OPERATING INSTRUCTIONS

DOSIC®

Flow sensor

SICK
Sensor Intelligence.

en

Product described

DOSIC®

Manufacturer

SICK AG
Erwin-Sick-Str. 1
79183 Waldkirch
Germany

Legal notes

Original document

This document is an original document published by SICK AG.

Contents

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 applications.

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 must be kept 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. Instructions are given in stages for all actions required.

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 this document, the sensor is referred to in simplified form as DOSIC®, 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.

HAZARD

... 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

NOTE

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

www.sick.com

The following information is available for download from this page:

- Model-specific online data sheets for device variants, containing technical data, dimensional drawings, and diagrams
- EU declaration of conformity for the product family
- Dimensional drawings and 3D CAD dimension models in various electronic formats
- These operating instructions, available in English and German, and in other languages if necessary
- Other publications related to the sensors described here (e.g., IO-Link)
- Publications dealing with accessories

1.5 Customer service

If you require any technical information, our customer service department will be happy to help. To find your representative, 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 Safety information

2.1 Intended use

With its measurement channel and stainless-steel housing, the ultrasonic flowmeter is suitable for measuring tasks in hygienic environments. The compact and rugged design makes the sensor ideal for a wide range of applications, including those where space restrictions or aggressive media play a role.

Installation is quick and easy, and does not require medium calibration. The seal-free, self-draining measuring channel enhances process reliability. The straight shape of the measuring channel reduces pressure loss, which in turn reduces energy costs.

The DOSIC® is EHEDG-certified, and all materials that come into contact with the media are FDA-compliant.

2.2 Improper use

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 improper use.

If the equipment is used in a manner not specified by this document, the protection provided by the equipment may be impaired.

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:

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

With special variants, where optional extras have been ordered, or owing to the latest technical changes, the actual scope of delivery may vary from the features and illustrations shown here.

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.

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 personnel** 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 detect 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 detect 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	• Basic practical technical training • Knowledge of the current safety regulations in the workplace
Electrical installation, device replacement	• Practical electrical training • Knowledge of current electrical safety regulations • Knowledge of device control and operation in the specific application concerned (e.g., conveying line)
Commissioning, configuration	• 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
Operation of the device for the specific application	• Knowledge of device control and operation in the specific application concerned (e.g., CIP/SIP system) • Knowledge of the software and hardware environment for the specific application concerned (e.g., CIP/SIP system)

2.6 Operational safety and specific hazards

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

2.7 Use at high operating temperatures

When the process temperature is high, the sensor housing may get hot.

CAUTION

Risk of burning on sensor housing

- Only touch the hot housing if you are wearing safety gloves.

2.8 General safety notes

- Read the operating instructions prior to commissioning.
- These operating instructions are valid for devices from firmware version 2.00.
- The DOSIC® is not a safety component under the EU Machinery Directive.
- Observe national safety and work safety regulations.
- Wiring work and the opening and closing of electrical connections may only be carried out when the power is switched off.
- The radiated power is far lower than that from telecommunication equipment. According to current scientific research, the operation of this device can be classified as safe and non-hazardous.

2.9 Repairs

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.

The customer is only permitted to change the alignment of the display and to remove the display cover in order to change its position.

3 Product description

3.1 Product identification

3.1.1 Information on the housing

Information for identification of the sensor and its electrical connection are marked on the housing.

The serial number, the part number and the type code are printed on a label stuck on the side of the display. It is visible after removing of the top cover of the sensor.

3.1.2 Type code

DOSIC® FUM	-	H	015	F	1	GC	5
1		2	3	4	5	6	7

Position	Description
1	**Product group** DOSIC® (flow sensors)
2	**Variant** H: Hygienic
3	**Channel size** 015: DN15 025: DN25
4	**Medium** F: Liquids
5	**Display** 1: Yes
6	**Process connection** GC: G 3/4 (DN15 only) GE: G 1 1/4 (DN25 only) CB: Clamp DN15 DIN 32676 (external diameter 34 mm) CD: Clamp DN25 DIN 32676 (external diameter 50.5 mm) MB: DIN 11851 DN15 (thread on both ends) MD: DIN 11851 DN25 (thread on both ends) NC: NPT 3/4 (DN15 only) NE: NPT 1 1/4 (DN25 only)
7	**Electrical connections** 5: M12, 5-pin (2 DI/O; 1 AO) 8: M12, 8-pin (2 DI/O; 2 AO)

Not all variants of the type code can be combined!

3.2 Product characteristics

3.2.1 Device view

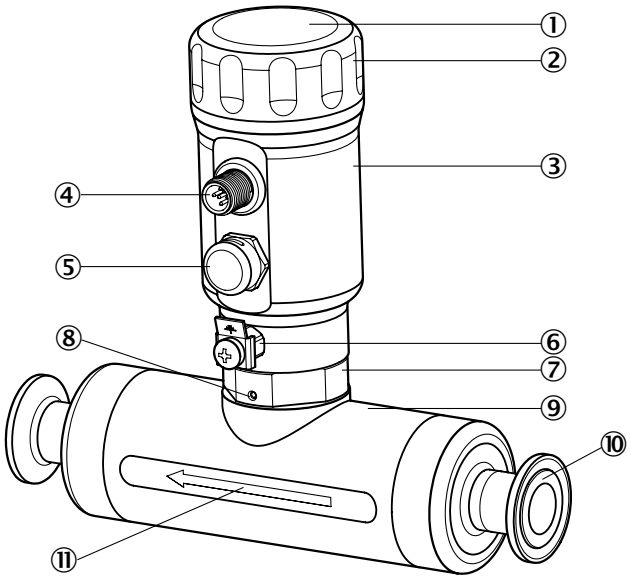


Fig. 1: DOSIC® overview

① Display and operating buttons
② Upper cover
③ Upper housing
④ M12 electrical connection
⑤ Pressure compensation element (prevents build-up of condensate)
⑥ Connection for ground cable
⑦ Nut to unlock/lock housing rotation
⑧ Screw to unlock/lock screw nut ⑦
⑨ Measuring channel
⑩ Process connection
⑪ Flow direction

3.2.2 Operating buttons

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

For a detailed description of the buttons and their functions, see “7.2.1 Display and operating buttons”.

3.3 Product features and functions

3.3.1 Principle of operation

The DOSIC® measures flow volume using ultrasonic technology and the time-of-flight method, making the sensor suitable for measuring both conductive and non-conductive liquids.

The sensor has two configurable digital inputs and outputs and up to two analog outputs. The switching output (Q1) also features an IO-Link interface; see “7.2.3 IO-Link”.

3.3.2 Fields of application

With its measurement channel and stainless-steel housing, the ultrasonic flowmeter is suitable for measuring tasks in hygienic environments. The compact and rugged design makes the sensor ideal for a wide range of applications, including those where space restrictions or aggressive media play a role.

Installation is quick and easy, and does not require medium calibration. The seal-free, self-draining measuring channel enhances process reliability. The straight shape of the measuring channel reduces pressure loss, which in turn reduces energy costs.

The DOSIC® is EHEDG-certified, and all materials that come into contact with the media are FDA-compliant.

This makes the DOSIC® suitable for use in applications such as:

- The food industry
- CIP/SIP systems
- Filter systems
- Osmosis systems
- Measurements with high-purity water

NOTE

Due the ultrasonic technology used is always recommended to perform evaluation tests on media that differ from water. To perform a first evaluation test it is enough to fill the channel of the sensor and close the two process connections of the sensor with blind plugs. Should the sensor show zero flow without any error message there is a good probability that the medium can be measured. In any case a test in the final installation conditions provides the definitive answer if the DOSIC® can measure the specific medium.

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 Goods-in, 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 scope 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: see “13 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

Install the sensor in line with the flow direction of the measurement medium (refer to the arrow on the measurement channel). The measurement medium must fill the measurement channel completely.

The formation of gas in the measurement medium can affect the measurement. For this reason, the sensor should be installed in a section where no gas formation is to be expected (in a vertical position where possible ①).

Where pumps are used, we recommend installing the sensor after the pump (pressure side). Solid particles will affect the measurement. Ensure that no solid particles can affect the measurement (e.g., by using filters).

The installation of inlet and outlet zones in the system is recommended. The inlet zone is a straight section of pipe of 5 x DN length ②. The outlet zone is a section of 3 x DN length ③. Increase the inlet zone to 15 x DN when the sensor is installed after a pump. Increase the inlet zone to 15 x DN when the sensor is installed after a valve. The tubes must not cause turbulences.

To ensure that the measurement channel is kept full with the medium to be measured at all times, the sensor should not be mounted in front of or in down pipes, or at the highest point in the system ④.

The sensor head can be turned to facilitate optimum installation. To turn the sensor head, the nut and the locking screw on the base of the sensor head must be loosened, and then tightened again once the sensor head has been turned (nut: 30 Nm ... 40 Nm; locking screw: 0.7 Nm ... 0.9 Nm).

The X-axis of the measurement channel should be installed at a horizontal angle to the ground ⑤. Where the sensor is being installed vertically and in an EHEDG-compliant installation, we recommend that the offset angle between inlet and outlet zone and Y-axis not exceed 4°, in order to allow self-drainage to take place ⑥.

For EHEDG-compliant installation, EHEDG-certified seals must be used (not supplied).

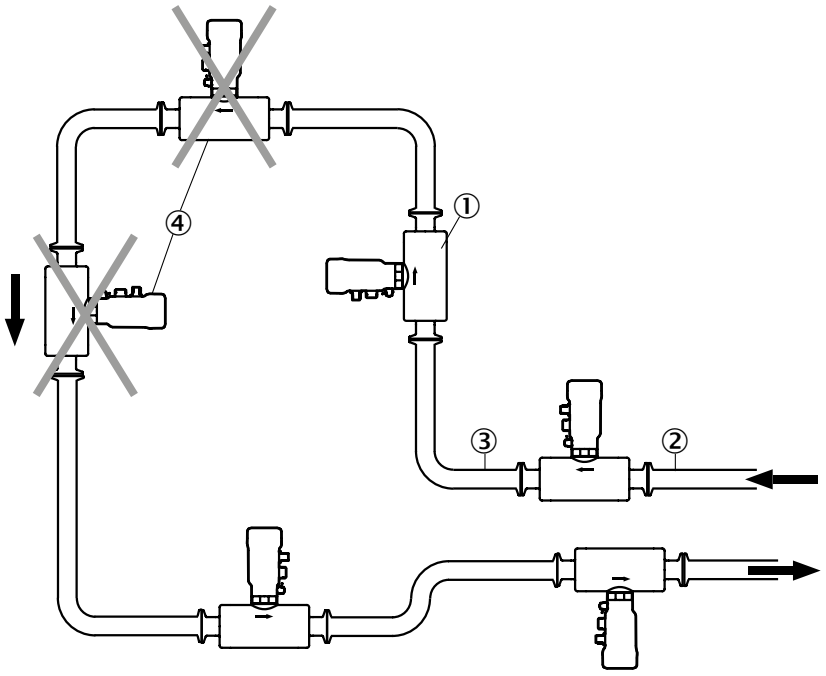


Fig. 2: Recommended installation

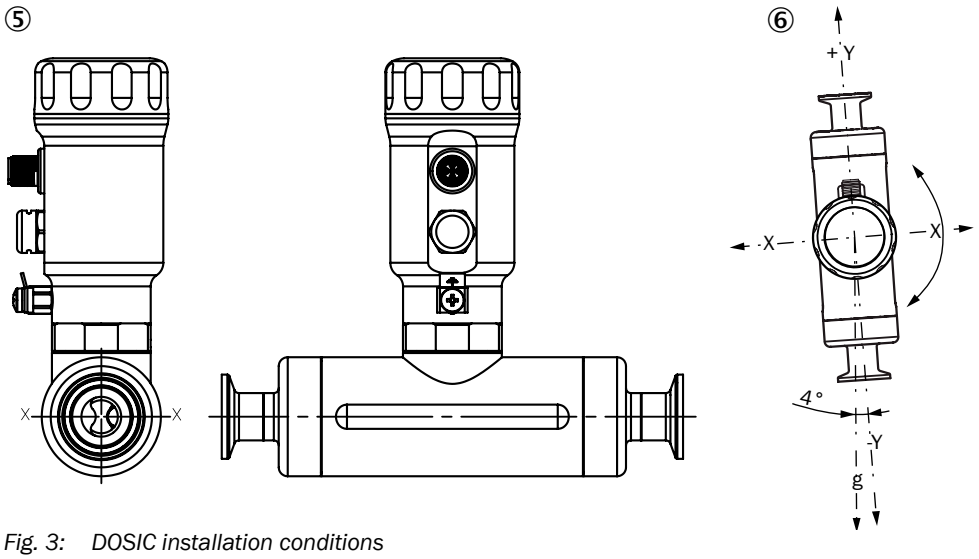


Fig. 3: DOSIC installation conditions

① *Installation in section without gas formation*

② *Inlet zone of 5 x DN length*

③ *Outlet zone of 3 x DN length*

④ *Not installed in front of or in down pipes or at the highest point*

⑤ *X-axis of measurement channel installed at a horizontal angle to the ground*

⑥ *Offset between inlet and outlet zone and Y-axis not exceeded 4 °*

IMPORTANT

The display cover at the top end of the housing must be screwed into position manually, by turning it until it no longer moves (see “3.2.1 Device view” on page 12., item number ②). The M12 connection must also be properly secured to ensure that the IP67/ IP69 enclosure rating is achieved.

IMPORTANT

The tightening torque on the process connection threads must not exceed 35 Nm (DN15) and 80 Nm (DN25). Do not push or pull the upper housing while the process connections are being tightened or while other work is being carried out. The force applied to the upper housing must not exceed 280 N (DN15) and 350 N (DN25).

6 Electrical installation

6.1 Safety

6.1.1 Notes on the 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 met 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 appropriately 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 circuits (SELV = Safety Extra Low Voltage).
- Protect the device with a separate fuse at the start of the supply circuit.

Notes on layout of data cables:

- Use screened data cables with twisted-pair wires.
- Implement the screening design correctly and completely.
- 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 channels.

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

- The cable on the M12 connection has been screwed on.
- The top cover is screwed (no gap between the upper cover and upper housing).

If this is not done, the device does not fulfill any 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 M12 x 1 plug connector (5-pin or 8-pin). With the power switched off, plug the female cable connector into the sensor and screw it tight.

Connect the cable according to its function. After the supply voltage has been applied, the sensor carries out a self-test. Once installed, the sensor is ready for operation on completion of the self-test. The display shows the current measured value.

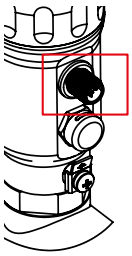


Fig. 4: DOSIC® M12 male connector

6.2.2 Pin assignment, M12 plug connector, 5-pin

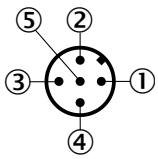


Fig. 5: M12 x 1 plug connector, 5-pin

Contact	Identification	Wire color	Description
1	L+	Brown	Supply voltage
2	Q_A	White	Analog current output 4 mA ... 20 mA
3	M	Blue	Ground, reference potential for current output
4	C/ Q_1	Black	Digital input or digital output (PNP/ NPN/push-pull/open collector). IO-Link communication (available only if Q_1 is defined as PNP or push-pull).
5	Q_2	Gray	Digital input or digital output (PNP/ NPN/push-pull/open collector). Switching/frequency/pulse output available only if Q_2 is defined as a digital output.

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

6.2.3 Pin assignment, M12 plug connector, 8-pin

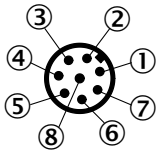


Fig. 6: M12 x 1 plug connector, 8-pin

Contact	Identification	Description
1	L+	Supply voltage
2	Q_2	Digital input or digital output (PNP/NPN/push-pull/open collector). Switching/frequency/pulse output available only if Q_2 is defined as a digital output.
3	M	Ground, reference potential for current output
4	C/Q_1	Digital input or digital output (PNP/NPN/push-pull/open collector). IO-Link communication available only if Q_1 is defined as PNP or push-pull.
5		No function
6		No function
7	Q_A	Analog current output 4 mA ... 20 mA
8	Q_B	Analog current output 4 mA ... 20 mA

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

The wire colors for 8-pin cables are not uniform. Always note the pin assignment of the sensor.

7 Commissioning

7.1 Quick commissioning (with factory settings)

Quick commissioning is used in applications under reference conditions see “5.1 Installation conditions”.

Commissioning

1. Install the sensor in line with the installation conditions in “5 Mounting” During the DOSIC® installation process, the pipe system must be empty.
2. Switch on the supply voltage.
   The sensor performs a self-test and is then ready for operation. The display shows the current measured value.

In the event of problems during commissioning, see “10 Troubleshooting”.

7.2 Operation

7.2.1 Display and operating buttons

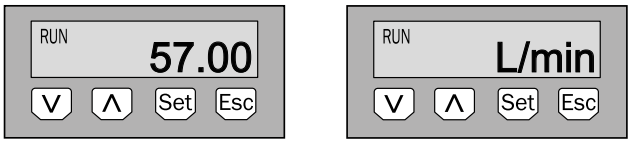
The display automatically alternates between various states, which can be pre-configured using the menu.

You can access the menu by pressing the Set pushbutton for at least 2 seconds.

Set display A and display B

1. Make your selection in the Config menu and confirm using Set.
2. Select Disp A or Disp B and confirm using Set.
3. Select the display value and confirm using Set.

7.2.2 Display and operating elements



Arrow pushbuttons: For navigating in the menu and changing values

Set pushbutton: For saving and confirming values and selecting the sub-menu

Esc pushbutton: For exiting the operating menu one step at a time

7.2.3 IO-Link

For operation via IO-Link, an IODD file, function blocks of common PLCs and a description of the available telegram parameters can be downloaded from **www.sick.com**.

IO-Link is available only if Q1 is defined as output and under Q1Type is defined as PNP or Push-Pull.

7.3 Configuration of digital switching inputs and switching outputs

7.3.1 Selection of digital switching inputs and switching outputs

For Q1Mode (Q2Mode), you can choose either digital switching input or digital switching output. If Q1 (Q2) has been set as an input, the switching behavior for this input is defined in Q1Act (Q2Act). ResetV and CutOff are available as options.

If Q1Mode (Q2Mode) is set as output, you can choose the behavior between flow, temperature, and state (under Q1Proc or Q2Proc). If Q1Proc (Q2Proc) is set as a State, Q1Stat (Q2Stat) can be selected as a Fail, Empty, Steril or Negatv.

If Q1Mode (Q2Mode) has been set as an output, you can choose hysteresis or window function as switching output behavior. You can only choose between switch, frequency and pulse if Q2Mode has been set as an output.

If Q1Mode (Q2Mode) has been set as an output, you can choose between the electrical mode PNP, NPN, Push-Pull and open collector. The output type can be set to normally open or normally closed with the parameter Q1Pol (Q2Pol).

Simulated values can be generated for Q1 and Q2 when chosen as output. The simulation mode can be set under QxSim. The available values are SimOff, Active, and Inactive. The values for active and inactive depend on the settings configured under QxType and QxPol.

Note:

The following configuration options apply to both Q1 and Q2. They apply to Q2 only when Q2Func is set to switch.

7.3.2 Configuration of the switching output

If the flow (or temperature) is fluctuating around the set value, the hysteresis keeps the switching status of the outputs stable.

When the flow (or temperature) is increasing, the output switches when the respective switching point (SP) is reached; if the flow (or temperature) sinks again, the output switches back only after the reset switching point (RP) has been reached.

The window function enables monitoring of a defined range. If the flow (or temperature) is between window high (FH) and window low (FL), the output will be active (normally open) and/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 the safe state; i.e., the switching outputs become inactive.

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

7.3.3 Normally open with configurable hysteresis

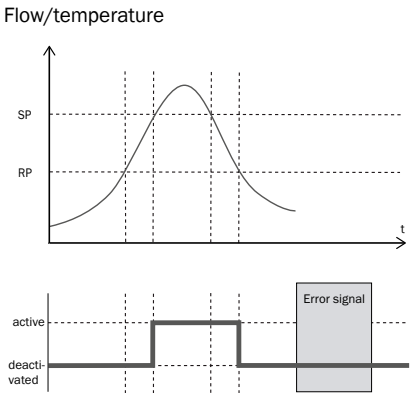
Configuration (based on Q1 as an example)

1. Configure the Q1 switching output as normally open.
   - Select no in the Q1Pol menu and confirm using Set.
2. Configure hysteresis.
   - Select Hyst in the Q1Out menu and confirm using Set.
3. Set the switching point.

- Set the value for Flow or Temperature in the Q1SP menu and confirm using Set.

4. Set the reset point.
   - Set the value for Flow or Temperature in the Q1RP menu and confirm using Set.
5. Select the electrical property (NPN/PNP/DRV/OC).
   Select the parameter in the Q1Type menu and confirm using Set.
   The following rules apply:
   - Q1-PNP = Switching output in PNP circuit
   - Q1-NPN = Switching output in NPN circuit
   - Q1-DRV = Switching output in Push-Pull function
   - Q1-OC = Switching output in open collector function

Switching output behavior



Switching output		PNP	NPN	DRV	OC	Error status
Normally open/ HNO	Active	High	Low	High (PNP switched)	Low	Inactive
	Inactive	Low	High	Low (NPN switched)	High	

7.3.4 Normally closed with configurable hysteresis

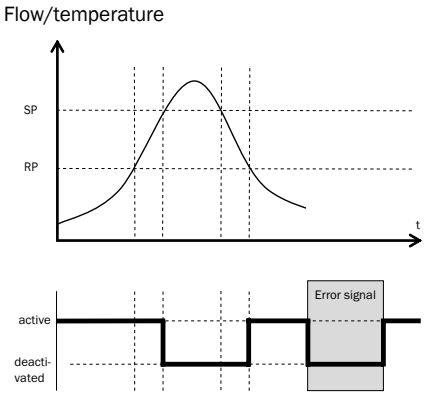
Configuration (based on Q1 as an example)

1. Configure the Q1 switching output as normally closed.
   - Set the parameter in the Q1Pol menu to nc and confirm using Set.
2. Configure hysteresis.
   - Set the parameter in the Q1Out menu to Hyst and confirm using Set.
3. Set the switching point.
   - Set the value for Flow or Temperature in the Q1SP menu and confirm using Set.
4. Set the reset point.
   - Set the value for Flow or Temperature in the Q1RP menu and confirm using Set.
5. Select the electrical property (NPN/PNP/DRV/OC).

Select the parameter in the Q1Type menu and confirm using Set.
The following rules apply:

- NPN = Switching output in NPN circuit
- PNP = Switching output in PNP circuit
- DRV = Switching output in Push-Pull function
- OC = Switching output in open collector function

Switching output behavior



Switching output		PNP	NPN	DRV	OC	Error status
Normally closed/HNC	Active	High	Low	High (PNP switched)	Low	Inactive
	Inactive	Low	High	Low (NPN switched)	High	

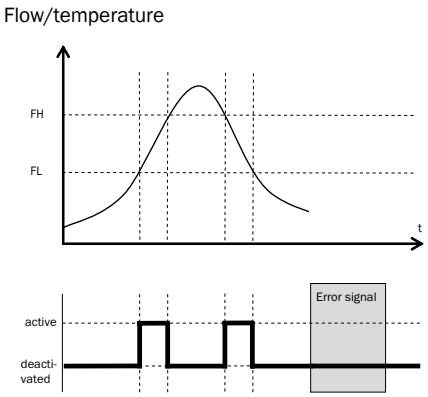
7.3.5 Normally open with window function

Configuration (based on Q1 as an example)

1. Configure the Q1 switching output as normally open.
   - Set the parameter in the Q1Pol menu to no and confirm using Set.
2. Configure window mode.
   - Set the parameter in the Q1Out menu to Window and confirm using Set.
3. Set the switching point.
   - Set the value for Flow or Temperature in the Q1FH menu and confirm using Set.
4. Set the reset point.
   - Set the value for Flow or Temperature in the Q1FL menu and confirm using Set.
5. Select the electrical property (NPN/PNP/DRV/OC).
   Select the parameter in the Q1Type menu and confirm using Set.
   The following rules apply:
   - NPN = Switching output in NPN circuit
   - PNP = Switching output in PNP circuit
   - DRV = Switching output in Push-Pull function

- OC = Switching output in open collector function

Switching output behavior



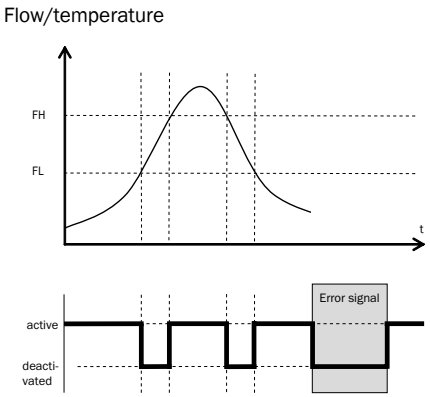
Switching output		PNP	NPN	DRV	OC	Error status
Normally open/ FNO	Active	High	Low	High (PNP switched)	Low	Inactive
	Inactive	Low	High	Low (NPN switched)	High	

7.3.6 Normally closed with window function

Configuration (based on Q1 as an example)

1. Configure the Q1 switching output as normally closed.
   - Set the parameter in the Q1Pol menu to nc and confirm using Set.
2. Configure window mode.
   - Set the parameter in the Q1Out menu to Window and confirm using Set.
3. Set the switching point.
   - Set the value for Flow or Temperature in the Q1FH menu and confirm using Set.
4. Set the reset point.
   - Set the value for Flow or Temperature in the Q1FL menu and confirm using Set.
5. Select the electrical property (NPN/PNP/DRV/OC).
   Select the parameter in the Q1Type menu and confirm using Set.
   The following rules apply:
   - NPN = Switching output in NPN circuit
   - PNP = Switching output in PNP circuit
   - DRV = Switching output in Push-Pull function
   - OC = Switching output in open collector function

Switching output behavior



Switching output		PNP	NPN	DRV	OC	Error status
Normally closed/FNC	Active	High	Low	High (PNP switched)	Low	Inactive
	Inactive	Low	High	Low (NPN switched)	High	

7.3.7 Pulse output

If pulse has been selected as output for Q2, PlsVal can be used to define the pulse value (definition of the volume that generates a pulse). PlsWid can be used to define the pulse width (duration of a pulse in µs).

Example:

PulsVal = 1000 ml, PulsWid = 50 µs

A pulse will be generated when 1000 ml are counted and the pulse duration will be 50 µs.

It is important to ensure that the pulse width set is as short as possible and as long as necessary so that the device connected to the digital output still recognizes the pulse (to avoid overlapped pulses). If the set pulse value is reached, a pulse is sent out at the digital output.

If the pulse valency chosen by the user is too low, the pulse repetition rate can get too high, leading to the sensor outputting a lower number of pulses than it should. If this is the case, the sensor will show the warning [i]HiFrq on the display (and “Q2 frequency too high” over the active notifications of IO-Link).

Example:

Configuration: PlsVal = 100 µL

Measured flowrate = 60 L/min --> Pulse repetition rate clipped to 100 ns --> Warning [i]HiFrq

7.3.8 Frequency output

If frequency has been selected as the output for Q2, FrqMax and FrqMin can be used to define the maximum and minimum frequencies.

The maximum frequency corresponds to the fullscale value. The minimum frequency corresponds to the intial scale value.

The fullscale value and the initial scale value are defined by Q2SP and Q2RP respectively.

Q2SP can be used to define the maximum flow, and Q2RP can be used to define the minimum flow.

Example:

FrqMax = 10.000 (Hz)
FrqMin = 0 (Hz)

Q2SP = 36.00 (L/min)
Q2RP = 0 (L/min)

With these settings, the output frequency varies between 0 and 10.000 Hz when the flow is changed from 0 to 36 L/min. If the flow is 18 L/min, for example, the output frequency is 5.000 Hz.

The frequency output can be simulated under Q2Sim.

Depending on the parameterization of the frequency output, the output frequency can be higher than 10 kHz or lower than 0 Hz. In case the frequency is too high, the sensor will show the warning [i]HiFrq on the display (and “Q2 frequency too high” over the active notifications of IO-Link).

In case the frequency is too low, the sensor will show the warning [i]LoFrq on the display (and “Q2 frequency too low” over the active notifications of IO-Link).

Example:

Configuration: FrqMax = 10kHz, FrqMin = 0Hz, Q2SP = 10.0L/min, Q2RP = 0.0L/min

Measured flowrate = 20 L/min --> Output frequency clipped to 10 kHz à Warning [i] HiFrq

Measured flowrate = -20 L/min --> Output frequency clipped to 0 kHz à Warning [i]LoFrq

7.4 Configuration of analog outputs

Configuration

1. Select the QaType or QbType (only 8-pin variant) menu using the arrow pushbuttons and confirm using Set.
   The available values are Off or 4-20 mA.

7.4.1 Current output 4-20 mA

The analog current outputs Qa and Qb can be configured as flow or/and temperature. However, Qb can only be configured in the 8-pin variant.

Configuration (based on Qa as an example)

1. Set the parameter in the QaType menu to 4-20 mA.
2. Select flow or temperature (under QaProc).
3. Set the upper limit value (20 mA or 4 mA, depending on the setting under QaPol).
   - In the QaHigh menu, set the value for flow range (e.g., 100.0) or temperature (e.g., 60 °C).
4. Set the lower limit value (4 mA or 20 mA, depending on the setting under QaPol).
   - In the QaLow menu, set the value for flow range (e.g., 50.0) or temperature (e.g., 40 °C).
5. Invert the signal.
   The analog signal can be inverted in the QaPol menu.
   Set the parameter to “Inverted” in the QaPol menu.

- Normal = Analog output signal as configured
- Inverted = Analog output signal is inverted; the value configured for QaHigh corresponds to 4 mA and the value configured for QaLow corresponds to 20 mA

6. Set QaFail to 3.5 mA or 21.5 mA.
   In the event of an error, a corresponding signal is output.

7.5 Advanced functions

7.5.1 Measurement Mode

Two different application specific measurement modes are available:

- **Standard**: standard measurement mode with high measurement accuracy for steady/slow changes processes.
- **Dynamic**: fast measurement mode suitable for dynamic applications (e.g. pulsating flow pumps).

Configuration

1. Set the parameter Mode in the Meas menu.
   The available values are: Stndrd, Dynamc

NOTE

When using the **Dynamc** measurement mode, it is recommended to increase the sensitivity of the sensor in order to react to changes in the flowrate as quickly as possible. This may be done by using the following settings in the CutOff menu (see 7.5.3 Zero flow cutoff):

Set = 0.15 L/min

Reset = 0.05 L/min .

7.5.2 Activate filtering

Smoothing of the measured value, e.g., if flow is irregular (e.g. when pumps are starting and stopping). For fast changes, the average of the measured values over a predefined number of seconds is output.

Configuration

1. Set the parameter in the Filter menu.
   The available values are: Off, 500 ms, 1 s, 2 s, 5 s, 10 s.

7.5.3 Zero flow cutoff

As the DOSIC® is a highly sensitive piece of equipment, the sensor detects even the smallest movements in the medium. If the flow rate of a medium is zero, this can result in inaccurate measurements.

The leak flow volume suppression feature helps prevent these measurements from triggering unwanted switching behavior or causing incorrect meter readings. With this feature, the sensor treats very low values as zero flow readings. If the flow drops below a defined reset value, the display and output are reset to zero. When the flow rises above the defined set value once more, the measurements continue.

NOTE

The analog output outputs the current which has been set for Q = 0 L/min.

The frequency output outputs the frequency set for Q = 0 L/min.

The pulse output does not output any pulses at Q = 0 L/min.

Configuration

1. Select the Meas menu using the arrow pushbuttons and confirm using Set.
2. Select the Cutoff menu using the arrow pushbuttons and confirm using Set.
3. Select the Mode menu using the arrow pushbuttons and confirm using Set. The available values are Active and Inactive.
4. Select the value and confirm using Set.
5. Set the parameter in the Set menu.
   - Select the value and confirm using Set.
6. Set the parameter in the Reset menu.
   - Select the value and confirm using Set.

7.5.4 Empty measurement channel

You can pre-configure the required switching behavior that will take effect if the measurement channel is empty.

Configuration

1. Select the Meas menu using the arrow pushbuttons and confirm using Set.
2. Select the Empty menu using the arrow pushbuttons and confirm using Set. The available values are 0-Flow and Fail.
3. Select the value and confirm using Set. For temperature the unit is shown as chosen in the Units menu.

Parameter selection

Parameter	Function
0-Flow	The analog output is set to the relevant value defined for QxLow.
Fail	The error signal is output via Qx-Sta if QxStat is set as Fail.

When the Q1Stat (Q2Stat) is selected as Fail or Empty the following situation and condition can be found on the output of the device:

State of channel	Mapping of QxStat	Empty behavior	System state	Qx state (normally open, as long as no other failure is present)
Filled with the medium	Empty or Failure	ZeroFlow or Failure	Ok	Low
Empty	Empty	ZeroFlow	Ok	High
Empty	Empty	Failure	Fail	Low (safe state)

State of channel	Mapping of QxStat	Empty behavior	System state	Qx state (normally open, as long as no other failure is present)
Empty	Failure	ZeroFlow	Ok	Low
Empty	Failure	Failure	Fail	High

7.5.5 Configure reverse flow direction

If the measurement medium flows through the sensor against the flow direction (see arrow on sensor housing), the sensor can be configured to prevent negative measured values.

Configuration

1. Select the Meas menu using the arrow pushbuttons and confirm using Set.
2. Select the Revrsl menu using the arrow pushbuttons and confirm using Set. The available values are Active, Inactive and Abs.
3. Select the value and confirm using Set.

7.5.6 Simulate flow or temperature

Even if there is no liquid in the measurement channel yet, it is possible to select a flow or temperature in the menu in order to test the sensor configuration.

When simulating a flow, all outputs on the DOSIC® are set according to the defined configuration. The function should not be selected until a configuration is complete.

Configuration

1. Select the Config menu using the arrow pushbuttons and confirm using Set.
2. Select the SimFlw or SimTmp menu using the arrow pushbuttons and confirm using Set.
3. Select the value and confirm using Set.
   For temperature the unit is shown as chosen in the Units menu.

Parameter selection

SimFlw	SimTmp
SimOff: Off	SimOff: Off
-100 % flow	0 °C (32 °F)
-80 % flow	20 °C (68 °F)
-60 % flow	40 °C (104 °F)
-40 % flow	60 °C (140 °F)
-20 % flow	80 °C (176 °F)
0 % flow	100 °C (212 °F)
+20 % flow	
+40 % flow	
+60 % flow	
+80 % flow	
+100 % flow	

NOTE

When the sensor is switched off and on again, the simulation mode is reset. The sensor resumes live measurement.

7.5.7 Media compensation

This functions allows the sensor to be calibrated for a new medium via the 0-Flow menu item or scaling the measured value with a defined factor via the Linear menu.

Configuring calibration for new medium

1. Select the Meas menu using the arrow pushbuttons and confirm using Set.
2. Select 0-Flow using the arrow pushbuttons and confirm using Set.
3. Select AutoCal using the arrow pushbuttons and confirm using Set.
   The automatic calibration process is executed.

NOTE

- The measurement channel must be completely filled with medium.
- There must be no air in the measurement channel.
- The medium must not be flowing while configuration takes place.

Configuring to compensate measurements

1. Select the Meas menu using the arrow pushbuttons and confirm using Set.
2. Select Linear using the arrow pushbuttons and confirm using Set.
3. Select LinFac using the arrow pushbuttons and confirm using Set.

Select the value and confirm using Set.
The measured value is multiplied by the relevant factor and output.
Default value is 1000 (corresponds to 100 %). Flow is represented 1:1.

Example:
LinFac = 1200 (corresponds to 120 %). Flow is increased by 20 %.
LinFac = 800 (corresponds to 80 %). Flow is reduced by 20 %.

7.5.8 Sterilization detection

The detection of a sterilization cycle is be performed by monitoring the process temperature. The following parameters are used under the menu Steril located under the menu Meas:

Set (Sterilization temperature set point)

Reset (Sterilization temperature reset point)

Time (Sterilization time)

A sterilization cycle is detected, if the process temperature exceeds the sterilization temperature set point and stays above the sterilization temperature reset point for at least as long as the sterilization time.

Configuration

1. Select the Meas menu using the arrow pushbuttons and confirm using Set.
2. Select the Steril menu item using the arrow pushbuttons and confirm using Set.

3. Select Set using the arrow pushbuttons and confirm using Set.
4. Select the value and confirm using Set.
5. Select Reset using the arrow pushbuttons and confirm using Set.
6. Select the value and confirm using Set.
7. Select Time using the arrow pushbuttons and confirm using Set.
8. Select the value and confirm using Set.

A notification of the sterilization cycle can be output over a status output configuring under the Q1Stat (Q2Stat) as Steril.

7.5.9 Evaluating signal quality

The signal quality is evaluated on the base of four different parameters: **SigQu1**, **SigQu2**, **SigQu3** and **SigQu4**.

These are described as follows.

SigQu1:

Indication for the robustness of the measurement environment. A low signal quality is an indication for disturbances such as strong vibration on the measurement pipe or turbulence formation due to a not correct installation conditions.

Value range: 0 to 100%

Good signal: > 50 %

SigQu2:

Indication for the attenuation of the ultrasound signal caused by the measured medium. A low signal quality is an indication that some medium parameters could influence the measurement (e.g. as viscosity or density too high).

Value range: 0 to 100%

Good signal: > 10 %

SigQu3:

Indication for the robustness of the ultrasound signals. A low signal quality is an indication for interferences on the signal path (e.g. gas bubbles or solid particles).

Value range: 0 to 100%

Good signal: > 30 %

SigQu4:

Not used. Available for future developments (always shown at 100 %).

7.5.10 Activating the display lock

To prevent the sensor from being tampered with, password protection can be activated for the display.

When the protection is active, the expert password (036742) must be entered before the menu can be accessed.

The menu is only unlocked once the correct password is entered.

Configuration

1. Select the Config menu using the arrow pushbuttons and confirm using Set.
2. Select the Lock menu item using the arrow pushbuttons and confirm using Set.

3. The password protection is activated using Activate.

NOTE

- The user is logged out again after 5 minutes of inactivity.
- When the display is locked, only the configured measured value display can be seen.

7.5.11 Output options for Disp A and Disp B

Outside of the menu, the display alternates between different values, which can be pre-configured via Disp A and Disp B.

- Flow (Flow)
- Fl+Unt (Flow and measuring unit)
- Volume (Volume)
- Temper (Temperature)
- QaCurr (Current value)
- QbCurr (Current value)
- QxStat (Status of the output)
- c (m/s) (Speed of sound)
- v (m/s) (Flow velocity)

7.5.12 Selecting display unit

This setting enables you to configure the units used for flow, volume, and temperature.

Configuration

1. Select the Config menu using the arrow pushbuttons and confirm using Set.
2. Select the Units sub-menu using the arrow pushbuttons and confirm using Set. Set values: Flow, Volume, Temper.
3. Select the value and confirm using Set.

Depending on the parameter, the following units are available:

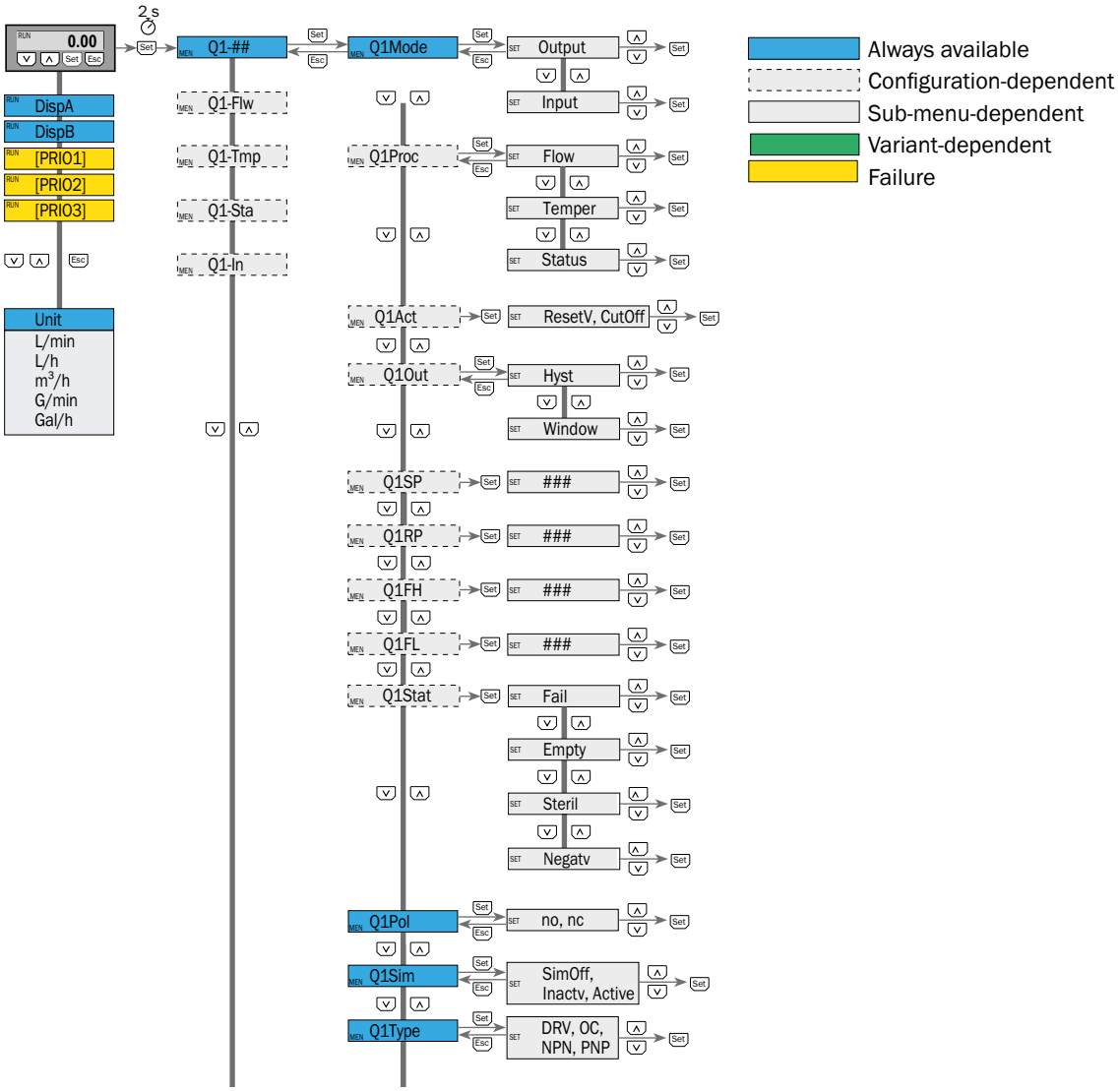
Parameter	Unit
Flow	• L/min • L/h • m^3/h • G/min • Gal/h
Volume	• L • m^3 • Gal
Temper	• °C • °F

7.5.13 Resetting to factory settings

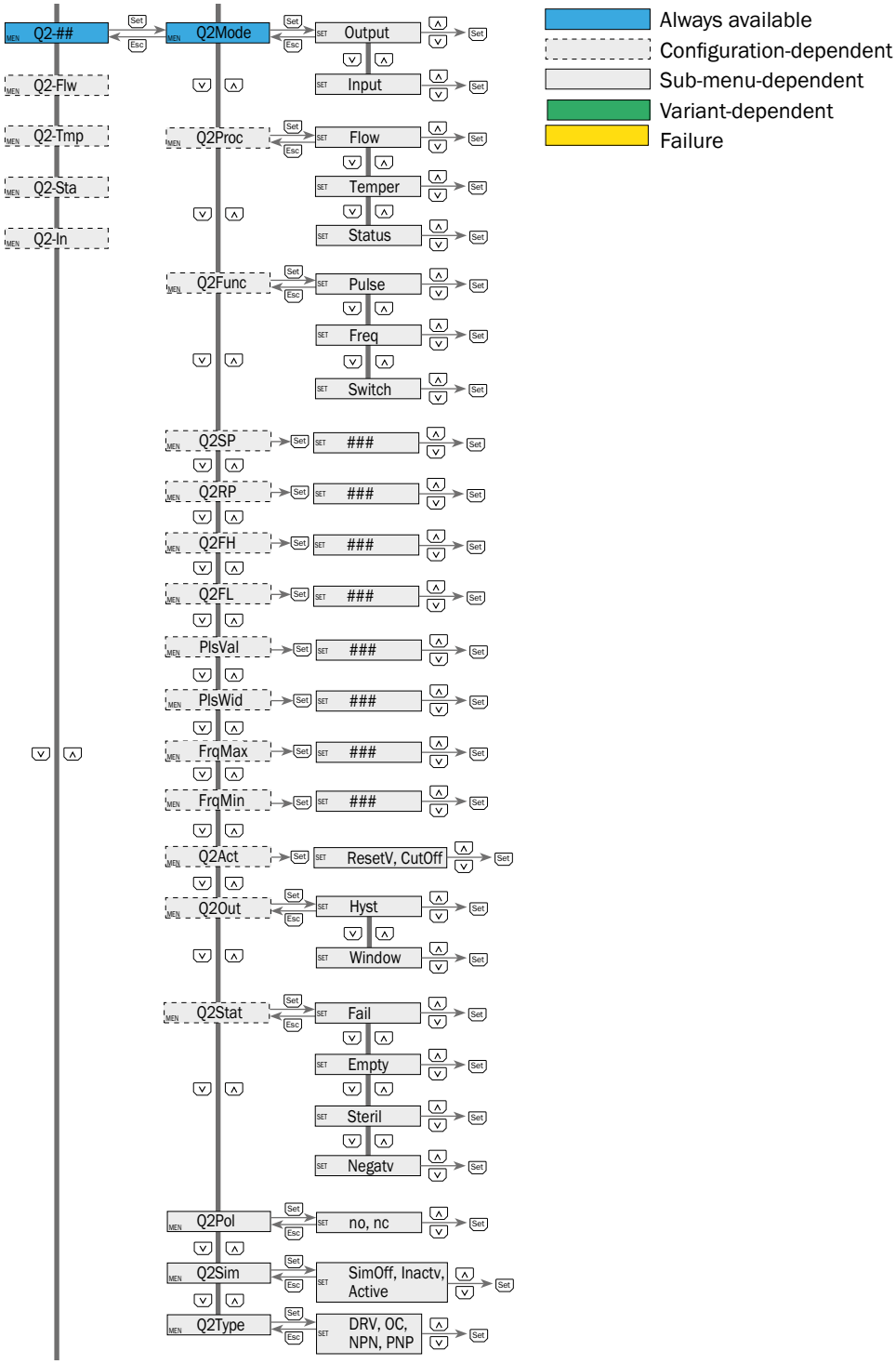
Resetting all parameters to factory settings

1. Select the RstFac menu using the arrow pushbuttons and confirm using Set.
2. Press Set again.

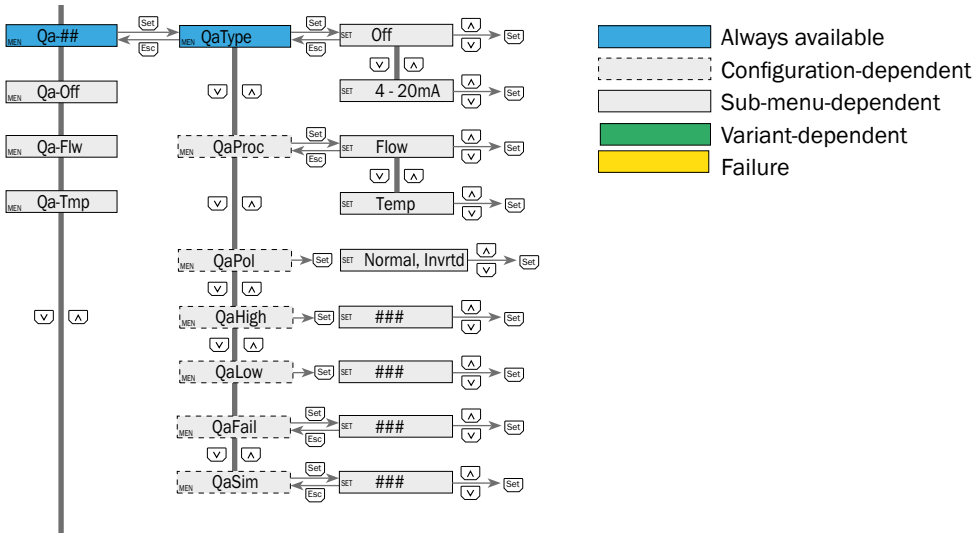
8 Menu overview



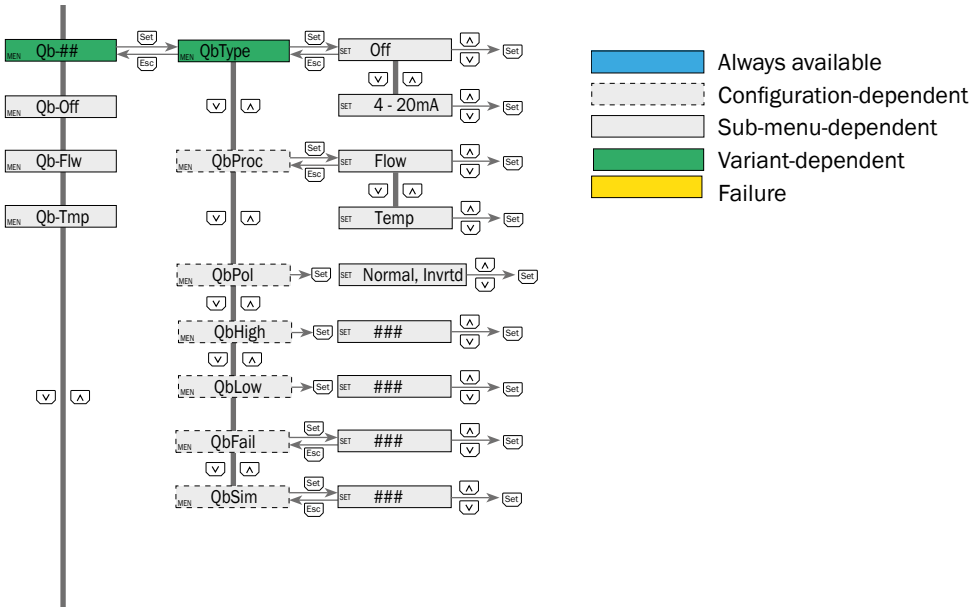
Q1Proc is visible when **Q1Mode** is set as an **Output**.
Q1Act is visible when **Q1Mode** is set as an **Input**.
Q1Out is visible when **Q1Mode** is set as an **Output** and **Q1Proc** is set as **Flow** or **Temper**.
Q1SP and **Q1RP** are visible when **Q1Out** is set as **Hyst**.
Q1FH and **Q1FL** are visible when **Q1Out** is set as **Window**.
Q1Stat is visible when **Q1Proc** is set as **Status**.



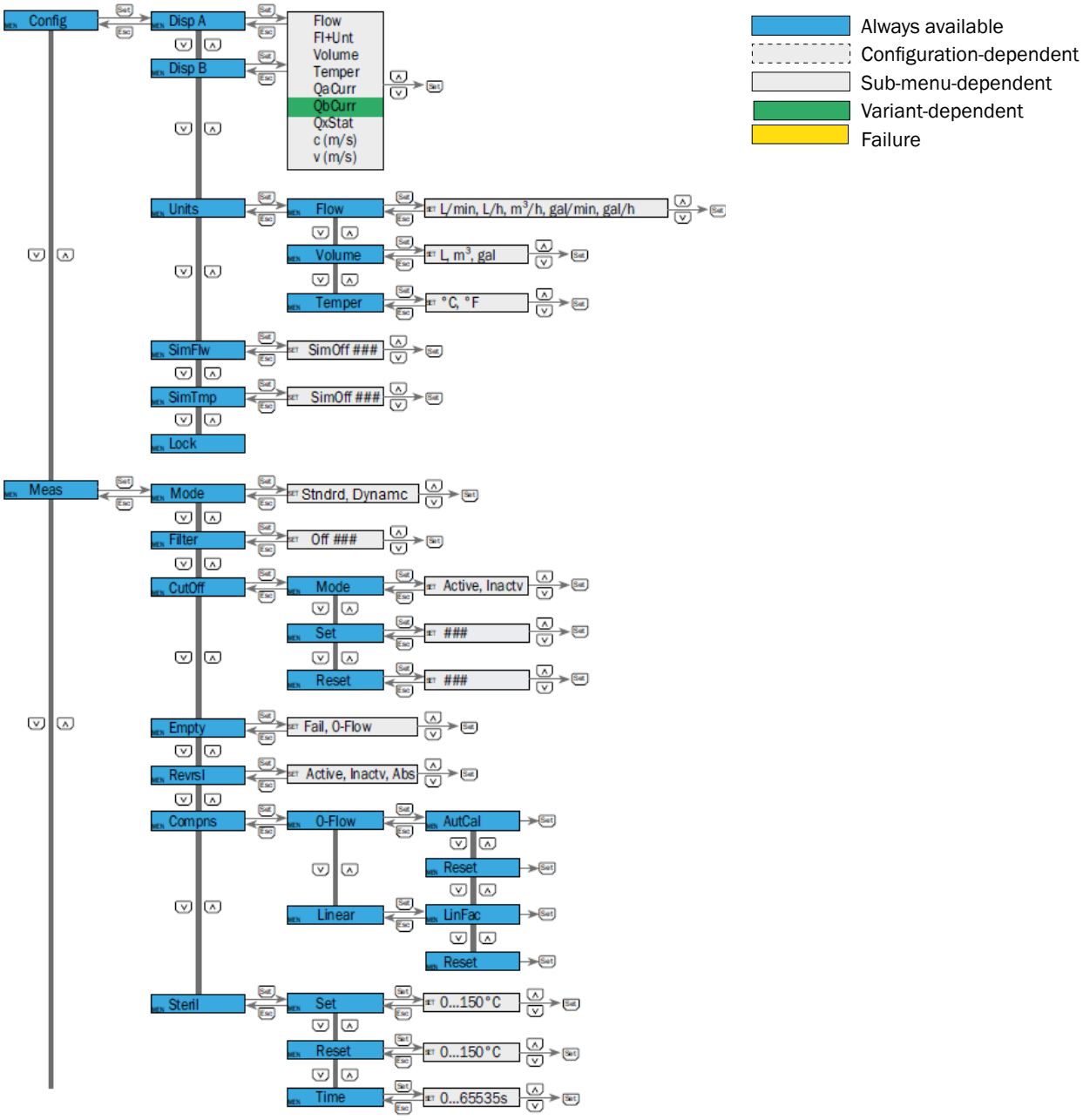
Q2Proc is visible when **Q2Mode** is set as an **Output**.
Q2Act is visible when **Q2Mode** is set as an **Input**.
Q2Func is visible when **Q2Mode** is set as an**Output** and **Q2Proc** is set as **Flow**.
Q2Out is visible when **Q2Func** is set as **Switch** and **Q2Proc** is set as **Temper**.
Q2SP and **Q2RP** are visible when **Q2Out** is set as **Hyst** and **Q2Func** as **Freq**.
Q2FH and **Q2FL** are visible when **Q2Out** is set as **Window**.
FrqMax and **FrqMin** are visible when **Q2Func** is set as **Freq**.
PlsVal and **PlsWid**are visible when **Q2Func** is set as **Pulse**.
Q2Stat is visible when **Q2Proc** is set as **Status**.

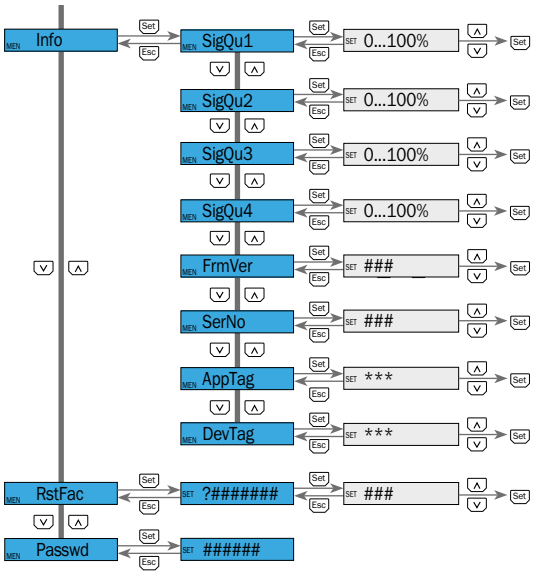


QaProc, **QaPol**, **QaHigh**, **QaLow**, **QaFail** and **QaSim** are visible when **QaType** is set as **4-20 mA**.



QbProc, **QbPol**, **QbHigh**, **QbLow**, **QbFail** and **QbSim** are visible when **QbType** is set as **4-20 mA**.


Always available
Configuration-dependent
Sub-menu-dependent
Variant-dependent
Failure
Config
Disp A
Disp B
Flow
Fl+Unt
Volume
Temper
QaCurr
QbCurr
QxStat
c (m/s)
v (m/s)
Units
Flow
L/min, L/h, m³/h, gal/min, gal/h
Volume
L, m³, gal
Temper
°C, °F
SimFlw
SimOff ###
SimTmp
SimOff ###
Lock
Meas
Mode
Stndrd, Dynamc
Filter
Off ###
CutOff
Mode
Active, Inactv
Set
###
Reset
###
Empty
Fail, 0-Flow
RevrsI
Active, Inactv, Abs
Compns
0-Flow
AutCal
Reset
Linear
LinFac
Reset
SteriI
Set
0...150 °C
Reset
0...150 °C
Time
0...65535s



Always available
Configuration-dependent
Sub-menu-dependent
Variant-dependent
Failure

9 Overview of parameters

Parameter	Description
Q1/Q2-Flw	Q1 or Q2 set as flow digital output (Switch/Frequency/Puls)
Q1/Q2-Tmp	Q1 or Q2 set as temperature digital output
Q1/Q2-Sta	Q1 or Q2 set as status digital output
Q1/Q2-In	Q1 or Q2 set as digital input
Q1/Q2Mode	Selection of mode for Q1 and Q2. Values: Output (digital output) or input (digital input)
Q1/Q2Act	Selection of action for Q1 and Q2. Values: ResetV (volume counter set to 0) or Cutoff (deactivation of cut-off function)
Q1/Q2Proc	Selection of function for Q1 and Q2 as outputs. Values: Flow, Temperature, or Status
Q1/Q2Out	Selection of set values for Q1 and Q2. Values: Hysteresis or Window
Q1/Q2SP	Q1 or Q2 switching point value (if Q1 or Q2 is set as Flow or Temperature and Hysteresis and Q2 is set as switch output mode). If Q2 is set as a frequency output, the maximum flow is set under maximum frequency.
Q1/Q2RP	Q1 or Q2 reset point value (if Q1 or Q2 is set as Flow or Temperature and Hysteresis and Q2 is set as switch output mode). If Q2 is set as a frequency output, the minimum flow is set under minimum frequency.
Q1/Q2FH	Q1 or Q2 upper threshold (if Q1 or Q2 is set as Flow or Temperature and Window and Q2 is set as switch output mode).
Q1/Q2FL	Q1 or Q2 lower threshold (if Q1 or Q2 is set as Flow or Temperature and Window and Q2 is set as switch output mode).
Q1/Q2Pol	Switching output Q1 or Q2. Values: no or nc (normally open or normally closed)
Q1/Q2Sim	Simulation mode Q1 or Q2. Values: SimOff (no simulation), Inactv (0 or 24 V, QxPol-dependent), Active (0 or 24 V, QxPol-dependent)
Q1/Q2Type	Switching output mode selection Q1 or Q2. Values: PNP, DRV, OC, NPN (PNP, push-pull, open collector, NPN)
Q1/Q2Stat	Sensor output. Values: Fail (system error), Empty (channel empty), Steril (sterilization detection) Negatv (negative flow)
Q2Func	Q2 digital output type selection. Values: Pulse, Freq or Switch
PlsVal	Volume that generates a pulse when Q2 is set as pulse output
PlsWid	Pulse duration if Q2 is set as frequency output
FrqMax	Maximum frequency if Q2 is set as frequency output
FrqMin	Minimum frequency if Q2 is set as frequency output
Qa/Qb-Off	Qa or Qb is deactivated
Qa/Qb-Flw	Qa or Qb set as flow analog output
Qa/Qb-Tmp	Qa or Qb set as temperature analog output
Qa/QbType	Select if the analog output is active (4 mA ... 20 mA) or inactive (Off)

Parameter	Description
Qa/QbPol	Switching output Qa or Qb. Values: Normal (normal = 4 ... 20 mA) or Invrtd (inverted = 20 ... 4 mA)
Qa/QbHigh	Qa or Qb full scale value
Qa/QbLow	Qa or Qb initial scale value
Qa/QbFail	Qa or Qb alarm value. Values: 3.5 mA or 21.5 mA
Qa/QbSim	Qa or Qb simulation function. Values: Simoff (no simulated value output), 3.5/3.8/4.0/10/12/18/20/20.5/21.5 (mA)
Config	System settings. Selection: • Disp A: Selection: Flow, Fl+Unt, Volume, Temper, QaCurr, QbCurr, QxStat, c (m/s), v (m/s) • Disp B: Selection: Flow, Fl+Unt, Volume, Temp, QaCurr, QbCurr, QxStat, c (m/s), v (m/s) • Units: Selection: Flow (L/min, L/h, m3/h, G/min, Gal/h), Volume (L, m3, gal,), Temp (°C, °F) • SimFlw: Selection: SimOff, -100 %, -80 %, -60 %, -40 %, -20 %, 0 %, 20 %, 40 %, 60 %, 80 %, 100 % • SimTmp: SimOff, 0 °C (32 °F), 20 °C (68 °C), 40 °C (104 °F), 60 °C (140 °F), 80 °C (176 °F), 100 °C (212 °F) • Lock: Selection: Inactive, Active
Meas	Measurement settings. Selection: • Mode: Stndrd, Dynamc • Filter: Selection: Off, 500 ms, 1 s, 2 s, 5 s, 10 s • CutOff: Selection: Mode (values: Active, Inactive), Set and Reset. • Empty: Selection: Fail, 0-Flow • Revrsl: Selection: Inactive, Active, Abs • Compns: Selection: 0-Flow (values: AutoCal, Reset), Linear (values: LinFact, Linear) • Steril: Selection: Set, Reset, Time
Info	Device information. Selection: SigQu1, SigQu2, SigQu3, SigQu4, Frmver (firmware version), SerNo (serial number), AppTag (application reference number, can be adjusted), DevTag (device reference number, can be adjusted)
RstFac	Reset to factory settings. Selection: [?]load / [?]deflt / [?]conf?
Passwd	If the lock has been activated (under Config), enter the password (036742) to unlock the device.

10 Troubleshooting

10.1 Error message on the display

On the display are shown up to three error messages with highest priority. The messages that can appear on the display are listed in the following table.

Error	Cause	Solution
[i]OL-Qa	The ohmic load at the analog output Q_A is too high.	Reduce the load on Q_A.
[i]SC-Qa	Short circuit at output Q_A.	Resolve short circuit.
[i]OL-Qb	The ohmic load at the analog output Q_B is too high.	Reduce the load on Q_B.
[i]SC-Qb	Short circuit at output Q_B.	Resolve short circuit.
[!]InErr	System error	Contact SICK; the sensor is defective.
[i]QxOff	Supply voltage at digital input/output too low.	Increase supply voltage to achieve the desired functionality.
[i]QaOff	Supply voltage at analog output too low.	Increase supply voltage to achieve the desired functionality.
[i]IOLOf	Supply voltage at IO-Link interface too low.	Increase supply voltage to achieve the desired functionality.
[i]LoFlw	Leak flow volume suppression is deactivated.	Informs you that leak flow volume suppression is deactivated.
[i]Empty	The measurement channel is not completely full.	Check sensor installation and ensure that the measurement channel is completely full.
[i]Simul	Simulation mode active.	Informs you that simulation mode is active.
[i]OL-Qx	Q_1 and/or Q_2 have overheated.	Reduce load on Q_1 and/or Q_2.
[!]MFail	System error	Contact SICK; the sensor is defective.
[i]SC-Q1	Short circuit at output Q_1.	Resolve short circuit.
[i]SC-Q2	Short circuit at output Q_2.	Resolve short circuit.
[i]QxErr	The configured parameters for Q_1 and Q_2 have been deleted.	Reconfigure the parameters.
[i]UVolt	The system voltage is lower than 12 V.	Increase the voltage to achieve the desired functionality.
[i]OVolt	The system voltage is higher than 30 V.	Reduce the voltage to achieve the desired functionality.
[i]PTmpL	Process temperature is too low (< –20 °C).	Increase process temperature.
[i]PTmpH	Process temperature is too high (> 150 °C).	Reduce process temperature.
[i]HTmpH	The electronic PCB has overheated.	Reduce the ambient temperature.
[i]HTmpL	The electronic PCB is too cold.	Increase the ambient temperature.
[!]Empty	The measurement channel is not 100% filled with medium.	An error signal is set (3.5 mA or 21 mA is set as QxFail).
[i]HiFrq	Pulse valency for pulse output to low or frequency of the frequency output too high.	Increase the pulse valency or decrease the maximum frequency.
[i]LoFrq	Frequency of the frequency output too low.	Increase the minimum frequency.
[i]Steri	Process temperature exceeds the sterilization temperature set point and stays above the sterilization temperature reset point for at least as long as the sterilization time.	Check the sterilization parameters.
[i]ErrFw	The firmware has been downgraded to a previous version	Please contact SICK.
[!]Err82	System error.	Please contact SICK; the sensor is defective.
[!]Err83	System error.	Please contact SICK; the sensor is defective.
[!]Err84	System error.	Please contact SICK; the sensor is defective.

Error	Cause	Solution
[i]Err96	System information message.	Please contact SICK.
[i]Err97	System information message.	Please contact SICK.
[i]Err98	System information message.	Please contact SICK.

10.2 Outputs

Error	Cause	Solution
Switching output does not behave as expected	Configuration incorrect.	Perform configuration of the switching output (see “7.3 Configuration of digital switching inputs and switching outputs”).
	An error is pending; the sensor outputs are in the safe state.	Remove the cause of the error.
	Line break.	Check cable.
Analog output does not behave as expected	Configuration incorrect.	Configure the analog output (see “7.4 Configuration of analog outputs”).
	An error is pending; the sensor outputs are in the safe state.	Remove the cause of the error.
	Line break.	Check cable.

11 Repair

11.1 Maintenance

The DOSIC® is maintenance-free. We recommend performing the following actions regularly:

- Checking the measurement area for deposits.
- Checking the screw connections and plug-in connections.

11.2 Returns

Rinse off and/or 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).

12 Disposal

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

13 Technical data

13.1 Features

Medium	Conductive and non-conductive liquids
Detection type	Ultrasonic time-of-flight measurement
Diameter	DN15 and DN25
Process pressure	–0.5 bar rel. ... +16 bar rel.
Process temperature	0 °C ... +95 °C with flow and temperature measurement; up to 143 °C only with temperature measurement during SIP process.
EHEDG certificate	✓
UL certificate	✓
IO-Link 1.1	✓
FDA	✓
Temperature measurement	✓

13.2 Performance

Accuracy[1)]	± 1% of measured value
Standard deviation[2)]	σ_V ≤ 0.7% of measured volume
Reproducibility	0.5 %
Resolution	10 ml/min
Response time	< 12 ms
Min./max. flow DN15[3)]	0.5 L/min ≤ Q_{DN15} ≤ 80 L/min
Min./max. flow DN25[3)]	1.5 L/min ≤ Q_{DN25} ≤ 250 L/min
Inlet/outlet zone DN15	5 x DN/3 x DN
Inlet/outlet zone DN25	5 x DN/3 x DN

[1)] Under reference conditions with water 26 °C ± 2 K, 2.5 bar ± 0.5 bar; standard settings (see chapter 15 Factory settings), DN15: 8 L/min ... 80 L/min, DN25: 25 L/min ... 250 L/min

[2)] Nominal volume between 100 mL and 2000 mL; DN15; 26 °C ± 2 K; settings (differ from default settings as listed in Chapter 15): Q2Func Pulse; Meas Mode Dynamc; Filter Off; Set (CutOff) 0.15 mL/min; Reset (CutOff) 0,05 L/min; PlsVal 100 µL).

[3)] Calibrated under reference conditions with water 3.6 L/min ≤ Q_{DN15} ≤ 36 L/min and 10 L/min ≤ Q_{DN25} ≤ 100 L/min.

13.3 Mechanics/materials

Materials in contact with the media	Stainless steel 1.4404
Surface finish[1)]	Ra ≤ 0.8 µm
Process connection	• G 3/4 • G 1 1/4 • 3/4" NPT • 1 1/4" NPT • DN15 DIN32676 • DN25 DIN32676 • DN15 DIN11851 • DN25 DIN11851
Housing material	Stainless steel 1.4305
Enclosure rating[2)3)]	IP67/IP69: DIN EN 60529
Weight	Approx. 2 kg (DN15) Approx. 3 kg (DN25)

1) Without welding seams

2) With screw-on housing cap and M12 connector

3) Not UL tested

13.4 Ambient conditions

Ambient temperature, operation[1)]	0 °C ... +60 °C
Ambient temperature, storage	-40 °C ...+80 °C

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

13.5 Electrical connections

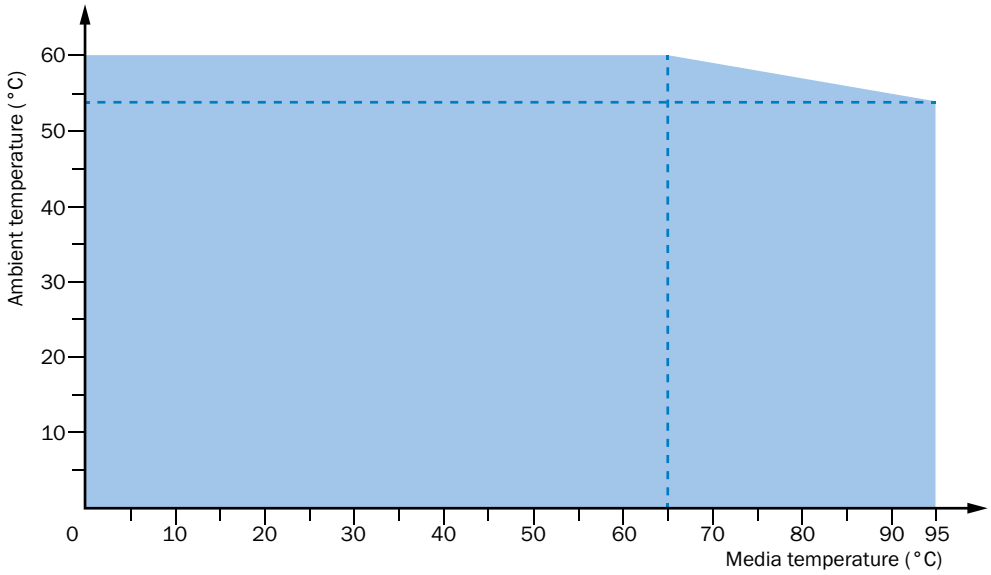
Supply voltage U_V [1]	12 V DC ... 30 V DC
Power consumption	< 10.5 W with output load < 3 W without output load
Current consumption	≤ 120 mA at 24V DC without output load
Initialization time	≤ 5 s
Protection class	III
Connection type	M12 x 1 (5-pin) M12 x 1 (8-pin)
Analog output signal	4 mA ... 20 mA (overload and short-circuit protected)
Output load	4 mA ... 20 mA < 500 Ω at Uv > 15 V; < 350 Ω at Uv > 12 V
Lower signal level	3.8 mA (Fail-Low: 3.5 mA)
Upper signal level	20.5 mA (Fail-High: 21.5 mA)
Digital output	< 100 mA
Pulse output signal	50 µs ... 2 s Valence DN15: 0.1 ml/pulse Valence DN25: 0.1 ml/pulse
Frequency output signal	f = 0 kHz ... 10 kHz
Signal voltage HIGH	> (U_V –4 V)
Signal voltage LOW	< 3 V
Inductive load	< 1 H
Capacitive load	100 nF 2.5 nF for IO-Link
Limit of digital inputs	HIGH state voltage > 16.0 V LOW state voltage < 4.0 V
EMC	EN 61326-1, EN 61326-2-3

[1] *Use an energy-limited circuit for power supply as per UL61010-1 3rd Ed., Section 9.4*

13.6 Temperature derating

The temperature derating graph allows you to determine the maximum permitted temperature pairings of ambient and media temperatures in specific framework conditions (typical conditions: U_v = 24 V, Q1 = 10 mA, Q2 = 10 mA, Qa = 21.5 mA, Qb = 21.5 mA, R_{Qa} = 250 Ω, R_{Qb} = 250 Ω).

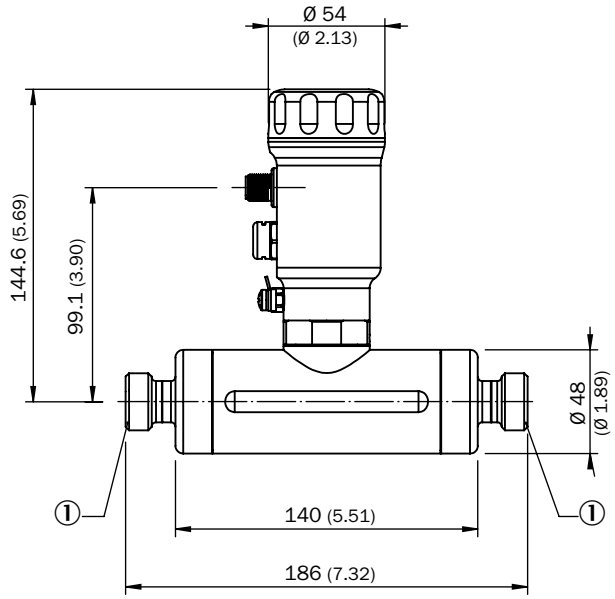
If the medium temperature is rising to the value of 95 °C the maximum ambient temperature allowed is decreased accordingly the following diagram.



14 Dimensional drawings

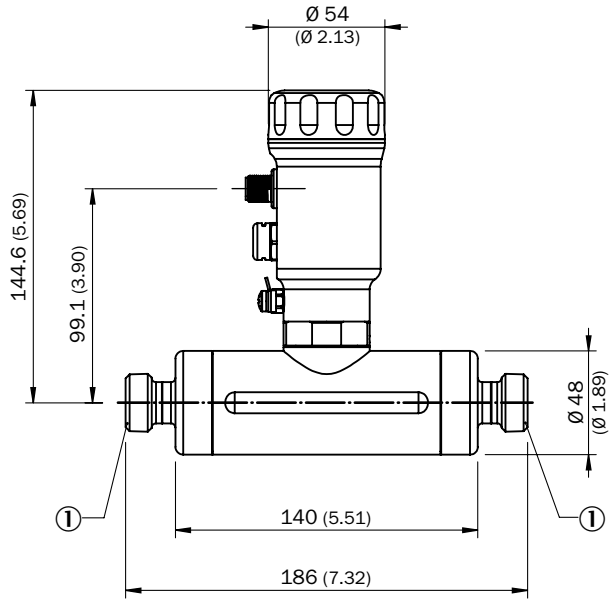
All dimensions are provided in mm (inches).

14.1 Process connection DN15 G 3/4



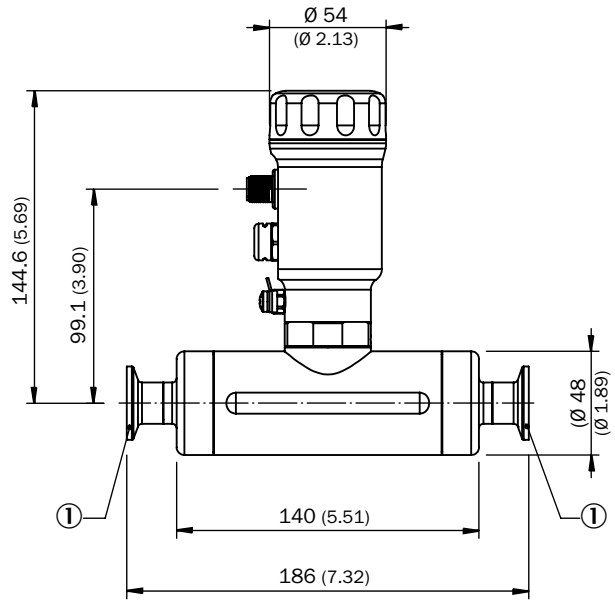
① Process connection DN15 G 3/4

14.2 Process connection DN15 3/4" NPT



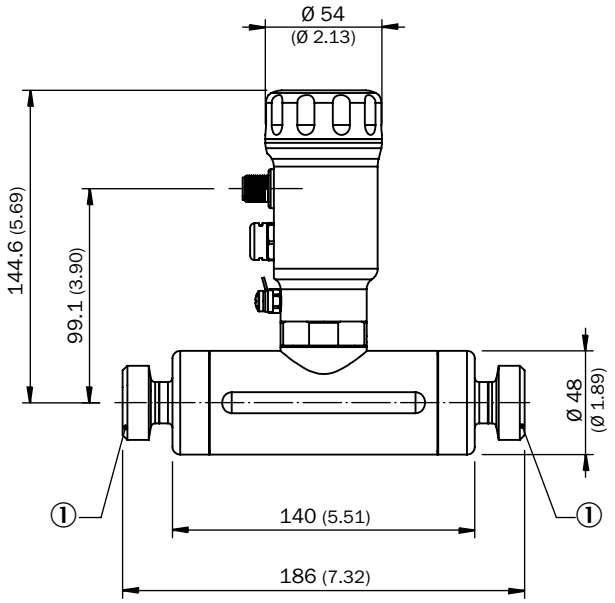
① Process connection DN15 3/4" NPT

14.3 Process connection DN15 clamp DIN 32676



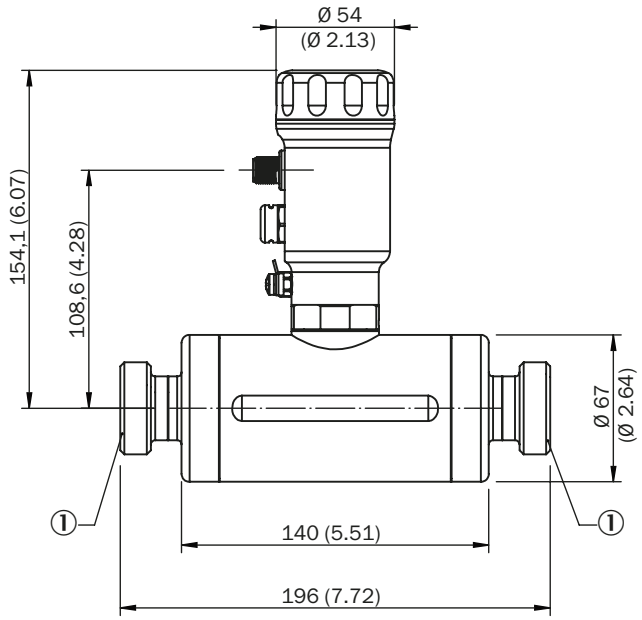
① Process connection DN15 clamp DIN 32676

14.4 Process connection DN15 DIN 11851



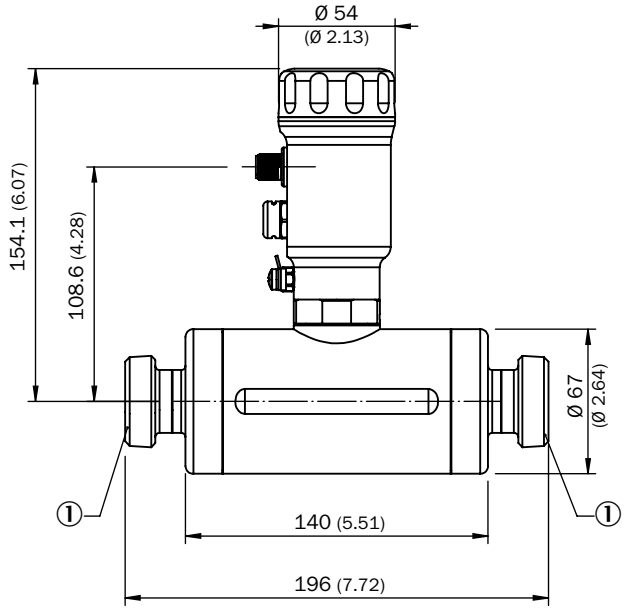
① Process connection DN15 DIN 11851

14.5 Process connection DN25 G 1 1/4



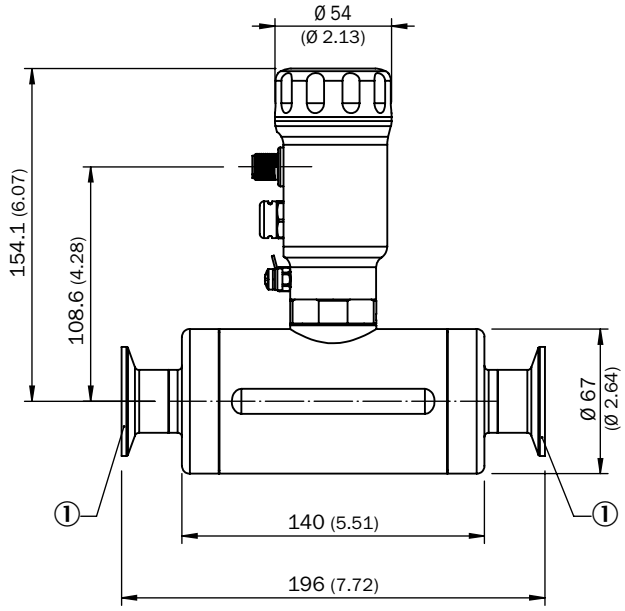
① Process connection DN25 G 1 1/4

14.6 Process connection DN25 DIN 1 1/4" NPT



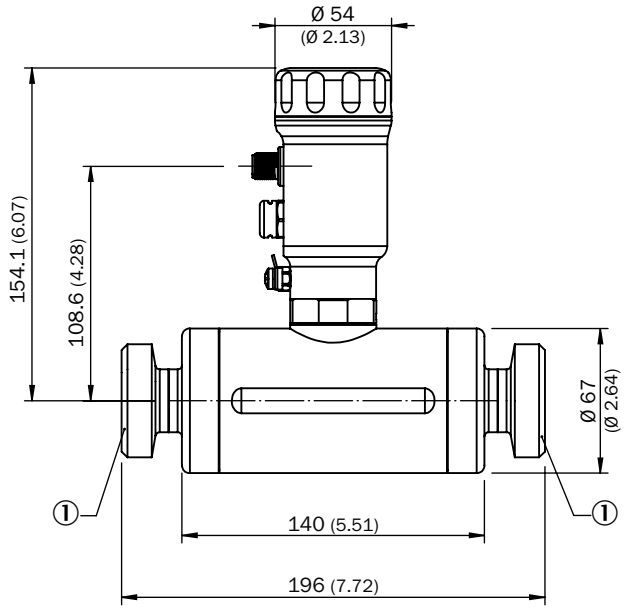
① Process connection DN25 1 1/4" NPT

14.7 Process connection DN25 clamp DIN 32676



① Process connection DN25 clamp DIN 32676

14.8 Process connection DN25 DIN 11851



① Process connection DN25 DIN 11851

15 Factory settings

Factory settings can be restored via RstFac.

Parameter	DN15	DN25
Q1Mode	Output	
Q1Act	ResetV	
Q1Proc	Flow	
Q1Out	Hyst	
Q1SP (Flow)	32 L/min	80 L/min
Q1RP (Flow)	30 L/min	75 L/min
Q1SP (Temperature)	40 °C	
Q1RP (Temperature)	30 °C	
Q1Stat	Empty	
Q1Pol	no	
Q1Type	DRV	
Q2Mode	Output	
Q2Act	ResetV	
Q2Proc	Flow	
Q2Out	Hyst	
Q2Func	Freq	
Q2PlsVal	1000 mL	3000 mL
Q2PlsWid	50 µs	
Q2FrqMax	10 kHz	
Q2FrqMin	0 kHz	
Q2SP (Flow)	36 L/min	100 L/min
Q2RP (Flow)	0 L/min	
Q2SP (Temperature)	40 °C	
Q2RP (Temperature)	30 °C	
Q2Stat	Empty	
Q2Pol	no	
Q2Type	DRV	
QaType	4 ... 20 mA	
QaProc	Flow	
QaPol	Normal	
QaHigh (Flow)	36 L/min	100 L/min
QaLow (Flow)	0	
QaHigh (Temperature)	90 °C	
QaLow (Temperature)	0	
QaFail	3,5 mA	
QbType (5-pin)	Inactive	
QbType (8-pin)	4...20 mA	
QbProc	Temper	
QbPol	Normal	
QbHigh (Flow)	36 L/min	100 L/min
QbLow (Flow)	0	
QbHigh (Temperature)	90 °C	
QbLow (Temperature)	0	
QbFail	3,5 mA	

Parameter	DN15	DN25
DisplayA	Flow	
DisplayB	Flow	
Lock	Inactv	
Unit (Flow)	L/min	
Unit (Volume)	L	
Unit (Temperature)	°C	
Measurement Mode	Standard	
Filter	10 s	
Empty	0-Flow	
CutOff	Active	
Set (CutOff)	1 L/min	3 L/min
Reset (CutOff)	0.5 L/min	1.5 L/min
Revrsl	Inactv	
Sterilization Set	120°C	
Sterilization Reset	100°C	
Sterilization Time	3600 s	
IOLApplicationSpecificTag	***	
IOLDeviceSpecificTag	***	
IOLDeviceAccessLocks.ParamWriteAccess	FALSE	
IOLDeviceAccessLocks.DataStorage	FALSE	
IOLDeviceAccessLocks.LocalParameterization	FALSE	
IOLDeviceAccessLocks.LocalUserInterface	FALSE	
usiDataStorageState	0	
eReservedA	Reserved0	
eReservedB	Reserved0	
eReservedC	Reserved0	
eReservedD	0	
eReservedE	0	
eReservedF	0	
eErrorDelay	5 s	
rUserCalibTOFOffset 0.0	0.0	
iUserCalib_FlowCoeff	1000	

16 Accessories

- Accessories can be found online at: www.sick.com

8020955/11HD/2018-12-12/COMAT/en

Australia
Phone +61 3 9457 0600
1800 334 802 – tollfree
E-Mail sales@sick.com.au

Austria
Phone +43 22 36 62 28 8-0
E-Mail office@sick.at

Belgium/Luxembourg
Phone +32 2 466 55 66
E-Mail info@sick.be

Brazil
Phone +55 11 3215-4900
E-Mail marketing@sick.com.br

Canada
Phone +1 905 771 14 44
E-Mail information@sick.com

Czech Republic
Phone +420 2 57 91 18 50
E-Mail sick@sick.cz

Chile
Phone +56 2 2274 7430
E-Mail info@schadler.com

China
Phone +86 20 2882 3600
E-Mail info.china@sick.net.cn

Denmark
Phone +45 45 82 64 00
E-Mail sick@sick.dk

Finland
Phone +358-9-2515 800
E-Mail sick@sick.fi

France
Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Germany
Phone +49 211 5301-301
E-Mail info@sick.de

Hong Kong
Phone +852 2153 6300
E-Mail ghk@sick.com.hk

Hungary
Phone +36 1 371 2680
E-Mail office@sick.hu

India
Phone +91 22 4033 8333
E-Mail info@sick-india.com

Israel
Phone +972 4 6881000
E-Mail info@sick-sensors.com

Italy
Phone +39 02 274341
E-Mail info@sick.it

Japan
Phone +81 3 5309 2112
E-Mail support@sick.jp

Malaysia
Phone +6 03 8080 7425
E-Mail enquiry.my@sick.com

Mexico
Phone +52 472 748 9451
E-Mail mario.garcia@sick.com

Netherlands
Phone +31 30 2044 000
E-Mail info@sick.nl

New Zealand
Phone +64 9 415 0459
0800 222 278 – tollfree
E-Mail sales@sick.co.nz

Norway
Phone +47 67 81 50 00
E-Mail sick@sick.no

Poland
Phone +48 22 539 41 00
E-Mail info@sick.pl

Romania
Phone +40 356 171 120
E-Mail office@sick.ro

Russia
Phone +7 495 775 05 30
E-Mail info@sick.ru

Singapore
Phone +65 6744 3732
E-Mail sales.gsg@sick.com

Slovakia
Phone +421 482 901201
E-Mail mail@sick-sk.sk

Slovenia
Phone +386 591 788 49
E-Mail office@sick.si

South Africa
Phone +27 11 472 3733
E-Mail info@sickautomation.co.za

South Korea
Phone +82 2 786 6321
E-Mail info@sickkorea.net

Spain
Phone +34 93 480 31 00
E-Mail info@sick.es

Sweden
Phone +46 10 110 10 00
E-Mail info@sick.se

Switzerland
Phone +41 41 619 29 39
E-Mail contact@sick.ch

Taiwan
Phone +886 2 2375-6288
E-Mail sales@sick.com.tw

Thailand
Phone +66 2645 0009
E-Mail Ronnie.Lim@sick.com

Turkey
Phone +90 216 528 50 00
E-Mail info@sick.com.tr

United Arab Emirates
Phone +971 4 88 65 878
E-Mail info@sick.ae

United Kingdom
Phone +44 1727 831121
E-Mail info@sick.co.uk

USA
Phone +1 800 325 7425
E-Mail info@sick.com

Vietnam
Phone +84 945452999
E-Mail Ngo.Duy.Linh@sick.com

Further locations at **www.sick.com**

SICK
Sensor Intelligence.