



Operating instructions
Pulse stretcher
DP2402

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 www.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 used



CAUTION

Warning of personal injury

- ▷ Slight reversible injuries may result.

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 can output incoming pulses stretched at the output. The device is designed as a standard IO device. IO-Link only serves as a configuration interface.

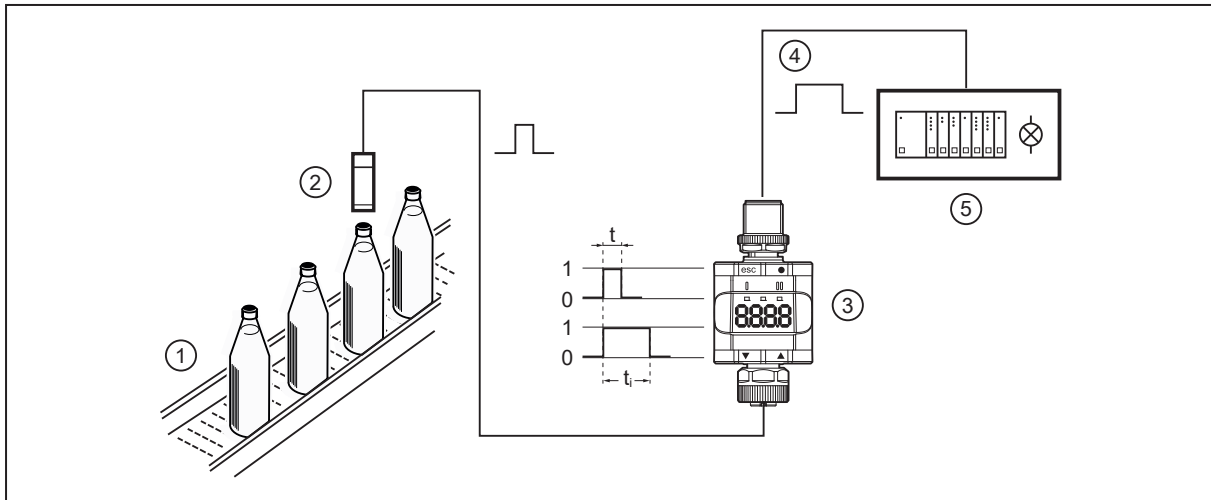


Fig. 1: Example: Pulse stretching between sensor and evaluation unit

- | | |
|-------------------------------|---|
| 1: Conveyor belt | 2: Pulse generator on the conveyor belt |
| 3: DP2402 | 4: Transistor output |
| 5: PLC, evaluation units, ... | |



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

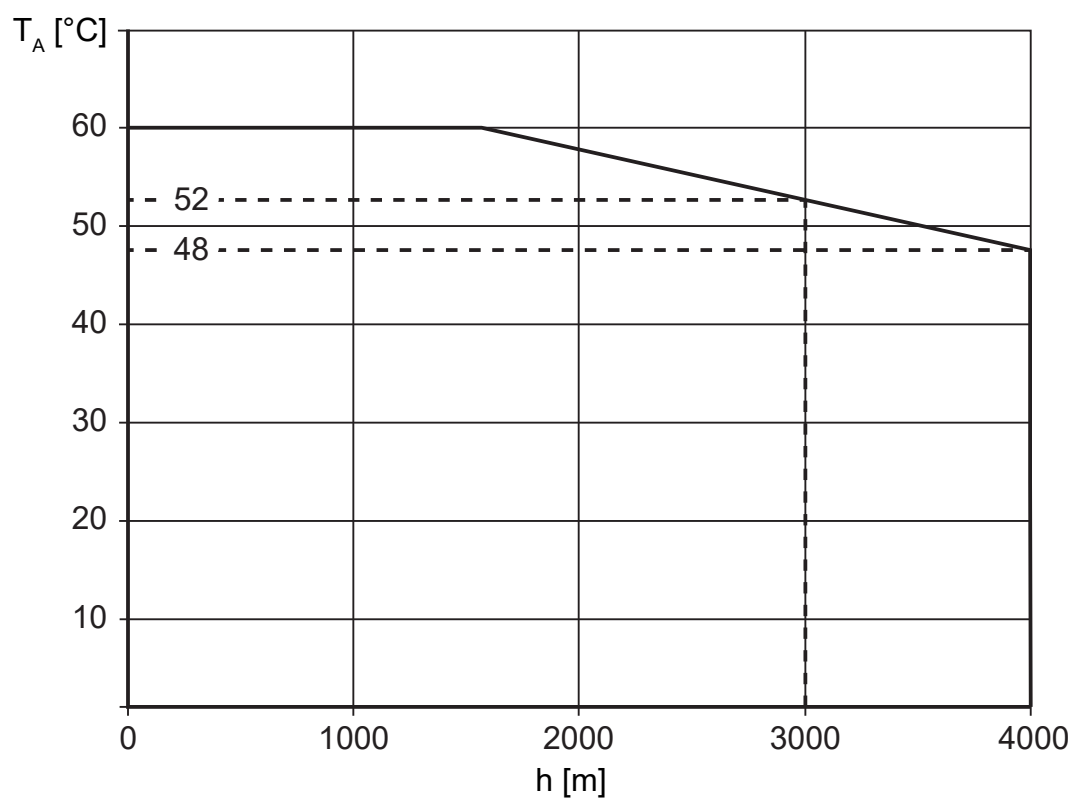
The unit is intended for indoor use only.

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



The accuracy and functionality of the unit can only be guaranteed within the specification. If necessary, the user must provide appropriate digital input filters for the input signals.

3.1 Temperature derating depending on the altitude



4 Function

The device supports two different output behaviours:

1. It can output an input pulse stretched, shortened or delayed at the output.
2. The edge of the input signal can serve as a trigger to initiate a pulse at the output. The pulse duration is set via a parameter.

For parameter setting and diagnostic purposes there is an IO-Link interface available. The following options are available:

- Remote parameter setting: reading and changing the current parameter setting
- IO-Link parameter setting: IO Device Description (IODD) (→ 8)

For diagnostic purposes, the input states and output states are available via the process data.



Due to the cycle time, the correctness of the process data displayed via IO-Link cannot be guaranteed.

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.ifm.com/gb/io-link

4.1.2 Application

The use of the IO-Link interface in the application is not intended. It is mainly used for convenient setting of the device.

4.1.3 IO Device Description (IODD)

You will find the IODDs necessary for the configuration of the IO-Link device and detailed information about process data structure, diagnostic information and parameter addresses at:

www.ifm.com

4.2 Function diagrams

The output is defined as a normally open (no) or normally closed (nc) via the parameter [ou1] or [ou2].

4.2.1 Input configuration: pulse-controlled

The application of the switch-on and switch-off delay makes it possible to output input pulses stretched, shortened or delayed at the output. The duration of the output pulse depends on the pulse duration at the input.

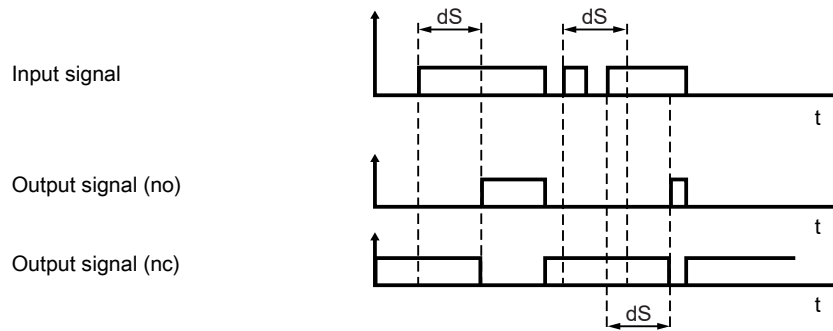


Fig. 2: Switch-on delay

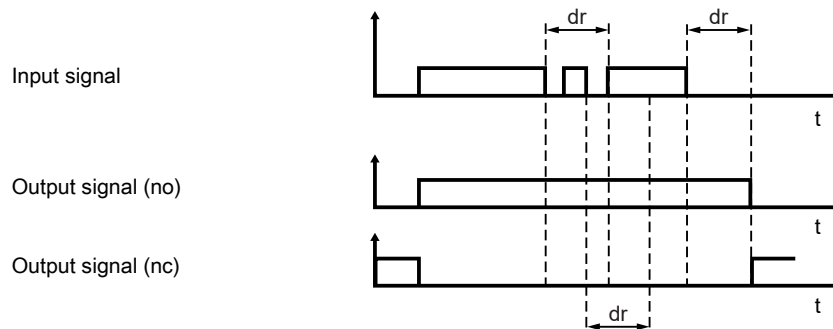


Fig. 3: Switch-off delay



After switching on, the device will not function properly until there is at least one rising edge at the input.

4.2.2 Input configuration: edge-controlled

The edge of the input signal is the trigger for the output of pulses at the output. The duration of the output pulse is always constant and is determined by the parameter [h.t1] or [h.t2]. The trigger can be set to either the positive or negative edge.

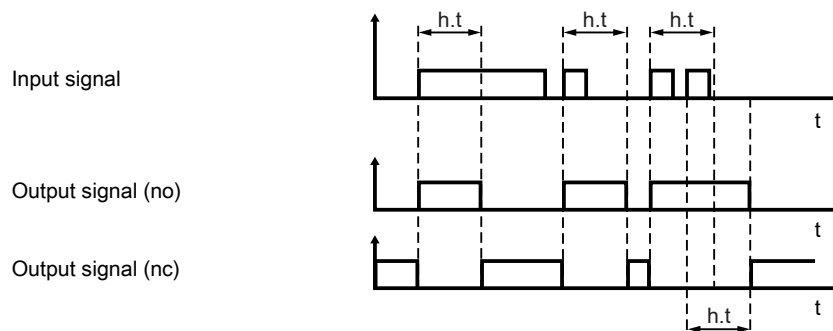


Fig. 4: Hold time

5 Installation

- ▶ Install the unit so that the M12 connection parts and the unit are protected from mechanical stress such as shock and vibration.
- ▶ If necessary, fix the unit with a clamp (use M4 screw or cable tie).

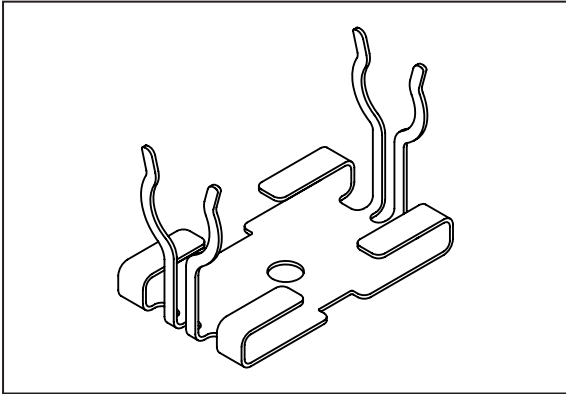


Fig. 5: Mounting clip

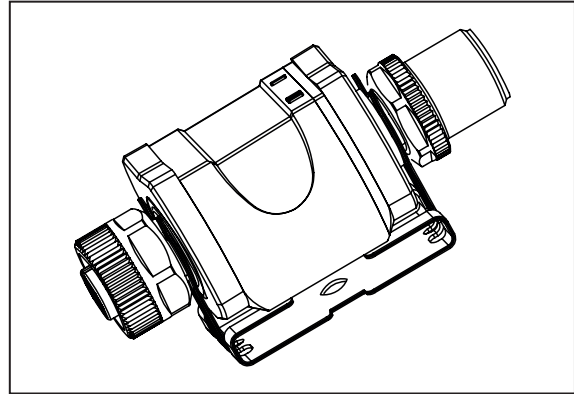


Fig. 6: Mounting clip with attached unit



The mounting clip is not supplied with the unit. More information about available accessories at www.ifm.com.

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.

By means of basic insulation according to EN61010-1, the circuits are isolated from each other and from device surfaces that could be touched (secondary circuit with max. 30 V DC, supplied from mains circuit up to 300 V overvoltage category II).



CAUTION

Input current is not limited.

▷ No fire protection.

▶ Protect circuits.

▶ Protect circuits.

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

Required tripping characteristic of the fuses:

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

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

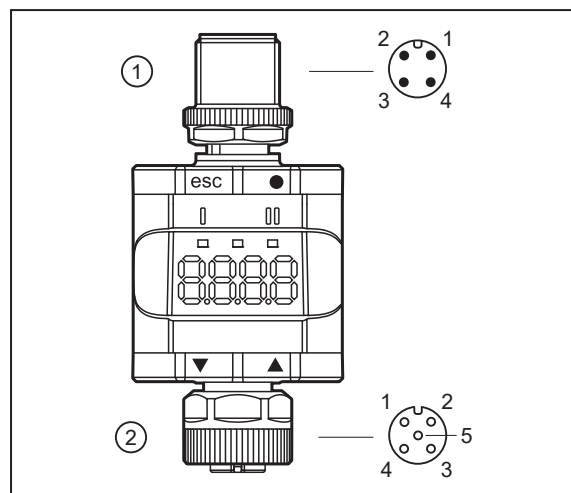


Output reaction to overload or short circuit:

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!

▶ Disconnect power.

▶ Connect the unit as follows:



1: 4-pole M12 connector
(output side)

- Pin 1: L+ / supply voltage
- Pin 2: OUT2 / digital output 2
- Pin 3: L- / supply voltage
- Pin 4: OUT1 / digital output 1 / IO-Link (C/Q)

2: 5-pole M12 socket
(input side)

- Pin 1: L+
- Pin 2: IN2 / digital input 2
- Pin 3: L-
- Pin 4: IN1 / digital input 1
- Pin 5: not used

Fig. 7: Electrical connection



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



Always use the provided connection cables to connect other devices.

See also application examples (→ Intended use)

6.1 Mounting the connector

To achieve the protection rating indicated in the data sheet, the following has to be observed:

- ▶ Use IO-Link cable with IP class.
- ▶ Use M12 connectors with gold-plated contacts.
- ▶ Connect the connector with the unit. The arrow indicates the position of the coding.
- ▶ Carry out the fitting according to the indications of the cable manufacturer.
- Maximum tightening torque on the connector side ①: 1.8 Nm
- Maximum tightening torque on the socket side ②: 1.3 ± 0.1 Nm

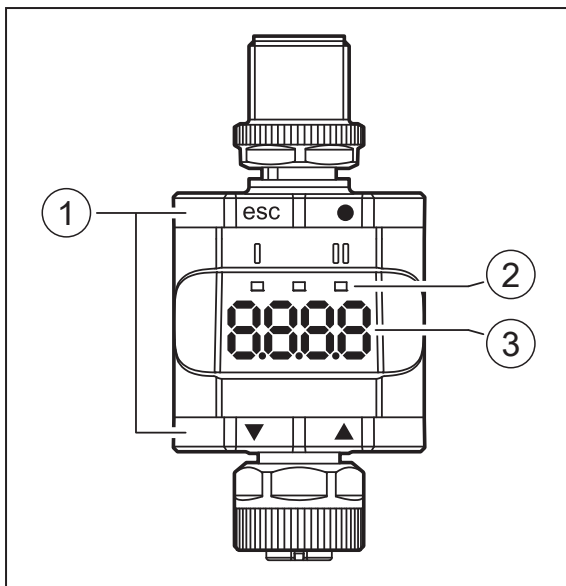
6.2 Removing the connector

- ▶ Press the connector against the unit and simultaneously loosen the coupling nut.

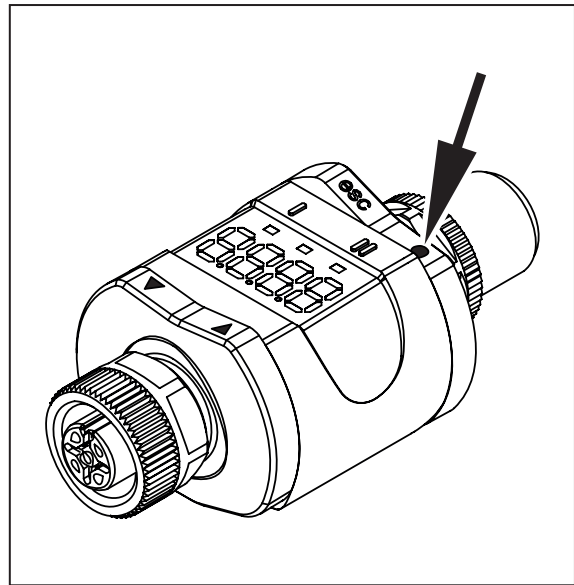
6.3 Cable length

- Without IO-Link communication: 30 m on each side
- With IO-Link communication: 20 m on the master side
- ▶ Provide all input and output side cables with a strain relief approx. 200 mm behind the connectors.

7 Operating and display elements



- 1: Push rings (pushbuttons)
 2: LEDs
 3: Display



Here, the Enter button [•] is shown pressed, as an example.

7.1 Push rings (pushbuttons)

To execute an [esc], [•], [▼] or [▲] command, press the corresponding corner of a push ring.

Button		Function
[esc]	Escape	Return to the previous menu. Exit parameter setting without saving the new value.
[•]	Enter	Open menu mode. Selection of the parameter and acknowledgement of a parameter value.
[▼]	Down	Selection of a parameter. Setting a parameter value (scrolling by holding down, incrementally by pressing repeatedly).
[▲]	Up	



To ensure correct operation of the push rings (buttons), do not install or place the unit directly on a metal surface.

For the installation use the mounting clip → Installation.

7.2 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

7.3 Indication

Colour	Designation
Red	7-segment LED display, 4 digits

Error signals and diagnostics: Troubleshooting

In operating mode, no value is shown on the display.

8 Menu

8.1 General

Irrespective of the operating mode (standard IO mode or IO-Link device) there are two options to set the parameters of the unit:

- directly on the unit via the menu Parameter setting (→ 19)
- or via an IO-Link tool

Access via an IO-Link tool has a higher priority than parameter setting via the menu.



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



Some parameters can only be set via the IO-Link interface:
Parameters adjustable via IO-Link.



If the unit was locked via IO-Link, it can also only be unlocked via the IO-Link interface:
Locking / unlocking (→ 20).

8.2 Menu structure

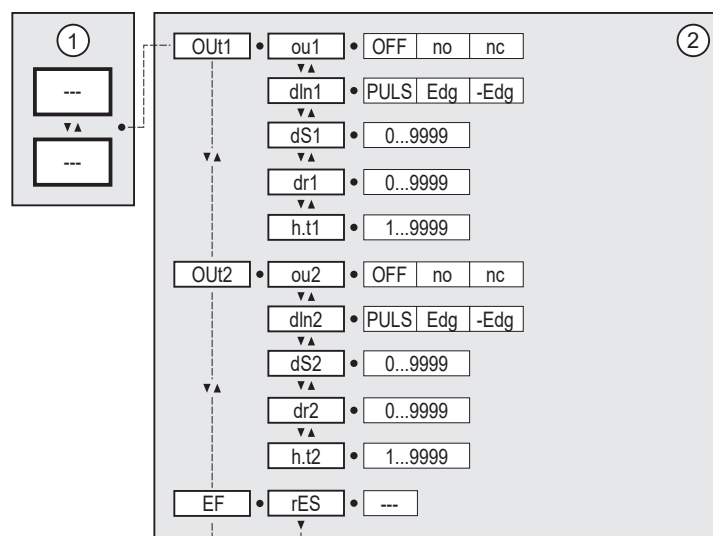


Fig. 8: Parameters

- 1: Operating mode: Menu (→ 15)
- 2: Parameters of the main menu: Parameters for OUT1 (→ 16), Parameters for OUT2 (→ 16) and Parameters of the extended functions (EF) (→ 17)
Parameter list and factory settings: Factory settings (→ 24)

8.3 Parameters of the main menu

8.3.1 OUT1 — output OUT1

The parameter opens the menu of the settings for OUT1.

8.3.2 Out2 — output OUT2

The parameter opens the menu of the settings for OUT2.

8.3.3 EF — extended functions

The parameter opens the extended functions menu.

8.4 Parameters for OUT1

8.4.1 ou1 — output configuration

Definition of the output logic at output OUT1.

[OFF] = output is switched off.

[no] = switch is closed when activated.

[nc] = switch is opened when activated.

8.4.2 dIn1 — input configuration

Configuration of the evaluation of signals at input IN1.

[PULS] = stretched, shortened and delayed output of an input pulse at the output

[EdG] = output of a pulse with defined duration for a rising edge at the input

[-EdG] = output of a pulse with defined duration for a falling edge at the input

8.4.3 dS1 — switch-on delay

Delay when the output OUT1 changes to the active switching status.



This function is only available if [PULS] is selected as input configuration.

8.4.4 dr1 — switch-off delay

Delay when the output OUT1 changes to the idle state.



This function is only available if [PULS] is selected as input configuration.

8.4.5 h.t1 — hold time

Definition of the hold time of output OUT1 in the active switching status.



This function is only available if [EdG] or [-EdG] is selected as input configuration.

8.5 Parameters for OUT2

8.5.1 ou2 — output configuration

Definition of the output logic at output OUT2.

[OFF] = output is switched off.

[no] = switch is closed when activated.

[nc] = switch is opened when activated.

8.5.2 dIn2 — input configuration

Configuration of the evaluation of signals at input IN2.

[PULS] = stretched, shortened and delayed output of an input pulse at the output

[EdG] = output of a pulse with defined duration for a rising edge at the input

[-EdG] = output of a pulse with defined duration for a falling edge at the input

8.5.3 dS2 — switch-on delay

Delay when the output OUT2 changes to the active switching status.



This function is only available if [PULS] is selected as input configuration.

8.5.4 dr2 — switch-off delay

Delay when the output OUT2 changes to the idle state.



This function is only available if [PULS] is selected as input configuration.

8.5.5 h.t2 — hold time

Definition of the hold time of output OUT2 in the active switching status.



This function is only available if [EdG] or [-EdG] is selected as input configuration.

8.6 Parameters of the extended functions (EF)

8.6.1 rES — restore factory setting

Resets all parameters to the Factory settings.

- ▶ Select [rES].
- ▶ Press [●].
- ▶ Press and hold [▲] or [▼] until [----] is displayed.
- ▶ Briefly press [●].

8.7 Parameters adjustable via IO-Link

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

8.7.1 FLASH_ON — activate flashing of the display

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

8.7.2 FLASH_OFF – deactivate flashing of the display

Deactivates the flashing of the display.

8.7.3 internal_temperature – operating temperature microcontroller

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

8.7.4 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.

8.7.5 Application-specific tag

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

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

8.7.6 Location tag

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

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

8.7.7 Function tag

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

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

9 Parameter setting



During parameter setting the unit remains in the operating mode. It continues its monitoring functions with the existing parameters until the parameter setting has been completed.

9.1 Parameter setting in general

Each parameter setting consists of 6 steps:

Step		Button
1	Change from operating mode to parameter setting mode.	[•]
2	Select the required parameter: [ou1], [dS1], ...	[▲] or [▼]
3	Change to the programming mode of the parameter.	[•]
4	Select or change the parameter value.	[▲] or [▼] > 2 s
5	Acknowledge the set parameter value.	[•]
6	Return to the operating mode.	[esc]

9.1.1 Example [ou2] - output configuration for OUT2

Step		Indication
1	Change from operating mode to parameter setting mode. ► Press [•] to get to the menu. ▷ The first parameter is displayed.	Out 1
2	Select the requested parameter, here [OUT2]. ► Press [▼] until [OUT2] is displayed. ► Press [•] to get to the extended functions menu. ▷ The first parameter of the extended functions is displayed.	Out2 ou2
3	Change to the programming mode of the parameter. ► Press [•] to change to the programming mode. ▷ The currently set parameter value is displayed.	no
4	Select or change the parameter value, here e.g. [nc]. ► Press [▼] or [▲] for at least 2 s. ▷ The currently set parameter value flashes, here e.g. [no]. ▷ After 2 s: - value is changed continuously by keeping the button pressed. - value is changed incrementally by pressing the button once. Numerical values (→ 9.2.3)	no nc
5	Acknowledge the set parameter value. ► Briefly press [•]. ▷ The parameter is displayed again. ▷ The new setting value is saved.	ou2
	Setting of other parameters: ► Press [▼] or [▲] until the requested parameter is displayed.	
6	Return to the operating mode. ► Press [esc]. ► - Press [▼] or [▲] several times until the current measured value is displayed. - Or wait for the timeout function (approx. 30 s). ▷ The unit has returned to the operating mode.	

9.2 Notes on programming

9.2.1 Locking / unlocking

The unit can be locked electronically to prevent unauthorised setting. Set parameter values and settings can be displayed but not changed.

To lock the unit:

- ▶ Make sure that the unit is in normal operating mode.
- ▶ Press [esc] + [▲] simultaneously for 10 s.
- ▷ [Loc] is displayed.
- ▷ The unit is locked.
- ▷ [Loc] is briefly displayed if you try to change parameter values.

To unlock the unit:

- ▶ Press [esc] + [▲] simultaneously for 10 s.
- ▷ [uLoc] is displayed.

On delivery the unit is not locked.



Customer locking

If [C.Loc] is displayed when an attempt is made to modify a parameter value, an IO-Link communication is active (temporary locking).



Software locking

If [S.Loc] is displayed, the sensor is permanently locked via software. This locking can only be removed using an IO-Link parameter setting software.

9.2.2 Timeout

If no button is pressed for 30 s during parameter setting, the unit returns to the operating mode with the unchanged value.

9.2.3 Numerical entries with [▼] or [▲]

- ▶ Press [▼] or [▲] for at least 2 s.
- ▷ After 2 s:
 - value is changed continuously by keeping the button pressed.
 - value is changed incrementally by pressing the button once.

Value is incrementally reduced with [▼] and increased with [▲].

10 Operation

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



The normal operating mode is SIO mode, as real-time transmission of data cannot be ensured due to the IO-Link cycle time.

11 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	any	flashes	Excessive current at the switching output OUTx (see LED I/II).	Check switching output for short circuit or excessive current. Remove the fault.
C.Loc	any	any	any	Parameter setting via pushbuttons locked due to active IO-Link transmission.	Wait until parameter setting via IO-Link is finished.
S.Loc	any	any	any	Parameter setting via pushbuttons disabled by software.	Unlocking only possible via IO-Link interface/IO-Link parameter setting software.
Loc	any	any	any	Parameter setting via pushbuttons disabled.	Unlock pushbuttons: Locking / unlocking (→ 20)
Rotating segment	any	any	any	Temperature in housing exceeds limit value.	Press any button to switch the display on for 30 s.
DEUC	any	on	any	Device identification activated (system command: FLASH_ON)	Deactivate device identification (system command: FLASH_OFF)

12 Maintenance, repair and disposal

The operation of the unit is maintenance-free.

Only the manufacturer is allowed to repair the unit.

- ▶ After use dispose of the device in an environmentally friendly way in accordance with the applicable national regulations.

Cleaning the unit:

- ▶ Disconnect the unit from the voltage supply.
- ▶ Clean the unit from dirt using a soft, chemically untreated and dry micro-fibre cloth.

13 Factory settings

Parameter		Factory settings	User settings
ou1	Output configuration OUT1	no	• OFF • no • nc
dIn1	Input configuration OUT1	PULS	• PULS • EDG • -EDG
dS1	Switch-on delay OUT1	0 ms	• 0...9999 ms
dr1	Switch-off delay OUT1	0 ms	• 0...9999 ms
h.t1	Hold time OUT1	200 ms	• 1...9999 ms
ou2	Output configuration OUT2	no	• OFF • no • nc
dIn2	Input configuration OUT2	PULS	• PULS • EDG • -EDG
dS2	Switch-on delay OUT2	0 ms	• 0...9999 ms
dr2	Switch-off delay OUT2	0 ms	• 0...9999 ms
h.t2	Hold time OUT2	200 ms	• 1...9999 ms
rES	Factory setting		