Process thermocouple
For additional thermowell or basic module
Models TC12-B, TC12-M

Applications
- Chemical industry
- Petrochemical industry
- Offshore
- Plant and vessel construction

Special features
- Sensor ranges from -40 ... +1,200 °C (-40 ... +2,192 °F)
- For many variants of temperature transmitters including field transmitter
- For mounting in all standard thermowell designs
- Spring-loaded measuring insert (replaceable)
- Explosion-protected versions

Description
Thermocouples in this series can be combined with a large number of thermowell designs. The replaceable, centrically spring-loaded measuring insert and its extended spring travel enable combination with the widest range of connection head designs.

A wide variety of possible combinations of sensor, connection head, insertion length, neck length, connection to thermowell etc. are available for the thermometers; suitable for any thermowell dimension and any application.

Operation without thermowell is only recommended in certain applications.
**Explosion protection (option)**

For application in hazardous areas, corresponding versions are available.

**Intrinsic safety**
These instruments comply with the requirements of the ATEX directive or IECEx for gas.

**Flameproof enclosure**
These instruments comply with the requirements of the ATEX directive or IECEx for gas.

The permissible power $P_{\text{max}}$ as well as the permissible ambient temperature for the respective category can be seen on the EC-type examination certificate or else the IECEx certificate or the operating instructions.

Built-in transmitters have their own EC-type examination certificate. The permissible ambient temperature ranges of the built-in transmitters can be taken from the corresponding transmitter approval.

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**Approvals (explosion protection, further approvals)**

<table>
<thead>
<tr>
<th>Logo</th>
<th>Description</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="logo.png" alt="CE" /></td>
<td><strong>EU declaration of conformity</strong>&lt;br&gt;EMC directive 1)&lt;br&gt;EN 61326 emission (group 1, class B) and interference immunity (industrial application)&lt;br&gt;- RoHS directive&lt;br&gt;- ATEX directive (option)&lt;br&gt;  Hazardous areas&lt;br&gt;  - Ex i Zone 0 gas&lt;br&gt;  Zone 1 mounting to zone 0 gas&lt;br&gt;  Zone 1 gas&lt;br&gt;  - Ex d Zone 1 mounting to zone 0 gas&lt;br&gt;  Zone 1 gas</td>
<td>European Union</td>
</tr>
<tr>
<td><img src="logo.png" alt="IECEx" /></td>
<td><strong>IECEx (option)</strong>&lt;br&gt;(in conjunction with ATEX)&lt;br&gt;  Hazardous areas&lt;br&gt;  - Ex i Zone 0 gas&lt;br&gt;  Zone 1 mounting to zone 0 gas&lt;br&gt;  Zone 1 gas&lt;br&gt;  - Ex d Zone 1 mounting to zone 0 gas&lt;br&gt;  Zone 1 gas</td>
<td>International</td>
</tr>
<tr>
<td><img src="logo.png" alt="EACEx" /></td>
<td><strong>EAC (option)</strong>&lt;br&gt;  Hazardous areas&lt;br&gt;  - Ex i Zone 0 gas&lt;br&gt;  Zone 1 gas&lt;br&gt;  Zone 20 dust 2)&lt;br&gt;  Zone 21 dust 2)&lt;br&gt;  - Ex d Zone 1 gas</td>
<td>Eurasian Economic Community</td>
</tr>
<tr>
<td><img src="logo.png" alt="INMETRO" /></td>
<td><strong>INMETRO (option)</strong>&lt;br&gt;  Hazardous areas&lt;br&gt;  - Ex i Zone 0 gas&lt;br&gt;  Zone 1 mounting to zone 0 gas&lt;br&gt;  Zone 1 gas&lt;br&gt;  Zone 20 dust 2)&lt;br&gt;  Zone 21 mounting to zone 20 dust 2)&lt;br&gt;  Zone 21 dust 2)&lt;br&gt;  - Ex d Zone 1 mounting to zone 0 gas&lt;br&gt;  Zone 1 gas</td>
<td>Brazil</td>
</tr>
<tr>
<td>Logo</td>
<td>Description</td>
<td>Country</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| ![NEPSI logo] | **NEPSI (option)**  
Hazardous areas  
- Ex i  
Zone 0 gas  
Zone 1 mounting to zone 0 gas  
Zone 1 gas  
[Ex ia IIC T1 – T6 Ga]  
[Ex ia IIC T1 – T6 Ga/Gb]  
[Ex ia IIC T1 – T6 Gb] | China |
| ![KC logo] | **KC - KOSHA (option)**  
Hazardous areas  
- Ex i  
Zone 0 gas  
Zone 1 gas  
[Ex ia IIC T4 ... T6]  
[Ex ib IIC T4 ... T6] | South Korea |
| ![PESO logo] | **PESO (option)**  
Hazardous areas  
- Ex i  
Zone 0 gas  
Zone 1 mounting to zone 0 gas  
Zone 1 gas  
[Ex ia IIC T1 ... T6 Ga]  
[Ex ib IIC T3 ... T6 Ga/Gb]  
[Ex ib IIC T3 ... T6 Gb]  
[Ex d IIC T1 ... T6 Gb] | India |
| ![DNOP logo] | **DNOP - MakNII (option)**  
Hazardous areas  
- Ex i  
Zone 0 gas 2)  
Zone 1 mounting to zone 0 gas 2)  
Zone 1 gas 2)  
Zone 20 dust 2)  
Zone 21 mounting to zone 20 dust 2)  
Zone 21 dust 2)  
[II 1G Ex ia IIC T3 ... T6 Ga]  
[II 1/2G Ex ia IIC T3 ... T6 Ga/Gb]  
[II 2G Ex ia IIC T3 ... T6 Gb]  
[II 1D Ex ia IIIC T125 ... T65 °C Da]  
[II 1/2D Ex ia IIIC T125 ... T65 °C Da/Db]  
[II 2D Ex ia IIIC T125 ... T65 °C Db] | Ukraine |
| ![GOST logo] | **GOST (option)**  
Metrology, measurement technology | Russia |
| ![KazInMetr logo] | **KazInMetr (option)**  
Metrology, measurement technology | Kazakhstan |
| ![MTSCHS logo] | **MTSCHS (option)**  
Permission for commissioning | Kazakhstan |
| ![BelGIM logo] | **BelGIM (option)**  
Metrology, measurement technology | Belarus |
| ![Uzstandard logo] | **Uzstandard (option)**  
Metrology, measurement technology | Uzbekistan |

**Manufacturer's information and certificates**

<table>
<thead>
<tr>
<th>Logo</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![SIL logo] | **SIL 2**  
Functional safety | |

1) Only for built-in transmitter  
2) Only for model TC12-B

Instruments marked with “ia” may also be used in areas only requiring instruments marked with “ib” or “ic”. If an instrument with “ia” marking has been used in an area with requirements in accordance with “ib” or “ic”, it can no longer be operated in areas with requirements in accordance with “ia” afterwards.

Approvals and certificates, see website
Specifications

### Output signal thermocouple

<table>
<thead>
<tr>
<th>Temperature range</th>
<th>Measuring range see page 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermocouple per IEC 60584-1</td>
<td>Types K, J, E, N, T</td>
</tr>
</tbody>
</table>
| Measuring point | ■ Ungrounded welded (ungrounded)  
■ Welded at the bottom (grounded) |
| Tolerance value of the measuring element | ■ per IEC 60584-1  
■ per ASTM E230  
■ Class 1  
■ Class 2  
■ Standard  
■ Special |

### Output signal 4 ... 20 mA, HART® protocol, FOUNDATION™ Fieldbus and PROFIBUS® PA

<table>
<thead>
<tr>
<th>Transmitter (selectable versions)</th>
<th>Model T16</th>
<th>Model T32</th>
<th>Model T53</th>
<th>Models TIF50, TIF52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data sheet</td>
<td>TE 16.01</td>
<td>TE 32.04</td>
<td>TE 53.01</td>
<td>TE 62.01</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ 4 ... 20 mA</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>■ HART® protocol</td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>■ FOUNDATION™ Fieldbus and PROFIBUS® PA</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

### Measuring insert (replaceable)

| Material | Ni alloy: alloy 600, others on request |
| Diameter | Standard: 3 mm, 4.5 mm, 6 mm, 8 mm  
Option (on request): 1/8 inch (3.17 mm), 1/4 inch (6.35 mm), 3/8 inch (9.53 mm) |
| Spring travel | approx. 20 mm |
| Response time (in water, per EN 60751) | $t_{50} < 5$ s  
$t_{90} < 10$ s (measuring insert diameter 6 mm: The thermowell required for operation increases the response time dependent upon the actual parameters for the thermowell and the process.) |

### Neck tube

| Material | Stainless steel 1.4571, 316, 316L |
| Connection thread to the thermowell | ■ G 1/2 B  
■ G 3/4 B  
■ 1/2 NPT  
■ 3/4 NPT  
■ M14 x 1.5  
■ M18 x 1.5  
■ M20 x 1.5  
■ M27 x 2 |
| Connection thread to the head | ■ M20 x 1.5 with counter nut  
■ 1/2 NPT |
| Neck length | ■ min. 150 mm, standard neck length  
■ 200 mm  
■ 250 mm  
other neck lengths on request |

### Ambient conditions

| Ambient and storage temperature | -60 °F / -40 ... +80 °C |
| Ingress protection | IP66 per IEC/EN 60529  
The specified ingress protection only applies for TC12-B with corresponding thermowell, connection head, cable gland and appropriate cable dimensions. |
| Vibration resistance | 50 g, peak-to-peak |

Use thermocouples with shielded cable, and ground the shield on at least one end of the lead.  
For a correct determination of the overall measuring deviation, both sensor and transmitter measuring deviations have to be considered.  
1) Special version on request (only available with selected approvals), other ambient and storage temperature on request.
**Sensor**

**Sensor types**

<table>
<thead>
<tr>
<th>Model</th>
<th>Operating temperatures per IEC 60584-1</th>
<th>Operating temperatures per ASTM E230</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class 2</td>
<td>Class 1</td>
</tr>
<tr>
<td>K</td>
<td>-40 ... +1,200 °C</td>
<td>-40 ... +1,000 °C</td>
</tr>
<tr>
<td>J</td>
<td>-40 ... +750 °C</td>
<td>-40 ... +750 °C</td>
</tr>
<tr>
<td>E</td>
<td>-40 ... +900 °C</td>
<td>-40 ... +800 °C</td>
</tr>
<tr>
<td>N</td>
<td>-40 ... +1,200 °C</td>
<td>-40 ... +1,000 °C</td>
</tr>
<tr>
<td>T</td>
<td>-40 ... +350 °C</td>
<td></td>
</tr>
</tbody>
</table>

Sheath material and sheath diameter may limit the maximum operating temperature.

The actual operating temperature of the thermometers is limited both by the maximum permissible working temperature and the diameter of the thermocouple and the MI cable, as well as by the maximum permissible working temperature of the thermowell material.

For detailed specifications for thermocouples, see IEC 60584-1 or ASTM E230 and Technical information IN 00.23 at www.wika.com.

**Tolerance value**

For the tolerance value of thermocouples, a cold junction temperature of 0 °C has been taken as the basis.

Listed models are available both as single or dual thermocouples. The thermocouple will be delivered with an ungrounded measuring point, unless explicitly specified otherwise.

**Measuring insert**

The replaceable measuring insert is made of a vibration-resistant, sheathed measuring cable (MI cable). The measuring insert diameter should be approx. 1 mm smaller than the bore diameter of the thermowell. Gaps of more than 0.5 mm between thermowell and the measuring insert will have a negative effect on the heat transfer, and they will result in unfavourable response behaviour of the thermometer.

When fitting the measuring insert into a thermowell, it is very important to determine the correct insertion length (= thermowell length for bottom thicknesses of ≤ 5.5 mm). In order to ensure that the measuring insert is firmly pressed down onto the bottom of the thermowell, the insert must be spring-loaded (spring travel: 0 ... 20 mm).

**Calculation of the measuring insert length in the event of replacement**

<table>
<thead>
<tr>
<th>Thread to connection head</th>
<th>Measuring insert lengthProbes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 NPT</td>
<td>NL + 12 mm</td>
</tr>
<tr>
<td>M20 x 1.5</td>
<td>NL + 18 mm</td>
</tr>
</tbody>
</table>

NL = Nominal length of the TC12-B or TC12-M

**Neck tube**

The neck tube is screwed into the connection head or the case. The neck length depends on the intended use. Usually an isolation is bridged by the neck tube. Also, in many cases, the neck tube serves as a cooling extension between the connection head and the medium, in order to protect any possible built-in transmitter from high medium temperatures.

In the Ex d version the flameproof joint is integrated in the neck tube.
Components model TC12

Model TC12-M
Module

Model TC12-B
Variant 1

Model TC12-B
Variant 2

Model TC12-B
Variant 3

Legend:

1️⃣ Connection head
2️⃣ Neck tube
3️⃣ Connection to thermowell
4️⃣ Measuring insert
5️⃣ Terminal block
6️⃣ Transmitter (option)
7️⃣ Field transmitter

A (U₂) Insertion length
NL Nominal length
N (Mₗₜ) Neck length

Neck tube versions

Legend:

1️⃣ Neck tube
2️⃣ Thread to the thermowell
3️⃣ Measuring insert
4️⃣ Thread to the connection head
5️⃣ Insertion length (tapered thread)
6️⃣ Insertion length (parallel thread)
7️⃣ Nominal length
8️⃣ Neck length
Thermowell selection

<table>
<thead>
<tr>
<th>Model</th>
<th>Material</th>
<th>Cable outlet</th>
<th>Ingress protection</th>
<th>Explosion protection</th>
<th>Cap</th>
<th>Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4000 F</td>
<td>Aluminium</td>
<td>½ NPT, ¾ NPT, M20 x 1.5</td>
<td>IP66 ¹</td>
<td>Without, Ex i, Ex d</td>
<td>Screw-on lid</td>
<td>Blue, lacquered ²</td>
</tr>
<tr>
<td>1/4000 S</td>
<td>Stainless Steel</td>
<td>½ NPT, ¾ NPT, M20 x 1.5</td>
<td>IP66 ¹</td>
<td>Without, Ex i, Ex d</td>
<td>Screw-on lid</td>
<td>Blank</td>
</tr>
<tr>
<td>5/6000</td>
<td>Aluminium</td>
<td>2 x ½ NPT, 2 x ¾ NPT, 2 x M20 x 1.5</td>
<td>IP66 ¹</td>
<td>Without, Ex i, Ex d</td>
<td>Screw-on lid</td>
<td>Blue, lacquered ²</td>
</tr>
<tr>
<td>7/8000 W</td>
<td>Aluminium</td>
<td>½ NPT, ¾ NPT, M20 x 1.5</td>
<td>IP66 ¹</td>
<td>Without, Ex i, Ex d</td>
<td>Screw-on lid</td>
<td>Blue, lacquered ²</td>
</tr>
<tr>
<td>7/8000 S</td>
<td>Stainless Steel</td>
<td>½ NPT, ¾ NPT, M20 x 1.5</td>
<td>IP66 ¹</td>
<td>Without, Ex i, Ex d</td>
<td>Screw-on lid</td>
<td>Blank</td>
</tr>
</tbody>
</table>

¹ The specified ingress protection only applies for TC12-B with corresponding cable gland, appropriate cable dimensions and mounted thermowell.
2) RAL 5022

Field temperature transmitter with digital display (option)

Field temperature transmitters models TIF50, TIF52
As an alternative to the standard connection head the thermometer can be fitted with an optional model TIF50 or TIF52 field temperature transmitter.
The field temperature transmitter comprises a 4 ... 20 mA/ HART® protocol output and is equipped with an LCD indication module.

Model TIF50: HART® slave
Model TIF52: HART® master
Transmitter (option)

As an option, WIKA transmitters can be installed in the TC12-B connection head.

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Explosion protection</th>
<th>Data sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>T16</td>
<td>Digital transmitter, PC configurable</td>
<td>Optional</td>
<td>TE 16.01</td>
</tr>
<tr>
<td>T32</td>
<td>Digital transmitter, HART® protocol</td>
<td>Optional</td>
<td>TE 32.04</td>
</tr>
<tr>
<td>T53</td>
<td>Digital transmitter FOUNDATION™ Fieldbus and PROFIBUS® PA</td>
<td>Standard</td>
<td>TE 53.01</td>
</tr>
<tr>
<td>TIF50</td>
<td>Digital field temperature transmitter, HART® protocol (slave)</td>
<td>Optional</td>
<td>TE 62.01</td>
</tr>
<tr>
<td>TIF52</td>
<td>Digital field temperature transmitter, HART® protocol (master)</td>
<td>Optional</td>
<td>TE 62.01</td>
</tr>
</tbody>
</table>

Other transmitters on request.

Electrical connection

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>IEC 60584-1</th>
<th>ASTM E230</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td>K</td>
<td>Green</td>
<td>White</td>
</tr>
<tr>
<td>J</td>
<td>Black</td>
<td>White</td>
</tr>
<tr>
<td>E</td>
<td>Violet</td>
<td>White</td>
</tr>
<tr>
<td>N</td>
<td>Pink</td>
<td>White</td>
</tr>
<tr>
<td>T</td>
<td>Brown</td>
<td>White</td>
</tr>
</tbody>
</table>

For the electrical connections of built-in temperature transmitters see the corresponding data sheets or operating instructions.
Functional safety (option)

In safety-critical applications, the entire measuring chain must be taken into consideration in terms of the safety parameters. The SIL classification allows the assessment of the risk reduction reached by the safety installations.

Selected TC12 process thermocouples in combination with an appropriate temperature transmitter (e.g. model T32.1S) are suitable as sensors for safety functions up to SIL 2.

Matched thermowells allow easy dismounting of the measuring insert for calibration. The optimally matched measuring point consists of a thermowell, a TC12 thermometer and a T32.1S transmitter developed in accordance with IEC 61508. Thus, the measuring point provides maximum reliability and a long service life.

Certificates (option)

<table>
<thead>
<tr>
<th>Certification type</th>
<th>Measurement accuracy</th>
<th>Material certificate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2 test report</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>3.1 inspection certificate</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>DKD/DAkkS calibration certificate</td>
<td>x</td>
<td>-</td>
</tr>
</tbody>
</table>

The different certifications can be combined with each other.

Approvals and certificates, see website

Ordering information
Model / Explosion protection / Ignition protection type / Sensor / Sensor specifications / Thermometer range of use / Measuring point / Connection housing / Thread size at cable outlet / Cable outlet / Transmitter / Neck tube version / Connection to case, connection head / Connection to thermowell / Neck tube length N(MH) / Insertion length A / Measuring insert / Options