Your Global Automation Partner

TURCK

TS700
Compact Temperature Sensors

Instructions for Use

Contents

1 About these instructions

These instructions for use describe the structure, functions and the use of the product and will help you to operate the product as intended. Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device. Retain the instructions for future use 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 at qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols used

The following symbols are used in these instructions:

	**DANGER** DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.
	**WARNING** WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.
	**CAUTION** CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.
	**NOTICE** NOTICE indicates a situation which may lead to property damage if not avoided.
	**NOTE** NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.
▶	**CALL TO ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULTS OF ACTION** This symbol denotes relevant results of actions.

1.3 Other documents

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

- Data sheet
- Declarations of conformity
- Commissioning manual IO-Link devices

1.4 Feedback about these instructions

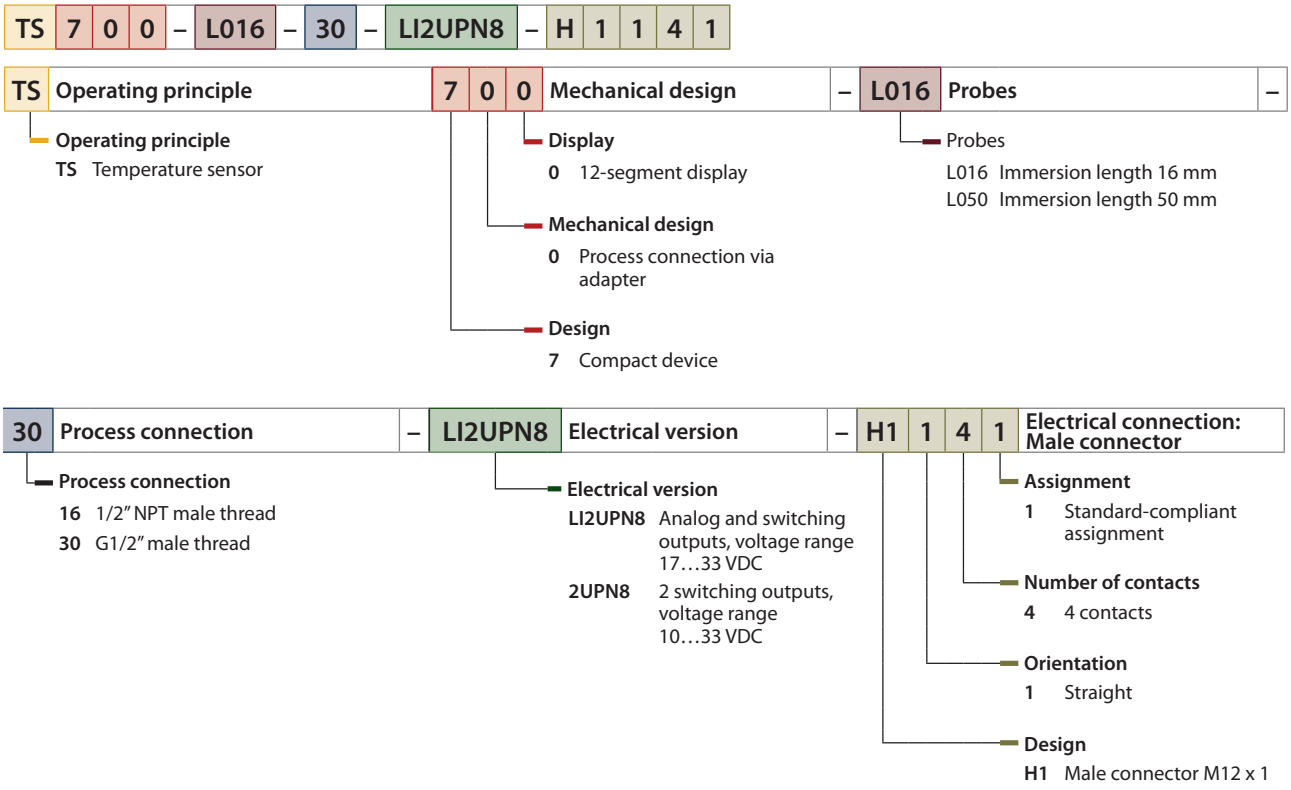
We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to techdoc@turck.com.

2 Notes on the product

2.1 Product identification

These instructions apply to the following compact temperature sensors:

- TS700…2UPN8-H1141
- TS700…LI2UPN8-H1141



2.2 Scope of delivery

The scope of delivery includes:

- Compact temperature sensor
- Screw-in adapter with process connection 1/2″ NPT or G1/2″ male thread
- TS700…-30-…: 2 AFM flat seals
- Quick Start Guide

2.3 Turck service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database under www.turck.com contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats.

The contact details of Turck subsidiaries worldwide can be found on p. [▷ 38].

3 For your safety

The product is designed according to state-of-the-art technology. However, residual risks still exist. Observe the following warnings and safety notices to prevent damage to persons and property. Turck accepts no liability for damage caused by failure to observe these warning and safety notices.

3.1 Intended use

The compact temperature sensors of the TS700… product series are designed for measuring temperatures in machines and plants.

The devices may 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 industrial areas. When used in residential areas, take measures to avoid radio interference.
- The device may only be assembled, installed, operated, parameterized and maintained by professionally-trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- Only operate the device within the limits stated in the technical specifications.

4 Product description

The compact temperature sensors in the TS+ product series feature a metal housing with an integrated temperature probe in immersion lengths of 16 mm or 50 mm. The devices are equipped with a 1/2″ NPT or G1/2″ process connection. The sensor head can also be rotated by 340° after installation. The display can be rotated by 180°. The devices have a metal M12 connector (male) for connecting the sensor cable.

Devices with the following output functions are available:

- TS…LI2UPN…: 2 switching outputs (PNP/NPN/Auto) or 1 switching output (PNP/NPN/Auto) and 1 analog output (I/U/Auto)
- TS…2UPN…: 2 switching outputs (PNP/NPN/Auto)

4.1 Device overview

TS700…-16-…

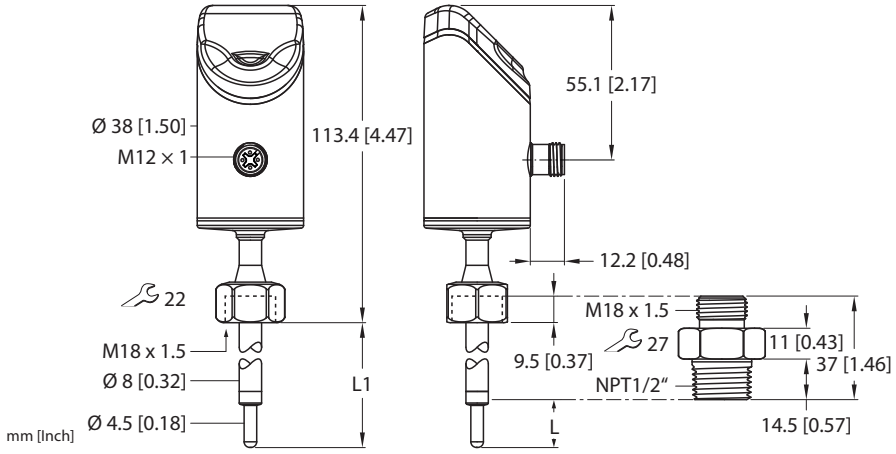


Fig. 1: Dimensions in mm [inch]

TS700…-30-…

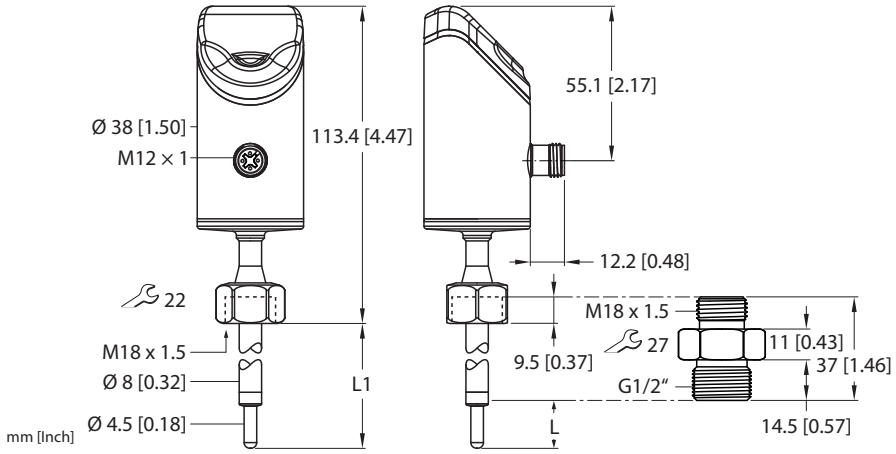


Fig. 2: Dimensions in mm [inch]

4.2 Properties and features

- Compact temperature sensor with G or NPT process connection
- 4-digit, 2-colored, 12-segment display, rotatable by 180°
- Upper part of housing can be rotated up to 340°
- Various IO-Link mapping profiles selectable

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 compact temperature sensor measures the temperature value through an integrated probe. The measured temperature value is passed on to the higher-level I/O. The device display shows the temperature value in the unit selected by the user.

4.5 Functions and operating modes

Type	Output
TS…LI2UPN…	2 switching outputs (PNP/NPN/Auto) or 1 switching output (PNP/NPN/Auto) and 1 analog output (I/U/Auto)
TS…2UPN…	2 switching outputs (PNP/NPN/Auto)

A window function or a hysteresis function can be set for the switching outputs. The measuring range of the analog output can be defined as required. The measured temperature can be displayed in °C, °F or K or the resistance in Ω. The devices can be parameterized via IO-Link and via touchpads.

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 operation — run mode

The device detects the temperature on the probe and shows the required switching or analog behavior according to the factory-set or customer-specific parameters. The display indicates the process temperature present, the selected unit and the status of the switching outputs.

4.5.3 Programming mode

When the sensor is unlocked, the display will go into programming mode after the user presses the [MODE] touch pad. 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] touch pad. The [MODE] and [SET] touch pads are used to navigate within programming mode. For more information, refer to the chapter “Setting and parameterization.”

4.5.4 Output functions — switching output

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 limits is 0.2 K. If the upper limit is changed, the lower limit value is adjusted automatically.

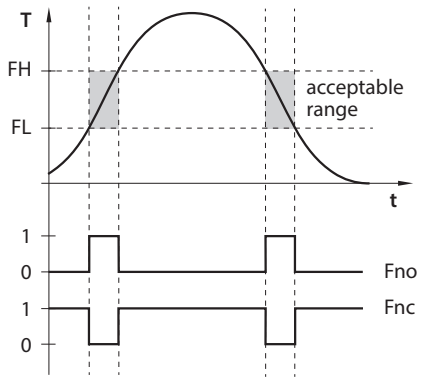


Fig. 3: Behavior of the switching output – Window function

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 0.2 K. If the switching point is changed, the release point is adjusted automatically.

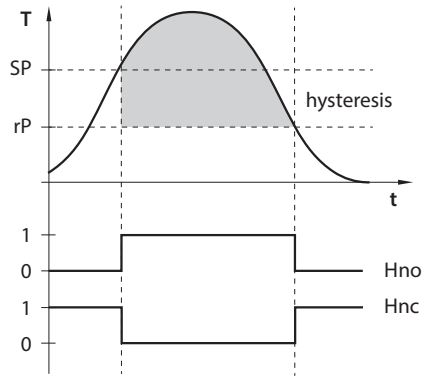


Fig. 4: Behavior of the switching output (hysteresis function)

4.5.5 Output functions – analog output

The analog output of the TS…LI2UPN8 sensors can be set as either a current or voltage output. The measuring range is freely definable.

The minimum distance between the start and end point is 0.2 K.

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

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 (rtio)
- 10…0 V
- 5…0 V
- 6…1 V

Output behavior of the analog outputs

The following figures illustrate the behavior of the analog outputs:

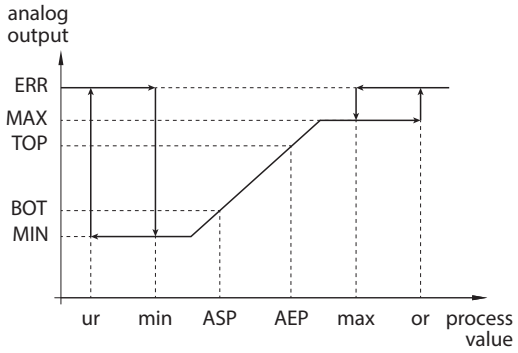


Fig. 5: Rising output characteristic

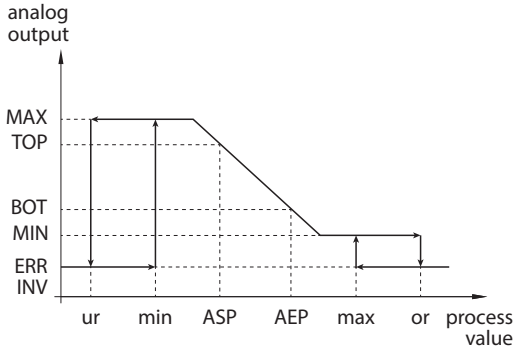


Fig. 6: Falling output characteristic, MIN ≠ 0

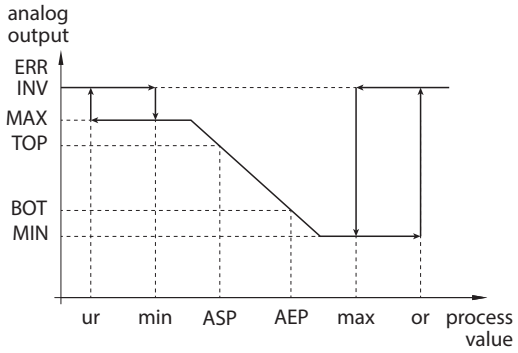


Fig. 7: Falling output characteristic, MIN = 0

Output configuration		BOT	TOP	ERR INV	MIN	MAX	ERR
4…20 mA	20…4 mA	4 mA	20 mA	3.5 mA	3.8 mA	20.5 mA	21.1 mA
0…20 mA	20…0 mA	0 mA	20 mA	21.1 mA	0 mA	20.5 mA	21.1 mA
0…10 V	10…0 V	0 V	10 V	11 V	0 V	10.5 V	11 V
0…5 V	5…0 V	0 V	5 V	6 V	0 V	5.5 V	6 V
1…6 V	6…1 V	1 V	6 V	0 V	0.5 V	6.5 V	7 V
0.5…4.5 V	4.5…0.5 V	0.5 V	4.5 V	5.5 V	0 V	5 V	5.5 V

Abbreviation	Description
ERR	Fault value
MAX	Upper value of the analog output
MIN	Lower value of the analog output
ASP	Analog start point
AEP	Analog end point
TOP	Value of the output when the AEP is reached
BOT	Value of the output when the ASP is reached
ur	Underrun/underrange
or	Overrun/overrange
max	Maximum process value
min	Minimum process value

4.5.6 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.

4.5.7 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.

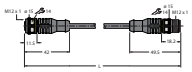
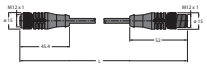
4.5.8 Auto detect function

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

4.6.1 Connectivity accessories

In addition to the below listed 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.

Dimension drawing	Type	ID	Description
	RKC4.4T-2-RSC4.4T/TEL	6625208	Extension cable, M12 female to male, straight, 4-pin, cable length: 2 m, jacket material: PVC, black; cULus approval
	RKC4.4T-2-RSC4.4T/TXL	6625608	Extension cable, M12 female, straight, 4-pin to M12 male, straight, 4-pin; cable length: 2 m, jacket material: PUR, black; cuLus approval
	HT-WAK4-2-HT-WAS4/S2430	8038668	High-temperature-resistant extension cable, M12 female, straight, 4-pin to M12 male, straight, 4-pin; cable length: 2 m, jacket material: PTFE, white
	RKH4.4-2-RSH4.4/TFG	6933472	Food and Beverage extension cable, M12 female, straight, 4-pin to M12 male, straight, 4-pin; cable length: 2 m, jacket material: TPE, gray; approval: Ecolab, FDA

5 Installing

The compact temperature sensors may be mounted in any orientation. The display can be rotated by 180°.

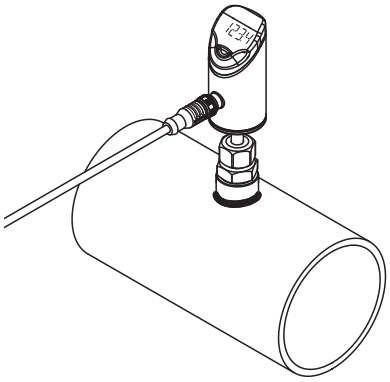


Fig. 8: Installing the TS700

- The compact temperature sensors in the TS700… product series can only be mounted with screw-in adapters from the FAA-… product series or with the supplied screw-in adapter.
- For TS700…-30-…: Position one of the two seals (included in the delivery) between the screw-in adapter and the process connection (e.g. union).
- Screw the screw-in adapter with the seal onto the process connection (maximum torque of 100 Nm).
- Guide the probe rod through the screw-in adapter and hand-tighten the sensor (M18 × 1.5 coupling nut) with the screw-in adapter.
- Screw an M18 × 1.5 coupling nut onto the screw-in adapter (maximum torque of 40 Nm).
- Optional: Rotate the sensor head within the 340° range to align the connection to the I/O level as well as to ensure optimum operability and readability.
- For TS700…-30-…: After removing and reinstalling the screw-in adapter, use a new seal (replacement seal included in the delivery).

6 Connection

NOTE
For USA/Canada: The devices must be supplied with limited energy in accordance with UL 61010-1 3rd Edition, section 9.4 or LPS in accordance with UL 60950-1 or Class 2 in accordance with UL 1310 or UL 1585. Connect the sensor to a separated extra-low voltage (SELV) power supply.

The connection cables between the temperature probe and the compact processing and display unit must have a rated operating temperature of at least 75 °C and a rated voltage of at least 300 V RMS.

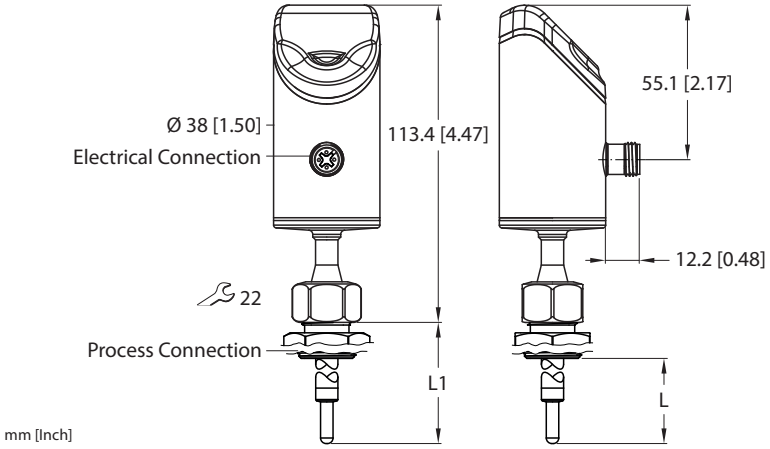


Fig. 9: Electrical connection for controller

- Connect the device to the controller or an I/O module according to the wiring diagram (see "Electrical connection").

6.1 Wiring diagrams

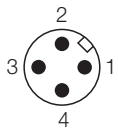


Fig. 10: Pin assignment TS…LI2UPN…

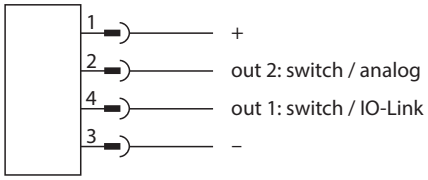


Fig. 11: Wiring diagram TS…2LIUPN…

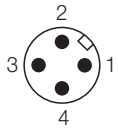


Fig. 12: Pin assignment TS…2UPN…

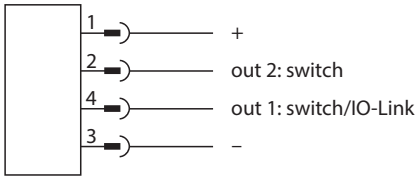


Fig. 13: Wiring diagram TS…2UPN…

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.

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 is operational
	Green flashing	IO-Link communication
FLT	Red	Error
°C	Green	Temperature in °C
°F	Green	Temperature in °F
K	Green	Temperature in K
Ω	Green	Resistance in Ω
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
Flashing	Value outside the measuring range, temperature > 5 % of full scale above or below the measuring range
OL	Value outside the measuring range, temperature > 5 % of full scale above the measuring range
UL	Value outside the measuring range, temperature > 5 % of full scale below the measuring range
SC1	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
ErrH	Internal hardware error
ErrF	Faulty factory parameters
ErrC	Internal communication fault or malfunction
ErrP	Faulty probe
ErrU	Operating voltage outside the permissible range
ErrL	Load on the analog output outside the permissible range
ErrT	Device temperature outside the permissible range
Loc	Device locked
uLoc	Device unlocked
- - - -	Sensor failure

9 Setting and parameterization

The device can be parameterized as follows:

- Setting via touchpad
- 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
- Window function
- Hysteresis function
- Analog range
- OUT1 output configuration for SIO mode: PNP/NPN, automatic detection on/off
- OUT2 output configuration for SIO mode: PNP/NPN, automatic 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 the previous settings (Pre-Settings)
- Advanced settings: Password setting

Other setting options — only via IO-Link

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

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

Auto detect function

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

9.2 Setting via touchpads

Use the [MODE] or [SET] touchpads to navigate through the main menu and the EF extended functions menu. A Turck-specific default menu guidance as well as a VDMA menu can be selected. The menu guidance can be set via the **SoF** parameter.

Standard menu guidance — main menu

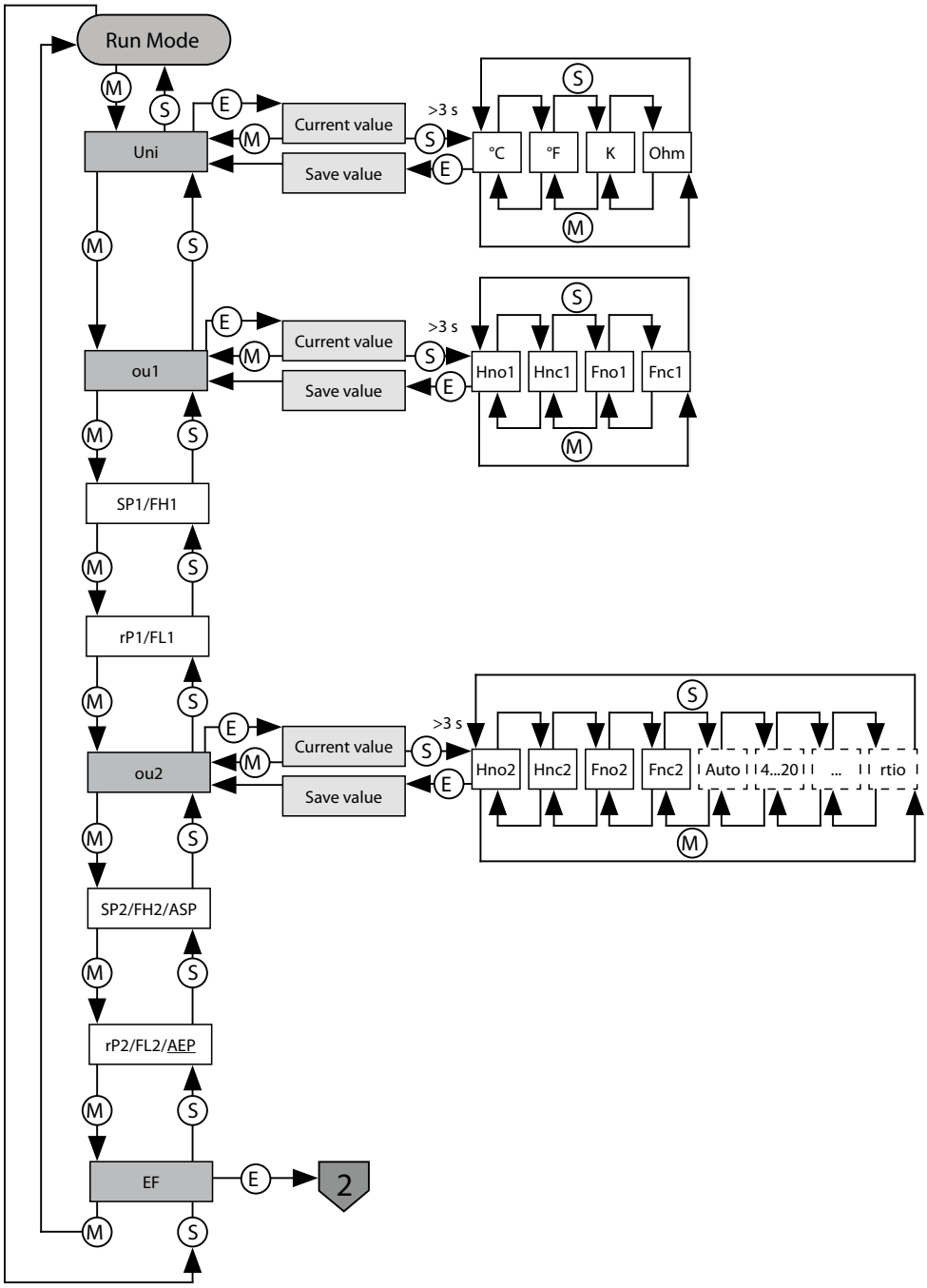


Fig. 14: Standard menu guidance — main menu

Standard menu guidance — EF extended functions menu

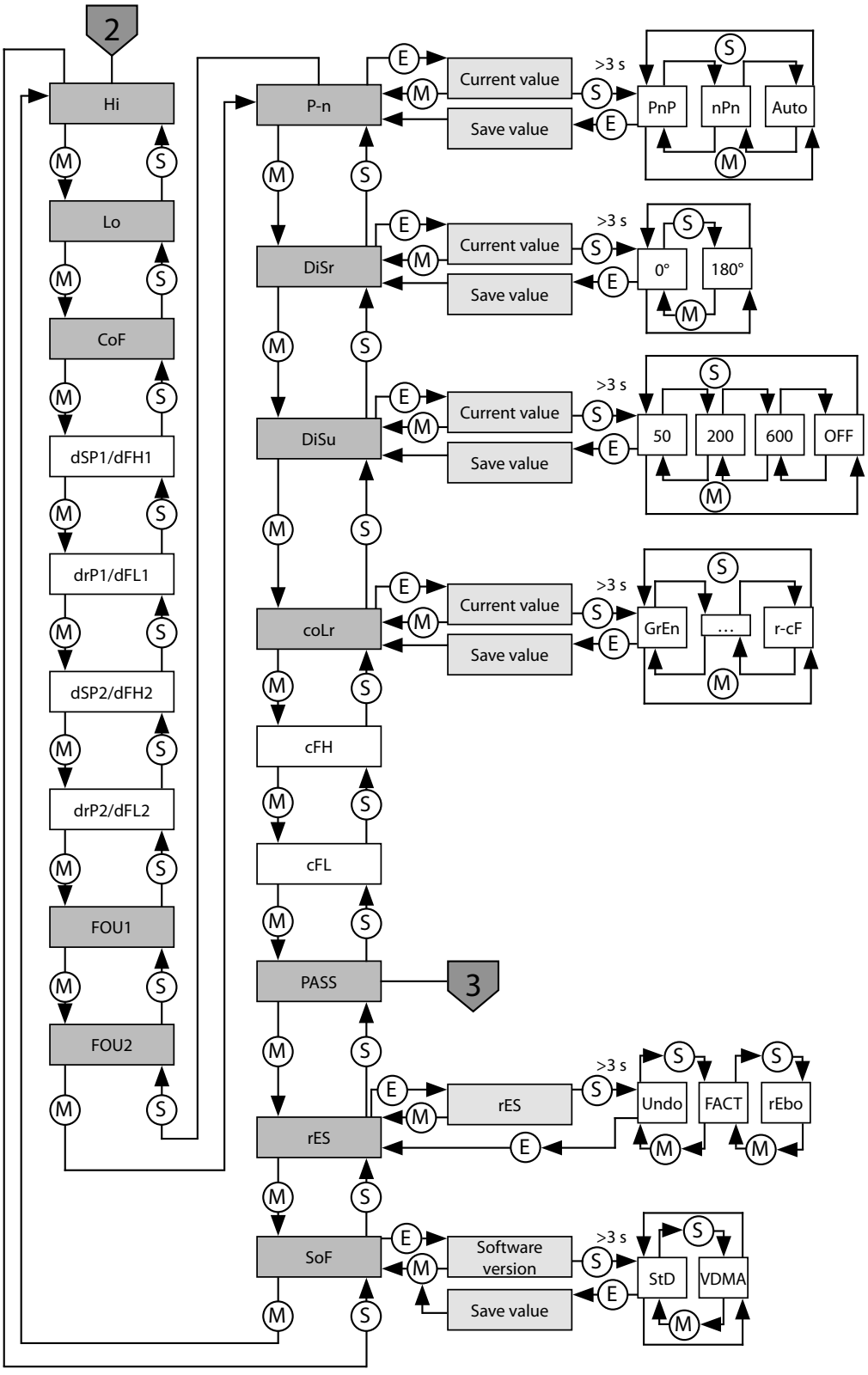


Fig. 15: Standard menu guidance — EF extended functions menu

VDMA menu — main menu

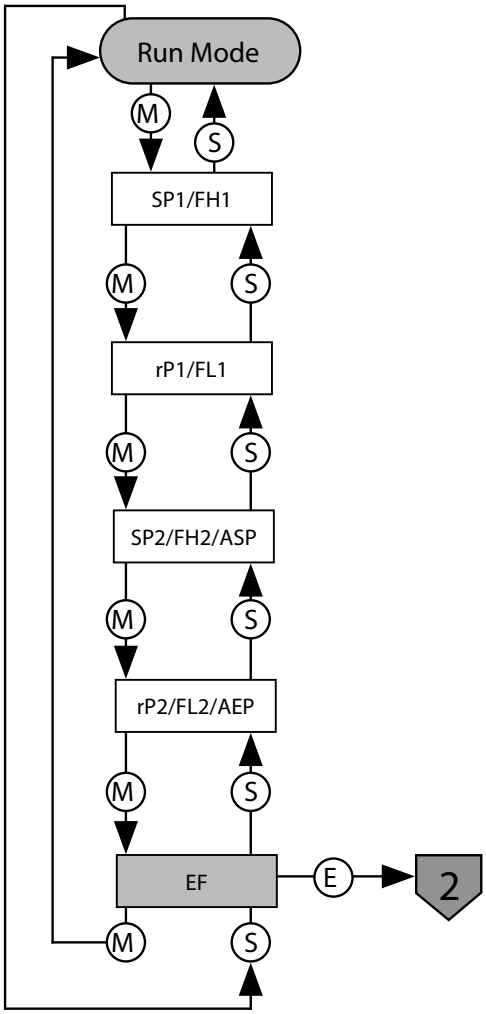


Fig. 16: VDMA menu — main menu

VDMA menu — EF extended functions menu

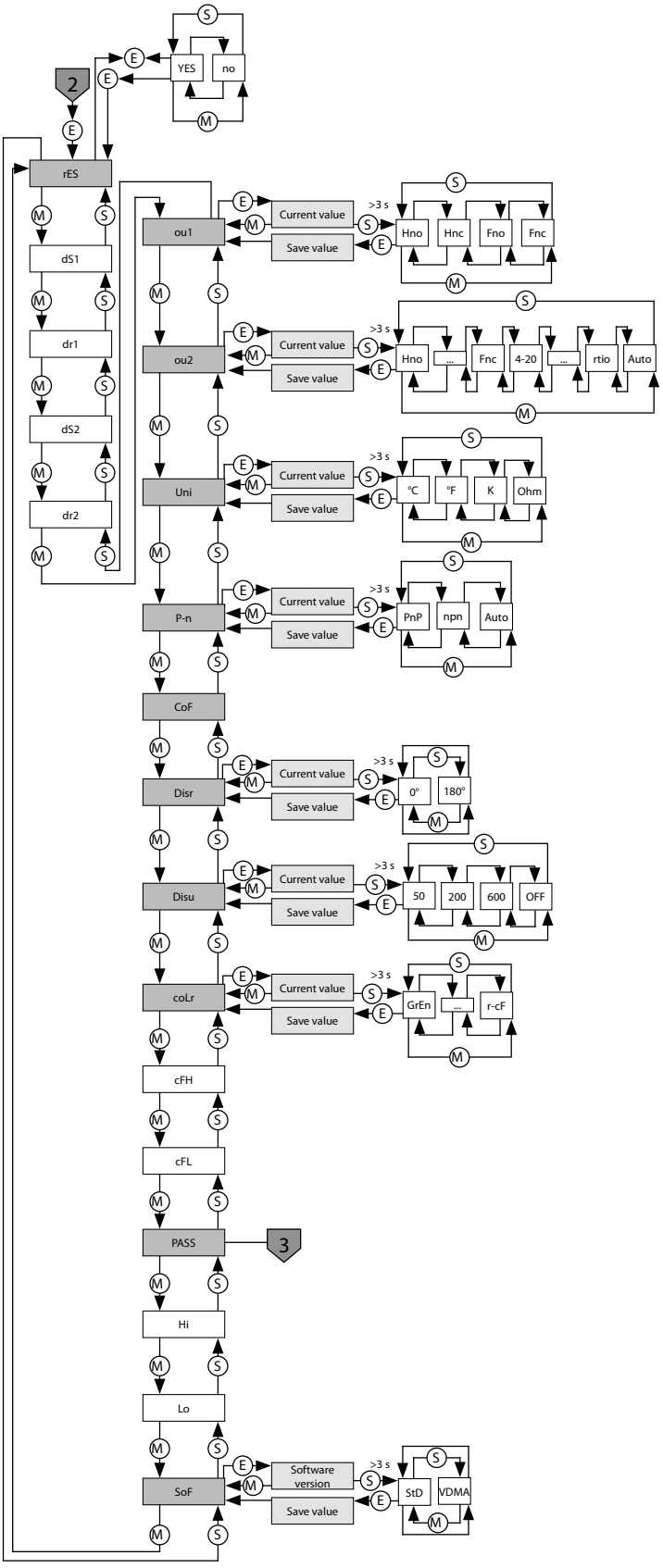


Fig. 17: VDMA menu — EF extended functions menu

9.2.1 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.

9.2.2 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.

9.2.3 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 is no longer flashing. Or: Touch [MODE] in order to return to parameter selection.
- ▶ Increase or decrease the value incrementally via [MODE] or [SET]. Certain values can be changed by continuously touching [MODE] or [SET].
- ▶ Touch [ENTER] to save the modified value. The saved value flashes twice.

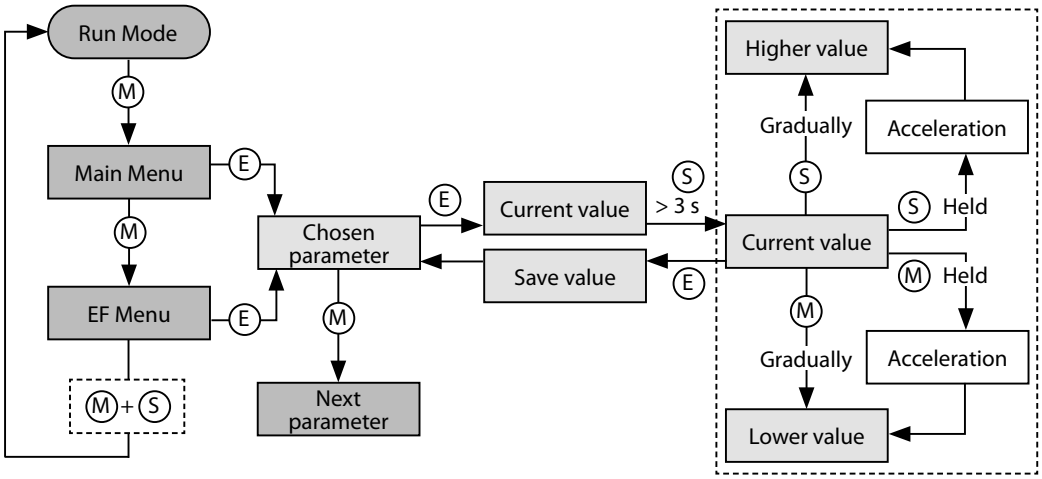


Fig. 18: Setting parameter values

VDMA 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.
- Increase or decrease the value incrementally via [MODE] or [SET]. Certain values can be changed by continuously touching [MODE] or [SET].
- Touch [ENTER] to save the modified value. The saved value flashes twice.

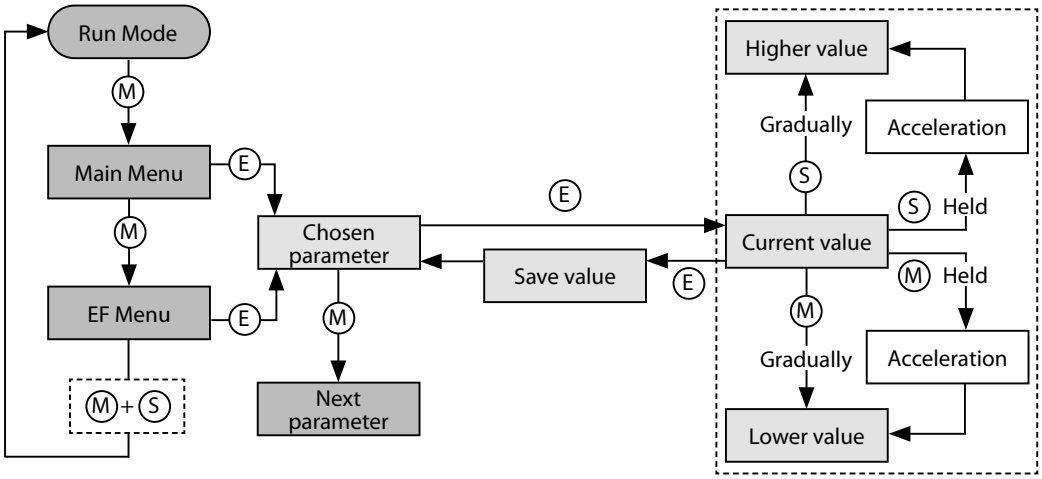


Fig. 19: Setting parameter values

9.2.4 Protecting the sensor with a password

- Select PASS in the EF menu.
- Change the values via the [SET] touchpad.
- Use [MODE] to navigate between the four digits of the password.
- Use [ENTER] to store the new password.

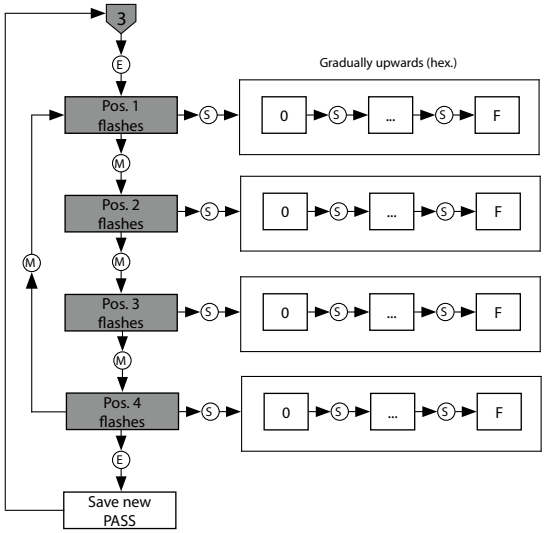


Fig. 20: Password setting

9.2.5 Parameters in the main menu

Default values are shown in **bold**.

	Explanation	Options	Function
Uni	Display unit	**°C**	°C
		°F	°F
		K	K
		Ω	Ohm
ou1	Function of output 1	**Hno**	Hysteresis function (NO = NO contact)
		Hnc	Hysteresis function (NC = NC contact)
		Fno	Window function (NO = NO contact)
		Fnc	Window function (NC = NC contact)
SP1	Switching point 1 for hysteresis function ou1: Hno/Hnc		Upper limit value at which output 1 changes its switching state as the temperature rises **Default: 80.0 °C**
rP1	Release point 1 for hysteresis function ou1: Hno/Hnc		Lower limit value at which output 1 changes its switching state as the temperature falls **Default: 70.0 °C**
FH1	Upper switching point for window function ou1: Fno/Fnc		Upper switching point at which output 1 changes its switching state **Default: 80.0 °C**
FL1	Lower switching point for window function ou1: Fno/Fnc		Lower switching point at which output 1 changes its switching state **Default: 70.0 °C**
ou2	Function of output 2	**Hno**	Hysteresis function (NO = NO contact)
		Hnc	Hysteresis function (NC = NC contact)
		Fno	Window function (NO = NO contact)
		Fnc	Window function (NC = NC contact)
	Analog output	**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
		rtio	0.5…4.5 V
SP2	Switching point 2 ou2: Hno/Hnc		Upper limit value at which output 2 changes its switching state as the temperature rises **Default: 80.0 °C**
rP2	Release point 2 ou2: Hno/Hnc		Lower limit value at which output 2 changes its switching state as the temperature falls **Default: 70.0 °C**

	Explanation	Options	Function
FH2	Upper switching point for window function ou2: Fno/Fnc		Upper switching point at which output 2 changes its switching state **Default: 80.0 °C**
FL2	Lower switching point for window function ou2: Fno/Fnc		Lower switching point at which output 2 changes its switching state **Default: 70.0 °C**
ASP	Start point of the analog signal ou2: Auto/analog values/rtio		Temperature value at which the analog output signal has its start point **Default: -49.8 °C**
AEP	End point of the analog signal ou2: Auto/analog values/rtio		Temperature value at which the analog output signal has its end point **Default: 50.0 °C**
EF	Submenu for additional setting options		See table "Parameters in the EF submenu"

9.2.6 Parameters in the EF (Extended Functions) submenu

	Explanation	Options	Function
Hi	Maximum value memory		The highest process temperature is stored and can be displayed/deleted (press and hold [SET]).
Lo	Minimum value memory		The lowest process temperature is stored and can be displayed/deleted here (hold down [SET]).
CoF	Offset adjustment		Severe temperature changes in the environment of the sensor can cause shifting of the zero point. As a result, the measured value zero is not displayed at 0 °C . This drift can be corrected with the offset value. Adjustment range: -55…+55 °C in increments of 0.1 K. **Default: 0.0 °C**
dSP1	Switching delay of SP1		0…60 s in increments of 0.1 s (0 = delay time not active) **Default: 0.0 s**
drP1	Switching delay of rP1		0…60 s in increments of 0.1 s (0 = delay time not active) **Default: 0.0 s**
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 **Default: 0.0 s**
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 **Default: 0.0 s**
dSP2	Switching delay of SP2		0…60 s in increments of 0.1 s (0 = delay time not active). **Default: 0.0 s**
drP2	Switching delay of rP2		0…60 s in increments of 0.1 s (0 = delay time not active). **Default: 0.0 s**
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 **Default: 0.0 s**
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 **Default: 0.0 s**
FOU1	Behavior of output 1 in the event of an error (not a short circuit)	ON	Binary output: The output is activated in the event of an error.
		OFF	Binary output: The output is deactivated in the event of an error.

	Explanation	Options	Function
FOU2	Behavior of output 2 in the event of an error (not a wire break or short circuit)	ON	Binary output: The output is activated in the event of an error. Analog output: Error value of the set function at output 2 (ou2)
		OFF	Binary output: The output is deactivated in the event of an error. Analog output: Error value of the set function at output 2 (ou2)
P-n	Behavior of switching output	**Auto**	Automatic detection (NPN/PNP)
		NPN	N switching
		PNP	P switching
diSr	Display orientation	**0°**	Display rotated by 0°
		180°	Display rotated by 180°
diSu	Measurement value display	**50**	50-ms update time
		200	200-ms update time
		600	600-ms update time
		OFF	The display does not show any values during operation. The status LEDs remain active. The value on the display appears when you touch the touch pads.
coLr	Display color	**GrEn**	Always green
		rEd	Always red
		G1ou	Green if ou1 is switched, otherwise red
		r1ou	Red if ou1 is switched, otherwise green
		G2ou	Green if ou2 is switched, otherwise red
		r2ou	Red if ou2 is switched, otherwise green
		G-cF	Green if the measured value is between the switching points cFL and cFH
		r-cF	Red if the measured value is between the switching points cFL and cFH
cFH	Virtual upper switching point		Upper switching point at which the display changes color (if display color G-cF or r-cF is selected) **Default: 80.0 °C**
cFL	Virtual lower switching point		Lower switching point at which the display changes color (if display color G-cF or r-cF is selected) **Default: 70.0 °C**
PASS	Password protection		Set password and activate password protection
		0000	No password
rES	Reset	FACT	Reset the parameters to the default settings
		Undo	Reset the parameters to the previous settings (last device start)
		rEbo	Device restart (warm start)
SoF	menu navigation	**StD**	Standard menu navigation
		VdMA	VDMA menu navigation

9.3 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 as well as also 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.

11 Maintenance

The device is maintenance-free. Clean with a damp cloth if required.

12 Repair

The device must not be repaired 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

Returns to Turck can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration can be downloaded from
https://www.turck.de/en/retoure-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 correctly and must not be included in general household garbage.

14 Technical data

14.1 TS700-…-LI2UPN8-H1141

Technical data	TS700-L016-16-LI2UPN8-…	TS700-L016-30-LI2UPN8-…	TS700-L050-16-LI2UPN8-…	TS700-L050-30-LI2UPN8-…
ID	100004380	100003641	100004382	100004381
Temperature range				
Measuring range	-50…150 °C -58…302 °F			
Accuracy	± 0.15 °C + 0.002 ·|t| (-30…300 °C)			
Measuring element	Pt-100 probe, DIN EN 60751, class A			
Response time	$t_{0.5}$ = 3.5 s/$t_{0.9}$ = 9.5 s in water at 0.2 m/s			
Immersion depth (L)	16 mm		50 mm	
Pressure resistance	300 bar			
Operating voltage	17…33 VDC			
Voltage drop at I_e	≤ 2 V			
Protective measure	SELV, PELV according to DIN EN 61140			
Short-circuit/reverse polarity protection	Yes/yes			
Protection class	III			
Outputs				
Output 1	Switching output or IO-Link mode			
Output 2	Analog or switching output			
Switching output				
Communication protocol	IO-Link			
Output function	NC/NO programmable, PNP/NPN			
Switching point accuracy	± 0.2 K			
Rated operational current	0.25 A			
Switching point	-49.8…+150 °C			
Release point	-50…+149.8 °C			
Switching point distance	≥ 0.2 K			
Switching cycles	≥ 100 million			
Repetition accuracy	-0.1 K			
Analog output				
Current output	0…20 mA/4…20 mA, each invertible			
Voltage output	0…5 V/0…10 V/1…6 V/0.5…4.5 V, each invertible			
Accuracy (Lin. + Hys. + Rep.)	± 0.3 K			
Repetition accuracy	0.1 K			

Technical data	TS700-L016-16-LI2UPN8-…	TS700-L016-30-LI2UPN8-…	TS700-L050-16-LI2UPN8-…	TS700-L050-30-LI2UPN8-…
IO-Link				
IO-Link specification	V 1.1			
Physical transmission layer	Complies with 3-wire technology (PHY2)			
Frame type	2.2			
Transmission rate	COM 2 (38.4 kBaud)			
Parameterization	FDT/DTM/selection of various mapping profiles			
Accuracy	± 0.1 K			
Included in the SIDI GSDML	Yes			
Programming				
Programming options	Automatic switching logic recognition, switching/release point; hysteresis/window mode; NO/NC; unit; IO-Link mapping profile; Analog output 0/4…20 mA, 0…5/10 VDC, 1…6 VDC, 0.5…4.5 VDC			
Mechanical data				
Housing material	Stainless steel/plastic, 1.4404 (AISI 316L)/Grilamid TR90 UV			
Process connection	1/2″ NPT male thread	G1/2″ male thread	1/2″ NPT male thread	G1/2″ male thread
Electrical connection	Male connector, M12 × 1			
Type of protection	IP66, IP67, IP69K			
Electromagnetic compatibility (EMC)	EN 61326-2-3: 2013 minimum operating quality: +3.0 K under worst possible conditions			
Environmental data				
Ambient temperature	-40…+80 °C			
Storage temperature	-40…+85 °C			
Shock resistance	50 g (11 ms), DIN EN 60068-2-27			
Vibration resistance	20 g (10…3000 Hz), DIN EN 60068-2-6			
Application range (UL)	Indoor application			
Tests/approvals				
Approvals	UL			
UL registration number	E516036			
Reference conditions acc. to IEC 61298-1				
Temperature	15…25 °C			
Atmospheric pressure	860…1060 hPa abs.			
Air humidity	10…95 % rel.			
Auxiliary power	24 VDC			
Display	4-digit, 2-colored (green/red), 12-segment display, rotatable by 180°			
Switching state indication	2 × LEDs, yellow			
Unit display	4 × green LED (°C, °F, K, Ohm)			
Included in delivery	Screw-in adapter with process connection 1/2″ NPT male thread	Screw-in adapter with process connection G1/2″ male thread, 2 × AFM flat seal	Screw-in adapter with process connection 1/2″ NPT male thread	Screw-in adapter with process connection G1/2″ male thread, 2 × AFM flat seal

14.2 TS700-…-2UPN8-H1141

Technical data	TS700-L016-16-2UPN8-…	TS700-L016-30-2UPN8-…	TS700-L050-16-2UPN8-…	TS700-L050-30-2UPN8-…
ID	100004377	100003635	100004379	100004378
Temperature range				
Measuring range	-50…150 °C -58…302 °F			
Accuracy	± 0.15 °C + 0.002 ·|t| (-30…300 °C)			
Measuring element	Pt-100 probe, DIN EN 60751, class A			
Response time	$t_{0.5}$ = 3.5 s/$t_{0.9}$ = 9.5 s in water at 0.2 m/s			
Immersion depth (L)	16 mm		50 mm	
Pressure resistance	300 bar			
Operating voltage	10…33 VDC			
Voltage drop at I_e	≤ 2 V			
Protective measure	SELV, PELV according to DIN EN 61140			
Short-circuit/reverse polarity protection	Yes/yes			
Protection class	III			
Outputs				
Output 1	Switching output or IO-Link mode			
Output 2	Switching output			
Switching output				
Communication protocol	IO-Link			
Output function	NC/NO programmable, PNP/NPN			
Switching point accuracy	± 0.2 K			
Rated operational current	0.25 A			
Switching point	-49.8…+150 °C			
Release point	-50…+149.8 °C			
Switching point distance	≥ 0.2 K			
Switching cycles	≥ 100 million			
Repetition accuracy	0.1 K			
IO-Link				
IO-Link specification	V 1.1			
Physical transmission layer	Complies with 3-wire technology (PHY2)			
Frame type	2.2			
Transmission rate	COM 2 (38.4 kBaud)			
Parameterization	FDT/DTM/selection of various mapping profiles			
Accuracy	± 0.1 K			
Included in the SIDI GSDML	Yes			
Programming				
Programming options	Automatic switching logic recognition, switching/release point; hysteresis/window mode; NO/NC; unit; IO-Link mapping profile			

Technical data	TS700-L016-16-2UPN8-…	TS700-L016-30-2UPN8-…	TS700-L050-16-2UPN8-…	TS700-L050-30-2UPN8-…
Mechanical data				
Housing material	Stainless steel/plastic, 1.4404 (AISI 316L)/Grilamid TR90 UV			
Process connection	1/2″ NPT male thread	G1/2″ male thread	1/2″ NPT male thread	G1/2″ male thread
Electrical connection	Male connector, M12 × 1			
Type of protection	IP66, IP67, IP69K			
Electromagnetic compatibility (EMC)	EN 61326-2-3: 2013 minimum operating quality: +3.0 K under worst possible conditions			
Environmental data				
Ambient temperature	-40…+80 °C			
Storage temperature	-40…+85 °C			
Shock resistance	50 g (11 ms), DIN EN 60068-2-27			
Vibration resistance	20 g (10…3000 Hz), DIN EN 60068-2-6			
Application range (UL)	Indoor application			
Tests/approvals				
Approvals	UL			
UL registration number	E516036			
Reference conditions acc. to IEC 61298-1				
Temperature	15…25 °C			
Atmospheric pressure	860…1060 hPa abs.			
Air humidity	10…95 % rel.			
Auxiliary power	24 VDC			
Display	4-digit, 2-colored (green/red), 12-segment display, rotatable by 180°			
Switching state indication	2 × LEDs, yellow			
Unit display	4 × green LED (°C, °F, K, Ohm)			
Included in delivery	Screw-in adapter with process connection 1/2″ NPT male thread	Screw-in adapter with process connection G1/2″ male thread, 2 × AFM flat seal	Screw-in adapter with process connection 1/2″ NPT male thread	Screw-in adapter with process connection G1/2″ male thread, 2 × AFM flat seal

15 Turck subsidiaries — contact information

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 Wien **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**
Great Britain	TURCK BANNER LIMITED Blenheim House, Hurricane Way, GB-SS11 8YT Wickford, Essex **www.turckbanner.co.uk**
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. B-509 Gwangmyeong Technopark, 60 Haan-ro, Gwangmyeong-si, 14322 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**
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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**
Russian Federation	TURCK RUS OOO 2-nd Pryadilnaya Street, 1, 105037 Moscow **www.turck.ru**
Sweden	Turck Sweden Office Fabriksstråket 9, 433 76 Jonsered **www.turck.se**
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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**
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