

Temperature sensors



Temperature sensors - Highly optimized specialists for every requirement

Temperature is a critical factor in many industrial processes and has to be monitored constantly in order to operate machines and systems safely and efficiently. A reliable and practical solution for temperature measurement are electronic temperature sensors and transmitters. Reliability is not just provided through high accuracy and repeatability but also through many available interfaces to the process and the operator.

Temperature measurement in industrial applications is mainly implemented with resistance thermometers or thermoelements. Resistance thermometers accomplish this via temperature-sensitive electrical resistors. While the resistance of PTCs increases with the rise of temperature, NTCs behave opposite.

Thermoelements are applied to detect temperatures up to +1700 °C and higher. A thermoelement consists of two different interconnected metals or semiconductors. A temperature difference between the two metals causes electric potential of corresponding magnitude at the interconnection. In practice, the temperature of a cold spot is detected with a separate probe from which the temperature of the hot spot is then deduced. Infrared sensors are applied for non-con-

tact measurement of surface temperatures in a range between -70 °C and +1000 °C. The distance-spot ratio is thereby of importance because it indicates the diameter (S) of the spot at a given distance (D).

The TURCK product portfolio guarantees maximum flexibility for temperature measurement through numerous connection possibilities and output signals.

The intelligent sensors of the TS series fulfill all application specific requirements to the optimum through easy programming, flexible process connection and well readable displays. The compact sensors of the TT/TC series are available with integrated probe but also with standard M12 male connection to mount external probes. The infrared sensors of the T-Gage series measure temperatures contactless between 0 and +300 °C at wavelengths between 8 and 14 μm. A further important device of the product portfolio is the IP67 rated Pt100 resistance thermometer for temperature measurements between -50 and +500 °C. The temperature probes of the TP series are available in different lengths and diameters. The sensor can be adapted to critical applications with a thermowell.

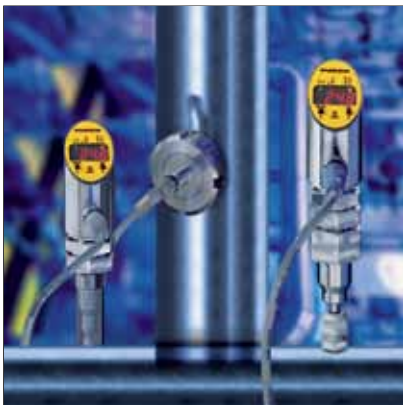
Temperature sensors – TS series



Made-to-measure solutions

Due to its high accuracy of 0.2 K, the temperature sensors of the TS series handle a large spectrum of applications with only a few devices. Temperature is detected with a Pt100 directly connected to the M12 male or via a standard connection cable. Temperatures are detected in a range between -50 and +500 °C. The 4-digit 7-segment LED display indicates

the temperature and makes programming easier. The devices are available with two transistor switching outputs or with one switching and one analog output. High EMC immunity and protection classes IP67/IP69K guarantee reliable operation, even under harsh conditions. All TS sensors are equipped with an IO-Link interface.



Flexible mounting

Inclined by 45° the display is well readable from any position and even from a great distance. Horizontal mounting is also possible. The read direction can be reversed by 180° degrees via software. After locking the pressure connection, the TS500 can be rotated by 320° degrees and moved in any desired position.

Once the final position is attained, the device is fixed in place with a second coupling nut. Special mounting aids are not required. With a diameter of only 34 mm, several sensors can be mounted side by side in confined spaces.



Clearly visible display

The bright 4-digit 7-segment display indicates the temperature during normal operation and is easy to program. The sloped display allows the sensors to be mounted on top or in front according to

the position of the process connection. The read direction can be reversed by 180° degrees via software. Values are thus perfectly readable, even if the sensor is mounted horizontally.

Sensors – TS series



Easy programming

Thanks to the user friendly menu guide the switch and release point, the output function, the analog range and various special functions are easily taught via pushbuttons. The TS series is programmed with the buttons MODE and SET. Tools are not

needed to view the parameter values. To protect against unintentional changes of data, the ENTER button for storing the values is recessed. The button can only be pressed with a pointed object, such as a ball pen for example.



Rugged design

The sensor body, temperature and electrical connection are made of stainless steel. All sensors feature excellent EMC properties and are IP67 protected. Absolute operational safety is thus guaranteed even in rough production environ-

ments. The mineral-insulated probes are enormously flexible and temperature-resistant. Rugged TURCK connection cables provide the necessary security for connection.



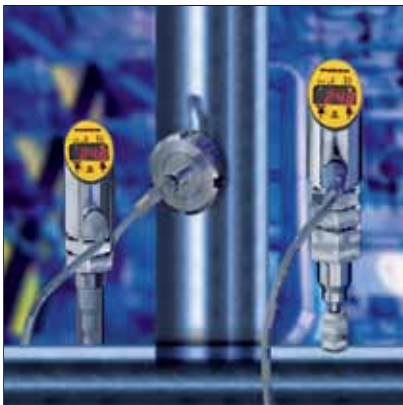
High system availability

The TS series excels in excellent EMC properties and is IP67 protected. Sensor body, temperature and electrical connection of the programmable devices are made of stainless steel and guarantee maximum operational safety:

- Excellent EMC properties, highly interference immune

- Protection against mechanical impacts thanks to the rugged design
- Minimum maintenance effort through optimized temperature coupling
- Short down-times through high system availability and short replacement times

Temperature sensors – TS series



Extremely service-friendly

Flexible mounting options, user-friendliness and accuracy provide calculable advantages, such as:

- Minimum maintenance effort through optimized performance of the sensors and a streamlined product portfolio.
- Easy configuration and operation via pushbuttons
- Recessed programming button
- Large and good readable display
- The upper part of the TS500 sensor is rotatable by 320°
- Communication via IO-Link
- VDMA menu guide (optional)



Efficient standardization

A single sensor replaces many conventional types. The intelligent temperature sensors fulfill many different control tasks and reduce the number of required sensors considerably.

A reduced inventory pays off for you:

- Only a few sensors are needed to cover a large range of applications
- Reduced training effort due to simple and failsafe operation
- High system safety achieved through a rugged design
- 4-pole standard M12 male connection at the probe and processor unit

rs – TS series

Type code

TS - 5 00 - LI2U PN 8 X - H1 1 4 1

TS Functional principle - 5 00 Mechanical version - LI2U PN 8 X Electrical version -

Functional principle

TS temperature sensor

Process connection

00 without process connection
temperature probe via
M12 x 1

Design

4 adjustable, with display,
non-rotatable
5 adjustable, with display,
rotatable

Indication

X... Number of LEDs or
multicolor LED

Voltage range

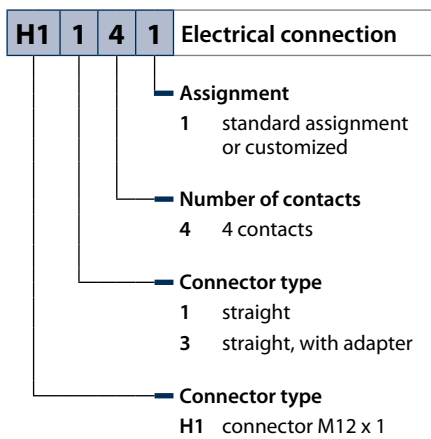
8 15(18)...30 VDC

Output range








PN PNP/NPN
output

Output function







2U output 1:
switching output
Ausgang 2:
switching output
LUU output 1:
switching output
output 2:
voltage output
LI2U output 1:
switching output
output 2:
current/switching
output
reprogrammable



Designs and variants

	Mechanical connection	Connection	Output 1	Output 2	Page
Pt100 processing unit – Switching and analog outputs 	Cylindrical, Ø 18 mm	male, M12 x 1	Switching output or IO-Link mode	switching output Analog or switching output analog output	449
Pt100 processing unit rotatable – Switching and analog outputs 	Cylindrical, Ø 18 mm	male, M12 x 1	Switching output or IO-Link mode	switching output Analog or switching output analog output	451
Processing unit without probe – 1 current output (2-wire) 	for compression ferrule fittings, protective tubing or direct mounting	male, M12 x 1	analog output	–	457
Processing unit without probe – 1 switching output 	–	male, M12 x 1	Switching output	–	457
Temperature transmitter with compact probe Ø 3 mm – 1 current output (2-wire) 	G 1/8" male thread	male, M12 x 1	analog output	–	458
Temperature switch with compact probe Ø 3 mm – 1 switching output 	G 1/8" male thread	male, M12 x 1	Switching output	–	458
Temperature transmitter with rod-type probe Ø 6 mm – 1 current output (2-wire) 	for compression ferrule fittings, protective tubing or direct mounting	male, M12 x 1	analog output	–	459

ts and variants

	Mechanical connection	Connection	Output 1	Output 2	Page
Transmitter with compact probe Ø 3 mm – Current output (2-wire)	G 1/8" male thread	male, M12 x 1	analog output	–	461
					
Transmitter with rod-shaped probe Ø 6 mm – Current output (2-wire)	for compression ferrule fittings, protective tubing or direct mounting	male, M12 x 1	analog output	–	461
					
Compact probe – Ø 3 mm – Process connection	G 1/8" male thread	male, M12 x 1	–	–	473
					
Rod-type probe – Ø 3 mm	for compression ferrule fittings, protective tubing or direct mounting	male, M12 x 1	–	–	473
					
Rod-type probe – Ø 6 mm	for compression ferrule fittings, protective tubing or direct mounting	male, M12 x 1	–	–	474
					
Cable probe – Ø 6 mm	for compression ferrule fittings, protective tubing or direct mounting	male, M12 x 1	–	–	474
					

TS400 series – Pt 100 probe (4-wire)

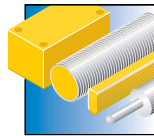


The TS400 processor units are incorporated in a non-rotatable, rugged stainless steel housing. A standard male M12 x 1 connection is available for TP temperature probes. The display indicates the temperature during normal operation and guides the operator through the programming menu. We offer sensors with switching outputs or a combination of switching and analog outputs. IO-Link communication is integrated as a standard.

Features

- Temperature probes connected via male M12 x 1
- Housing, temperature and electrical connection are made of stainless steel
- Highest flexibility through modular system
- Secure programming through recessed pushbutton and keylock
- Permanent display of temperature (°C, °F, K, Ω)
- Storage of max/min values

Properties



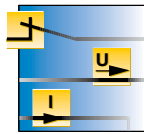
Designs

Cylindrical, non-rotatable, with display



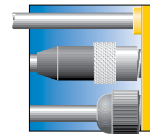
Measuring ranges

-50...+500 °C



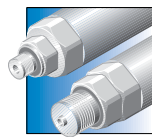
Electrical versions

IO-Link capable, 2-channel, switching, current or voltage output



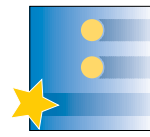
Electrical connections

Male M12 x 1, 4-pin



Connectivity

Cylindrical design 18 mm, for mounting bracket
Male M12 x 1 for probe



Special features

Failsafe 3-key operation, VDMA menu guide (optional), IP67, fully encapsulated sensor



Internet link

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Pt100 processing unit – Switching and analog outputs



General data			
Output 1	Switching output or IO-Link mode	Protection class	IP67
Connection	male, M12 x 1	Temperature operating range	-50...500 °C
Mechanical connection	Cylindrical, Ø 18 mm	Response time	100 ms
Housing material	V2A (1.4305)	Switching frequency	180 Hz
Remark	0.1% of full scale applies to temperatures > 200°C	Switching point accuracy	0.2 K

Types and data – selection table

Type	Output 2	Operating range	Operating voltage	Accuracy (Lin. + Hys. + Rep.)	w	d
TS-400-2UPN8X-H1141	switching output	–	15...30 VDC	–	w166	d641
TS-400-LI2UPN8X-H1141	Analog or switching output	4...20/0...20 mA (3-wire)	18...30 VDC	0.2 K	w167	d641
TS-400-LUUPN8X-H1141	analogue output	0...10 V/0...5 V/1...6 V (3-wire)	18...30 VDC	0.2 K	w168	d641

TS500 series fo Pt 100 probe (4-wire)

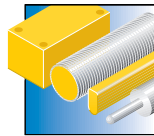


The TS500 processor units are rotatable by 320° and equipped with 4-digit 7-segment displays. A standard male M12 x 1 connection is available for TP temperature probes. The display indicates the temperature during normal operation and guides the operator through the programming menu. We offer sensors with switching outputs or a combination of switching and analog outputs. IO-Link communication is integrated as a standard.

Features

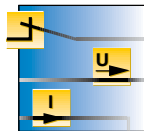
- Sensor rotatable by 320°
- Temperature probes connected via male M12 x 1
- Housing, temperature and electrical connection are made of stainless steel
- Highest flexibility through modular system
- Secure programming through recessed pushbutton and keylock
- Permanent display of temperature (°C, °F, K, Ω)
- Storage of max/min values

Properties



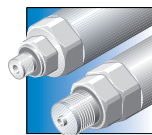
Designs

Cylindrical, rotatable, with display



Electrical versions

IO-Link capable, 2-channel, switching, current or voltage output



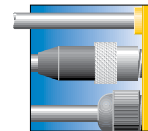
Connectivity

Cylindrical design 18 mm, for mounting bracket
Male M12x1 for probe



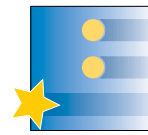
Measuring ranges

-50...+500 °C



Electrical connections

Male M12 x 1, 4-pin



Special features

Failsafe 3-key operation, VDMA menu guide (optional), IP67, fully encapsulated sensor



Internet link

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Pt100 processing unit rotatable – Switching and analog outputs



General data			
Output 1	Switching output or IO-Link mode	Protection class	IP67
Connection	male, M12 x 1	Temperature operating range	-50...500 °C
Mechanical connection	Cylindrical, Ø 18 mm	Response time	100 ms
Housing material	V2A (1.4305)	Switching frequency	180 Hz
Remark	0.1% of full scale applies to temperatures > 200°C	Switching point accuracy	0.2 K

Types and data – selection table

Type	Output 2	Operating range	Operating voltage	Accuracy (Lin. + Hys. + Rep.)	w	d
TS-500-2UPN8X-H1141	switching output	–	15...30 VDC	–	w166	d642
TS-500-LI2UPN8X-H1141	Analog or switching output	4...20/0...20 mA (3-wire)	18...30 VDC	0.2 K	w167	d642
TS-500-LUUPN8X-H1141	analogue output	0...10 V/0...5 V/1...6 V (3-wire)	18...30 VDC	0.2 K	w168	d642