



Operating instructions
Flow monitor
SI5010

GB



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1 Preliminary note

You will find instructions, technical data, approvals and further information using the QR code on the unit / packaging or at documentation.ifm.com.

1.1 Symbols used

- ✓ Requirement
- Instructions
- ▷ Reaction, result
- [...] Designation of keys, buttons or indications
- Cross-reference
-  Important note
Non-compliance may result in malfunction or interference.
-  Information
Supplementary note

1.2 Warnings

Warnings indicate the possibility of personal injury and damage to property. This enables safe product handling. Warnings are graded as follows:



WARNING

Warning of serious personal injury

- ▷ If the warning is not observed, fatal and serious injuries are possible.



CAUTION

Warning of minor to moderate personal injury

- ▷ If the warning is not observed, minor to moderate injuries are possible.

ATTENTION

Warning of damage to property

- ▷ If the warning is not observed, damage to property is possible.

2 Safety instructions

- The unit described is a subcomponent for integration into a system.
 - The system architect is responsible for the safety of the system.
 - The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.

- Only use the product for its intended purpose (→ Intended use).
- Only use the product for permissible media.
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.

3 Intended use

The device monitors the flow in liquid and gaseous media.

4 Function

The device detects flow based on the calorimetric measuring principle and switches the output.

For the factory setting the switch point is at LED 7 and the device is set to normally open. The output can be switched to normally closed function. The switch point LED indicates the switching status: orange = output closed; red = output open.

With normal flow, the output has the following status:

- output closed for normally open function
- output open for normally closed function.

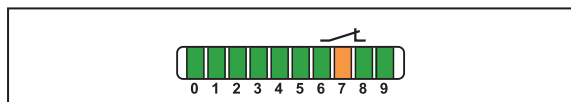


Fig. 1: Flow \geq SP / normally open function

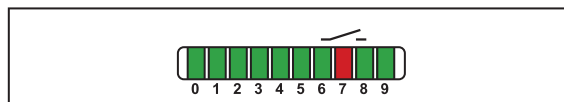


Fig. 2: Flow \geq SP / normally closed function

If the flow velocity decreases, the switching status changes when the value falls below the switch point SP minus the hysteresis.

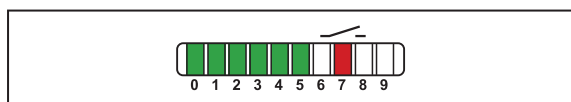


Fig. 3: Flow $<$ SP / normally open function

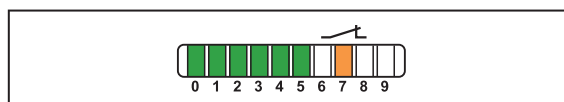


Fig. 4: Flow $<$ SP / normally closed function



The hysteresis changes with the flow velocity and it is essentially influenced by the set monitoring range. It is 2...5 cm/s for the setting 5...100 cm/s (= factory setting), it increases with higher flow velocities.

The typical response time of the device is 1 ... 10 s. It can be influenced by the setting of the switch point:

- Low switch point = quick reaction with rising flow.
- High switch point = quick reaction with falling flow.

See: Changing the switch point (→ 9).

4.1 IO-Link

IO-Link is a communication system for connecting intelligent sensors and actuators to automation systems. IO-Link is standardised in the IEC 61131-9 standard.



General information on IO-Link at [io-link.ifm](https://io-link.ifm.com)



Input Output Device Description (IODD) with all parameters, process data and detailed descriptions of the device at documentation.ifm.com

IO-Link offers the following advantages:

- Interference-free transmission of all data and process values
- Parameter setting in the running process or presetting outside the application
- Parameters for identifying the connected devices in the system
- Additional parameters and diagnostic functions
- Automatic backup and restore of parameter sets in case of device replacement (data storage)
- Logging of parameter sets, process values and events
- Device description file (IODD - Input Output Device Description) for easy project planning
- Standardised electrical connection
- Remote maintenance

5 Installation



CAUTION

During installation or in case of mechanical failure, high pressure or hot media can leak from the system.

- ▷ Risk of injury caused by pressure or burns.
- ▶ Ensure that the system is free of pressure during installation.
- ▶ Ensure that no media can leak at the mounting location during installation.

5.1 Installation position

5.1.1 Immersion depth



Fig. 5: Immersion depth

- The sensor tip must be completely surrounded by the medium.
- Recommended immersion depths: minimum 12 mm.

5.1.2 Recommended mounting position



Fig. 6: Recommended mounting position

- For horizontal pipes: mounting from the side.
- For vertical pipes: mounting in the rising pipe.

5.1.3 Conditionally possible installation position

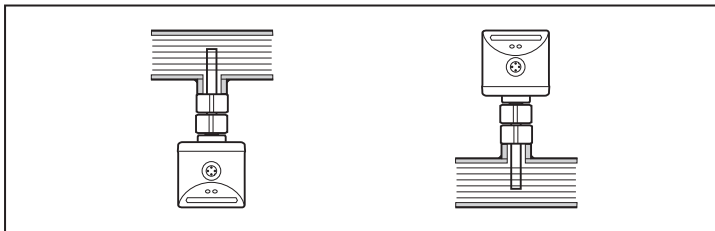


Fig. 7: Conditionally possible installation position

- For horizontal pipes, if the pipe is free from build-up: mounting from below.
- For horizontal pipes, if the pipe is completely filled with medium: mounting from the top.

5.1.4 Impermissible installation position

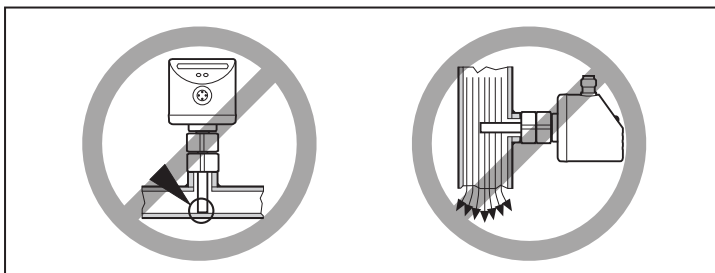


Fig. 8: Impermissible installation position

- The sensor tip must not be in contact with the pipe wall.
- Do not mount in downpipes that are open at the bottom.

5.2 Interference

Structures in the pipe, bends, valves, reducing pieces and the like affect the function of the unit.

► Adhere to the distances between sensor and interference.

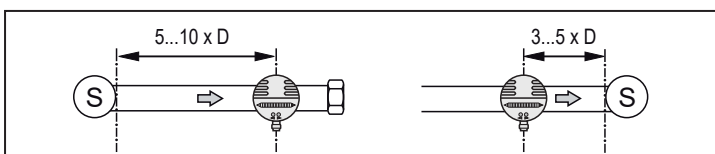


Fig. 9: Inlet and outlet pipe lengths

- D: Outside diameter of the pipe
S: Interference

5.3 Process connection

Using process adapters the unit can be adapted to different process connections.

A correct fit of the unit and ingress resistance of the connection are only ensured using ifm adapters.

For small flow rates, ifm adapter blocks are available.



The device is supplied without accessories.

Information about available accessories at documentation.ifm.com.

The optimum function is not ensured when using components from other manufacturers.

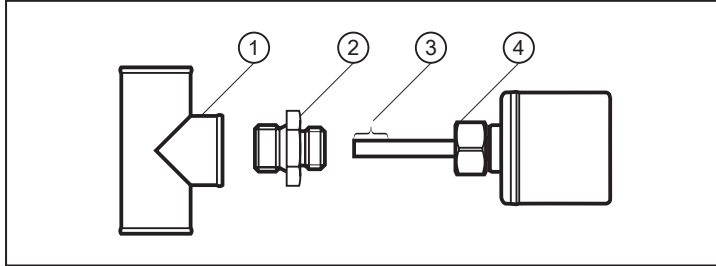


Fig. 10: Connect the device to the process using the adapter

1: Process connection

2: Adapter

3: Sensor tip

4: Coupling nut

- Grease the threads of the process connection, adapter and sensor. Use a lubricating paste which is suitable and approved for the application.



Ensure no grease is applied to the sensor tip.

- Screw the suitable adapter into the process connection.
- Place the flow monitor onto the adapter and tighten the nut. Tightening torque 25 Nm. Ensure that the unit is correctly oriented.

6 Electrical connection



The unit must be connected by a qualified electrician.

Observe the national and international regulations for the installation of electrical equipment.

Voltage supply according to SELV, PELV.

- Disconnect power.
- Connect the unit as follows:

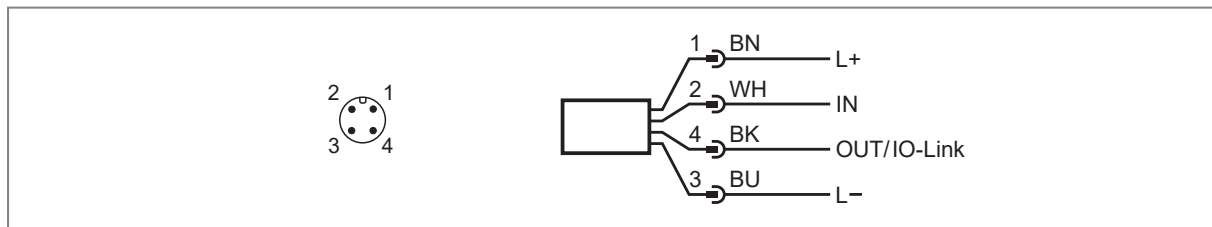
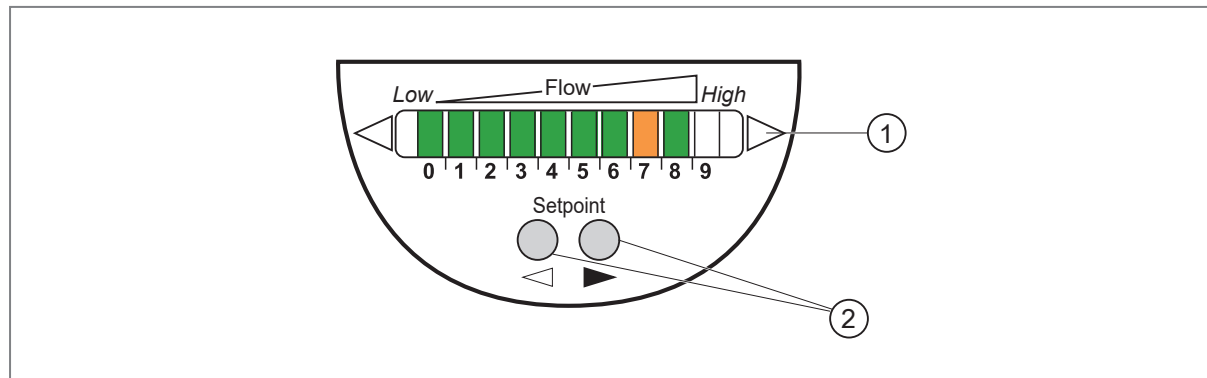


Fig. 11: Wiring diagram (colours to DIN EN 60947-5-2: BN = brown, WH = white, BK = black, BU = blue)

Pin	Assignment
1	Ub+
3:	Ub-
2:	<ul style="list-style-type: none"> Input for external teach signal (remote adjustment)
4:	<ul style="list-style-type: none"> Switching signal flow IO-Link

- !** Only use 4-wire sockets without bridge between pin 2 and pin 4.
If 3-wire sockets with a bridge between pin 2 and pin 4 are used, power on of the output stage triggers the remote calibration.

7 Operating and display elements



①	Operation indication <ul style="list-style-type: none"> The LEDs 0...9 represent the range between flow standstill and maximum flow. The green LEDs show the current flow. An illuminated LED shows the position of the switch point: <ul style="list-style-type: none"> Orange: output closed Red: output open <p>In the current example: normally open function (factory setting).</p>
②	Setting buttons for adjustment and configuration

8 Set-up

- ▶ Switch on the supply voltage.
 - ▷ All LEDs light and go out again step by step. During this time, the output is closed if set to normally open and open if set to normally closed.
- ▷ The device is in the operating mode.
- ▶ Let the normal flow circulate in the installation.
- ▶ Check the display and determine further actions:

Display	Explanation
1 	The factory setting is suitable for the application. No further settings are required.
2 	Your normal flow is below the representation range of the display. 2 setting options: <ul style="list-style-type: none"> ▶ Changing the switch point (→ □ 9) ▶ High-flow adjustment (→ □ 9)
3 	Your normal flow exceeds the representation range of the display (LED 9 flashes). ▶ High-flow adjustment (→ □ 9)

Tab. 1: Display for factory setting (normally open function, switch point at LED 7)
LED orange: output closed; LED red: output open

The factory settings can be restored at any time.

- i** For media other than water:
- ▶ Carry out additional adjustment to the minimum flow: Low-flow adjustment (→ □ 9).

9 Settings

The settings can also be made via the IO-Link interface. (→ Parameter setting via IO-Link □ 11)

9.1 Changing the switch point

For the factory setting the switch point is at LED 7. A change makes sense in the following cases:

- The normal flow falls below the representation range of the display, see (→ Set-up □ 8).
 - The flow fluctuates strongly or pulsates.
 - A faster response time of the device is required.
 - Low switch point = quick reaction with rising flow.
 - High switch point = quick reaction with falling flow.
- ▶ Briefly press [<] or [▶].
- ▷ The switch point LED flashes.
- ▶ Press [<] or [▶] as often as required.
- ▷ Each press of the pushbutton shifts the LED by one position in the indicated direction.
- ▶ When the required switch point is reached, do not press the button for more than 2 seconds.
- ▷ The device goes into operating mode with the newly set value.

9.2 High-flow adjustment

The switch point can be set to the current flow value (flow adjustment).

- ▶ Let the normal flow circulate in the installation.
- ▶ Press [▶] and keep it pressed.
- ▷ LED 9 is on, after approx. 5 seconds it flashes.
- ▶ Release [▶].
- ▷ The device is adapted to the flow conditions. It goes into operating mode.
 - ▷ The display should now show an LED indication similar to example 1, see (→ Set-up □ 8).



The adjustment affects the switch point: It is increased proportionally (maximum up to LED 7).

9.3 Low-flow adjustment

If the device is used in media other than water, the device should additionally be adapted to the minimum flow.



- ▶ Carry out the high-flow adjustment before the low-flow adjustment.
- ▶ Let the minimum flow circulate in the installation or ensure flow standstill.
- ▶ Press [<] and keep it pressed.
- ▷ LED 0 is on, after approx. 5 seconds it flashes.
- ▶ Release [<].

- ▷ The device adopts the new value and returns to the operating mode.

9.4 Switch point logic

Upon delivery, the device is set to normally open.

Changeover to normally closed function:

- ▶ Press [◀] for at least 15 seconds.
 - ▷ LED 0 is on, after approx. 5 seconds it flashes.
 - ▷ After 10 seconds the current setting is displayed: LEDs 5...9 light orange (= output normally open).
 - ▷ After approx. 15 seconds LEDs 0...4 flash orange.
- ▶ Release [◀].
- ▷ The output is changed to normally closed function.
- ▶ For a new changeover repeat the operation.

9.5 Reset the device

- ▶ Press [▶] for at least 15 seconds.
 - ▷ LED 9 is on, after approx. 5 seconds it flashes.
 - ▷ After approx. 15 seconds LEDs 0...9 flash orange.
- ▶ Release [▶].
- ▷ All settings are reset to the factory setting:
 - Operating range: 5 ...100 cm/s for water
 - Switch point: LED 7
 - Output function: normally open
 - Not locked

9.6 Lock / unlock

The unit can be locked electronically to prevent unauthorised setting.

Factory setting: not locked.

- ▶ Press both setting keys for 10 seconds.
 - ▷ The display goes off.
- ▷ The unit is locked.
- ▶ For unlocking repeat the process.

9.7 Remote calibration

The device can be adapted to new flow conditions at any time using the remote setting function.

The relative switch point is not shifted.

High-flow adjustment:

- ▶ Let the normal flow circulate in the installation.
- ▶ Apply Ub+ to pin 2 for > 5...< 10 seconds.

- ▷ LED 9 is on, after approx. 5 seconds it flashes.
- ▶ Disconnect the voltage.
- ▷ The device is adapted to the flow conditions. It goes into operating mode.

Low-flow adjustment:

- ▶ Let the normal flow circulate in the installation.
- ▶ Apply Ub+ to pin 2 for > 10...< 15 seconds.
 - ▷ LED 0 is on, after approx. 5 seconds it flashes.
- ▶ Disconnect the voltage.
- ▷ The device is adapted to the flow conditions. It goes into operating mode.

Restore factory settings:

- ▶ Apply Ub+ to pin 2 for > 15 seconds.
 - ▷ LED 9 is on, after approx. 5 seconds it flashes.
 - ▷ After approx. 15 seconds LEDs 0...9 flash orange.
- ▶ Disconnect the voltage.
- ▷ All settings are reset to the factory setting:
 - Operating range: 5 ...100 cm/s for water
 - Switch point: LED 7
 - Output function: normally open
 - Not locked



- ▶ Observe the time frame for the input signal on pin 2 exactly to avoid an unintentional reset to the factory setting.

10 Parameter setting via IO-Link

Requirements for parameter setting via the IO-Link interface:

- ✓ A suitable parameter setting software, e.g. ifm moneo|configure
- ✓ The Input Output Device Description (IODD) for the device, see documentation.ifm.com
- ✓ One IO-Link master
- ▶ Connect the IO-Link master to a parameter setting software.
- ▶ Set the port of the master to the IO-Link operating mode.
- ▶ Connect the device to a free port of the IO-Link master.
- ▷ The unit switches to IO-Link mode.
- ▶ Change parameter settings in the software.
- ▶ Write parameter settings to the unit.



Notes on parameter setting → Manual of the parameter setting software

Parameters can be set before installation or during operation.



- If you change parameters during operation, this will influence the function of the plant.
 - ▶ Ensure that there will be no malfunctions in your plant.

During parameter setting the unit remains in the operating mode. It continues to monitor with the existing parameter until the parameter setting has been completed.

10.1 Switch point

- ▶ Call up [Parameters] > [Digital output 1].
- ▶ Select [SP1] and set switch point 1.

See also: Changing the switch point (→ [9](#)).

10.2 Switch-on and switch-off delay

- ▶ Call up [Parameters] > [Digital output 1].
- ▶ Select [dSx] and set the delay for switching OUTx in seconds.
- ▶ Select [drx] and set the delay for resetting OUTx in seconds.



This function is only available via the IO-Link interface.

10.3 High-flow adjustment

- ▶ Let the normal flow circulate in the installation.
- ▶ Select [Parameters] > [Teach].
- ▶ Select the command: [High Flow adjustment].
- ▷ The device defines the existing flow as maximum flow (final value of the measuring range = 100 %).

See also: High-flow adjustment (→ [9](#)).

10.4 Low-flow adjustment

- ▶ Let the minimum flow circulate in the installation or ensure flow standstill.
- ▶ Select [Parameters] > [Teach].
- ▶ Select the command: [Low Flow adjustment].
- ▷ The device defines the existing flow as minimum flow (0 %).

See also: Low-flow adjustment (→ [9](#)).

10.5 Lock remote adjustment

- ▶ Select [Parameters] > [Setup].
- ▶ Select [T_en] and set [OFF]
- ▷ Pin 2 is blocked as an input for an external teach signal.
- ▶ Unblock by switching to [ON].

Factory setting: [ON].

10.6 Switch-point logic

- ▶ Select [Parameter] > [Application configuration].
- ▶ Select [ou1] and set the switching signal: [Hno] or [Hnc].

10.7 Resetting the device

- ▶ Select [Parameters] > [Setup].
- ▶ Execute command: [Restore Factory Settings].
- ▷ The unit carries out a reboot.

10.8 Lock / unlock

- ▶ Call up [Parameters] > [Display Setting].
- ▶ Select [Loc] and set the lock.
- ▷ The device is locked for parameter setting via the device keys. Unlocking is possible on the device.
- or -
- ▶ Select [Parameters] > [Setup].
- ▶ Select [Device Access Locks.Local User Interface] and set [Locked].
- ▷ The setting keys on the device are locked. Unlocking is only possible via IO-Link.
- or -
- ▶ Select [Device Access Locks.Data Storage] and set [Locked]
- ▷ The device is locked for the data storage function of the IO-Link master.





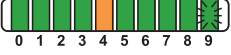
11 Operation

The device detects the flow and switches the output according to the setting.

The device displays the current flow and the switching status.

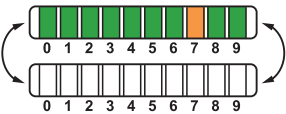
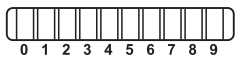
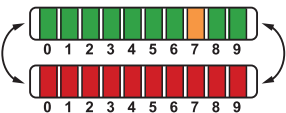



In case of power failure or interruption of the operating voltage, all settings remain.

Display	Explanation
1  LED 0 flashes	Current flow below the display range.
2  LED 4 is orange	Current flow below the switch point.
3  LED 4 is orange	Current flow corresponds to the switch point.
4  LED 4 is orange	Current flow above the switch point.
5  LED 9 flashes	Current flow above the display range.

Tab. 2: Display for normally open function, switch point at LED 4
 LED orange: output closed; LED red: output open

12 Troubleshooting

Display	Description	Corrective measures
 <p>LEDs go off briefly when a button is pressed. After approx. 0.6 seconds, the last operating status is indicated.</p>	The device is permanently locked.	<ul style="list-style-type: none"> ▶ Unlock device.
 <p>LEDs are permanently off.</p>	Operating voltage too low (< 19 V) or failed.	<ul style="list-style-type: none"> ▶ Ensure correct voltage supply.
 <p>Operating indicator and red LEDs light alternately.</p>	Short circuit at the switching output.	<ul style="list-style-type: none"> ▶ Remove short circuit. ▷ The device immediately returns to the normal operating status and the current operating indication appears in the display.
 <p>LEDs flash red after flow adjustment. The device then returns to the operating mode with unchanged values.</p>	High-flow adjustment or low-flow adjustment not successful.	<ul style="list-style-type: none"> ▶ Check whether all installation requirements have been met. ▶ Increase the distance between maximum flow and minimum flow and carry out the adjustment again. ▶ Carry out the two adjustment operations again in the right sequence.

13 Maintenance, repair and disposal

Only the manufacturer is allowed to repair the unit.

- ▶ Ensure that the sensor tip is free from build-up:
 - Check the sensor tip for build-up one month after set-up.
 - Repeat check regularly. Determine check intervals based on the application.
 - In case of soiling clean the sensor tip with a soft cloth. Stubborn build-up, such as lime, can be removed using a common vinegar cleaning agent.
- ▶ After use dispose of the device in an environmentally friendly way in accordance with the applicable national regulations.