Input

Output
- 2-wire technique
- 4...20 mA
- Temperature-linear

Deviation 0.15 %

Electrical isolation

Programming of the measuring range via push-button
- Setting of the measuring range is drift-free, faster and more precise than with instruments using zero or span potentiometers
- Range programming without a special software
- Flexible setting of upper and lower range value

Functional description
The TS 05 head-mounted temperature transmitter converts the temperature-dependent thermovoltage of a connected thermocouple directly on site into a stable 4...20 mA standard signal that is linear to the temperature.

The user can assign the sensor temperature range rapidly and conveniently to the 4...20 mA signal by programming the instrument via its push-button.

A supply voltage of 8...30 V DC is provided to the 2-wire temperature transmitter. The instrument is loop-powered, i.e. the signal lines are used for power transmission as well. The 4...20 mA current flowing in the current loop between the power supply and the transmitter covers the TS 05 transmitter’s current requirements up to 3.8 mA. A higher current (4...20 mA) additionally contains the temperature information from the sensor.
TS 05 – Head-mounted temperature transmitter, programmable via push-button, thermocouples

Output

Output signal (temperature-linear) 4...20 mA
Current consumption 3.8 mA
Max. output current 22 mA
Error current signal 22 mA
(Sensor or sensor cable break, or sensor signal out of the max. measuring range of the respective thermocouple; error current optically indicated through permanently lit LED)

Input

Thermocouples

Transmitter type max. measuring range
TS 05-1/TC Type K: -200...1370 °C (-328...2498 °F)
Type J: -200...1200 °C (-328...2192 °F)
Type T: -200...400 °C (-328...752 °F)
TS 05-2/TC Type R: 0...1760 °C (32...3200 °F)
Type S: 0...1760 °C (32...3200 °F)
Type B: 0...1820 °C (32...3308 °F)
Type F: -200...1200 °C (-328...2192 °F)
Type E: -200...1000 °C (-328...1832 °F)
TS 05-4/TC Type K: -200...1370 °C (-328...2498 °F)
Type N: 0...1300 °C (32...2372 °F)
Type R: 0...1760 °C (32...3200 °F)
Type J: -200...1200 °C (-328...2192 °F)
Type F: -200...1200 °C (-328...2192 °F)
Type E: -200...1000 °C (-328...1832 °F)

Min. measuring range
4 mV or min. temperature range, depending on thermocouple type, e.g. Type K 4 mV corresp. to 100 K
Conversion in °F: $T[°F] = \frac{9}{5} \times T[°C] + 32 K$

Power supply (protected against polarity reversal)
(2-wire technique: power cable = signal cable)
Supply voltage $V_s = 8...30$ V DC

Max. load

$R[\Omega] = \frac{(V_{\text{max}} - V_{\text{min}})}{20}$
(e.g. $V_s = 24$ V, $R = 800 \Omega$)

General specifications

Measuring range 500 ms
Response time ($T_{70%}$) 500 ms
Electrical isolation (I/O) 50 V DC
(Test: 200 V DC 1 min.)

Electromagnetic compatibility

Compliance with EN 301 489-1
RFI suppression to EN 55022-3, EN 55022-2
EMI/RFI shielding to EN 50081-1, EN 50082-1, EN 50110-3-2/3-2/4-6/8

Note: Observe the max length of 3 m for the sensor feed cable. Use shielded power/signal cables, ground on one side

Meets the requirements for CE conformity
Installation category II
Degree of pollution 1
Insulation class II
Inflammability class UL 94 HB

Environmental capabilities

Ambient temperature range -20...70 °C (-4...158 °F)
Storage temperature -40...70 °C (-40...158°F)
Relative humidity max. 95 %
(non-condensing)

Mechanical construction

Dimensions see dimensional drawing
Weight 30 g
Housing material ABS
Color black
Terminals max. 2.5 mm²

Characteristics at rated conditions

(acc. to IEC 770 (referred to 25 °C / 77 °F))
Balancing uncertainty < 0.15 % or < 0.15 K
The greater value is valid
Linearity deviation < 0.05 % or < 0.05 K
The greater value is valid

Influences

Ambient temperature drift < 0.1 %/10 K or < 0.1 K/ 10K
The greater value is valid
Influence of reference junction < 0.05 %/10 K bzw. < 0.05 K /10K,
The greater value is valid
Long-term drift (can be re-adjusted) < 0.1 % per year
Supply voltage influence 0.008 %/V referred to 20 V

Standard measuring ranges

TS 05-1/TC Type K: 0...1000 °C (32...1832 °F)
TS 05-2/TC Type R: 0...1600 °C (32...2912 °F)
TS 05-2/TC Type J: 0...1000 °C (32...1832 °F)
TS 05-4/TC Type K: 0...1000 °C (32...1832 °F)
Overranging (22 mA) in case of error

1) The specified percentages refer to the selected measuring span
Connecting a thermocouple

Connecting diagram

<table>
<thead>
<tr>
<th>Transmitter type</th>
<th>TS 05-1/TC</th>
<th>TS 05-2/TC</th>
<th>TS 05-3/TC</th>
<th>TS 05-4/TC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selectable thermocouple types</td>
<td>K</td>
<td>J</td>
<td>T</td>
<td>R</td>
</tr>
<tr>
<td>Thermocouple terminals</td>
<td>+</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>–</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>No. of LED flashes</td>
<td>⋆</td>
<td>⋆</td>
<td>⋆</td>
<td>⋆</td>
</tr>
</tbody>
</table>

Table 1: Assignment between LED and thermocouple type

Selecting the thermocouple type by using the push-button

Each of the four available thermocouple transmitter types is designed for connecting three different thermocouple types.

The current thermocouple configuration of the transmitter is indicated on the rating plate and, upon power on, by the number of LED flashes.

Refer to the table above for details about the assignment between the thermocouple type and the flashing rate of the LEDs.

Proceed as described below to change the thermocouple type:
1. Switch on the transmitter: insert a screw driver (diameter 3 mm) into the respective hole on the top side of the housing to actuate the recessed programming switch.
2. Release the programming switch and press it briefly once, twice or three times again to select the appropriate thermocouple.
3. The device will automatically restart after around 5 seconds. Check if the number of LED flashes (one, two or three) is in accordance with your selection (see table above).
Programming the measuring range by using the push-button

1. Connect thermocouple simulator, power supply and ammeter or loop current indicator. Note: the material of the connection cables between the TE/TC simulator and the transmitter input must always comply with the simulated thermocouple type.
2. Set simulator to desired lower range value of the sensor.
3. Press push button for app. 5 seconds until red LED flashes.
4. Set to desired upper range value and let transmitter line up for 10 seconds.
5. Press push-button; red LED first flashes with a higher frequency and is then extinguished. This indicates acknowledgement of the programmed measuring range.
6. Finally check the 4 and 20 mA output signal of the transmitter by setting the lower and upper range value again.

1) see thermocouple connection page 3
2) thermo-material or compensation cable
**Ordering information**

<table>
<thead>
<tr>
<th>Model</th>
<th>Standard configuration: Type</th>
<th>Temperature range °C (°F)</th>
<th>Catalog No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS 05-1/TC</td>
<td>K, 0...1000 °C (32...1832 °F)</td>
<td>V11507-1100</td>
<td></td>
</tr>
<tr>
<td>TS 05-2/TC</td>
<td>R, 0...1600 °C (32...2912 °F)</td>
<td>V11507-1200</td>
<td></td>
</tr>
<tr>
<td>TS 05-3/TC</td>
<td>J, 0...1000 °C (32...1832 °F)</td>
<td>V11507-1300</td>
<td></td>
</tr>
<tr>
<td>TS 05-4/TC</td>
<td>K, 0...1000 °C (32...2912 °F)</td>
<td>V11507-1400</td>
<td></td>
</tr>
</tbody>
</table>

1) Overranging (22 mA) in case of error