Sense it! Connect it! Bus it! Solve it!

TEMPERATURE MEASUREMENT

Industrial Automation
**Temperature measurement – The perfect solution for your application**

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.

In industrial applications, temperature is measured with resistance thermometers or thermocouples. Resistance thermometers accomplish this via temperature-sensitive electrical resistors. While the resistance of PTCs increases with the rise of temperature, NTCs behave opposite.

The TURCK product portfolio offers a broad range of connectivity solutions and different output signals for many different temperature measurement tasks.

- **Maximum operating comfort**
  The TS series is programmed with the buttons MODE and SET. The ENTER button is recessed to avoid accidental changes of programmed values.

- **Many mounting options**
  The sensors can be mounted in many positions thanks to the rotatable sensor body, the inclined display and the reading that can be reversed by 180° via software.

- **Highest accuracy**
  Thanks to an accuracy of 0.2 K, only a few types of temperature sensors are needed to handle many different applications.

- **Highest system availability**
  The rugged stainless steel housing, excellent EMC properties and protection rating IP67 provide highest operational safety.
IM and IMS series – Interface technology delivered in a modular housing

The interface modules of the IM and IMS series are incorporated in a compact housing which is simply snapped on a DIN rail EN 60715. They can be aligned close together, horizontally or vertically. The 1 and 2-channel IMS modules are only 6.2 mm slim and offer functions such as galvanic isolation, signal conditioning and temperature measurement.

The 18 mm and 27 mm devices of the IM series can also be screwed on a panel. Thanks to a great variety of functions, these interface modules are suitable for many applications. In addition, they are equipped with a universal power supply unit 20…250 VUC, resp. 20…250 VAC/20…125 VDC for Ex devices, allowing them to be connected to all industrial power supply networks.

Through features such as easy programming, flexible process connection and a well readable display, the TS series provides everything you need to optimize your application. The compact sensors of the TTM series are available either with integrated probe or with a standard M12 plug connection to mount probes. The infrared sensors of the T-Gage series measure temperatures contactless in a range between 0 and +300 °C and at wavelengths between 8 and 14 μm.

A further important device of the product portfolio is the IP67 rated Pt 100 resistance thermometer, used for temperatures between -50 and +500 °C. The temperature probes of the TP series are available in different lengths and diameters.

When using a thermowell for protection, the sensor can be adapted to critical application conditions.
Flexibility in every respect
Temperature monitoring

Communication via IO-Link
IO-Link communication is built on a point-to-point connection between sensor and an interface module. Until now, only switching signals could be transferred via the binary connection. IO-Link instead, enables a combined transfer of switching signals and data, typically 2 bytes per 2 ms cycle. In addition to the process values, also parameters or diagnostic messages can be interchanged.

This way, the entire process down to the sensors is covered to enable integrated communication. IO-Link doesn’t need any special wiring. You can continue using the well established, reasonably priced and unshielded industrial cables. You can also choose between the standard switching or communication mode.

IO-Link solutions
- Simplified maintenance
- Seamless integration
- Flexible production
- Reduced inventory
- Easy and comfortable FDT/DTM based engineering

Your advantages with IO-Link:
- Parameters and configurations are safely stored in the system and always retrievable
- False parametrization is excluded.
- No complicated local parametrization
- Interferences on analog lines belong to the past
- Interferences on analog lines belong to the past
### TS series IO-Link

- Accuracy ± 0.2 K
- Sensor rotatable by 320°
- Connection of temperature probes via M12 x 1 male
- Stainless steel 1.4305 (AISI 303)
- Permanent display of temperature (°C, °F, K, Ω)
- Storage of max/min values
- Protection class IP67

The processing units of the TS-400/TS-500 series are incorporated in a non-rotatable, rugged stainless steel housing.

A standard M12 x 1 plug 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 with a combination of switching and analog outputs.

<table>
<thead>
<tr>
<th>TS - 500 - LI2UPN 8 X - H1 1 4 1</th>
</tr>
</thead>
</table>

#### Functional principle

- **Design**
  - **TS** temperature sensor

#### Mechanical version

- **Process connection**
  - 00 without process connection temperature probe via M12 x 1 male
  - 16 G½” with integrated probe
  - 30 ½” NPT with integrated probe
  - Only with design 5

#### Electrical version

<table>
<thead>
<tr>
<th>LED display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
</tr>
<tr>
<td>8 15 (18)…30 VDC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2UPN 2 switching outputs</td>
</tr>
<tr>
<td>LUUPN switching and voltage output</td>
</tr>
<tr>
<td>LI2UPN current and switching output</td>
</tr>
</tbody>
</table>

### Electrical connection: male

<table>
<thead>
<tr>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 standard assignment</td>
</tr>
<tr>
<td>other special assignments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 straight</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>H1 1 4 1</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Connector type</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 M12 x 1 male</td>
</tr>
</tbody>
</table>
The TTM series is a miniature temperature transmitter designed for confined spaces. It features a precise measuring element with a Platinum class A accuracy ± 0.2 K, protection class IP67, stainless steel 1.4404 (AISI 316L), and an analog current output 4…20 mA (2-wire). The adjustment range is -210…+650 °C.

TTM Functional principle
- Design:
  - TTM: Temperature transmitter miniature
  - TTMS: Temperature transmitter miniature stainless steel

TTM Measuring range
- Design:
  - Measuring range (other on request)
    - 50°C: 0…50 °C
    - 100°C: 0…100 °C
    - 150°C: 0…150 °C
    - blank: freely adjustable via IO-Link

Process connection
- Design:
  - 100A: processing unit without probe, connection via M12 x 1 male
  - 103A: processing unit with probe Ø 3 mm, process connection via standard thread accuracy class A
  - 203A: compression fitting/thermowell, probe Ø 3 mm, accuracy class A
  - 206A: compression fitting/thermowell, probe Ø 6 mm

Electrical version
- Design:
  - LI6: 4…20 mA 2-wire
  - LIUPN: 4…20 mA 2-wire, switching output PNP/NPN, IO-Link

Probe length
- Design:
  - L013: 13 mm (only 103A)
  - L024: 24 mm (only 103A)
  - L100: 100 mm
  - L150: 150 mm
  - Customized lengths on request!
**TP series**

- Accuracy
  - class A for temp. < 350 °C
  - class B for temp. > 350 °C
- Pt100 probe acc. to DIN EN 60751
- Vibration proof
- Connectable to TS, TT and TC series as well as IM34 and IMS
- Protection class IP67
- Mineral-insulated probes
- Bendable rod-type probe

The core element of the TP series is a Pt100 measuring resistor in 4-wire technology. All probes feature a standard M12 x 1 connection to the processing unit.

### Functional principle

<table>
<thead>
<tr>
<th>TP</th>
<th>103A</th>
<th>G1/8</th>
<th>H1</th>
<th>4</th>
<th>0</th>
<th>L013</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP</td>
<td>103A</td>
<td>G1/8</td>
<td>H1</td>
<td>4</td>
<td>0</td>
<td>L013</td>
</tr>
</tbody>
</table>

**Design**
- TP temperature probe

**Mechanical version**
- 103A processing unit with probe Ø 3 mm, process connection via standard thread accuracy class A
- 203A compression fitting thermowell probe Ø 3 mm, accuracy class A
- 206A processing unit with probe Ø 6 mm, process connection via clamping sleeve, accuracy class A
- 306A cable probe Ø 6 mm
- 504A with food-proof process connection Ø 4 mm, accuracy class A

**Process connection**
- DN25 DN25 dairy screw connection DIN 11851 (only 504A)
- CF compression fitting or thermowell
- G1/8 G1/8’-male thread (nur 103A)
- TR3/4 Tri-Clamp 3/4” (only 504A)

### Electrical connection

<table>
<thead>
<tr>
<th>H1</th>
<th>1</th>
<th>4</th>
<th>L013</th>
</tr>
</thead>
</table>
| Assignment
  - 0 special assignment
  - 1 standard assignment|
| Number of contacts
  - 4 four|
| Connector type
  - 1 gerade|

**Probe length**
- L013 13 mm (only 103A)
- L024 24 mm (only 103A)
- L035 35 mm (only 504A)
- L100 100 mm
- L150 150 mm
- L200 200 mm
- L250 250 mm
- L300 300 mm
- L1000 1000 mm
- L2000 2000 mm
- L5000 5000 mm

Customized lengths on request!

more@turck.com • www.turck.com • 2014/03
Temperature measuring amplifiers, 1-channel, mounting on DIN rail
Input for Pt100/ Ni100 resistors in 2, 3 or 4-wire technology, variable resistors, thermocouples and millivolt signals
With intrinsically safe input circuits Ex ia, for zone 2, additional limit value relay required
Current output of 0/4…20 mA,
Galvanic isolation between input circuits and output circuits and supply voltage
Parametrized via PACTware™
HART® transmission
Universal operating voltage
Removable terminal blocks, reverse-polarity protected

The IM34 temperature measuring amplifiers are designed to evaluate temperature-dependent changes of Ni100/Pt100 resistors, thermocouples B, E, J, K, L, N, R, S, T or low voltage in a range of -160…+160 mV and to output them as temperature linear current signals 0/4…20 mA. Types with relay output are additionally available for monitoring of limit values. The devices are parametrized via FDT/DTM. The following adjustments can be made: 2, 3, or 4-wire technology, measuring range, wire-break monitoring, output behaviour in the event of input circuit failure, internal or external cold junction compensation, temperature unit and mode (resistance, thermocouple, low voltage and line compensation).
Temperature measuring amplifier, 1 channel
Modular housing, width 6.2 mm, for DIN rail mounting
Input for Pt100
Output signal 0/4...20 mA
Output signal 0...10 V
Galvanic isolation between input circuits and output circuits and supply voltage

Galvanic isolation, signal conditioning and transmission in a slim 6.2 mm housing – these are the unique features provided by the IMS series for mounting on DIN rail.

A 1-channel version is available for temperature measurement. Pt100 temperature probes in 2, 3 or 4-wire technology can be connected. Measuring range (–50...+150 °C, 0...+100 °C or 0...+200 °C) and output signal (0/4...20 mA or 0...10 V) are adjusted via DIP switch.
T-Gage series

- Short response time of 75 ms
- User-friendly programming
- Compact design
- Rugged, fully encapsulated construction
- Available with cable or 5-pole M12 x 1 male
- Target need not be moved to be detected
- Alarm output for maximum signal
- Programmable for rising or dropping analog characteristic

The T-GAGE is a passively operating device, used for analog temperature measurement. It measures the temperature of objects in a defined range and emits a proportional voltage. Unlike other photoelectric sensors, the T-GAGE doesn’t emit light but only measures the infrared radiation of objects. This sensor is thus perfectly suited for monitoring the temperature of hot objects, such as injection-moulded parts or bakery products, but also metals, bottles or rubbers. To avoid overload, the T-GAGE is also used for monitoring the temperature of conveyor-belt rollers. The sensor can also be used in applications of the food industry to monitor cold objects, such as ice cream or milk products for example.

**M18T B 6 Q**

<table>
<thead>
<tr>
<th>M18T Design</th>
<th>Configuration of output and voltage</th>
<th>D:S ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>M18T cylindrical thread, metal, 18 mm</td>
<td>B bipolar (NPN/PNP); 10…30 VDC 0…30 V analog output and 1 PNP alarm output, 12…30 VDC 4…20 mA analog output and 1 PNP alarm output, 12…30 VDC</td>
<td>6:1</td>
</tr>
</tbody>
</table>

**Q Electrical connection**

- cable, 2 m, 5-pole
- M12 x 1 male, 5-pole

**Diagram of electrical connections**

- BN (1) +
- BU (3) -
- WH (2)
- BK (4)
- GY (5) teach

- BN +
- BU -
- WH 4…20 mA alarm
- BK teach

- BN +
- BU -
- WH 0…10 VDC alarm
- BK teach
**THW**

- Thermowells
- Stainless steel 1.4404 (AISI 316L)
- Pressure-resistant up to 600 bar
- Probes fixed in place with compression fitting
- Rugged construction

THW thermowells are used to protect probes against environmental influences. They are available in different material qualities and for many requirements. Standard thermowells are made of 1.4404 stainless steel and designed for individual sensors.

<table>
<thead>
<tr>
<th>THW</th>
<th>Functional principle</th>
<th>-</th>
<th>3</th>
<th>Probe diameter</th>
<th>-</th>
<th>G1/8</th>
<th>Process connection</th>
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<tbody>
<tr>
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<td></td>
<td>Process connection</td>
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<td></td>
<td></td>
<td></td>
<td>G1/8 G1/8&quot; male thread</td>
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<td></td>
<td></td>
<td></td>
<td>N1/8 1/2&quot; NPT male thread</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>G1/4 G1/4&quot; male thread</td>
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<td></td>
<td></td>
<td></td>
<td>N1/4 1/4&quot; NPT male thread</td>
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<td></td>
<td></td>
<td></td>
<td>G1/2 G1/2&quot; male thread</td>
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<td></td>
<td></td>
<td></td>
<td>N1/2 1/2&quot; NPT male thread</td>
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<td></td>
<td></td>
<td></td>
<td>TR13/4 ¾&quot; Tri-Clamp</td>
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<td></td>
<td></td>
<td>DN2SK DN25 dairy screw connection DIN 11851</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A4</th>
<th>Material</th>
<th>-</th>
<th>L013</th>
<th>Immersion depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Material</td>
<td></td>
<td></td>
<td>Probe length mm</td>
</tr>
<tr>
<td>A4</td>
<td>Stainless steel AISI 316L/1.4404</td>
<td></td>
<td></td>
<td>L050 50 mm</td>
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<td></td>
<td></td>
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<td></td>
<td>L100 100 mm</td>
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<td>L150 150 mm</td>
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<td>L200 200 mm</td>
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<td>L250 250 mm</td>
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<td></td>
<td>L300 300 mm</td>
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<tr>
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<td></td>
<td></td>
<td>Customized lengths on request!</td>
</tr>
</tbody>
</table>
Compression fittings are always used when temperature probes have direct contact with a medium. A liquid and gas-tight connection is established by means of a compression fitting installed between the process and the environment.

### CF – M – 3 – G1/8 – A4

<table>
<thead>
<tr>
<th>CF</th>
<th>Functional principle</th>
<th>M</th>
<th>Material</th>
<th>3</th>
<th>Probe diameter</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Threaded adapter CF</td>
<td>M</td>
<td>AISI 316L</td>
<td>3</td>
<td>3 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P</td>
<td>PTFE</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>6 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G1/8</th>
<th>Process connection</th>
<th>A4</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Process connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>G1/8  G1/8&quot; male thread</td>
<td>A4</td>
<td>stainless steel AISI 316L/1.4404</td>
</tr>
<tr>
<td></td>
<td>N1/8  1/4&quot; NPT male thread</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>G1/4  G1/4&quot;male thread</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N1/4  1/4&quot;-NPT male thread</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>G1/2  G1/2&quot; male thread</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N1/2  1/2&quot;-NPT male thread</td>
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</tbody>
</table>
Accessories

With the available product-specific accessories, the sensors can be mounted almost anywhere. We offer the right accessories for operation and installation of the temperature sensors.

This includes accessories for simple and safe mounting of temperature probes.

<table>
<thead>
<tr>
<th>TP-MZ-001</th>
<th>TP-MZ-002</th>
<th>TP-MZ-003</th>
<th>TP-MZ-004</th>
<th>TP-MZ-005</th>
</tr>
</thead>
<tbody>
<tr>
<td>weld-on plate</td>
<td>wall mounting kit TP series</td>
<td>barrel holder</td>
<td>clamp sleeve</td>
<td>wall bushing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PTS-Cover</th>
<th>PK-P-MZ-001</th>
<th>USB-2-IOL-0002</th>
</tr>
</thead>
<tbody>
<tr>
<td>closure cap for TS-Serie</td>
<td>mounting kit TP-103A</td>
<td>IO-Link USB Master</td>
</tr>
</tbody>
</table>