



Operating instructions
Counter (IP 69K)
DP4302

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.

1.3 Safety symbol on the device



Safety symbol on the device:

- Adhere to the operating instructions for the safe operation of the unit.

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).
- 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, programming, configuration, operation and maintenance of the product must be carried out by personnel qualified and authorised for the respective activity.
- Protect units and cables against damage.
- Replace damaged units, otherwise the technical data and safety will be impaired.
- Observe applicable documents.

3 Intended use

The device is a pulse evaluation system. It can, for example, count any objects. It receives the pulses from external sensors and counts the number of pulses. This value is compared with the set switch points; the outputs are switched in accordance with the set parameters. Scaling factors allow for flexible setting of the increment for each pulse.

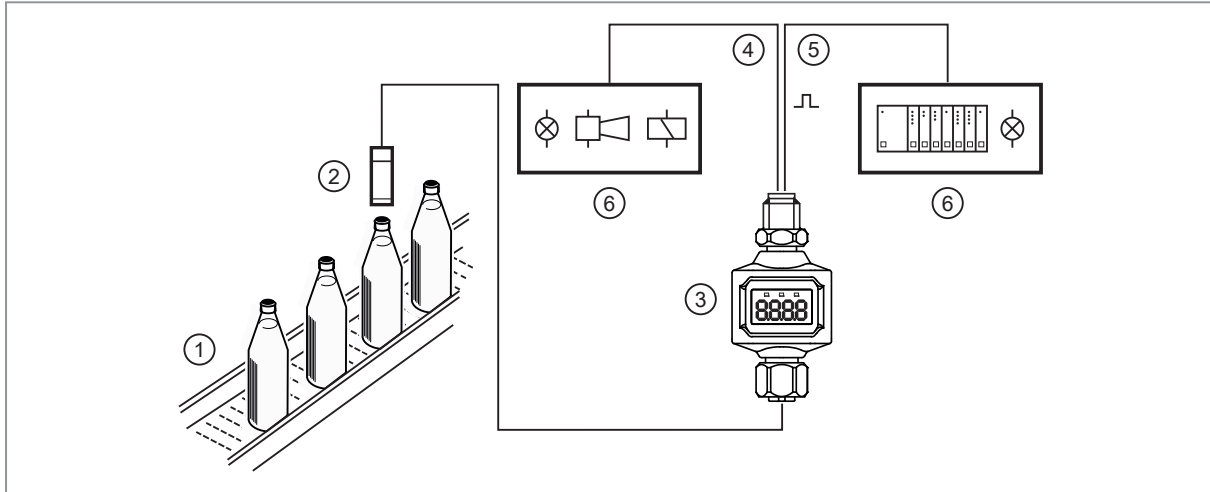


Fig. 1: Counting sealed bottles on a conveyor belt

- | | |
|--------------------------------|---|
| 1: Conveyor belt | 2: Counting pulse generator on the conveyor belt |
| 3: DP4302 | 4: Transistor output (e.g. to control a light indicator, horn, relay or fieldbus I/O device Profinet/AS-i etc.) |
| 5: Transistor output / IO-Link | 6: Signals depending on the selected switching function |

The device is suited for wet environments. Observe instructions in chapters "Installation" and "Electrical connection".



The unit is not suited for environments with particular requirements on mechanical stability (e.g. shock/vibration).

The unit is intended for indoor use only.

► Observe the operating conditions (→ Technical data at www.ifm.com).

3.1 Supported sensors

Any suitable 3- and 2-wire sensors (e.g. inductive, optical, etc) are supported. The sensors must meet the following requirements:

- PNP switching
- compatibility with 24 V supply voltage



The mark-to-space ratios of the sensor used must be taken into account.

4 Function

The device supports three adjustable counting modes. The counter can be permanently defined as an up counter or as a down counter or be flexibly switched between up and down counter via IN2: [Function diagrams \(counting behaviour\)](#) (→ [8](#)). A display indicates the current counter reading. The device generates output signals according to the parameter setting. Moreover, it provides the process data via IO-Link.

The device is designed for half-duplex communication. So the following options are possible:

- Remote display: reading and displaying the current counter readings
- Remote parameter setting: reading and changing the current parameter setting
- IO-Link parameter setting: [IO Device Description \(IODD\)](#) (→ [7](#))

4.1 Application as an IO-Link device

4.1.1 General information

The unit has an IO-Link communication interface which requires an IO-Link capable module (IO-Link master).

The IO-Link interface allows direct access to the process and diagnostic data and enables setting of the parameters of the unit during operation.

You will find further information about IO-Link and all the necessary information about the required IO-Link hardware and software at:

www.io-link.ifm

4.1.2 Application example

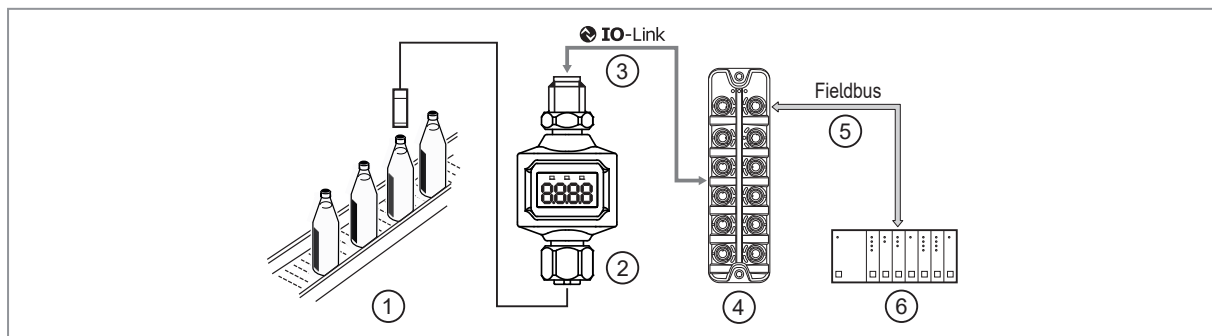


Fig. 2: Application example with IO-Link master

- | | |
|--|-------------------|
| 1: Conveyor belt and counting pulse generator | 2: Counter |
| 3: Fully bidirectional IO-Link communication
- remote parameter setting: reading and changing the parameter setting | 4: IO-Link master |
| 5: Fieldbus (e.g. Profibus, Profinet, AS-i etc.) | 6: PLC |

4.1.3 IO Device Description (IODD)

You will find the IODDs required for configuration of the IO-Link device as well as detailed information about the process data structure, diagnostic information and parameter addresses at documentation.ifm.com

4.2 Standard IO wiring

Switch points (standard IO mode) can also be used in combination with the standard inputs of a PLC. OUT1 and OUT2 can be switched to digital inputs (e.g. standard input modules). OUT1 and OUT2 can be evaluated via two digital inputs and implement a window function.

Voltage supply (pin 1 and 3) can be done via the input modules. With standard input modules, pins 1 and 3 are used for voltage supply (→ Electrical connection).

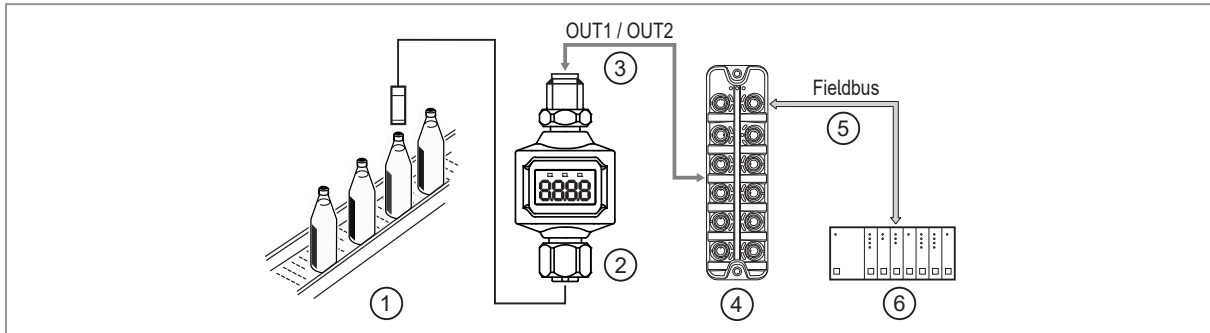


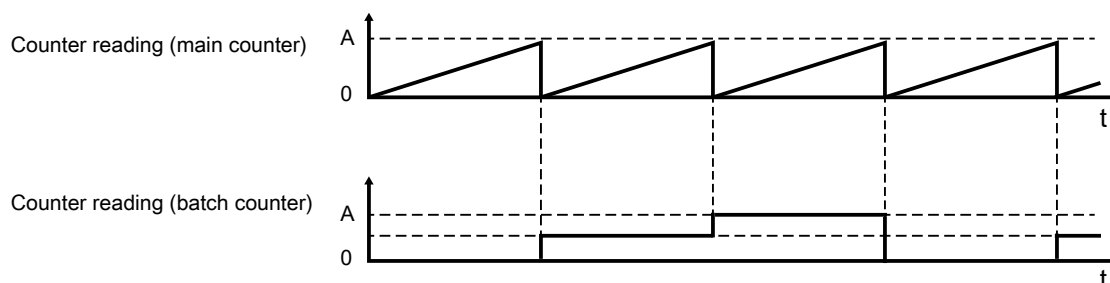
Fig. 3: Application example with a fieldbus system (e.g. AS-i)

- | | |
|--|----------------------------|
| 1: Conveyor belt and counting pulse generator | 2: Counter |
| 3: Digital outputs | 4: Digital fieldbus module |
| 5: Fieldbus (e.g. Profibus, Profinet, AS-i etc.) | 6: PLC |

4.3 Function diagrams (counting behaviour)

The counting direction is set via the parameter [dIn1] and, in case of counting direction control by IN2, via [dIn2].

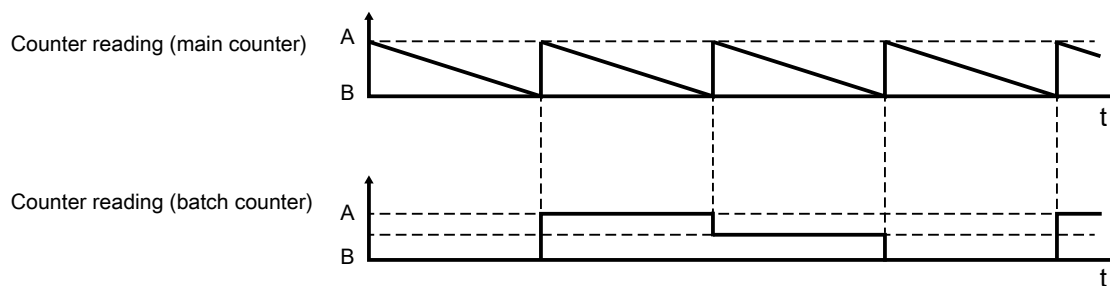
4.3.1 Up counter (InC)



A: overflow

- Overflow condition: current counter value $\geq$ maximum permissible counter value
- The maximum permissible counter value depends on the switch point mode.
- If during overflow the counter value is equal to the maximum permissible counter value, the counter is immediately reset to 0.
- If during overflow the counter value is greater than the maximum permissible counter value, the counter is immediately reset to the resulting positive amount.

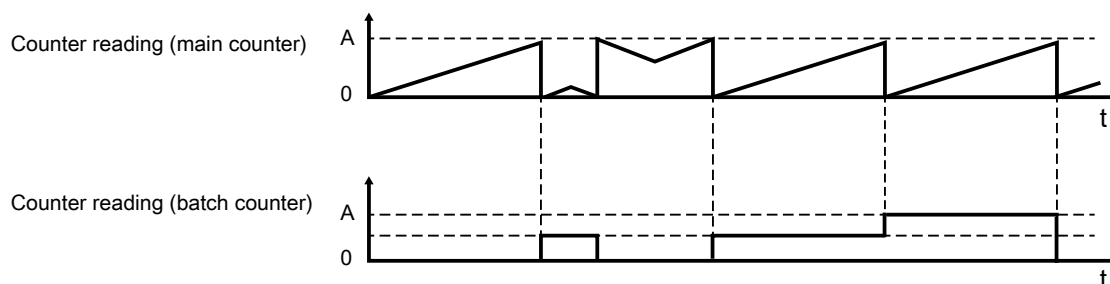
4.3.2 Down counter (dEC)



A: maximum counter value
B: underflow

- Underflow condition: current counter value < 0
- The maximum permissible counter value depends on the switch point mode.
- Upon triggering of an underflow, the counter is immediately reset to the maximum permissible counter value minus the negative amount.

4.3.3 Counting direction control by IN2 (dLr)



A: overflow
B: underflow

- Overflow condition: current counter value $\geq$ maximum permissible counter value
- Underflow condition: current counter value < 0
- The maximum permissible counter value depends on the switch point mode.
- If during overflow the counter value is equal to the maximum permissible counter value, the counter is immediately reset to 0.
- If during overflow the counter value is greater than the maximum permissible counter value, the counter is immediately reset to the resulting positive amount.
- Upon triggering of an underflow, the counter is immediately reset to the maximum permissible counter value minus the negative amount.

[dIn1]	[dIn2]	IN2 = low	IN2 = high
[dLr]	[InC]	Up counter	Down counter
[dLr]	[dEC]	Down counter	Up counter

Tab. 1: Counting direction control

4.4 Function diagrams (output behaviour)

Function diagram display is based on the up counter. The down counter and the counter with flexible counting direction behave in the same way.

4.4.1 Single point mode

When the set switching value is reached, the output is set, in accordance with the counter (main and/or batch counter), for the time of the switch-off delay. After expiry of the switch-off delay, the output resets automatically. During the delay, the input signals continue to be evaluated without restrictions.

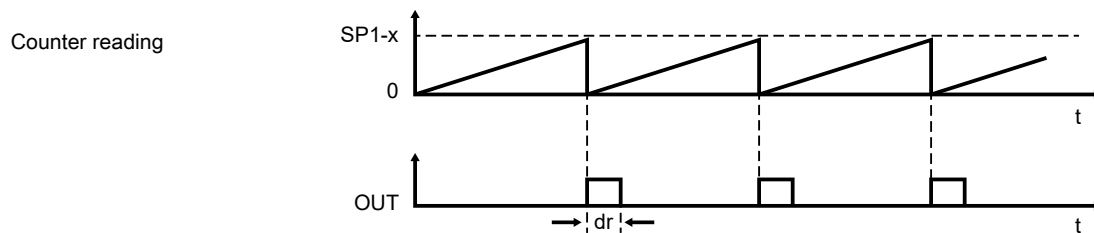


Fig. 4: NO (IO-Link parameter LoGc: no / high active)

SP1: switch-on point / maximum value of the counter
 x: integer rounded up value of the set scaling factor:
 $c.nu / c.dno$ – scaling factor for the main counter (→ 19)
 dr: switch-off delay:
 dr – switch-off delay (→ 19)

If a counter value is exceeded, this is signalled by the switching signal as closed.

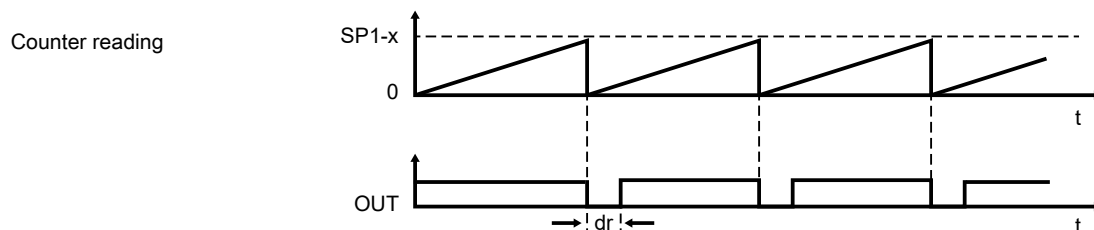


Fig. 5: NC (IO-Link parameter LoGc: nc / low active)

SP1: switch-off point / maximum value of the counter
 x: integer rounded up value of the set scaling factor:
 $c.nu / c.dno$ – scaling factor for the main counter (→ 19)
 dr: switch-off delay:
 dr – switch-off delay (→ 19)

If a counter value is exceeded, this is signalled by the switching signal as open.

4.4.2 Window mode

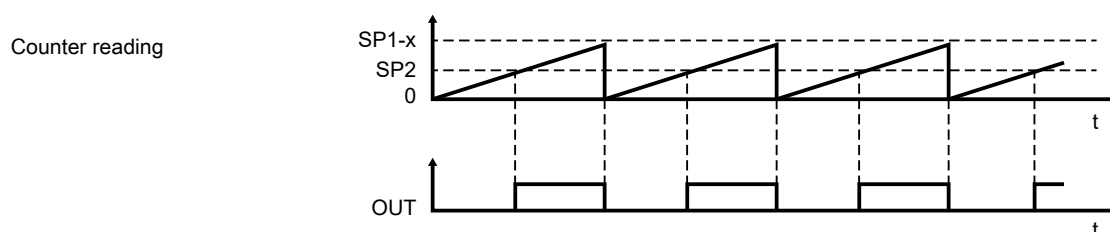


Fig. 6: NO (IO-Link parameter LoGc: no / high active)

SP1: switch-off point window
 x: integer rounded up value of the set scaling factor:
 $c.nu / c.dno$ – scaling factor for the main counter (→ 19)
 SP2: switch-on point window

If a counter value is not reached, this is signalled by the switching signal as open.

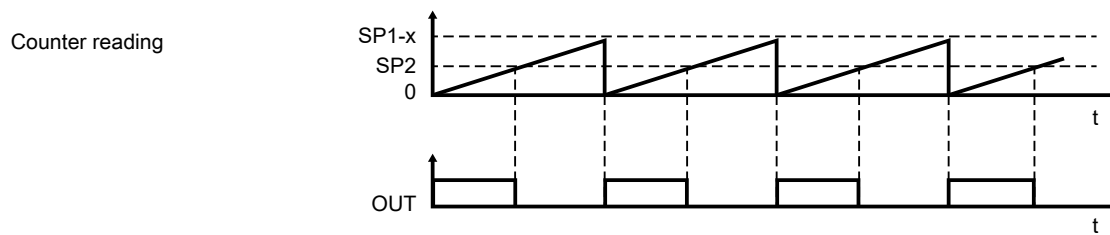


Fig. 7: NC (IO-Link parameter LoGc: nc / low active)

SP1: switch-on point window

x: integer rounded up value of the set scaling factor:
[c.nu / c.dno – scaling factor for the main counter](#) (→ 19)

SP2: switch-off point window

If a counter value is exceeded, this is signalled by the switching signal as open.

4.4.3 Deactivated mode

NO (IO-Link parameter LoGc: no / high active)

The switching signal is always signalled as open.

NC (IO-Link parameter LoGc: nc / low active)

The switching signal is always signalled as closed.



Maximum value of the main counter (SSC1) = 1,000,000

Maximum value of the batch counter (SSC2) = 9,999

4.4.4 Latch mode

After activating the latch mode, the output is permanently set when the overflow or underflow value is reached and must be actively reset. As long as the output is set, evaluation of the input signals is deactivated.

Latch mode can only be activated if

1. the device is configured as an up counter ([dIn]=[InC]) or a down counter ([dIn]=[dEC]) only.
2. the parameter [LTC1] is set to the desired counter.
3. the corresponding counter (main or batch counter) is operated in single point mode.



The setting under [LTC1] is ignored as soon as one of the specified conditions is not fulfilled.

The output can only be released by the following measures:

- PDO: To the rising edge of the PDO bits “Release_Latch_Counter” or “Release_Latch_Batch_Counter”.
- IO-Link: system command “RELEASE_LATCH_COUNTER” or “RELEASE_LATCH_BATCH_COUNTER”
Parameters adjustable via IO-Link
- Standard IO: rising edge signal at IN2

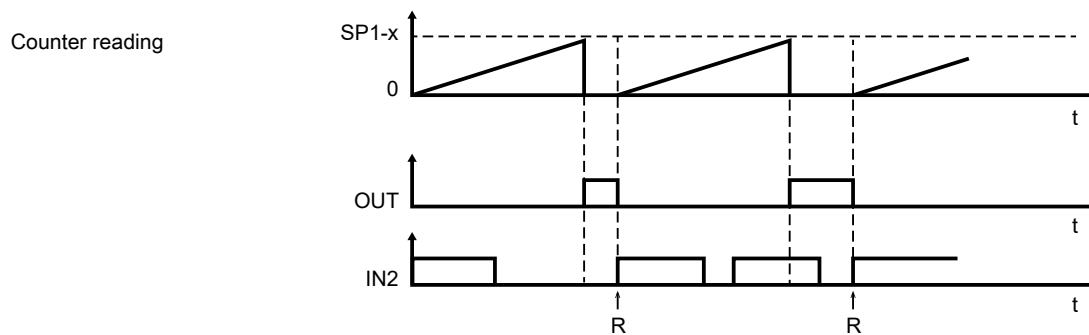


Fig. 8: NO (IO-Link parameter LoGc: no / high active)

SP1: switch-on point / maximum value of the counter
 x: integer rounded up value of the set scaling factor:
[c.nu / c.dno — scaling factor for the main counter \(→ 19\)](#)

If a counter value is exceeded, this is signalled by the switching signal as closed.

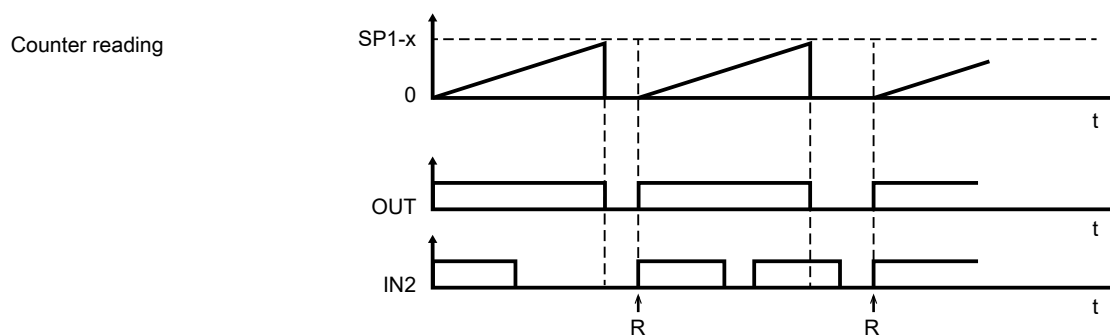


Fig. 9: NC (IO-Link parameter LoGc: nc / low active)

SP1: switch-off point / maximum value of the counter
 x: integer rounded up value of the set scaling factor:
[c.nu / c.dno — scaling factor for the main counter \(→ 19\)](#)

If a counter value is exceeded, this is signalled by the switching signal as open.

4.4.5 Standard IO mode

The yellow LEDs indicate the switching status of the device.

Switching function NO:

Transistor output	LED yellow	Description
closed	on	counter reading $\geq$ SP1
open	off	counter reading $<$ SP1

Switching function NC:

Transistor output	LED yellow	Description
closed	on	counter reading $<$ SP1
open	off	counter reading $\geq$ SP1

4.5 Scaling of the counters

The scaling of the counters is configured via [c.nu] and [c.dno] (main counter) or [b.nu] and [b.dno] (batch counter), with *.nu indicating the value by which the corresponding counter is to be increased in *.dno steps.

The counters only count in whole numbers. In case of non-integer ratios of *.nu/*.dno, the non-integer residual value is stored and taken into account in the next counting step.

Counting step	[c.nu] = 5; [c.dno] = 4		[c.nu] = 2; [c.dno] = 5	
	Theoretical counter reading	Current counter reading	Theoretical counter reading	Current counter reading
0	0	0	0	0
1	1.25	1	0.4	0
2	2.5	2	0.8	0
3	3.75	3	1.2	1
4	5	5	1.6	1
5	6.25	6	2	2

Tab. 2: Examples

Calculation formula:

$$z_n = \frac{*.nu + r_{n-1}}{*.dno} = \frac{c_n *.dno}{*.dno} + \frac{r_n}{*.dno}$$

$$r_n = *.nu + r_{n-1} - c_n *.no$$

z_n : Theoretical count value with decimal place in counting step n

c_n : Number of increments (increase/decrease) in counting step n

r_n : Non-integer share in counting step n; is taken into account in the next counting step



The maximum limit of the scaling factor is SP1.

5 Installation

ATTENTION

Higher shock $\geq$ IK06

- ▷ Damage possible
- ▷ Protection rating and, in wet environments, electrical protection might be impaired
- ▶ If necessary, the system creator must take external measures to protect the device depending on the requirements of the corresponding application.
- ▶ Replace damaged devices, otherwise the technical data and safety will be impaired.

The IP rating of the overall system depends on the protection ratings of the individual devices, the applied connection elements and the corresponding protective caps.

ATTENTION

No protection rating / no protection of the contacts without mounted connectors / protective caps.

- ▷ Inadmissible soiling / moisture possible.
- ▷ Disconnection of circuits / safety possibly impaired.
- ▷ Before installation / when replacing the device, maintain pollution degree 2.
- ▶ Disconnection / safety guaranteed.

- ▶ Connect the M12 connectors of the device (→ Electrical connection).
- ▶ Install the device so that the M12 connection parts and the device are protected from mechanical stress such as shock and vibration.
- ▶ If necessary, fix the device with cable ties.



The following applies to all types of mounting:

The responsibility for the compliance with the requirements concerning mounting of the device in the application with regard to shock, vibration, acceleration and weight lies with the system architect.

6 Electrical connection



The unit must be connected by a qualified electrician.

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



CAUTION

Use in wet environments

- ▷ Electric shock possible.
- ▶ Voltage derating required (→ Technical data).

The input and output circuits are insulated from each other and from device surfaces that could be touched with basic insulation according to IEC 61010-1 (secondary circuit with max. 32 V DC, supplied from the mains circuit up to 300 V of overvoltage category II).

The external wiring has to be carried out in a way that ensures the required separation from other circuits.

6.1 Input side

Operating voltage (SELV/PELV)



CAUTION

The input current of the operating voltage is not limited.

- ▷ No fire protection.
- ▶ Protect the circuit.
- ▶ Protect the sensor supply via the same fuse.

Potential	M12 connector ①	Fuse
L+ / supply voltage	Pin 1	≤ 2 A

Required tripping characteristic of the fuse:

$T_{\text{fuse}} \leq 120 \text{ s}$ at max. 6.25 A (fire protection)

- ▶ Alternatively supply the device via a limited energy circuit according to IEC 61010-1 or class 2 according to UL1310.



Output reaction to overload or short circuit:

For self-protection of the output in case of excessive thermal load (due to short circuit or overload), the output driver starts clocking. If a short circuit / overload continues for several hours, the driver may be damaged!

6.2 Connecting the device

- ▶ Disconnect power.
- ▶ Connect the unit as follows:

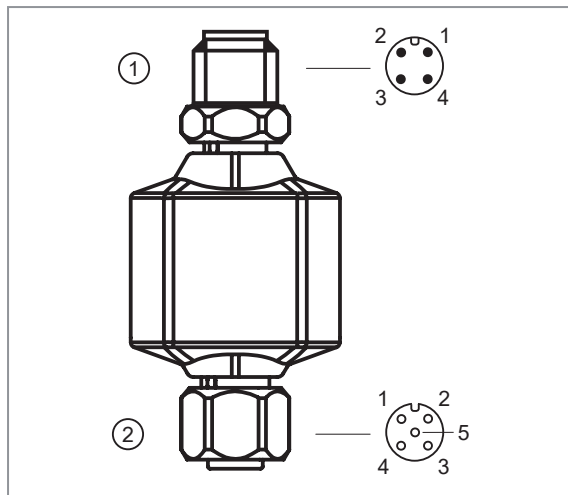


Fig. 10: Electrical connection



The device must not be externally supplied via the 5-pole M12 socket ②.



Always use the provided connection cables to connect other devices.

See also application examples (→ Intended use)

6.2.1 Mounting the connector

The threaded connections in the device correspond to the M12 standard. To ensure compliance with the specified protection rating, only cables that comply with this standard may be used. In the case of self-assembled cables, the system manufacturer is responsible for the protection rating.

- ▶ Use connectors with gold-plated contacts.
- ▶ During installation, place the connectors vertically so that the coupling nut will not damage the thread.
- ▶ Observe the coding of the connectors during installation.

If connector in the device:

- ▶ Tighten the cable sockets according to the torque specifications indicated by the cable vendor.
Maximum permissible tightening torque: 1.8 Nm

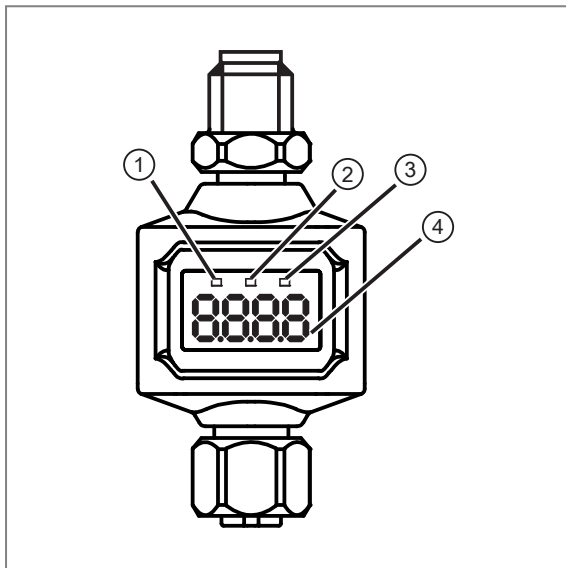
If sockets in the device:

- ▶ Tighten the cable plug using 1.3 ± 0.1 Nm.
- ▶ Provide all outgoing cables with suitable strain relief after a maximum of 200 mm. Observe the minimum bending radius of the cables (→ information from the cable manufacturer).

6.2.1.1 Maximum cable length

- Without IO-Link communication: 30 m on each side
- With IO-Link communication: 20 m on the master side

7 Operating and display elements



- 1: LED I
- 2: LED Power
- 3: LED II
- 4: Display

7.1 LEDs

LED		Colour	Status	Designation
I	OUT1	yellow	on	Output 1 switched.
Power		green	on	Voltage supply OK. Device in operating mode.
			off	No voltage supply. Device switched off.
II	OUT2	yellow	on	Output 2 switched.

Error signals and diagnostics: Troubleshooting

7.2 Display

Colour	Designation
Red/green	7-segment LED display, 4 digits, with colour change

Error signals and diagnosis: Troubleshooting

In operating mode, the counter reading is displayed.

8 Menu

8.1 General

Irrespective of the operating mode (standard IO mode or IO-Link device), the device can be configured via an IO-Link tool.



Parameter cloning and parameter setting backup is possible with an IO-Link tool.

8.2 Parameters adjustable via IO-Link

The following functions or parameters are only available via IO-Link tools.

8.2.1 dIn1 — counter configuration 1

The parameter defines the counting mode of the counters:

- [InC] = up counter: [Up counter \(InC\) \(→ 8\)](#)
- [dEC] = down counter: [Down counter \(dEC\) \(→ 9\)](#)
- [dLr] = switching of counting direction possible via IN2: [Counting direction control by IN2 \(dLr\) \(→ 9\)](#)
- [OFF] = counting function deactivated

8.2.2 dIn2 — counter configuration 2

The parameter defines the counting direction of the counters if [dIn1] is set to [dLr]. The counting direction can be changed by the input signal at IN2 during operation.

Options	IN2 = low	IN2 = high
[InC]	Up counter	Down counter
[dEC]	Down counter	Up counter



[dIn2] is only active if dIn1 is set to [dLr].

8.2.3 ModE — switch point mode

Setting of the switch point mode.

- [Single point mode \(→ 10\)](#)
- [Window mode \(→ 10\)](#)
- [Deactivated mode \(→ 11\)](#)

8.2.4 LoGc — switch point logic

Setting of the switch point logic: [Function diagrams \(output behaviour\) \(→ 9\)](#).

- [High active] = switch is closed when activated.
- [Low active] = switch is opened when activated.

8.2.5 SP1 — switch point 1

Permissible maximum value of the counter.

In “Single point mode” SP1 is adjustable over its entire value range. In “Window mode” the lower limit is restricted by SP2. It always applies:

SP1 > SP2.



Set SP2 to an integer multiple of the scaling factor.
Otherwise, the overflow only occurs after SP2 has been exceeded.

8.2.6 SP2 — switch point 2

Count value for setting of the output.

Only active in “Window Mode” switch point mode.

In “Single point mode” the existing setting of SP2 is ignored. When changing to “Window mode”, SP2 is automatically adjusted.

It always applies: SP2 < SP1.

SP1 limits the maximum setting value of SP2.



Set SP1 to an integer multiple of the scaling factor.
Otherwise, the overflow only occurs after SP1 has been exceeded. The difference between the real value and SP1 is taken into account in the following counting step.

8.2.7 PST — initial value of the counter

The parameter defines the value to which the counter is to be reset when executing the system command “RESET_COUNTER”.

8.2.8 c.nu / c.dno — scaling factor for the main counter

The scaling factor is composed of the numerator [c.nu] and the denominator [c.dno] and defines the main counter's increment.



If the scaling factor is odd, the counter reading is rounded down to an integer value. The resulting deviation between the displayed and the actual counter reading is taken into account in the following counting step.

8.2.9 dr — switch-off delay

Delay when the output changes to the idle state.

8.2.10 P-n — output configuration

- [PnP] = load connected to ground
- [nPn] = load connected to VBB

8.2.11 PST.b — initial value of the counter

The parameter defines the value to which the counter is to be reset when executing the system command “RESET_BATCH_COUNTER”.

8.2.12 b.nu / b.dno — scaling factor for the batch counter

Identical to SSC1 (but with regard to the batch counter): [c.nu / c.dno — scaling factor for the main counter](#) (→ [19](#))

8.2.13 SELd — selection of the primary counter

The parameter defines which counter is permanently shown on the display.

- [cnt] = main counter
- [bcnt] = batch counter

8.2.14 dAP — switching delay for debouncing the input

Delays the change of the output from the idle state to the active switching status.

8.2.15 coLr — display colours

- [rEd] = primary counter continuously red (independent of the measured value)
- [GrEn] = primary counter continuously green (independent of the measured value)

8.2.16 diS.b — display power on

- [OFF] = the measured value display is switched off in the operating mode.
- [On] = the measured value display is switched on in the operating mode.

8.2.17 diS.U — refresh rate of the displayed measured value

- [d1] = update of the measured values every 50 ms.
- [d2] = update of the measured values every 200 ms.
- [d3] = update of the measured values every 600 ms.



Even with an unsteady frequency, [d1] provides optimum readability.

8.2.18 LTC1 — latch

The parameter activates the latch mode for the main or batch counter. When deactivated, the switch-off delay automatically takes effect: [dr — switch-off delay](#) (→ [19](#)).

- [OFF] = Latch mode deactivated
- [cnt] = Latch mode on output of the main counter
- [bcnt] = Latch mode on output of the batch counter

8.2.19 RESET_COUNTER — reset main counter

The main counter is reset to its initial value: PST — initial value of the counter.



If the counter is in latch, it must be released separately via "RELEASE_LATCH_COUNTER".

8.2.20 RESET_BATCH_COUNTER — reset batch counter

The batch counter is reset to its initial value: PST.b — initial value of the counter.



If the counter is in latch, it must be released separately via "RELEASE_LATCH_BATCH_COUNTER".

8.2.21 RELEASE_LATCH_COUNTER - release latch of the main counter

If the main counter is in latch, execution of this parameter resumes input signal evaluation.

8.2.22 RELEASE_LATCH_BATCH_COUNTER - release latch of the batch counter

If the batch counter is in latch, execution of this parameter resumes input signal evaluation.

8.2.23 FLASH_ON – activate flashing of the display

Used to identify a unit. Display flashes and shows [dEVC].

8.2.24 FLASH_OFF – deactivate flashing of the display

Deactivates the flashing of the display.

8.2.25 internal_temperature – operating temperature microcontroller

Reads the data from the internal temperature sensor of the microcontroller.

8.2.26 operation_hours – operating hours

Only counts full operating hours. Operating times of less than one full hour are not saved. Counter readings are saved permanently.

8.2.27 Application-specific tag

Customer-specific application description, max. 32 characters long.

Default value: " *** " / can be freely defined by the customer

8.2.28 Location tag

Customer-specific location tag of the unit, max. 32 characters long.

Default value: " *** " / can be freely defined by the customer

8.2.29 Function tag

Customer-specific function tag of the unit, max. 32 characters long.

Default value: " *** " / can be freely defined by the customer

9 Operation

After power on, the device is in the operating mode (SIO). It carries out its measurement and evaluation functions and provides output signals according to the set parameters.

10 Troubleshooting

Display	LED			Error	Troubleshooting
	I	Power	II		
OFF	off	off	off	Supply voltage too low.	Check/correct the supply voltage: Electrical connection.
SC	flashes	can differ	flashes	Excessive current at the switching output OUTx (see LED I/II).	Check switching output for short circuit or excessive current. Remove the fault.
d_OL	can differ	on	can differ	Count value too high for the display (from counter readings > 9999).	Check the value range if the value should be readable on the display.
F_OL	can differ	on	can differ	Frequency of the input signal too high.	Check the frequency of the input signal.
Rotating segment	can differ	can differ	can differ	Temperature in housing exceeds limit value.	Check the device temperature.
DEUC	can differ	on	can differ	Device identification activated (system command: FLASH_ON).	Deactivate device identification (system command: FLASH_OFF).

11 Maintenance, repair and disposal

The unit is maintenance-free.

- ▶ Carry out cleaning considering the technical data (protection rating) and the connection technology used.
- ▶ Cleaning agents must be checked by the system manufacturer / operator for their suitability for the device materials (→ Technical data) and the connection technology used.
- ▶ The cleaning agents must not damage the device materials.
- ▶ It is not possible to repair the unit.
- ▶ After use, dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.