delay time Q1</b> (see “7.4.11 Delay Time Q1”) has elapsed.
Ton&Toff Delay	When <b>Q1 Switchpoint 1</b> is reached, the status of Q1 does not change until <b>Delay time Q1</b> (see “7.4.11 Delay Time Q1”) has elapsed. When <b>Q1 Switchpoint 2</b> is reached, the status of Q1 does not change until <b>Delay time Q1</b> (see “7.4.11 Delay Time Q1”) has elapsed.

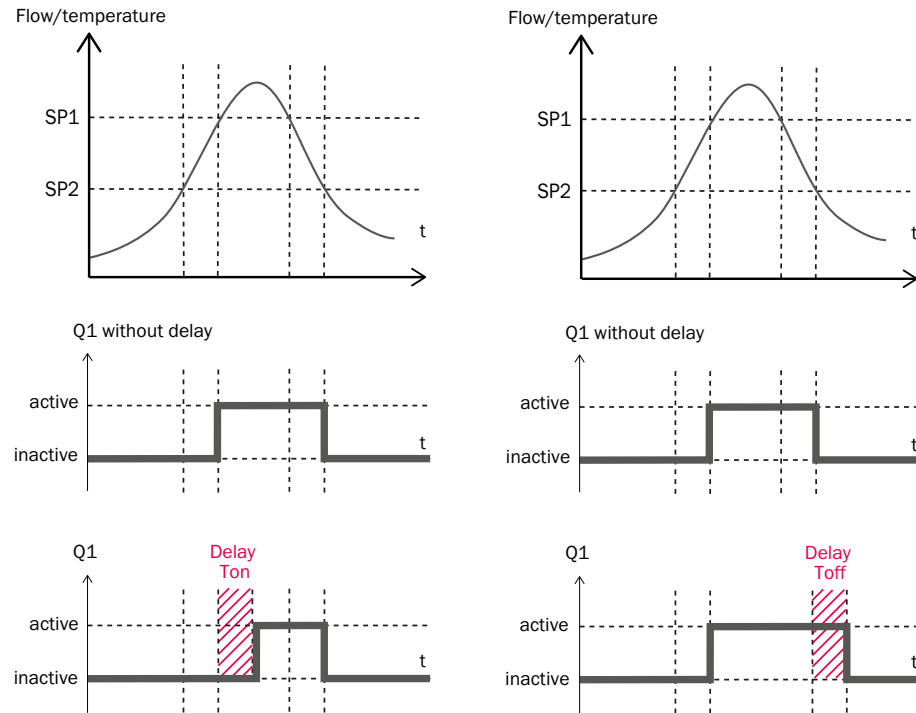


Fig. 34: Delay mode Q1 with setting "Toff Delay"/Hysteresis - normally open (left) and delay mode Q1 with setting "Toff Delay"/Hysteresis - normally open (right)

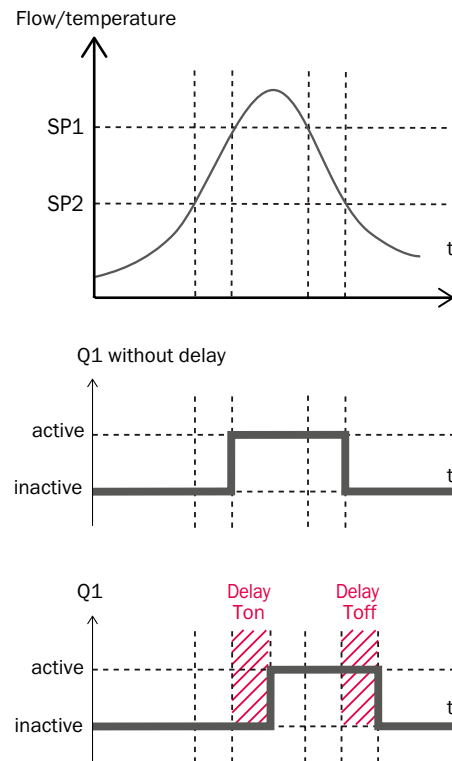


Fig. 35: Delay mode Q1 with setting "Ton&Toff Delay"/Hysteresis - normally open

### 7.4.11 Delay Time Q1

In this submenu, you can set the delay time for Q1 according to the mode selected under **Delay Mode Q1** (see “7.4.10 Delay Mode Q1”). This menu is not available if **Delay Mode Q1** is set to Off.

### 7.4.12 Delay Mode Q2

This parameter is used to define the delay mode for Q2. The following parameters are available for selection:

Parameter	Function
Off	No delay when a Q2 status change occurs.
Ton Delay	When <b>Q2 Switchpoint 1</b> is reached, the status of Q2 does not change until <b>Delay time Q2</b> (see “7.4.13 Delay Time Q2”) has elapsed.
Toff Delay	When <b>Q2 Switchpoint 2</b> is reached, the status of Q2 does not change until <b>Delay time Q2</b> (see “7.4.13 Delay Time Q2”) has elapsed.
Ton&Toff Delay	When <b>Q2 Switchpoint 1</b> is reached, the status of Q2 does not change until <b>Delay time Q2</b> (see “7.4.13 Delay Time Q2”) has elapsed and <b>Q2 Switchpoint 2</b> has been reached. The status of Q2 does not change until <b>Delay time Q2</b> (see “7.4.13 Delay Time Q2”) has elapsed.

### 7.4.13 Delay Time Q2

In this submenu, you can set the delay time for Q2 according to the mode selected under **Delay Mode Q2** (see “7.4.12 Delay Mode Q2”). This menu is not available when **Delay Mode Q2 Off** is set.

### 7.4.14 Error Current Q2a

In this submenu, you can configure how the analog output behaves in the event of a critical device error. You can select whether to output 3.5mA or 21.5mA as a signal in the event of an error. This menu item is only available in the electrical version B of the T-Easic® FTS.

### 7.4.15 Display Language (industrial version only)

In this submenu, you can configure the display language - English or Chinese.



#### NOTE

If you set the Chinese language by mistake, you can return to the English menu by pressing and holding the right arrow key and left arrow key simultaneously for 5 seconds.

**7.4.16 Display Mode (industrial version only)**

In this submenu, you can specify the information shown on the display during operation. The following parameters are available for selection:

Parameter	Function
Flow & Temperature	The flow rate is shown in the lower part of the display and the temperature in the upper part.
Flow & Volume	The flow rate is shown in the lower part of the display and the volume in the upper part.
Volume & Temperature (Volume and Temperature)	The volume is shown in the lower part of the display and the temperature in the upper part.

**7.4.17 Display Rotation (industrial version only)**

In this submenu, you can rotate the display by 180°.

**7.4.18 Display Lock (industrial version only)**

To prevent setting changes, the display of the industrial version can be locked (HMI locked). When the display is locked, an unlock password must be entered before any changes can be made.

The password to unlock the display and keys is **000387**.

**7.4.19 Simulation**

Even if there is no liquid in the measurement channel yet, you can simulate a flow or temperature in this submenu to test the sensor configuration. You can also simulate an error state (safe state simulation).

- Set the desired value for the flow or temperature using the arrow keys (up/down).

The following parameters are available for selection:

- Off
- Flow Simulation 0%
- Flow Simulation 25%
- Flow Simulation 50%
- Flow Simulation 75%
- Flow Simulation 100%
- Temp Simulation –25 °C
- Temp Simulation 0 °C
- Temp Simulation +25 °C
- Temp Simulation +50 °C
- Temp Simulation +75 °C
- Temp Simulation +100 °C
- Temp Simulation +125 °C
- Temp Simulation +150 °C
- Simulate Failure

When a simulated state is activated, the display cyclically shows the message **Info Simulation is active**. When a simulated fault condition is activated, the display cyclically shows the message **Failure Failure Simulation is active** and the status LEDs S1 and S2 flash simultaneously.

## 7.4.20 Factory Reset

In this submenu you can reset all parameters to the factory settings. The following value is available for selection:

- **Reset All?**
- ▶ Reset the values to the factory settings using the arrow keys (up/down).

## 7.4.21 Password

This submenu is reserved for SICK service.

## 7.4.22 Close Menu

Use this submenu to close the advanced configuration menu.  
The following value is available for selection:

- **Close Menu**
- ▶ Use the arrow keys (up/down) to return to the main menu.

After exiting the advanced menu, **Advanced menu - Open Menu** is displayed.

## 7.5 Information

In this menu you can check sensor relevant information.

< Information >	
<b>18411481</b>	Serial No.
<b>V1.22.2R</b>	Firmware Version
<b>***</b>	ApplicationSpecificTag
<b>***</b>	Device Specific Tag
<b>24.12 V</b>	Supply Voltage
<b>33.2 °C</b>	Sensor Temp

Fig. 36: Structure of the information menu

The following parameters are available for selection:

Parameter	Function
Serial No	Device serial number
Firmware	Firmware version installed in the sensor
Application Specific Tag	Name of the sensor in a specific application. Can be set by the customer via the IO-Link interface.
Device Specific Tag	Displays the device identifier assigned to the sensor. Can be set by the customer via the IO-Link interface.
Supply Voltage	Supply voltage currently applied to the device
Internal Temp	Displays the temperature measured at the PCB of the sensor

## 8 Troubleshooting

### 8.1 Error message shown on the display (industrial version only)

The display shows up to three error messages with the highest priority. The following table lists the messages that can be shown on the display. If a warning message is active, the sensor continues to function in normal mode. If an error message is active, the sensor goes into the error state. As soon as no error is present, the sensor automatically switches back to normal operation.

Message	Level	Cause	Solution
Supply Voltage too low	Warning	The supply voltage is too low.	Check the supply voltage and, if necessary, adjust it according to the specifications (see <a href="#">“11 Technical data”</a> ).
Supply Voltage too high	Failure	The supply voltage is too high.	Check the supply voltage and, if necessary, adjust it according to the specifications (see <a href="#">“11 Technical data”</a> ).
Low Voltage IO-Link	Info	The supply voltage is < 16 V, IO-Link communication is no longer possible.	Check the supply voltage and, if necessary, adjust it according to the specifications (see <a href="#">“11 Technical data”</a> ).
Simulation is active	Info	The simulation function is active. The status of the outputs does not correspond to the actual measured flow or temperature in the process.	If necessary, deactivate the simulation function.
Failure Simulation is active	Info	The "Safe State" simulation of the sensor is active. The status of the outputs corresponds to the safe state of the device.	If necessary, deactivate the simulation function.
MemoryInvalid	Failure	Device memory contains an invalid configuration. The sensor goes into the safe state.	Please contact SICK.
Outputdriver Error No.70	Warning	Output driver for the switching outputs is too warm.	Connect a suitable load (see <a href="#">11 “Technical data”</a> ) or reduce the ambient temperature according to the specification (see <a href="#">“11 Technical data”</a> ).
Outputdriver Error No.86	Failure	Configuration of the analog output is lost, analog output no longer functions correctly.	Please contact SICK.
Outputdriver Error No.89	Failure	Output driver for the switching outputs is much too warm. Sensor goes into the safe state, the outputs are switched off.	Connect a suitable load (see <a href="#">“11 Technical data”</a> ) or reduce the ambient temperature according to the specification (see <a href="#">“11 Technical data”</a> ).
Outputdriver Error No.91	Failure	Configuration of the switching outputs is lost, switching outputs no longer function correctly.	Please contact SICK.
Q1 Shortcut	Info	Short circuit or overload at Q1.	Reduce the load at the output to the maximum values according to the specification (see <a href="#">“11 Technical data”</a> ).

Message	Level	Cause	Solution
Q1: SP too high for used medium	Warning	One switchpoint of Q1 is above the permissible measuring range.	Check the settings and correct them if necessary.
Q1: Distance SP1 to SP2 too small	Warning	Switchpoint 1 of Q1 is too close to switchpoint 2 of Q1. The settings can lead to undesired sensor behavior.	Check the settings and correct them if necessary.
Q2 Shortcut	Info	Short circuit or overload at Q2.	Reduce the load at the output to the maximum values according to the specification (see <a href="#">"11 Technical data"</a> ).
Q2: SP too high for used medium	Warning	One switchpoint of Q2 is above the permissible measuring range.	Check the settings and correct them if necessary.
Sensor displays a constant value or 0% or 100%		Medium does not match the taught-in or selected medium in the sensor	Teach in the medium (see <a href="#">"7.3 Measurement configuration"</a> ).
Q2: Distance SP1 to SP2 too small	Warning	Switchpoint 1 of Q2 is too close to switchpoint 2 of Q2. The settings can lead to undesired sensor behavior.	Check the settings and correct them if necessary.
Q2a Overload	Warning	The load at the analog output is too small (resistance too high) or no load is connected.	Connect a suitable load (see <a href="#">"11 Technical data"</a> ) or change the configuration of Q2 (do not configure as an analog output, instead switch it to "off" or use it as a switching output)
Q2a Config out of range	Warning	A threshold of Q2a is above the permissible measuring range.	Check the settings and correct them if necessary.
Q2a Overtemperature	Warning	The output driver for the analog output is too warm. The ambient temperature may be too warm, or the hardware is defective.	Reduce the ambient temperature according to the specification (see <a href="#">"11 Technical data" on page 54</a> ) or contact Sick if necessary.
Q2 PulseConfig	Warning	The pulse output is not configured to match the flow rate. The pulse output is configured to output too many pulses per time. This is not possible and therefore pulses are lost.	Decrease the pulse width or increase the pulse valency.
Q2: Pulseout only in Volume-Mode	Warning	Q2 is configured as a pulse output, but Volume Flow and Counter is not selected as the measurement mode. No volume is therefore measured, and no pulses are output at the pulse output.	Set the Volume Flow and Counter measurement mode.
DisplayVolume only in VolumeMode	Warning	Flow&Volume" or "Volume& Temperature" is selected in the Display Mode, but VolumeMode is not set as the measurement mode. No volume is therefore measured, so zero is always displayed.	Set the Volume Flow and Counter measurement mode.
Ambient Temperature too high	Warning	Ambient temperature is too high.	Reduce the ambient temperature according to the specification (see <a href="#">"11 Technical data"</a> ).
Ambient Temperature too low	Warning	Ambient temperature is too low.	Increase the ambient temperature according to the specification (see <a href="#">"11 Technical data"</a> ).
Medium Temperature too high	Warning	Process temperature of the medium is too high.	Reduce the process temperature according to the specification (see <a href="#">"11 Technical data"</a> ).
Medium Temperature too low	Failure	Process temperature of the medium is much too low.	Increase the process temperature according to the specification (see <a href="#">"11 Technical data"</a> ).

Message	Level	Cause	Solution
Medium Temperature too low	Warning	Process temperature of the medium is too low.	Increase the process temperature according to the specification (see <a href="#">“1.1 Technical data”</a> ).
Medium Temperature too high	Failure	Process temperature of the medium is much too high.	Reduce the process temperature according to the specification (see <a href="#">“1.1 Technical data”</a> ).
Internal error	Failure	Internal device error. The sensor goes into the safe state.	Please contact SICK.
Sensor is not taught	Warning	The sensor is in teach-in mode, but there are no valid teach-in values. The flow rate is 0%. The outputs are switched accordingly.	Correct the minimum and maximum value for teach-in.
Teach is not finished	Warning	Teach was started but did not complete.	Perform the teach-in again.

## 8.2 Outputs

Error	Cause	Solution
The switching output does not behave as expected.	Configuration is incorrect.	Configure the switching output (see <a href="#">“7.3 Measurement configuration”</a> ).
	An error has occurred; the sensor outputs are in the safe state.	Eliminate the cause of the error.
	Cable break.	Check the cable.

### 9 Repair

Repair work on the sensor may only be performed by qualified and authorized personnel from SICK AG. Tampering with or modifying the sensor will void any warranty claims against SICK AG.

#### 9.1 Maintenance

The T-Easic® operates maintenance-free. We recommend that the following measures be performed on a regular basis:

- Check the measurement probe for deposits and wear.
- Check the threaded and plug connections.

Repair work on the sensor may only be performed by qualified and authorized personnel from SICK AG. Tampering with or modifying the sensor will void any warranty claims against SICK AG.

#### 9.2 Return

Rinse and/or clean the removed device before returning it to protect our employees and the environment from dangers posed by residues of the material being measured. Defective devices can only be examined if a completed return form is included. 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 on our website ([www.sick.com](http://www.sick.com)).

## 10 Disposal

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



## 11 Technical data

### 11.1 Features

<b>Measurement principle</b>	Calorimetric measurement method for determining the flow
<b>Media</b>	Aqueous and oily media
<b>Pipe inner diameter</b>	≥ 25 mm <sup>1)</sup>
<b>Measuring range</b>	Water: 3 cm/s ... 300 cm/s Oil A / Oil B: 3 cm/s ... 300 cm/s Taught-in media: 3 cm/s ... 600 cm/s <sup>2)</sup>
<b>Maximum process pressure</b>	100 bar 40 bar (with SICK DN15, DN25 T-piece) (see "14 Accessories") <sup>4)</sup> 25 bar (with SICK DN40 T-piece) (see "14 Accessories") <sup>4)</sup> 20 bar (with SICK DN50 T-piece) (see "14 Accessories") <sup>4)</sup>
<b>Process temperature</b>	–40 °C ... +150 °C <sup>5)</sup>
<b>IO-Link 1.1</b>	✓ COM3 (230.4 kbit/s)
<b>Temperature measurement</b>	Via IO-Link

<sup>1)</sup> For highest measurement accuracy, the probe tip must be in the middle of the pipe.

<sup>2)</sup> The measuring range limit value depends on the medium used.

<sup>3)</sup> According to the Pressure Equipment Directive 2014/68/EU: Good engineering practice, according to Article 13 for media of media group 2 (other substances).

<sup>4)</sup> At medium temperatures above 100 °C, the distance between the bottom of the housing and the top of the process connection adapter must be at least 25 mm.

If a Sick process connection adapter (see "14 Accessories") is used, the 60 mm probe cannot be used at process temperatures above 100 °C because the distances cannot be maintained.

## 11.2 Performance

Inlet zone	5 x DN
Outlet zone	3 x DN
Measurement accuracy for flow	$\pm (7\% \text{ of measured value} + 2\% \text{ of full scale})^{1)}$
Reproducibility of flow	$< 1 \text{ cm/s}^{1)}$
Resolution for flow (via IO-Link)	Velocity: 0.01 m/s; Volume: 0.1 L/min; Relative: 0.1 %
Temperature drift for flow	$< 0.5 \text{ cm}/(\text{s} \cdot \text{K})^{1)}$
Response time for flow	$< 2.5 \text{ s}$ (filter off)
Measurement accuracy - temperature	$\pm 1 \text{ }^{\circ}\text{C}$
Resolution for temperature	$< 0.1 \text{ }^{\circ}\text{C}$
Response time for temperature (T90 time)	$< 5 \text{ s}^{2)}$
Operating mode	Relative velocity (%) Absolute velocity Volume flow and counter Teach-in relative (%)

<sup>1)</sup> Reference conditions: Pipe inner diameter 25 mm, water, vertical installation in the pipe, tip in the middle of the pipe, probe oriented in the pipe as described in section, see [“5.2 Probe alignment to flow direction” on page 17](#), completely filled pipe without air bubbles, velocity between 10 cm/s and 100 cm/s, inlet zone > 30 cm, outlet zone > 30 cm, 26 °C  $\pm$  1 °C, 2 bar  $\pm$  1 bar

<sup>2)</sup> Under reference conditions as in <sup>1)</sup> but flow rate always = 100 cm/s

## 11.3 Mechanics/materials

Process connection	Without process connection (adapter required for installation) or with permanently installed clamping ring (only in conjunction with Sick T-pieces)
Wetted parts	Stainless steel 1.4404/316L
Housing material	Industrial version: VISTAL® (PA66+PA6I GF50) Hygienic version: 1.4404/316L stainless steel
Probe diameter	8 mm
Probe length	60 mm, 100 mm, 200 mm (tolerance $\pm 1 \text{ mm}$ )
Probe roughness <sup>1)</sup>	$R_a \leq 0.8 \text{ }\mu\text{m}$
Enclosure rating (DIN EN 60529) <sup>2) 3)</sup>	Industrial version: IP67 Hygienic version: IP67 / IP69
Minimum inner pipe diameter	25 mm for centered installation
Minimum insertion distance	12 mm
Minimum distance from probe tip to pipe wall	10 mm
Weight	Industrial version: approx. 80 g Hygienic version: approx. 205 g

<sup>1)</sup> excluding welds

<sup>2)</sup> only with M12 male connector fitted

<sup>3)</sup> not UL tested

## 11.4 Ambient conditions

Ambient temperature, operation <sup>1)</sup>	-40 °C ... +70 °C
Ambient temperature, storage	-40 °C ... +80 °C

<sup>1)</sup> 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.

## 11.5 Electrical connections

Supply voltage $U_V$ <sup>1)</sup>	9 V DC ... 30 V DC
Power consumption	< 2 W at 24 V DC (without load at the outputs) < 8 W at maximum load
Initialization time	≤ 5 s (IO-Link < 10 s)
Protection class	III
Connection type	M12 round connector x 1, 4-pin
Output signal	2 push-pull digital outputs (Q2 configurable as pulse output or digital input) for flow and temperature; In the electrical version B: Q2 configurable as analog output (4...20mA scalable)
Output current	≤ 100 mA (per output)
Output load <sup>2)</sup>	4 mA ... 20 mA, max. 350 Ohm when $U_V < 12$ V, 500 Ohm when $U_V > 12$ V
Lower signal level <sup>2)</sup>	3.5 mA ... 3.8 mA
Upper signal level <sup>2)</sup>	20.5 mA ... 21.5 mA
Inaccuracy of analog output <sup>2)</sup>	QA Pin2: < 0.5 % full range (20 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)
Limits for digital input	HIGH state voltage: depends on $U_V$ LOW state voltage < 4.0 V
EMC	EN 61326-1, EN 61326-2-3
MTTF	> 200 years

<sup>1)</sup> All connections are protected against reverse polarity and overcurrent. Q1 and Q2 are short-circuit proof.  
Use an energy-limited circuit for the voltage supply as per UL61010-1 3. Outp.

<sup>2)</sup> Analog output available in electrical version B.

## 12 Dimensional drawings

All dimensions are in mm (inches).

### 12.1 Industrial version

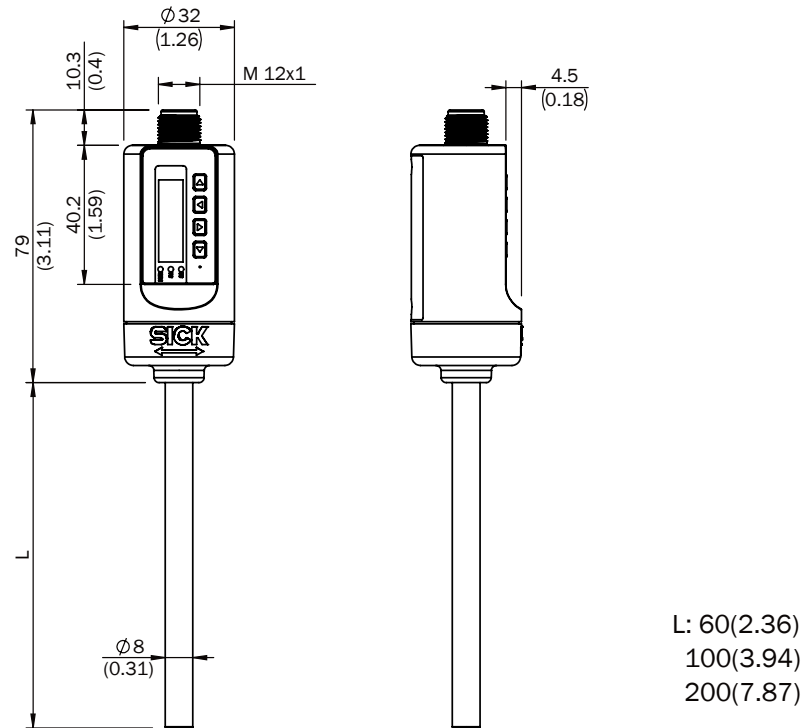


Fig. 37: Dimensional drawing for industrial version

## 12.2 Hygienic version

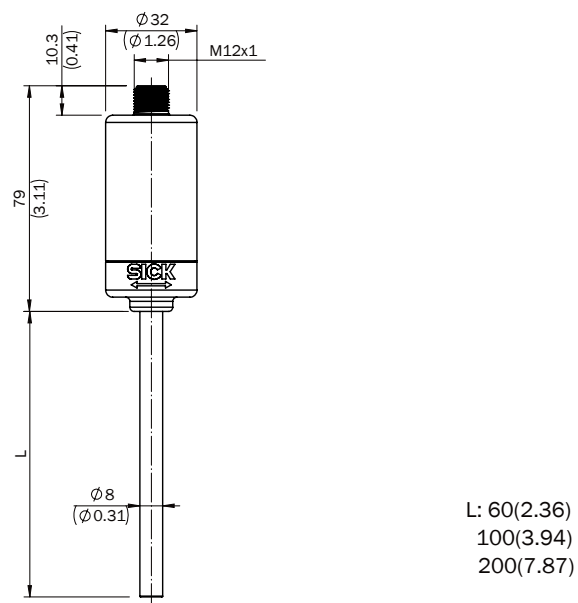


Fig. 38: Dimensional drawing for hygienic version

## 12.3 Industrial version with clamping ring

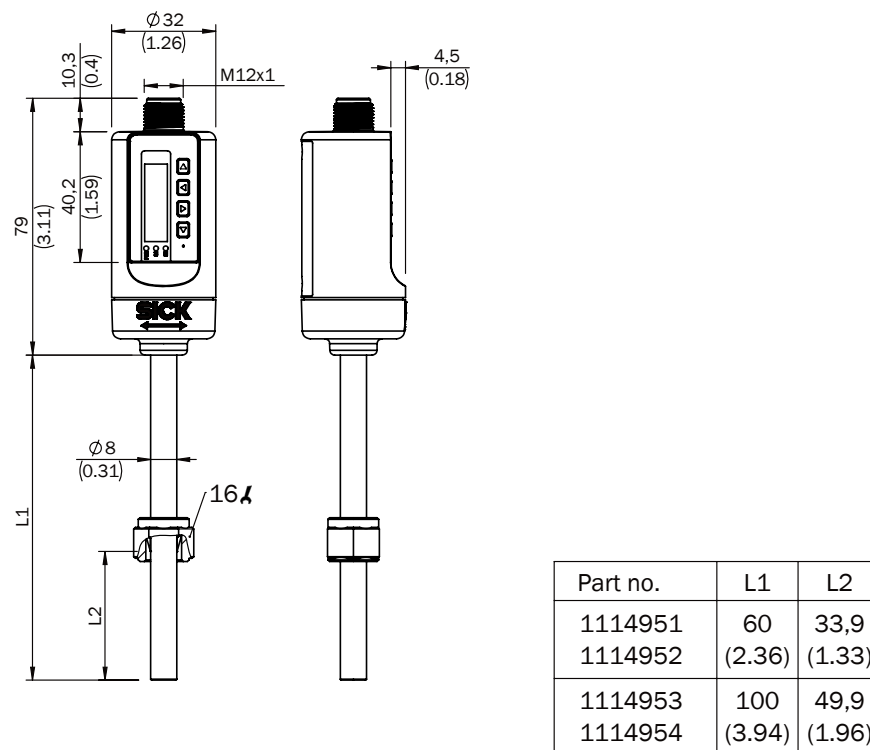
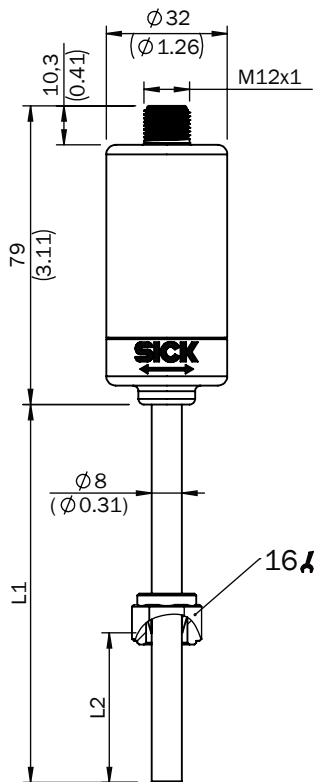


Fig. 39: Dimensional drawing for industrial version with clamping ring

## 12.4 Hygienic version with clamping ring



Part no.	L1	L2
1114955	60	33,9
1114956	(2.36)	(1.33)
1114957	100	49,9
1114958	(3.94)	(1.96)

Fig. 40: Dimensional drawing for hygienic version with clamping ring

### 12.5 Mounting adapter for T-Easic® FTS

#### 12.5.1 G1/2 adapter (P/N 5338774)

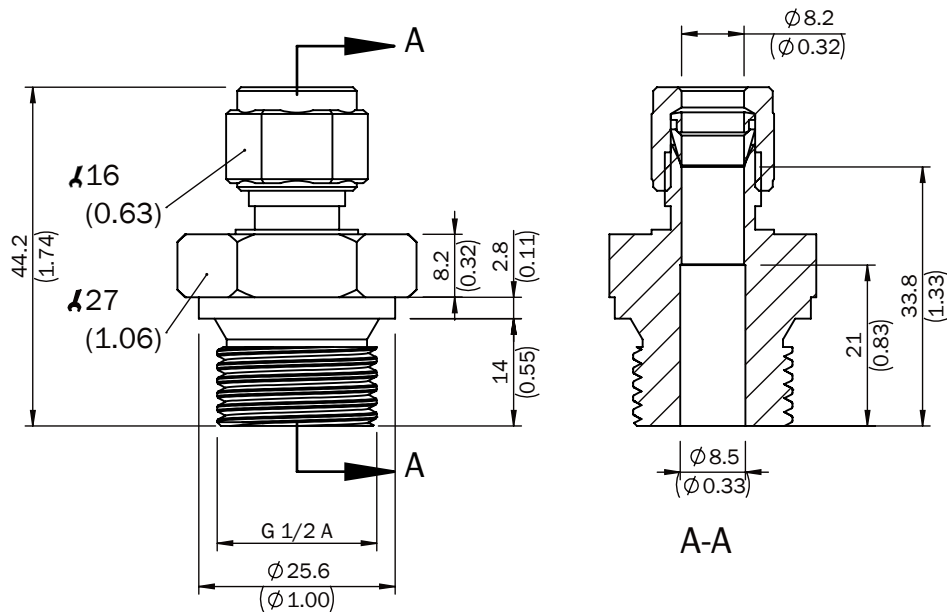


Fig. 41: Dimensional drawing of G1/2 adapter (P/N 5338774)

#### 12.5.2 1/2" NPT adapter (P/N 5338775)

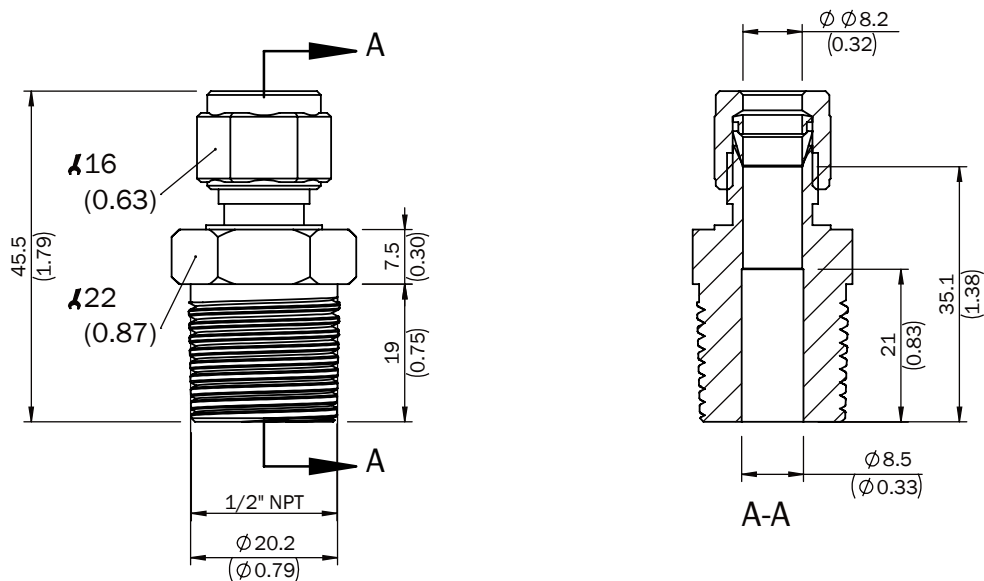


Fig. 42: Dimensional drawing of 1/2" NPT adapter (P/N 5338775)

### 12.5.3 M18 x 1.5 adapter (P/N 2104208)

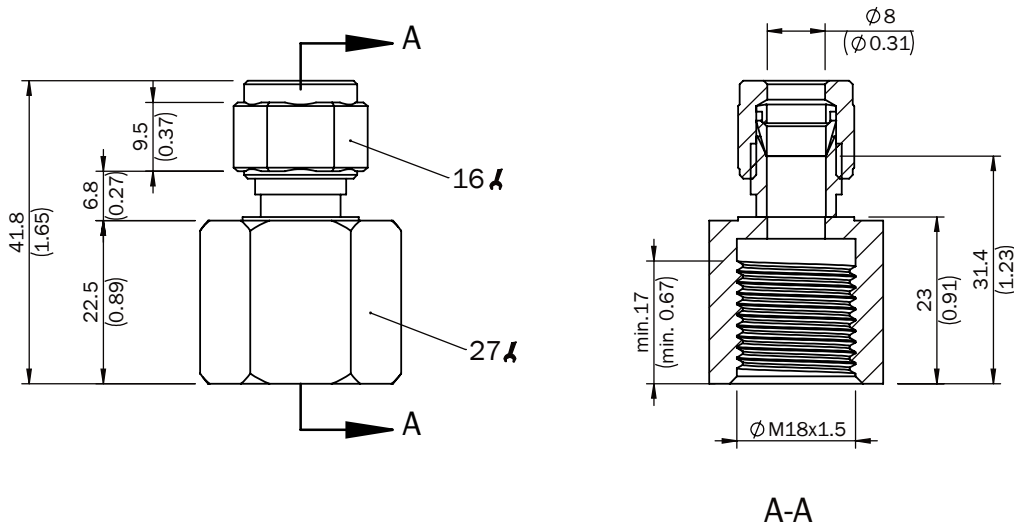


Fig. 43: Dimensional drawing for M18 x 1.5 adapter (P/N 2104208)

### 12.5.4 Clamp connection with weld end (P/N 2121340)

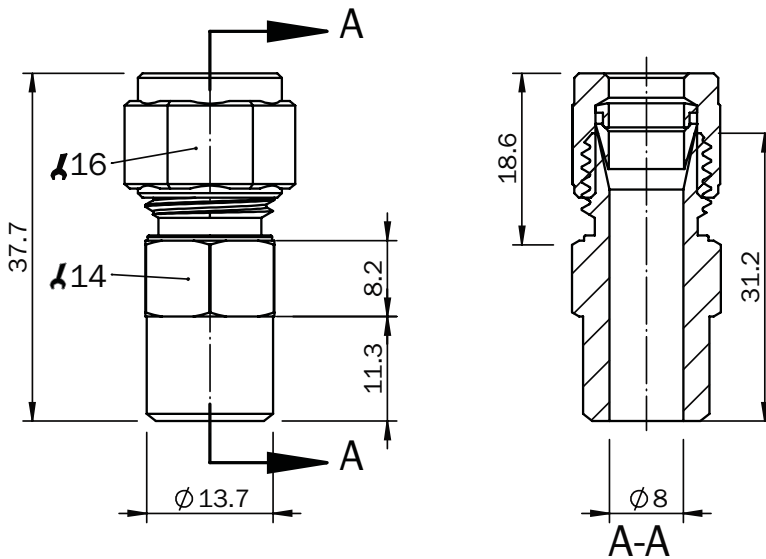
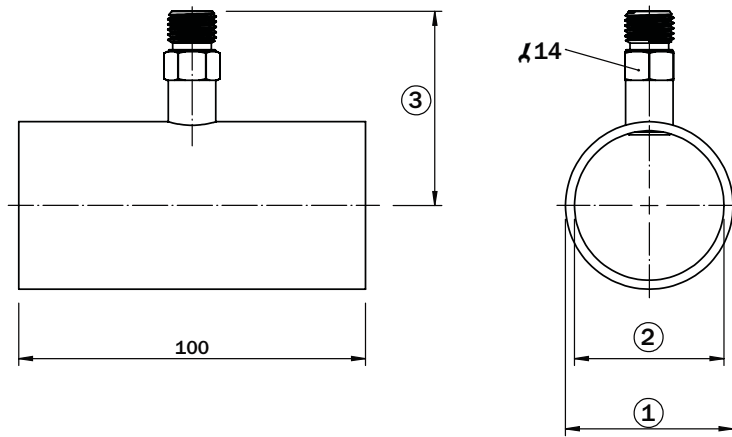


Fig. 44: Dimensional drawing for clamp connection with weld end (P/N 2121340)

## 12.6 T-pieces for T-Easic® FTS

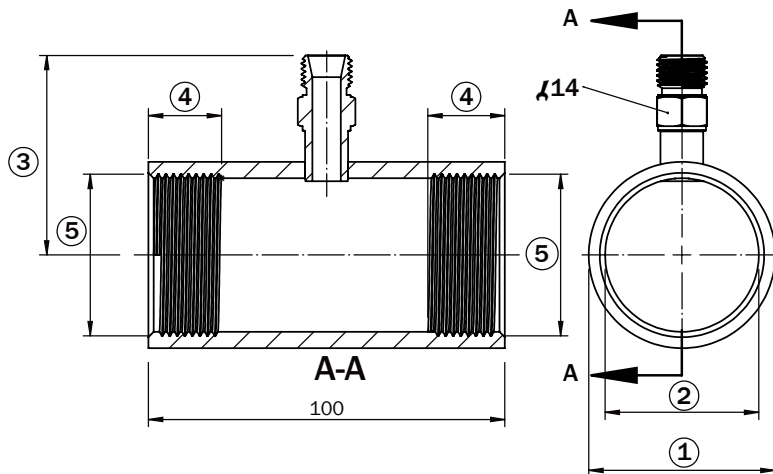
### 12.6.1 T-piece DN25 (P/N 2118844) / DN40 (P/N 2118845) / DN50 (2118846) with weld end



	2118844	2118845	2118846
①	Ø 33.7	Ø 48.3	Ø 60.3
②	Ø 28.5	Ø 43.1	Ø 54.5
③	40	56	56

Fig. 45: Dimensional drawing for T-piece DN25 (P/N 2118844) / DN40 (P/N 2118845) / DN50 (2118846) with weld end

### 12.6.2 T-piece DN25 (P/N 2122453) / DN40 (P/N 2122454) / DN50 (2122455) with Rp thread



	2122453	2122454	2122455
①	Ø 37,7	Ø 52,3	Ø 63,7
②	Ø 28,5	Ø 43,1	Ø 54,5
③	40	56	56
④	21	22	27
⑤	RP 1	RP 1 1/2	RP 2

Fig. 46: Dimensional drawing for T-piece DN25 (P/N 2122453) / DN40 (P/N 2122454) / DN50 (2122455) with Rp thread

### 12.6.3 T-piece DN15 (P/N 2123468) with weld end

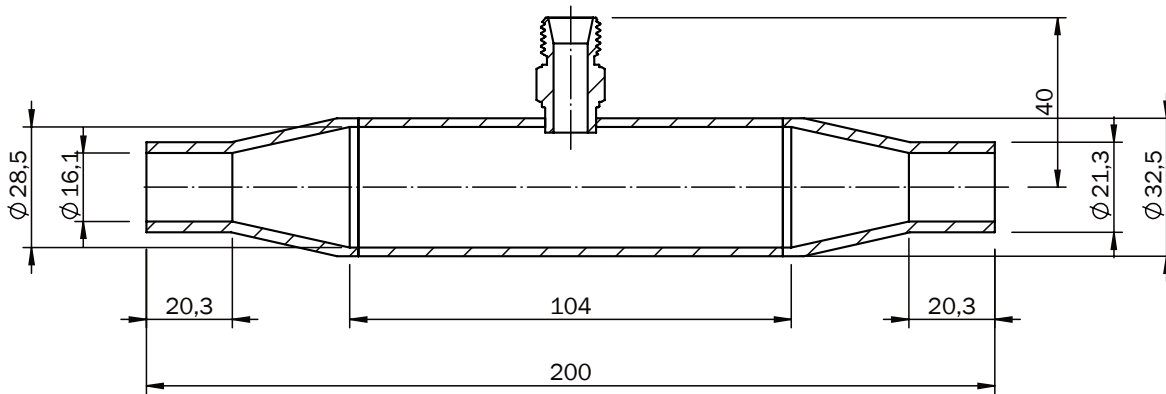


Fig. 47: Dimensional drawing for T-piece DN15 (P/N 2123468) with weld end

### 12.6.4 T-piece DN15 (P/N 2123463) with Rp thread

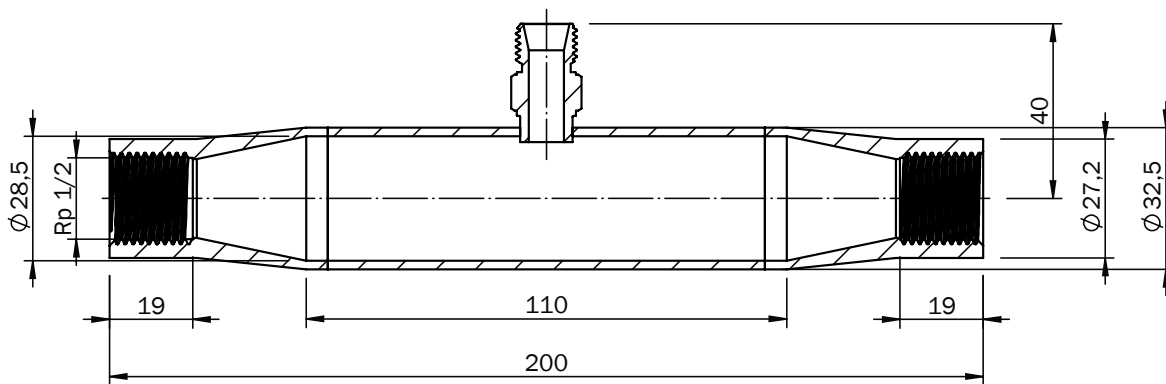


Fig. 48: Caption: Dimensional drawing for T-piece DN15 (P/N 2123463) with Rp thread

## 13 Factory settings

The factory settings can be restored using the factory reset.

Parameter	Value
Measurement mode	Relative (%)
Medium	Water
Diameter	26 mm
Q1 switchpoint 1 - relative velocity	50%
Q1 switchpoint 2 - relative velocity	30%
Q1 switchpoint 1 - absolute velocity	0.5 m/s
Q1 switchpoint 2 - absolute velocity	0.3 m/s
Q1 switchpoint 1 - volume flow	16 L/min
Q1 switchpoint 2 - volume flow	9.5 L/min
Q1 switchpoint 1 - temperature	30 °C
Q1 switchpoint 2 - temperature	25 °C
Q1 mode	Flow hysteresis for normally open
Q2 switchpoint 1 - relative velocity	80%
Q2 switchpoint 2 - relative velocity	60%
Q2 switchpoint 1 - absolute velocity	0.8 m/s
Q2 switchpoint 2 - absolute velocity	0.6 m/s
Q2 switchpoint 1 - volume flow	25.5 L/min
Q2 switchpoint 2 - volume flow	19.0 L/min
Q2 switchpoint 1 - temperature	80 °C
Q2 switchpoint 2 - temperature	75 °C
Q2 mode - electrical version A	Flow hysteresis for normally closed
Q2 mode - electrical version B	Flow analog
Q2a analog lower limit - relative velocity	2%
Q2a analog upper limit - relative velocity	100%
Q2a analog lower limit - absolute velocity	0.03 m/s
Q2a analog upper limit - absolute velocity	1.5 m/s
Q2a analog lower limit - volume flow	1 L/min
Q2a analog upper limit - volume flow	40 L/min
Q2a analog lower limit - temperature	0 °C

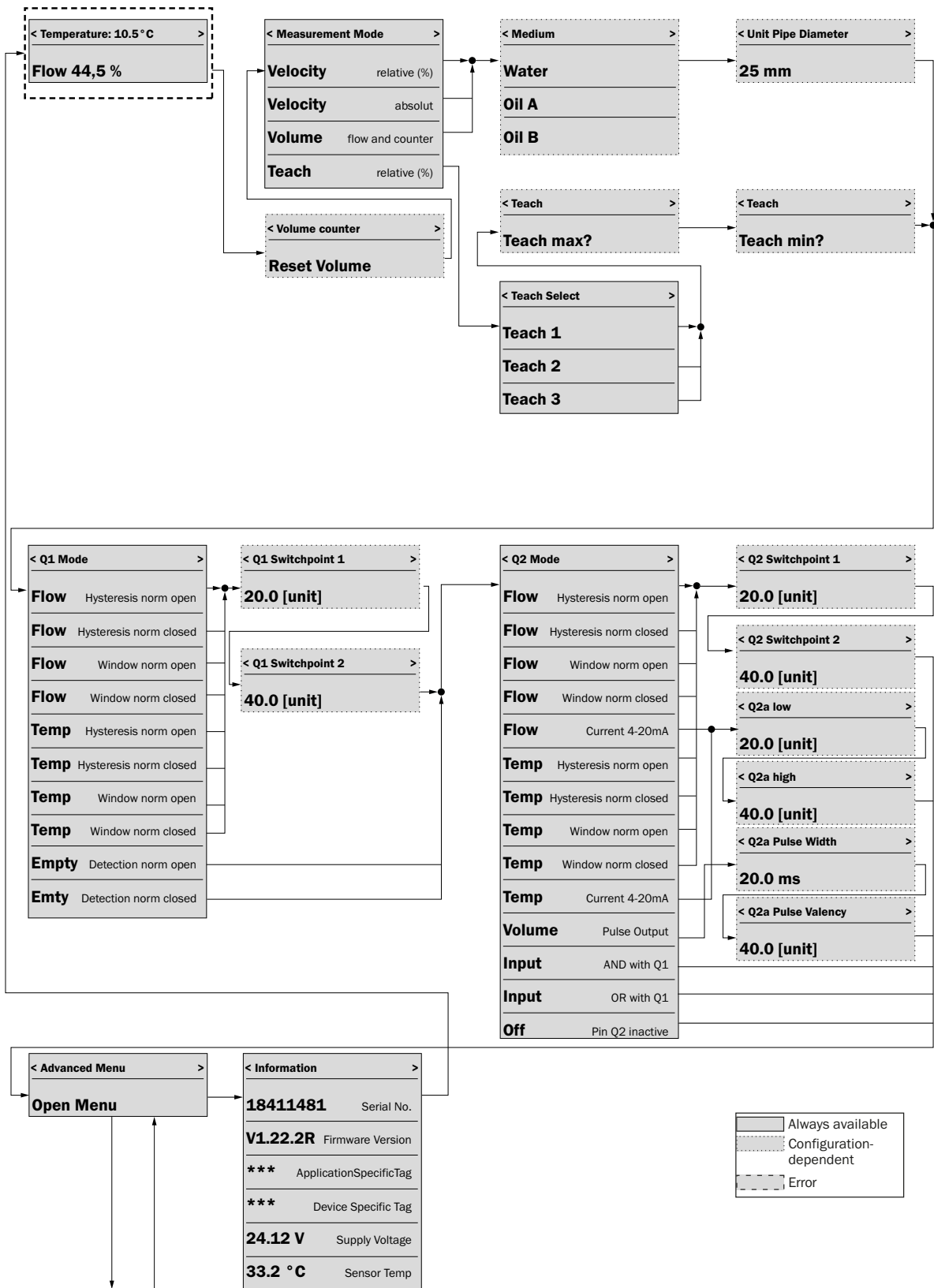
Parameter	Value
Q2a analog upper limit - temperature	100 °C
Q2a analog error mode	3.5 mA
Q2 pulse valency	0.1 L
Q2 pulse width	10 ms
Diameter unit	mm
Unit Velocity	m/s
Unit Temperature	°C (Celsius)
Unit Volume	L
Unit Volume Flow	L/min
Filter (process data)	1 s
Linear Flow Factor	100%
Empty Detection Factor	100%
Low Flow Cutoff (relative velocity)	0% (inactive)
Low flow cutoff (absolute velocity)	0 m/s (inactive)
Low Flow Cutoff (volume flow)	0 l/min (inactive)
Cutoff Hysteresis	50%
Display Language	English
Display Rotation	Standard
Delay Mode Q1	Off
Delay Time Q1	0
Delay Mode Q2	Off
Delay Time Q2	0
Simulation	Off
Display Mode	Flow and temperature
Display Lock	Deactivated
Application-specific indicator	***
Device-specific indicator	***

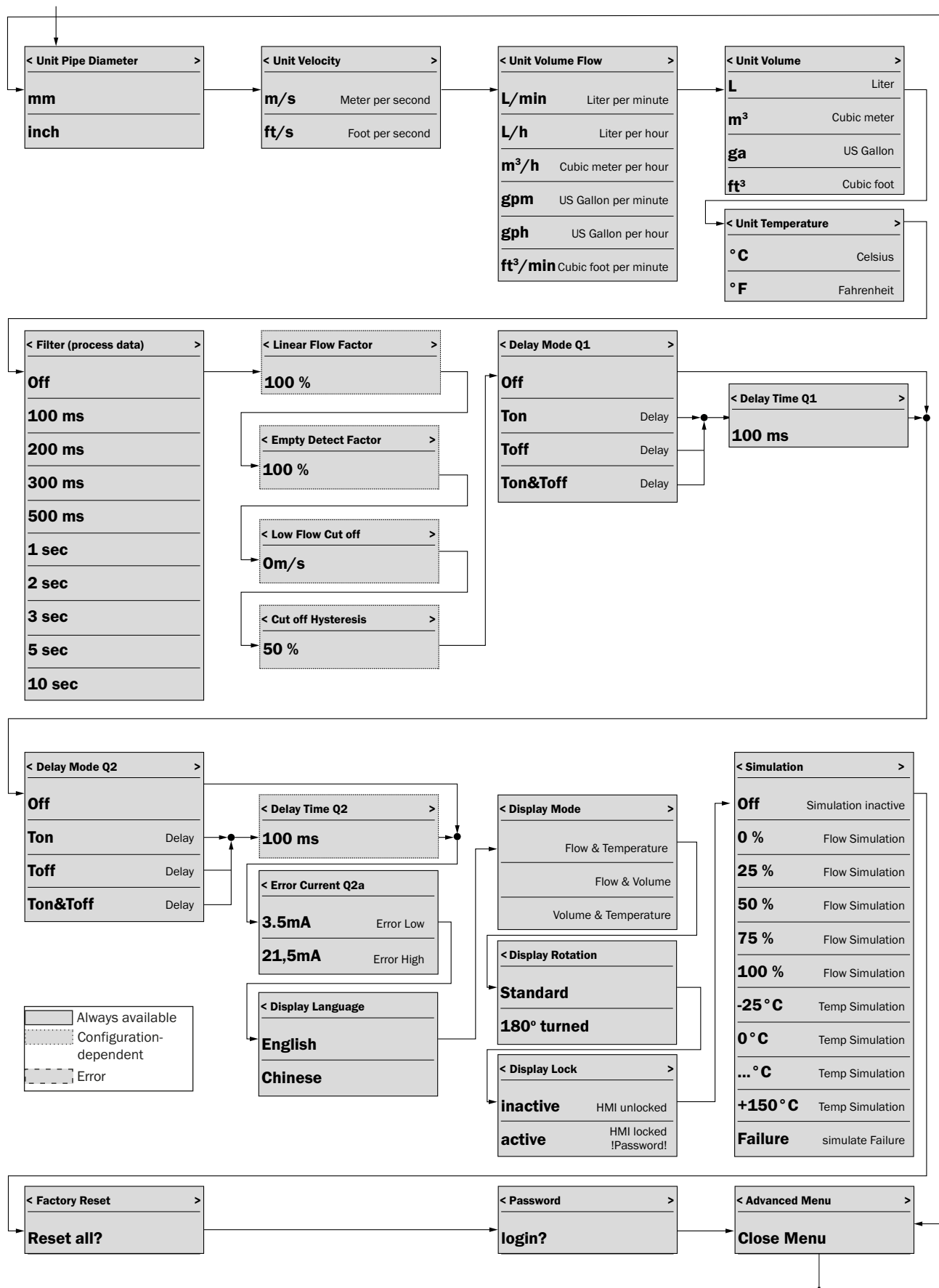
## 14 Accessories

Part number	Type code	Description
5338774	BEF-CFSG12-FTS1-COMPR. FITTING G1/2	Compression fitting for T-Easic® FTS G1/2
5338775	BEF-CFSN12-FTS1-COMPR. FITTING 1/2 "NPT	Compression fitting for T-Easic® FTS 1/2" NPT
2104208	BEF-CFSM18-FTS1-COMPR. FITTING M18X1.5	Compression fitting for T-Easic® FTS M18 x 1.5
2118844	BEF-TCFW25-FTS1	T-piece DN25 weld end for T-Easic® FTS
2118845	BEF-TCFW40-FTS1	T-piece DN40 weld end for T-Easic® FTS
2118846	BEF-TCFW50-FTS1	T-piece DN50 weld end for T-Easic® FTS
2123468	BEF-TCFW15-FTS1	T-piece DN15 weld end for T-Easic® FTS
2121340	BEF-CFWAXX-FTS1	Compression fitting with weld end for T-Easic® FTS
2122453	BEF-TCFR10-FTS1	T-piece DN25 Rp1 thread for T-Easic® FTS
2122454	BEF-TCFR11-FTS1	T-piece DN40 Rp1 1/2 thread for T-Easic® FTS
2122455	BEF-TCFR20-FTS1	T-piece DN50 Rp2 thread for T-Easic® FTS
2123463	BEF-TCFR12-FTS1	T-piece DN15 Rp1/2 thread for T-Easic® FTS
6052613	DOL-1204-G02MNI	Cable IP69K - M12x1, 4-pin, -2 m straight
6052615	DOL-1204-G05MNI	Cable IP69K - M12x1, 4-pin, -5 m straight
6052617	DOL-1204-G10MNI	Cable IP69K - M12x1, 4-pin, -10 m straight

- You can find further accessories online at [www.sick.com](http://www.sick.com)

15 Menu overview





## 16 License text

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