TURCK

Your Global Automation Partner

PS310 | PS311 | PS510
Pressure Sensors

Instructions for Use

Contents

1 About these instructions

These instructions describe the setup, functions and use of the product and help you to operate the product according to its intended purpose. Read these instructions carefully before using the product. This will prevent the risk of personal injury and damage to property. Keep these instructions safe during the service life of the product. If the product is passed on, pass on these instructions as well.

1.1 Target groups

These instructions are aimed a qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols

The following symbols are used in these instructions:

	**DANGER** DANGER indicates a hazardous situation with a high level of risk, which, if not avoided, will result in death or serious injury.
	**WARNING** WARNING indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in death or serious injury.
	**CAUTION** CAUTION indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in moderate or minor injury.
	**NOTICE** CAUTION indicates a situation which, if not avoided, may cause damage to property.
	**NOTE** NOTE indicates tips, recommendations and important information about special action steps and issues. The notes simplify your work and help you to avoid additional work.
▶	**MANDATORY ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULT OF ACTION** This symbol denotes the relevant results of an action.

1.3 Other documents

Besides this document the following material can be found on the Internet at www.turck.com:

- Data sheet
- Quick Start Guide
- IO-Link parameters manual
- Commissioning manual IO-Link devices

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to techdoc@turck.com.

2 Notes on the product

2.1 Product identification

PS 310 – 1V – 03 – LI2UPN 8 / H1 1 4 1 / X

PS 310 Functional principle – 1V Measuring range – 03 Mechanical version –

Version
- **310** Ceramic measuring cell
- **311** Ceramic measuring cell with flush metal diaphragm
- **510** Metal measuring cell

Functional principle
- **PS** Pressure sensor

Measuring range

Ceramic measuring cell
- **0V** -1…0 bar
- **1V** -1…1 bar
- **1** 0…1 bar
- **1A** 0…1 bar absolute
- **2.5V** -1…2.5 bar
- **2.5** 0…2.5 bar
- **2.5A** 0…2.5 bar absolute

Metal measuring cell
- **10V** -1…10 bar
- **10** 0…10 bar
- **10A** 0…10 bar absolute
- **16V** -1…16 bar
- **16A** 0…16 bar absolute
- **25V** -1…25 bar
- **25A** 0…25 bar absolute
- **40V** -1…40 bar
- **100** 0…100 bar
- **250** 0…250 bar
- **400** 0…400 bar
- **600** 0…600 bar

Mechanical version
- **01** G1/4" female thread
- **02** 1/4" NPT female thread
- **03** 1/4" NPT male thread
- **04** G1/4" male thread
- **05** 7/16" UNF male thread
- **06** G3/4" front-flush male thread
- **08** G1/2" manometer
- **09** G1/2" front-flush male thread

LI2UPN 8 Electrical version / H1 1 4 1 Electrical connection: connector / X Special version

Operating voltage
- **8** 18…33 VDC

Output function
- **2UPN** 2 switching outputs/ IO-Link
- **LI2UPN** Current and switching output/ IO-Link

Design
- **H1** Connector M12 × 1

Alignment
- **1** Straight

Number of contacts
- **4** 4 Contacts

Assignment
- **1** Standard assignment

Special version
- **X** Peak pressure aperture
- **F** Customized special version

Devices with Smart Sensor Profile 4.1.1

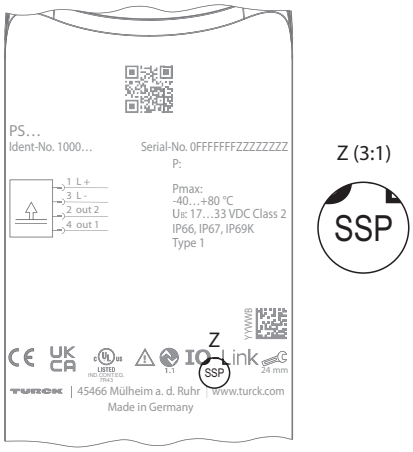


Fig. 1: SSP PS+ label

These instructions for use apply to devices with the **SSP** (Smart Sensor Profile) label. You can find the label on the back of the housing.

For devices without a Smart Sensor Profile, instructions 100004407 apply.

2.2 Scope of delivery

The delivery consists of the following:

- Pressure sensor
- Quick Start Guide

2.3 Turck service

Turck supports you in your projects — from the initial analysis right through to the commissioning of your application. The Turck product database at www.turck.com offers you several software tools for programming, configuring or commissioning, as well as data sheets and CAD files in many export formats.

For the contact details of our branches worldwide, please see page [▶ 43].

3 For your safety

The product is designed according to state of the art technology. Residual hazards, however, still exist. Observe the following safety instructions and warnings in order to prevent danger to persons and property. Turck accepts no liability for damage caused by failure to observe these safety instructions.

3.1 Intended use

The pressure sensors in the PS+ product series monitor media in fluid group 2 and indicate the measured values via a display. The sensors are vacuum-tight.

The device must only be used as described in these instructions. Any other use is not in accordance with the intended use. Turck accepts no liability for any resulting damage.

3.2 Obvious misuse

- The devices are not safety components and must not be used for personal or property protection.

3.3 General safety instructions

- The device meets the EMC requirements for the industrial areas. When used in residential areas, take measures to prevent radio frequency interference.
- The device must only be fitted, installed, operated, parameterized and maintained by trained and qualified personnel.
- Only use the device in compliance with the applicable national and international regulations, standards and laws.
- The max. permissible overpressure must not be exceeded.
- Check the compatibility of the medium and the media-contacting parts.

4 Product description

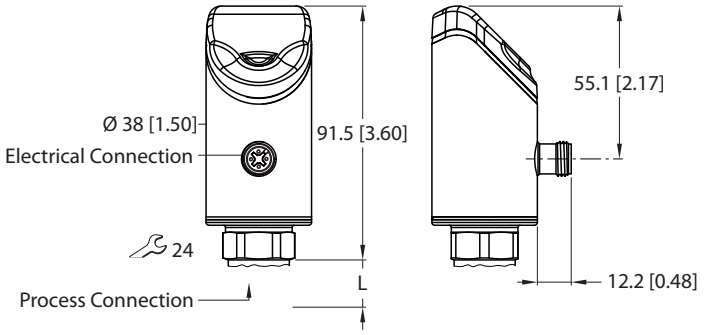
NOTE
These instructions apply to the Pressure sensors in the P310…, PS311…, PS510… product series with Smart Sensor Profile 4.1.1 (PS+ SSP device label [▷ 6]).
For old devices without a Smart Sensor Profile, instructions 100004407 apply.

The pressure sensors in the PS+ series are incorporated in metal housing and are available with various process connections. The housing can be aligned and fixed before or after installation. All devices have a metal M12 connector to connect the sensor cable. The device settings can be configured via touchpads, FDT/DTM or IO-Link. The measured pressure can be displayed in bar, psi, kPa, MPa or ten other units of pressure (Ud1…Ud10).

Devices with the following output functions are available:

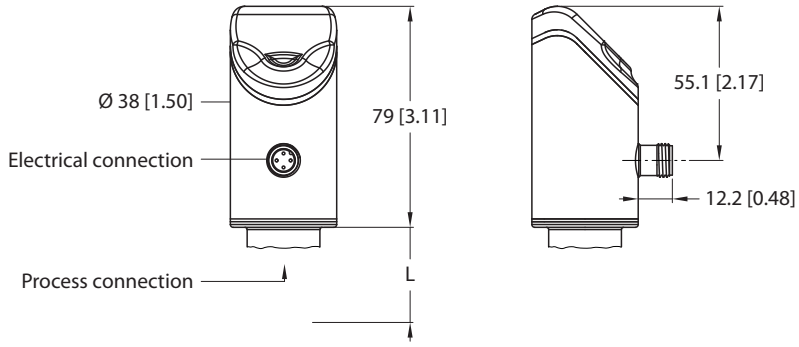
- PS…2UPN8…: two switching outputs (PNP/NPN)
- PS…LI2UPN8…: one switching output (PNP/NPN) and one switching output (PNP/NPN) or one analog output (can be set as current output or voltage output)

4.1 Device overview



mm [Inch]

Fig. 2: Dimensions of PS310…, PS510…



mm [Inch]

Fig. 3: Dimensions of PS311…

4.2 Properties and features

- Pressure monitoring of fluid group 2
- IO-Link 1.1
- Smart Sensor Profile 4.1.1
- Automatic signal detection
- Up to seven-time overpressure resistance
- Protection classes IP66, IP67, IP69K
- 180° reversible 12-segment display
- Rotatable sensor body
- Housing material: 1.4404 (AISI 316L)/Grilamid TR90 UV

4.3 Operating and display functions

The front of the device is provided with three touchpads [ENTER], [MODE] and [SET], a 4-digit 12-segment multicolor display and status LEDs. This enables the user to set all essential functions and properties directly on the device and read the actual process values and set switching points.

4.4 Operating principle

The pressure sensors in the PS310 and PS311 series work with ceramic measuring cells, while the pressure sensors in the PS510 series work with fully welded metal measuring cells. As a result of the pressure acting on the ceramic or metal substrate, a signal that is proportional to the pressure is generated and processed electronically. Depending on the sensor variant, the processed signal is available as either a switching output or an analog output with an accuracy of 0.5 % of full scale.

4.5 Functions and operating modes

The pressure sensors monitor media in fluid group 2 and indicate the measured values via a display.

The sensors can be operated in Normal Mode (factory setting) or in Legacy Mode. In Normal Mode, Single Point Mode (SPM), Two Point Mode (TPM) or Window Mode (WIn) can be set for the switching outputs. In Single Point Mode, a limit value is set at which the selected switching output changes its switching state. In Two Point Mode, a lower and an upper limit are set at which the selected switching output changes its switching state as the process value rises or falls. In Window Mode, a lower and an upper window limit are set. Outside the window, the selected switching output changes its switching state. In Legacy Mode, a window function or a hysteresis function can be defined for the switching outputs. The output range of the analog output can be defined as required. The measured pressure is displayed in bar, psi, kPa, MPa and ten other units of pressure (Ud1…Ud10).

Type	Output
PS…2UPN8…	Two switching outputs (PNP/NPN/Auto) according to Smart Sensor Profile 4.1.1
PS…LI2UPN8…	Two switching outputs (PNP/NPN/Auto) according to Smart Sensor Profile 4.1.1 or one switching output (PNP/NPN/Auto) according to Smart Sensor Profile 4.1.1 and one analog output (I/U/Auto)

4.5.1 Setting options

The devices have three setting options:

- Setting via IO-Link
- Setting via touchpads
- Setting via FDT/DTM

4.5.2 Normal Mode — Run Mode

The sensor detects the system pressures and shows the measured process values according to the preset switching and analog behavior. The display indicates the system pressure present, the selected unit and the status of the switching outputs present.

4.5.3 Programming mode

When the sensor is unlocked, the display will go into programming mode after the user presses the [MODE] touchpad. In programming mode, all parameters and their corresponding values can be read out and changed. The values for a parameter are displayed by briefly pressing the [ENTER] touchpad. The [MODE] and [SET] touchpads are used to navigate within programming mode. For more information, refer to the chapter “Setting and parameterization.”

4.5.4 Legacy Mode

Devices without Smart Sensor Profile operate with their own menu guidance, which is divided into a main menu, an extended functions menu and VDMA menus.

In Legacy Mode, devices with the **SSP** label (Smart Sensor Profile) can be operated using the old menu guidance.

4.5.5 Output functions — switching output

The switching logic can be inverted via IO-Link or via the touchpad (parameter LOGI). The following examples apply to the **HIGH** (0 → 1) switching logic.

Single point mode

In single point mode, the switching behavior is defined via a SP1 limit value and a hysteresis. The output changes its switching state at limit value SP1.

The hysteresis can be set via IO-Link or via the touchpad (parameter HYST) and must be within the detection range.

If the process value increases, the switching output is inactive as long as the process value is between the start of the detection range and the SP1 limit value. If the process value increases above the SP1 limit value, the switching output becomes active.

If the process value decreases, the switching output is active as long as the process value is between the end of the detection range and the SP1 limit minus the set hysteresis (SP1-Hyst). If the process value decreases below the limit value (SP1-Hyst), the switching output becomes inactive.

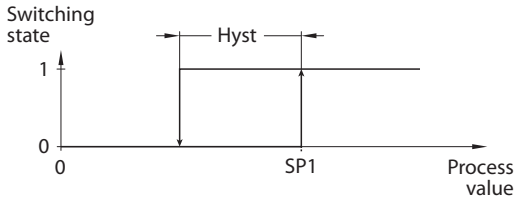


Fig. 4: Single point mode

Two point mode

In two point mode, the switching behavior is defined via a switch-on point SP1 and a switch-off point SP2. This mode can also be used as a freely adjustable hysteresis.

If the process value increases, the switching output is inactive as long as the process value is between the start of the detection range and the switch-on point SP1. If the process value rises above the switch-on point SP1, the switching output becomes active.

If the process value decreases, the switching output is active as long as the process value is between the end of the detection range and the SP2 switch-off point. If the process value decreases below the switch-off point SP2, the switching output becomes inactive.

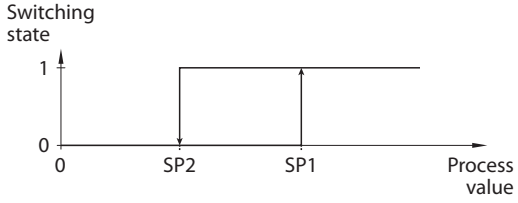


Fig. 5: Two point mode

Window mode

In window mode, an upper and lower window limit are set for the switching output. A hysteresis can be set for the window limits SP1 and SP2. The switching window must be within the detection range.

The hysteresis can be set via IO-Link or via the touchpad (parameter HYST) and must be within the detection range.

If the process value increases, the switching output is inactive as long as the process value is between the start of the detection range and the window limit SP2. The switching output remains active until the process value increases above the window limit SP1 plus the hysteresis (SP1+Hyst). If the process value increases above (SP1+Hyst), the switching output becomes inactive again.

If the process value decreases, the switching output is inactive as long as the process value is between the end of the detection range and the window limit SP1. The switching output remains active until the process value decreases below the window limit SP2 minus the hysteresis (SP2-Hyst). If the process value decreases below (SP2- Hyst), the switching output becomes inactive again.

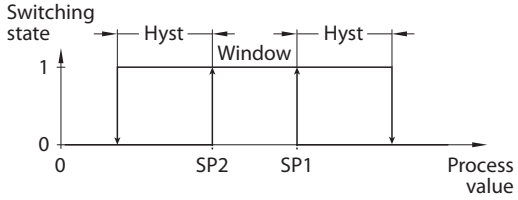


Fig. 6: Window mode

4.5.6 Output functions — switching output in Legacy Mode

A window function and a hysteresis function can be set for the switching outputs.

Window function

The window function is used to set a switching range in which the switching output takes on a defined switching state. The switching range is defined by means of an upper (FH) and lower limit (FL). The minimum distance between the limit values is 0.5 % of the measuring range. The release point is automatically adjusted if the switching point is changed.

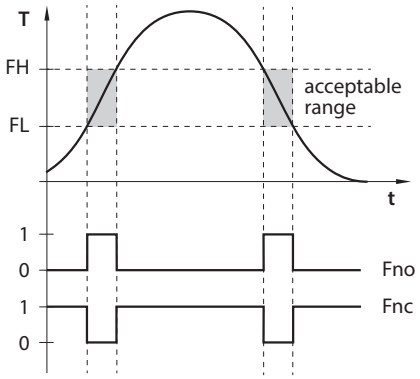


Fig. 7: Behavior of the switching output – Window function

Hysteresis function

The hysteresis function is used to set a stable switching state around a setpoint that is independent of system-related temperature fluctuations. The switching range is defined by means of a switching point (SP) and a release point (rP). The minimum hysteresis is 0.5 % of the measuring range. The release point is automatically adjusted if the switching point is changed.

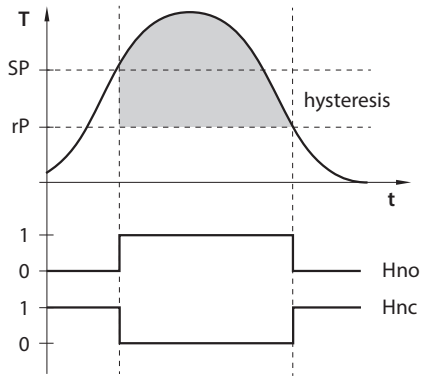


Fig. 8: Behavior of the switching output (hysteresis function)

4.5.7 Output functions — analog output

The analog output of the PS…LI2UPN8 sensors can be set as either a current or voltage output. The measuring range can be defined as required.

The minimum distance between the start and end point is 10 % of the set measuring range.

Current output

In the defined measuring range, the device supplies an analog current signal between ASP (analog start point) and AEP (analog end point). The following output configurations can be set:

- 4…20 mA (factory setting)
- 0…20 mA
- 20…4 mA
- 20…0 mA

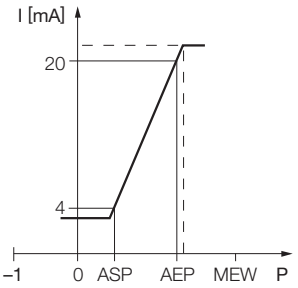


Fig. 9: Behavior of the current output (4… 20 mA)

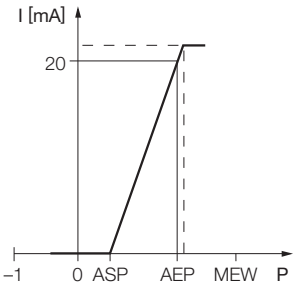


Fig. 10: Behavior of the current output (0…20 mA)

Voltage output

In the defined measuring range, the device supplies an analog voltage signal between ASP (analog start point) and AEP (analog end point). The following output configurations can be set:

- 0…10 V
- 0…5 V
- 1…6 V
- 0.5…4.5 V
- 4.5…0.5 V (Not in Legacy Mode)
- 10…0 V
- 5…0 V
- 6…1 V

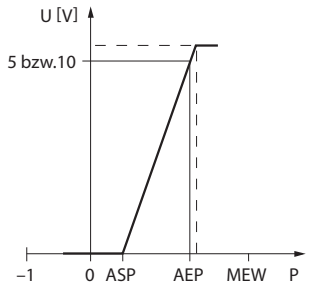


Fig. 11: Behavior of the voltage output (0…10 V or 0…5 V)

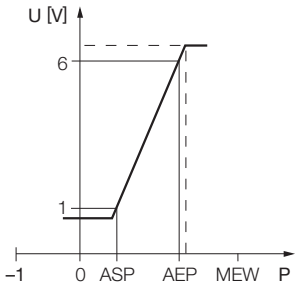


Fig. 12: Behavior of the voltage output (1…6 V)

4.5.8 IO-Link mode

In order to operate in IO-Link mode, the device must be connected to an IO-Link master. When the port is configured in IO-Link mode, bidirectional IO-Link communication takes place between the IO-Link master and the device. To make this possible, the device is integrated via an IO-Link master at the control level. First the communication parameters are exchanged, and then the cyclic data exchange of process data (objects) starts.

4.5.9 SIO mode (standard I/O mode)

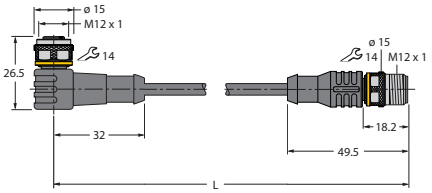
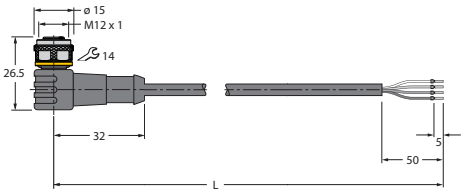
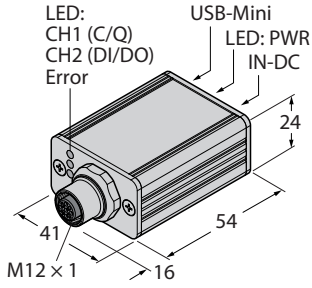
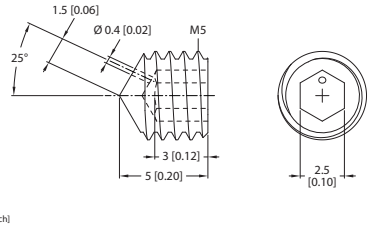
In standard I/O mode no IO-Link communication takes place between the device and the master. The device only transfers the switching state of its binary outputs and can also be run via a fieldbus device or controller with digital PNP or NPN inputs. An IO-Link master is not required for operation.

The device parameters can be set via IO-Link and then operated at the digital inputs with the appropriate settings in SIO mode. Not all functions and properties of the device can be used in SIO mode.

4.5.10 Auto detect function

When connected to an I/O module, the device detects the pre-defined switching output behavior (PNP/NPN) or the analog output characteristic. The auto detect function is activated by default.

4.6 Technical accessories

Figure	Item designation	ID	Description
	WKC4.4T-2-RSC4.4T/TXL	6625640	Extension cable, M12 female connector, angled to M12 connector, straight, 4-pin, cable length: 2 m, jacket material: PUR, black; cULus approval
	WKC4.4T-2/TXL	6625515	Connection cable, M12 female connector, angled, 4-pin, cable length: 2 m, jacket material: PUR, black; cULus approval
	USB-2-IOL-0002	6825482	IO-Link adapter with integrated USB interface
	PAM-P3	100004416	Pressure gauge aperture for mounting on the process connection

In addition to the above connection cables, Turck also offers other cable types for specific applications with the correct terminals for the device. More information on this is available from the Turck product database at **www.turck.de/products** in the Connectivity area.

5 Installing

DANGER
Installation is pressurized
Risk of injury
- Depressurize the installation before mounting.

NOTICE
Pressure peaks
Damage to the measuring cell possible
- Mount the device in a position in the installation at which no pulsating pressure or pressure peaks occur.
- If there are pressure peaks, only mount the device with a peak pressure aperture or accessories for overpressure areas.

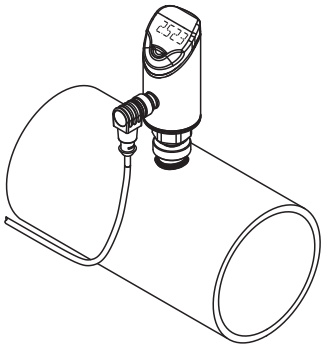


Fig. 13: Vertical mounting

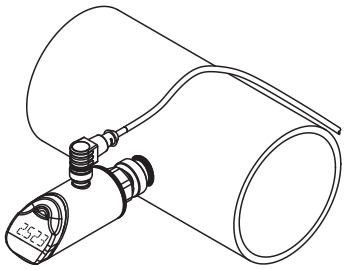


Fig. 14: Horizontal mounting

- Depressurize the installation before mounting.
- Do not mount the device in a location that is subject to high pressure pulses.
- Mount the device to the pressure connection using a suitable counterpiece as shown in the figure.
- Observe the different process connections.
- Mount the sensor in any orientation.
- The display can be rotated by 180°.
- The maximum tightening torque for fastening the sensor is 35 Nm (15 Nm for 7/16 UNF).
- The housing can be rotated 340°.

Significant temperature changes in the environment of the sensor can cause the zero point to drift. This means that the measured value displayed in a depressurized state is not zero. If the zero point has drifted, an offset value can be set via the COF parameter (see chapter " [▶ 21]").

6 Connecting

- Connect the female connector of the connection cable to the male connector of the sensor.
- Connect the open end of the connection cable to the power supply and/or processing units.

6.1 Wiring diagrams

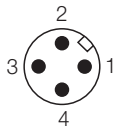


Fig. 15: Pin assignment PS…2UPN…

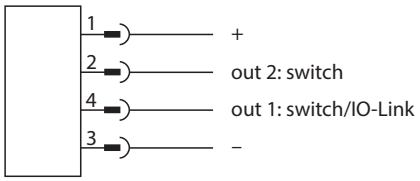


Fig. 16: Wiring diagram PS…2UPN…

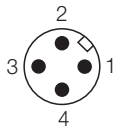


Fig. 17: Pin assignment PS…LI2UPN…

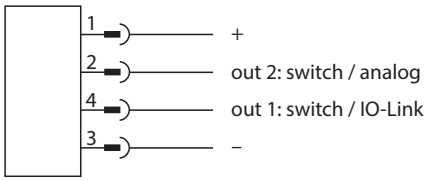


Fig. 18: Wiring diagram PS…LI2UPN…

7 Commissioning

The device is operational automatically once the power supply is switched on.

When connected to an I/O module, the device detects the pre-defined switching output behavior (PNP/NPN) or the analog output characteristic. The auto detect function is activated by default.

7.1 Replacing devices

If replacing an old device (Without SSP label (Smart Sensor Profile)) with a new device, proceed as follows:

- Set Compatible Device Mode in the IO-Link master so that the device changes to Legacy Mode.
- Alternatively, set Legacy Mode in the Extended Functions menu.

8 Operation

WARNING
The enclosure can heat to over 75 °C (167 °F).
Risk of burns from hot enclosure surfaces!
- ▶ Prevent the enclosure from coming into contact with flammable substances.
- ▶ Prevent the enclosure from being touched unintentionally.

8.1 LEDs — operation

LED	Display	Meaning
PWR	Green	Device operational
	Green flashing	IO-Link communication
FLT	Red	Error
bar	Green	Display in bar
psi	Green	Display in psi
kPa	Green	Display in kPa
MPa	Green	Display in MPa
MISC	Green	Other display unit
LOC	Yellow	Device locked
	Yellow flashing	"Lock/unlock" process active
	Off	Device unlocked
I and II (switching point LEDs)	Yellow	Switching output ■ NO: Switching point exceeded/within window (active output) ■ NC: Switching point undershot/outside window (active output)
	Off	Switching output ■ NO: Switching point undershot/outside window (inactive output) ■ NC: Switching point exceeded/within window (inactive output)

8.2 Display indications

Display	Meaning
- - - -	Sensor failure
HW	Internal hardware fault
SC 1	Short circuit at output 1
SC 2	Short circuit at output 2
SC12	Short circuit at both outputs
WB 2	Wire break at current output 2
VOLT	Operating voltage outside the permissible range
LOAD	Load at the analog output outside the permissible range
Oor+	Value outside the measuring range, process value > 5 % of full scale above the measuring range
Oor-	Value outside the measuring range, process value > 5 % of full scale below the measuring range
Oor	No measurement data available
PArA	Incorrect user parameterization
TEMP	Device temperature outside the permissible range
Err	Unspecified error

9 Setting and parameterization

The device can be assigned parameters as follows:

- Setting via touchpads
- Setting via IO-Link
- Setting via FDT/DTM

9.1 Settable functions and properties

The three front touchpads [ENTER], [MODE] and [SET] enable the user to set all the essential functions and properties directly on the device via the menu guidance. It is also possible to configure the device via the IO-Link interface (see IODDfinder).

Setting options — via touchpads and IO-Link interface

The following functions and properties can be set and used both in standard I/O mode as well as in IO-Link mode:

- Locking/unlocking the device
- Switching behavior in Smart Sensor Profile:
  - Window mode
  - Single point mode
  - Two point mode
- Switching behavior in Legacy Mode:
  - Window function
  - Hysteresis function
- Analog range
- OUT1 output configuration for SIO mode: PNP/NPN, auto detection on/off
- OUT2 output configuration for SIO mode: PNP/NPN, auto detection on/off
- Advanced settings: Reset to factory settings.
- Advanced settings: Minimum and maximum value memory
- Advanced settings: Offset adjustment
- Advanced settings: Display color and behavior

Other setting options — only via touchpads

- Advanced settings: Reset to presettings.
- Advanced settings: Set password.

Other setting options — only via IO-Link

Additional functions and properties can also be set via the IO-Link interface.

- Set display units for IO-Link mode
- Fully lock user interface (display and touchpads locked)
- Lock local parameters (user interface parameters — parameters are displayed but cannot be changed)

9.2 Setting parameter values via touchpads

Turck standard menu

- Unlock the device when [MODE] or [SET] is touched, a red running light appears and the LOC LED is lit.
- Touch [MODE] or [SET] until the required parameter is displayed.
- Touch [ENTER] to select a parameter.
- Changing the displayed value: Touch [SET] for 3 s until the display stops flashing. Or: Touch [MODE] to return to the parameter selection.
- Increase or decrease the value gradually via [MODE] or [SET]. Certain values can be continuously changed by holding down [MODE] or [SET].
- Touch [ENTER] to save the modified value. The saved value flashes twice.

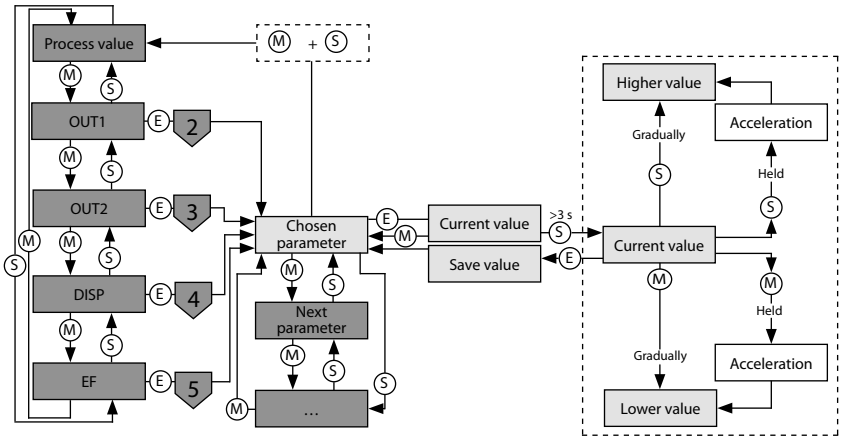


Fig. 19: Setting parameter values

9.3 Unlocking the device

- Touch [ENTER] for 3 s until all green bars are flashing on the display.
- Swipe [MODE], [ENTER], [SET] in succession: Two red flashing bars appear when each touchpad is touched. Once the two red bars have turned green, move onto the next touchpad without removing your finger from the touchscreen.
- Release the touchpads when six green bars are flashing on the display.
- ⇨ LOC LED goes off.
- ⇨ uLoc appears in the display and then disappears.

9.4 Locking the device

- Touch [MODE] and [SET] simultaneously for 3 s.
- ⇨ When the LOC LED flashes, Loc will appear on the display and then go out.
- ⇨ LOC LED is yellow.

The sensor is automatically locked if the touchpads of the device are not actuated for 1 min.

9.5 Protecting the sensor with a password

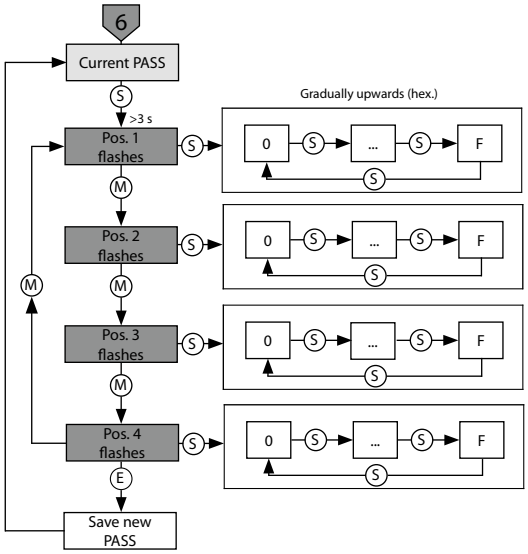


Fig. 20: Setting the password

9.6 Setting via touchpads — standard menu guidance

Use the [MODE] or [SET] touchpads to navigate through the main menu, as well as the OUT1 and OUT2 submenus, the EF extended functions menu and the DISP display menu. Press [ENTER] to select the respective submenu. Touching [MODE] and [SET] at the same time will cancel the parameter assignment. The device returns to the standard display.

In the EF menu, you can select Legacy Mode with its own menu guidance.

Standard menu guidance — main menu

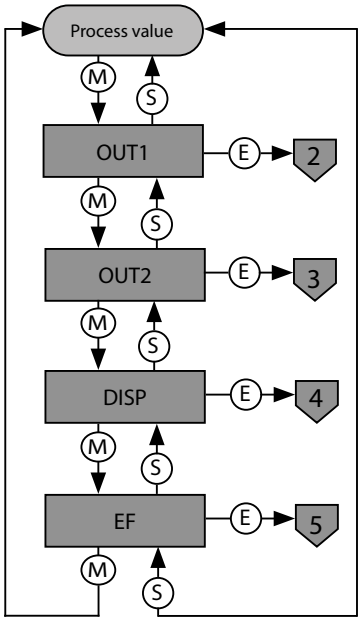


Fig. 21: Main menu

Outputs (OUT…) submenu

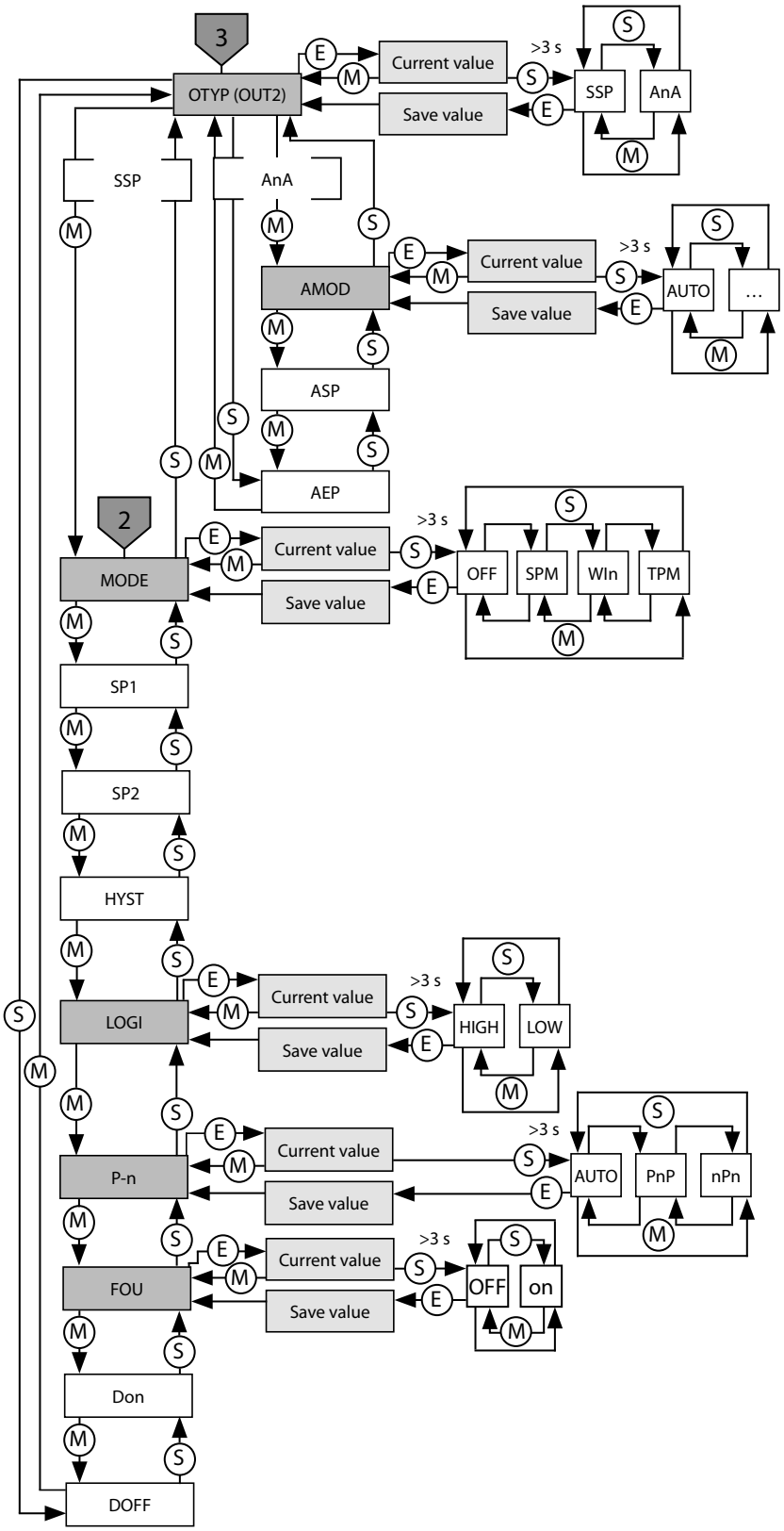


Fig. 22: Outputs (OUT…) submenu

Display (DISP) submenu

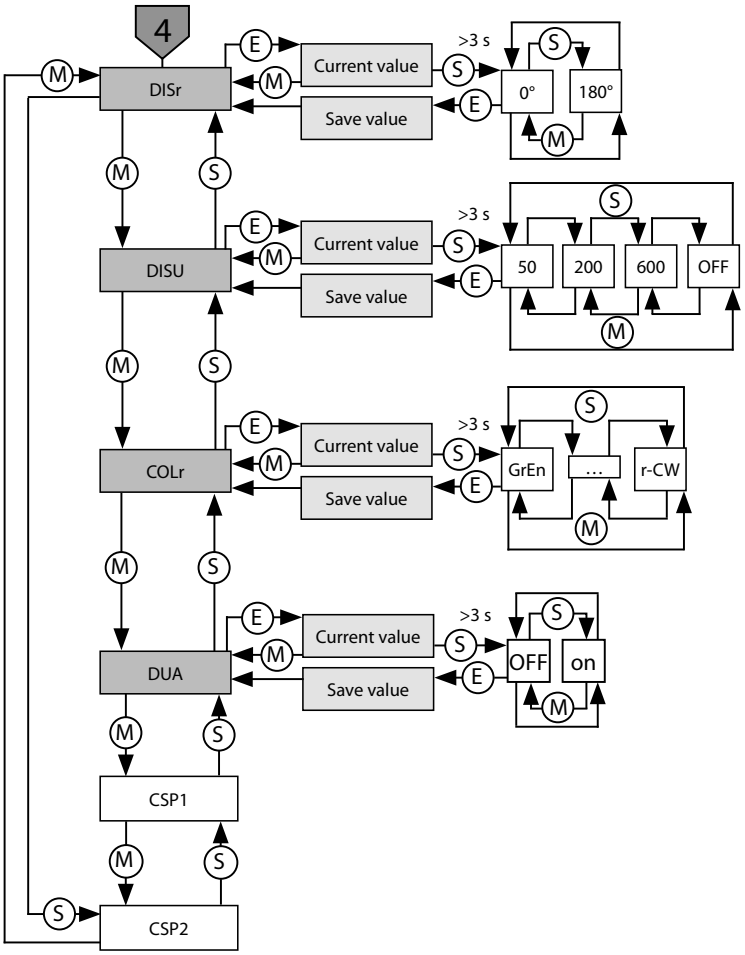


Fig. 23: Display (DISP) submenu

Extended functions (EF) submenu

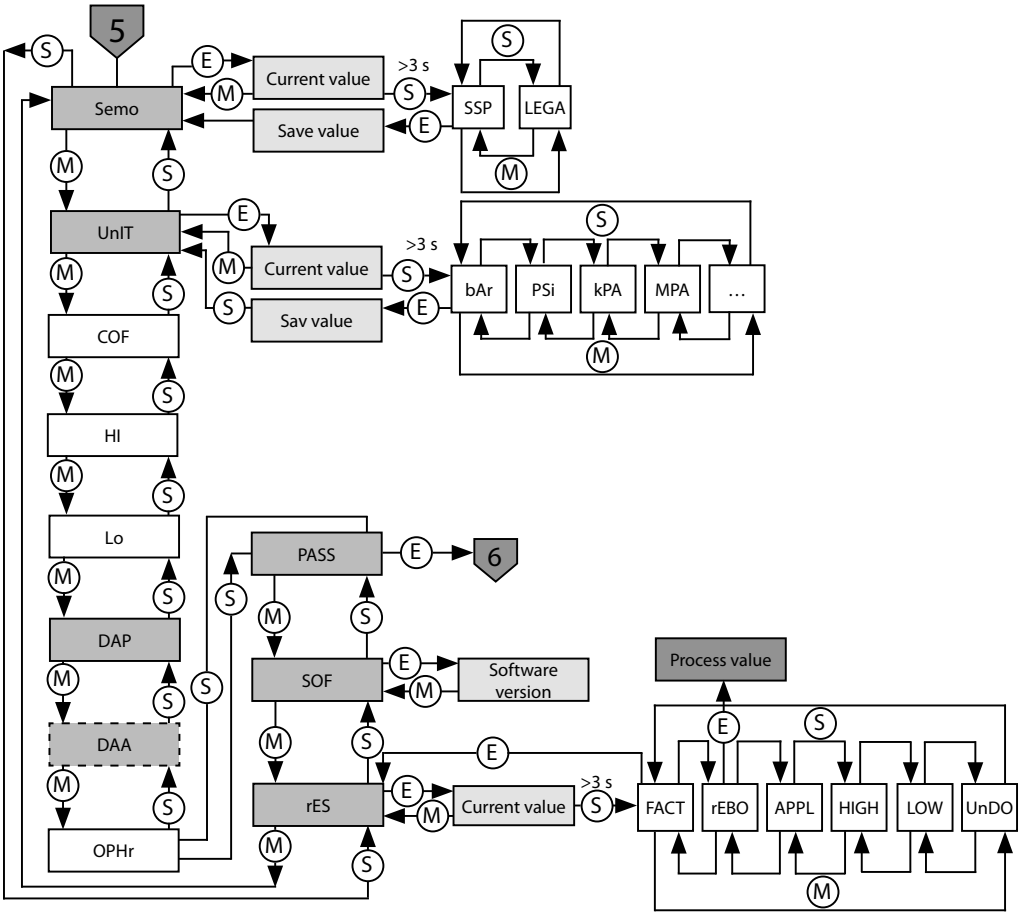


Fig. 24: Extended functions (EF) submenu

9.6.1 Parameters in the main menu

Default values are shown in **bold**.

	Explanation	Function
OUT1	Output 1 submenu	Switching output 1 setting options
OUT2	Output 2 submenu	Switching output 2 setting options or analog output
DISP	Display submenu	Refer to the "Parameters in the DISP submenu" table for additional setting options
EF	Extended Functions submenu	For additional setting options see the “Parameters in the EF sub-menu” table

9.6.2 Parameters in the OUT… (outputs) submenu

	Explanation	Options	Function
OTYP	Output Type (OUT2)	SSP	Switching output Smart Sensor Profile
		AnA	Analog output
MODE		OFF	
		SPM	Single Point Mode
		WIn	Window Mode
		TPM	Two Point Mode
SP1	Switching point 1		SPM: Limit value at which the switching output changes its switching state TPM: Upper limit value at which the switching output changes its switching state as the measured value rises WIn: Upper window limit at which the switching output changes its switching state **Default:** depends on pressure range
SP2	Switching point 2		SPM: not available TPM: lower limit value at which the switching output changes its switching state as the measured value falls WIn: lower window limit at which the switching output changes its switching state **Default:** depends on pressure range
HYST	Hysteresis		The min. hysteresis is depends on pressure range. The maximum hysteresis comprises the complete value range of the sensor. **Default:** depends on pressure range
LOGI	Invert switching logic	**HIGH**	0 → 1
		LOW	1 → 0
P-n	Behavior of the switching output	**AUTO**	Auto detection (NPN/PNP)
		PnP	N switching
		nPn	P switching
Don	Switch-on delay		0…60 s in increments of 0.1 s (0 = delay time not active) **Default: 0.0 s**
DOFF	Switch-off delay		0…60 s in increments of 0.1 s (0 = delay time not active) **Default: 0.0 s**
FOU	Behavior in the event of a fault (e.g. wire break or short circuit)	On	Switching output: The output is activated in the event of a fault. Analog output: Fault value of the set function at output 2 (OUT2)
		OFF	Switching output: The output is deactivated in the event of a fault. Analog output: Fault value of the set function at output 2 (OUT2)

	Explanation	Options	Function
AMOD	Analog output (only available for OUT2)	**AUTO**	Automatic detection (4…20 mA/0…10 V)
		4–20	4…20 mA
		0–20	0…20 mA
		20–4	20…4 mA
		20–0	20…0 mA
		0–10	0…10 V
		0–5	0…5 V
		1–6	1…6 V
		10–0	10…0 V
		5–0	5…0 V
		6–1	6…1 V
		0545	0.5…4.5 V
		4505	4.5…0.5 V
ASP	Start point of the analog signal		Measured value at which the analog output signal has its start point **Default:** depends on pressure range
AEP	End point of the analog signal		Measured value at which the analog output signal has its end point **Default:** depends on pressure range

9.6.3 Parameters in the DISP (display) submenu

	Explanation	Options	Function
DISr	Display orientation	**0°**	Display rotated by 0°
		180°	Display rotated by 180°
DISU	Display update	50	50-ms update time
		200	200-ms update time
		600	600-ms update time
		OFF	Display update deactivated
COLr	Display color	**GrEn**	Always green
		rED	Always red
		G1oU	Green if OUT1 is switched, otherwise red
		r1oU	Red if OUT1 is switched, otherwise green
		G2ou	Green if OUT2 is switched, otherwise red
		r2ou	Red if OUT2 is switched, otherwise green
		G-CW	Green if the process value is between the virtual switching points CSP1 and CSP2
		r-CW	Red if the process value is between the virtual switching points CSP1 and CSP2
DUA	Display	**OFF**	Display of process value
		On	Alternating display of process value and unit
CSP1	Virtual upper switching point		Virtual upper switching point at which the display changes color (if display color G-CW or r-CW is selected) **Default:** depends on pressure range
CSP2	Virtual lower switching point		Virtual lower switching point at which the display changes color (if display color G-CW or r-CW is selected) **Default:** depends on pressure range

9.6.4 Parameters in the EF submenu (Extended Functions)

	Explanation	Options	Function
Semo	Set Mode	SSP	Smart Sensor Profile
		LEGA	Legacy Mode
Unl	Display unit	**bAr**	bar
		PSi	psi
		kPA	kPa
		MPA	MPa
		Ud1-Ud10	Other units
COF	Offset adjustment		Significant temperature changes in the environment of the sensor can cause the zero point to drift. This means that the measured value displayed in a depressurized state is not 0. The drift can be corrected with the offset value. Setting range: -5…+5 % of the measuring range. **Default: 0**
HI	Maximum value memory		The highest measured value is stored and displayed.
Lo	Minimum value memory		The lowest measured value is stored and displayed.
DAP	Damping of the switching output		Filter for momentary or high frequency measurement peaks: 0…8 s in increments of 0.01 s **Default: 0.0 s**
DAA	Damping of the analog output		Filter for momentary or high frequency measurement peaks: 0…8 s in increments of 0.01 s **Default: 0.0 s**
OPHr	Operating hours counter		Display of operating hours in years (y), days (d) and hours (h)
PASS	Password protection		Define password and activate password protection
		0000	No password
SOF	Software version		Display the firmware version
rES	Reset	FACT	Reset the parameters to factory settings
		rEBO	Restart the device (warm start)
		APPL	Reset application-specific data
		HIGH	Reset the maximum value memory: The highest measured value is deleted.
		LOW	Reset the minimum value memory: The lowest measured value is deleted.
		UnDO	Reset the parameters to the previous settings (last device start)

9.7 Setting via touchpads — Legacy Mode

Use the [MODE] or [SET] touchpads to navigate through the main menu or the EF extended functions menu. Press [ENTER] to select the respective submenu. Touching [MODE] and [SET] at the same time will cancel the parameter assignment. The device returns to the standard display.

Legacy Mode — main menu

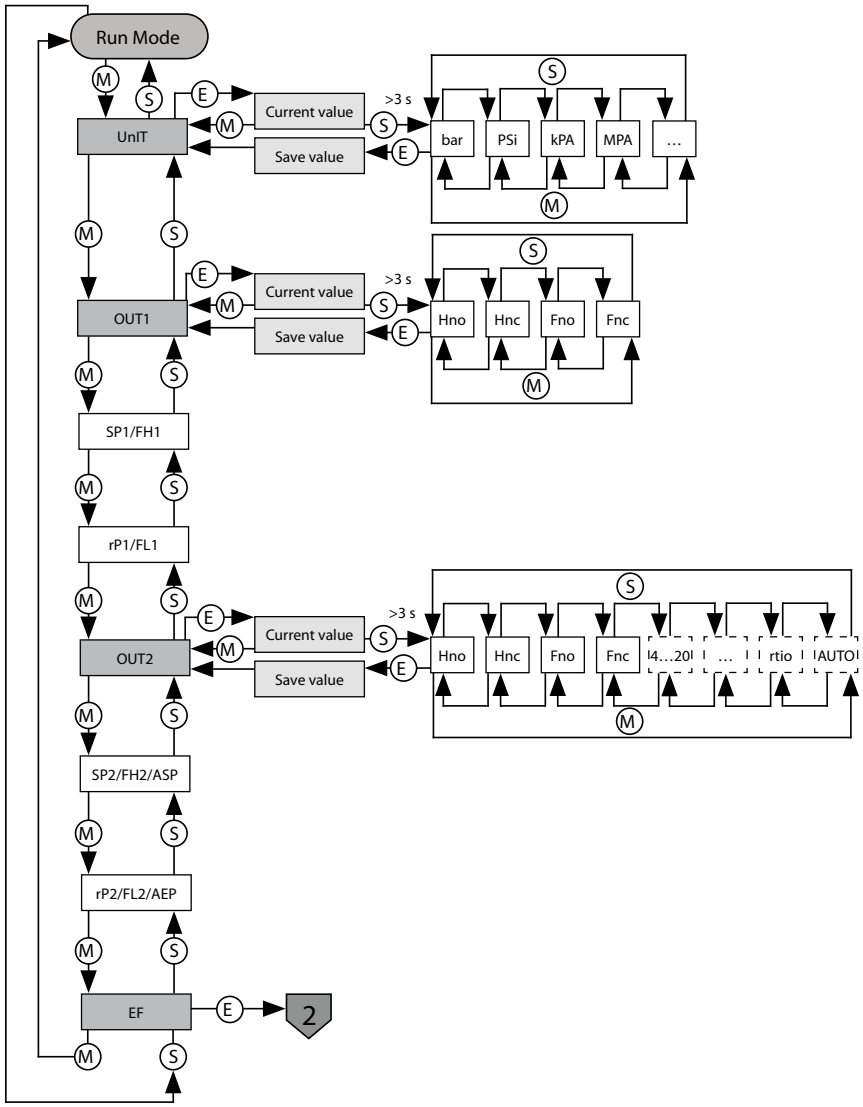


Fig. 25: Legacy Mode — main menu

Legacy Mode — extended functions (EF) submenu

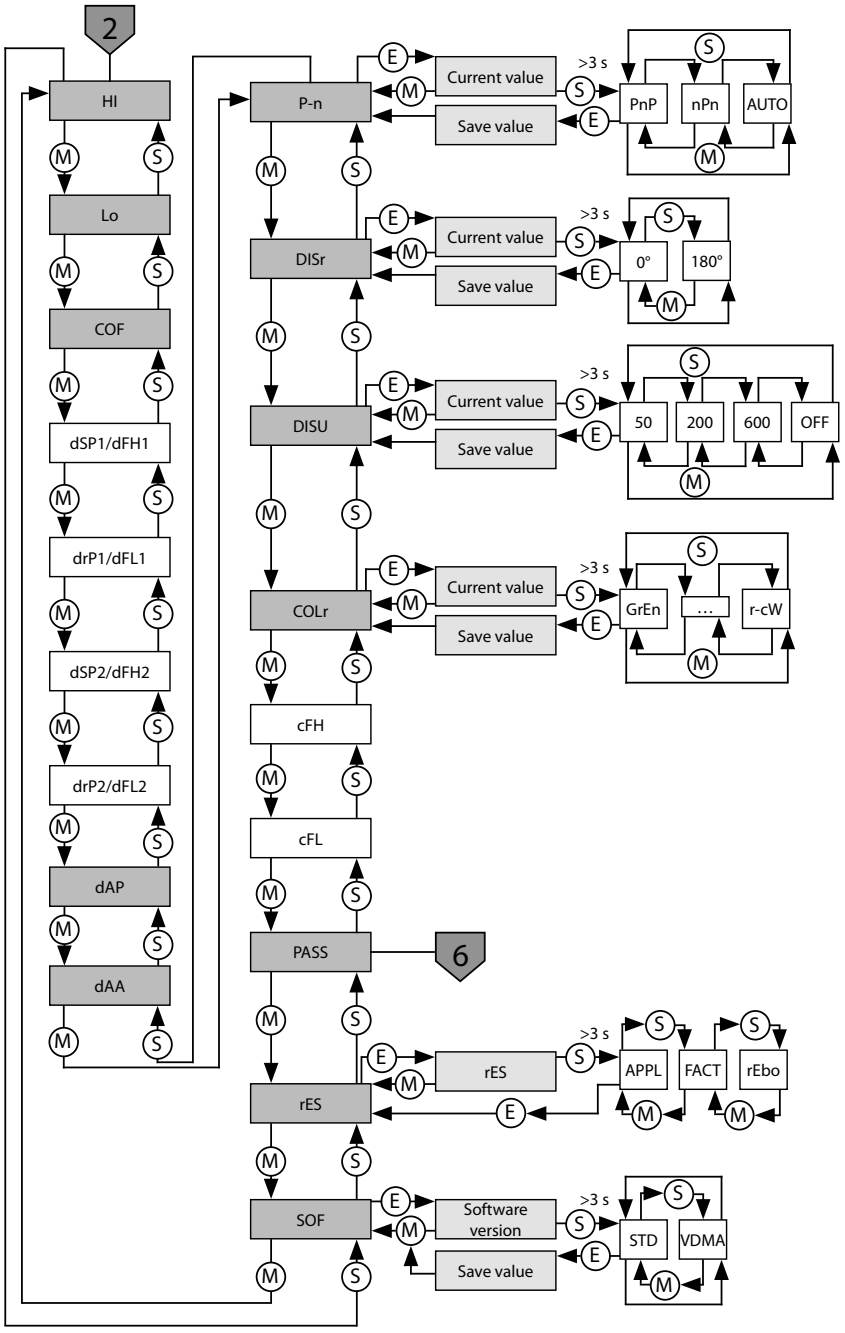


Fig. 26: Legacy Mode — extended functions (EF) submenu

9.7.1 Legacy Mode — parameters in the main menu

	Explanation	Options	Function
UnIT	Display unit	**bar**	bar
		psi	psi
		kPa	kPa
		MPa	MPa
		Ud1	mbar
		Ud2	Torr = mmHg (0 °C)
		Ud3	Inch of water (60 °F)
		Ud4	Inch of water (39 °F)
		Ud5	Foot of water (39 °F)
		Ud6	Inch of Hg (60 °F)
		Ud7	Inch of Hg (32 °F)
		Ud8	mH20 (16 °C)
		Ud9	mH20 (4 °C)
		Ud10	kg/cm^2
OUT1	Function of output 1	**Hno**	Hysteresis function (NO contact)
		Hnc	Hysteresis function (NC contact)
		Fno	Window function (NO contact)
		Fnc	Window function (NC contact)
SP1	Switching point 1 for hysteresis function ou1: Hno/Hnc		Upper limit value at which output 1 changes its switching state with rising pressure
rP1	Release point 1 for hysteresis function ou1: Hno/Hnc		Lower limit value at which output 1 changes its switching state when the pressure drops
FH1	Upper switching point for window function ou1: Fno/Fnc		Upper switching point at which output 1 changes its switching state
FL1	Lower switching point for window function ou1: Fno/Fnc		Lower switching point at which output 1 changes its switching state

	Explanation	Options	Function
OUT2	Function of output 2	**Hno**	Hysteresis function (NO = normally open)
		Hnc	Hysteresis function (NC = normally closed)
	Window function	**Fno**	Window function (NO = normally open)
		Fnc	Window function (NC = normally closed)
	Analog output	**auto**	
		4–20	4…20 mA
		0–20	0…20 mA
		20–4	20…4 mA
		20–0	20…0 mA
		0–10	0…10 V
		0–5	0…5 V
		1–6	1…6 V
		10–0	10…0 V
		5–0	5…0 V
		6–1	6…1 V
		rtio	0.5…4.5 V
SP2	Switching point 2 ou2: Hno/Hnc		Upper limit value at which output 2 changes its switching state with rising pressure
rP2	Release point 2 ou2: Hno/Hnc		Lower limit value at which output 2 changes its switching state when the pressure drops
FH2	Upper switching point for window function ou2: Fno/Fnc		Upper switching point at which output 2 changes its switching state
FL2	Lower switching point for window function ou2: Fno/Fnc		Lower switching point at which output 2 changes its switching state
ASP	Start point of the analog signal ou2: Auto/analog values/rtio		Pressure level where the analog signal has its start point
AEP	End point of the analog signal ou2: Auto/analog values/rtio		Pressure level where the analog signal has its end point
EF	Sub-menu for additional setting options		See table “Parameters in the EF submenu”

9.7.2 Legacy Mode — parameters in the EF (extended functions) submenu

	Explanation	Options	Function
Hi	Maximum value memory		The highest pressure is stored and can be displayed/deleted here.
Lo	Minimum value memory		The lowest pressure is stored and can be displayed/deleted here.
CoF	Offset adjustment		Significant temperature changes in the environment of the sensor can cause the zero point to drift. This means that the measured value displayed in a depressurized state is not 0. This drift can be corrected. Setting range: -5 %…+5 % of the measuring range.

	Explanation	Options	Function
dSP1	Switching delay of SP1		0…60 s in increments of 0.1 s (0 = delay time not active)
drP1	Switching delay of rP1		0…60 s in increments of 0.1 s (0 = delay time not active)
dFH1	Switching delay of FH1		0…60 s in increments of 0.1 s (0 = delay time not active), only available with Window Mode Fno or Fnc
dFL1	Switching delay of FL1		0…60 s in increments of 0.1 s (0 = delay time not active), only available with Window Mode Fno or Fnc
dSP2	Switching delay of SP2		0…60 s in increments of 0.1 s (0 = delay time not active)
drP2	Switching delay of rP2		0…60 s in increments of 0.1 s (0 = delay time not active)
dFH2	Switching delay of FH2		0…60 s in increments of 0.1 s (0 = delay time not active), only available with Window Mode Fno or Fnc
dFL2	Switching delay of FL2		0…60 s in increments of 0.1 s (0 = delay time not active), only available with Window Mode Fno or Fnc
dAP	Damping the switching output (filter)		Momentary or high frequency pressure peaks can be filtered: 0…8 s in increments of 0.01 s (0 = filter is deactivated)
dAA	Damping the analog output		Momentary or high frequency pressure peaks can be filtered: 0…8 s in increments of 0.01 s (0 = delay time deactivated)
P-n	Behavior of the switching output	**auto**	Automatic detection of the output behavior
		nPn	n switching
		PnP	p switching
diSr		**0°**	Display rotated by 0°
		180°	Display rotated by 180°
diSu	Measured value display	50	50-ms update time
		200	200-ms update time
		600	600-ms update time
		OFF	Display update deactivated

	Explanation	Options	Function
coLr	Display color	**GrEn**	Display is always green
		rEd	Display is always red
		G1ou	Display is green if ou1 is switched, otherwise display is red
		r1ou	Display is red if ou1 is switched, otherwise display is green
		G2ou	Display is green if ou2 is switched, otherwise display is red
		r2ou	Display is red if ou2 is switched, otherwise display is green
		G-cF	Display is green if the measured value is between the switching points cFL and cFH
		r-cF	Display is red if the measured value is between the switching points cFL and cFH
PASS	Password protection		Define password and activate password protection
		0000	No password
rES	Reset	FacT	Reset the parameters to factory settings
		Undo	Reset the parameters to the previous settings (last device start)
SOF	Software version		Display the firmware version

9.8 Setting via IO-Link

The device can be parameterized within the technical specifications (see data sheet) via the IO-Link communication interface — both offline, e.g. with the configuration tool, and online via the controller. An overview of the different functions and properties that can be set and used for IO-Link or SIO mode can be found in the chapter “Setting and parameterization” and via the IODDfinder. Detailed instructions on the parameterization of devices via the IO-Link interface are provided in the IO-Link commissioning manual.

All parameters can be changed in IO-Link mode via the controller, both during commissioning and during operation. In SIO mode, the device operates in accordance with the most recent setting configured in IO-Link mode.

10 Troubleshooting

If the device does not function as expected, first check whether ambient interference is present. If there is no ambient interference present, check the connections of the device for faults.

If there are no faults, there is a device malfunction. In this case, decommission the device and replace it with a new device of the same type.

If the device does not work as expected, proceed as follows:

- Exclude environmental disturbances.
- Check the connections of the device for errors.
- Check device for parameterization errors.

If the malfunction persists, the device is faulty. In this case, decommission the device and replace it with a new device of the same type.

11 Maintenance

Ensure regularly that the plug connections and cables are in good condition.

The devices are maintenance-free, clean dry if required.

12 Repair

The device is not intended for repair by the user. The device must be decommissioned if it is faulty. Observe our return acceptance conditions when returning the device to Turck.

12.1 Returning devices

If a device has to be returned, bear in mind that only devices with a decontamination declaration will be accepted. This is available for download at
https://www.turck.de/en/return-service-6079.php
and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal

The devices must be disposed of properly and do not belong in the domestic waste.

14 Technical data

14.1 PS…-LI2UPN8-…

Type designation	PS310…-LI2UPN8-…	PS311…-LI2UPN8-…	PS510…-LI2UPN8-…
Pressure range	Sensor-dependent		
Pressure type	Relative pressure		
Electrical data			
Operating voltage	17…33 VDC		
Short-circuit/reverse polarity protection	Yes, cyclic/yes (power supply)		
Capacitive load	100 nF		
Protection class	III		
Outputs			
Output 1	Switching output or IO-Link		
Output 2	Switching output or analog output		
Switching output			
Communication protocol	IO-Link		
Output function	NO/NC, PNP/NPN		
Rated operating current	0.25 A		
Switching frequency	≤ 300 Hz		
Switching point distance	≥ 0.5 %		
Switching points	(Min. + 0.005 × range)…100 % of full scale		
Release points	Min. up to (SP - 0.005 × range)		
Switching cycles	≥ 100 million		
Analog output			
Current output	4…20 mA, 20… mA, each invertible		
High-level signal current	20.5 mA		
Low-level signal current	3.8 mA		
Load resistance, current output	0.5 kΩ		
Voltage output	0 to 10 V, 0 to 5 V, 1 to 6 V		
Voltage output load resistance	≥ 8 kΩ		
IO-Link			
IO-Link specification	V 1.1		
IO-Link port type	Class A		
Physical transmission layer	Corresponds to 3-wire technology (PHY2)		
Transmission rate	COM 2/38.4 kBd frame type 2.2		
Process data width	32 bits (of which 5 bits are not used)		
Measured value information	24 bits (16-bit process values + 8-bit scale)		
Switching point information	3-bit		
Minimum cycle time	3 ms		
Function pin 4	IO-Link		
Function pin 2	DI		
Maximum cable length	20 m		

Type designation	PS310…-LI2UPN8-…	PS311…-LI2UPN8-…	PS510…-LI2UPN8-…
Profile support	Smart Sensor Profile SSP 4.1.1		
Included in the SIDI GSDML	In preparation		
Programming	Start/end value analog output; switch/release points at switching output; PNP/NPN; NO/NC contact; Hysteresis/Window Mode; damping; pressure unit; peak pressure memory		
Mechanical data			
Housing material	Stainless steel/plastic, 1.4404 (316L)/polyarylamide 50 % GF UL 94 V-0		
Medium-contacting materials	Stainless steel 1.4404 (316L), Al_2O_3, FKM (Viton)	Stainless steel 1.4435 (AISI 316L), FPM specific	Stainless steel 1.4404 (316L)/ 1.4542 (AISI 630)
Process connection Wrench size pressure connection/coupling nut Max. tightening torque of housing nut	Sensor-dependent		
Electrical connection	M12 × 1 connector		
Protection class	IP66/IP67/IP69K acc. to ISO 20653		
Ambient conditions			
Temperature of medium	-40…+80 °C		
Ambient temperature	-40…+80 °C		
Storage temperature	-40…+80 °C		
Shock resistance	50 g (11 ms) acc. to EN 60068-2-27		
Vibration resistance	20 g (10…2000 Hz) acc. to EN 60068-2-6		
EMC	EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6		
Tests/approvals			
Approvals	CE, cULus (PS311…: UL only for pressure ranges up to 100 bar)		
UL approval number	E183243		
Display/controls			
Display type	4-digit 12-segment display, rotatable by 180°		
Status display	2 × LEDs, yellow		
Display of the pressure unit	5 × LEDs green (bar, psi, kPa, MPa, misc)		
Temperature behavior			
Temperature coefficient range TK	± 0.15 % of full scale/10_K	± 0.15 % of full scale/10_K	± 0.1 % of full scale/10_K
Temperature coefficient range TK_0	± 0.15 % of full scale/10_K	± 0.15 % of full scale/10_K	± 0.1 % of full scale/10_K
MTTF	100 years acc. to SN 29500 (ed. 99) 40 °C		

14.2 PS…-2UPN8-…

Type designation	PS310…-2UPN8-…	PS311…-2UPN8-…	PS510…-2UPN8-…
Pressure range	Sensor-dependent		
Pressure type	Relative pressure		
Electrical data			
Operating voltage	17…33 VDC		
Short-circuit/reverse polarity protection	Yes, cyclic/yes (power supply)		
Capacitive load	100 nF		
Protection class	III		
Outputs			
Output 1	Switching output or IO-Link		
Output 2	Switching output		
Switching output			
Communication protocol	IO-Link		
Output function	NO/NC, PNP/NPN		
Rated operating current	0.25 A		
Switching frequency	≤ 300 Hz		
Switching point distance	≥ 0.5 %		
Switching points	(Min. + 0.005 × range)…100 % of full scale		
Release points	Min. up to (SP - 0.005 × range)		
Switching cycles	≥ 100 million		
IO-Link			
IO-Link specification	V 1.1		
IO-Link port type	Class A		
Physical transmission layer	Corresponds to 3-wire technology (PHY2)		
Transmission rate	COM 2/38.4 kBd frame type 2.2		
Process data width	32 bits (of which 5 bits are not used)		
Measured value information	24 bits (16-bit process values + 8-bit scale)		
Switching point information	3-bit		
Minimum cycle time	3 ms		
Function pin 4	IO-Link		
Function pin 2	DI		
Maximum cable length	20 m		
Profile support	Smart Sensor Profile SSP 4.1.1		
Included in the SIDI GSDML	In preparation		
Programming	Switching/release points at switching output; PNP/NPN; NC contact/NO contact; hysteresis/Window Mode; damping; pressure unit; peak pressure memory		
Mechanical data			
Housing material	Stainless steel/plastic, 1.4404 (316L)/polyarylamide 50 % GF UL 94 V-0		
Medium-contacting materials	Stainless steel 1.4404 (316L), Al_2O_3, FKM (Viton)	Stainless steel 1.4435 (AISI 316L), FPM specific	Stainless steel 1.4404 (316L)/ 1.4542 (AISI 630)

Type designation	PS310…-2UPN8-…	PS311…-2UPN8-…	PS510…-2UPN8-…
Process connection Wrench size pressure connection/coupling nut Max. tightening torque of housing nut	Sensor-dependent		
Electrical connection	M12 × 1 connector		
Protection class	IP66/IP67/IP69K acc. to ISO 20653		
Ambient conditions			
Temperature of medium	-40…+80 °C		
Ambient temperature	-40…+80 °C		
Storage temperature	-40…+80 °C		
Shock resistance	50 g (11 ms) acc. to EN 60068-2-27		
Vibration resistance	20 g (10…2000 Hz) acc. to EN 60068-2-6		
EMC	EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6		
Tests/approvals			
Approvals	CE, cULus (PS311…: UL only for pressure ranges up to 100 bar)		
UL approval number	E183243		
Display/controls			
Display type	4-digit 12-segment display, rotatable by 180°		
Status display	2 × LEDs, yellow		
Display of the pressure unit	5 × LEDs green (bar, psi, kPa, MPa, misc)		
Temperature behavior			
Temperature coefficient range TK	± 0.15 % of full scale/10_K	± 0.15 % of full scale/10_K	± 0.1 % of full scale/10_K
Temperature coefficient range TK_0	± 0.15 % of full scale/10_K	± 0.15 % of full scale/10_K	± 0.1 % of full scale/10_K
MTTF	100 years acc. to SN 29500 (ed. 99) 40 °C		

15 Turck branches — contact data

Germany	Hans Turck GmbH & Co. KG Witzlebenstraße 7, 45472 Mülheim an der Ruhr www.turck.de
Australia	Turck Australia Pty Ltd Building 4, 19-25 Duerdin Street, Notting Hill, 3168 Victoria www.turck.com.au
Austria	Turck GmbH Graumanngasse 7/A5-1, A-1150 Vienna www.turck.at
Belgium	TURCK MULTIPROX Lion d'Orweg 12, B-9300 Aalst www.multiprox.be
Brazil	Turck do Brasil Automação Ltda. Rua Anjo Custódio Nr. 42, Jardim Anália Franco, CEP 03358-040 São Paulo www.turck.com.br
Canada	Turck Canada Inc. 140 Duffield Drive, CDN-Markham, Ontario L6G 1B5 www.turck.ca
China	Turck (Tianjin) Sensor Co. Ltd. 18,4th Xinghuazhi Road, Xiqing Economic Development Area, 300381 Tianjin www.turck.com.cn
Czech Republic	TURCK s.r.o. Na Brne 2065, CZ-500 06 Hradec Králové www.turck.cz
France	TURCK BANNER S.A.S. 11 rue de Courtalin Bat C, Magny Le Hongre, F-77703 MARNE LA VALLEE Cedex 4 www.turckbanner.fr
Hungary	TURCK Hungary kft. Árpád fejedelem útja 26-28., Óbuda Gate, 2. em., H-1023 Budapest www.turck.hu
India	TURCK India Automation Pvt. Ltd. 401-403 Aurum Avenue, Survey. No 109 /4, Near Cummins Complex, Baner-Balewadi Link Rd., 411045 Pune - Maharashtra www.turck.co.in
Italy	TURCK BANNER S.R.L. Via San Domenico 5, IT-20008 Bareggio (MI) www.turckbanner.it
Japan	TURCK Japan Corporation ISM Akihabara 1F, 1-24-2, Taito, Taito-ku, 110-0016 Tokyo www.turck.jp

Korea	Turck Korea Co, Ltd. A605, 43, Iljik-ro, Gwangmyeong-si 14353 Gyeonggi-do www.turck.kr
Malaysia	Turck Banner Malaysia Sdn Bhd Unit A-23A-08, Tower A, Pinnacle Petaling Jaya, Jalan Utara C, 46200 Petaling Jaya Selangor www.turckbanner.my
Mexico	Turck Comercial, S. de RL de CV Blvd. Campestre No. 100, Parque Industrial SERVER, C.P. 25350 Arteaga, Coahuila www.turck.com.mx
Netherlands	Turck B. V. Ruiterlaan 7, NL-8019 BN Zwolle www.turck.nl
Poland	TURCK sp.z.o.o. Wroclawska 115, PL-45-836 Opole www.turck.pl
Romania	Turck Automation Romania SRL Str. Siriului nr. 6-8, Sector 1, RO-014354 Bucuresti www.turck.ro
Sweden	Turck AB Fabriksstråket 9, 433 76 Jonsered www.turck.se
Singapore	TURCK BANNER Singapore Pte. Ltd. 25 International Business Park, #04-75/77 (West Wing) German Centre, 609916 Singapore www.turckbanner.sg
South Africa	Turck Banner (Pty) Ltd Boeing Road East, Bedfordview, ZA-2007 Johannesburg www.turckbanner.co.za
Turkey	Turck Otomasyon Ticaret Limited Sirketi Inönü mah. Kayisdagi c., Yesil Konak Evleri No: 178, A Blok D:4, 34755 Kadiköy/ Istanbul www.turck.com.tr
United Kingdom	TURCK BANNER LIMITED Blenheim House, Hurricane Way, GB-SS11 8YT Wickford, Essex www.turckbanner.co.uk
USA	Turck Inc. 3000 Campus Drive, USA-MN 55441 Minneapolis www.turck.us

TURCK

Your Global Automation Partner

Over 30 subsidiaries and
60 representations worldwide!

100048281 | 2025/03

www.turck.com