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You can download all instructions, catalogs and certificates for SITRANS T free of charge at the following Internet address:

[www.siemens.com/sitranst](http://www.siemens.com/sitranst)
## Overview

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<td></td>
</tr>
<tr>
<td>• Mounting in sensor head</td>
<td></td>
<td></td>
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</tr>
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</table>
The bus-capable transmitter with Profibus PA interface in accordance with profile 3

You can use this bus-capable device with PROFIBUS PA interface in all branches and integrate it (like the SITRANS TK / TK-H) in keeping with the Totally Integrated Automation concept.

SITRANS T3K PA converts signals from resistance thermometers, resistance-based sensors, thermocouples and voltage sensors into digital signals. The measured value from the microprocessor is then made available with status as a quality specification and other parameters electrically isolated on processor is then made available with status as a quality specification and other parameters electrically isolated on processor interprets the bus commands, initiates device-internal actions and provides electrically-isolated measured values, status and device data on the bus.

Great safety

The current consumption amounts to less than 11 mA. For safety, the bus current is limited in the event of an error to less than 14 mA, and an EMC filter prevents malfunctions in the case of electromagnetic interference. Intrinsically safe versions are available for this device too. EEx ia and EEx ib.

Fast and error-free parameterization

SITRANS T3K PA fits in the connection head type B with raised cover. Parameterization is performed with the user-friendly software package SIMATIC PDM.

Application

The SITRANS T3K PA temperature transmitter can be used in all branches. The following sensors/signal sources can be connected via its universal input module:

- Resistance thermometer
- Thermocouple
- Resistance-based sensors/potentiometers
- DC voltage sources.

The useful data are provided on PROFIBUS PA.

SITRANS T3K PA with the "Non-incendive" type of protection can be mounted within potentially explosive atmospheres (zone 2).

SITRANS T3K PA with the "Intrinsically safe" type of protection can be mounted within potentially explosive atmospheres (zone 1) and used for feeding sensors in zone 0. The conformity declarations comply with the European standard (ATEX) or with the American standard (FM).

Features

- Temperature transmitters with bus connection according to DIN 61158-2 and EN 50170, part 4
- Data transmission and transmitter supply via common bus link
- Assembly in connection head type B (or larger, DIN 43729) with raised cover
- Can communicate via PROFIBUS PA (profile B, version 3.0); sensor, measuring range and much more can therefore be programmed.
- Quality data for the measured values: Status and limit values
- Fixed bus current limiting in the event of an error
- Electrical isolation (test voltage 500 V AC)
- Intrinsically safe version for use in potentially explosive areas

Mode of operation

The signal supplied by a resistance-based sensor (two, three or four-wire circuit) or thermocouple element is amplified in the input stage. The voltage proportional to the input variable is then converted into digital signals by the analog/digital converter (1).

The microprocessor (2) converts the digital signals in accordance with the sensor characteristic. Furthermore, the microprocessor interprets the bus commands, initiates device-internal actions and provides electrically-isolated measured values, status and device data on the bus.

Integrated device protection functions:

- Electrical current limiting: avoids bus overloading in the event of a fault. The data traffic of the other, correctly operating nodes is maintained.
- Reverse polarity protection: allows the bus lines to be connected as required
- EMC filter: Prevents malfunctions in the case of electromagnetic interference

Parameterization

Communication via PROFIBUS PA interface

The parameterization of SITRANS T3K PA is performed by a master with the help of signals which are transmitted through PROFIBUS DP. These signals are converted by a SIMATIC DP/PA coupler with power supply (5, 6) into a signal for PROFIBUS PA. A bus terminator is required for cable lengths over 2 m. SIMATIC PDM is preferably used as parameterization software.
Technical specifications

### Input
- **Selectable filters to suppress the line frequency**: Selectable for 50/60 Hz (also 10 Hz for special applications)

### Resistance thermometer
- **Measured variable**: Temperature
- **Measured range**: Depending on type of connected sensor (defined sensor range)
- **Sensor type**
  - Acc. to DIN IEC 751, DIN 43760, JIS C 1604-97, BS 1904
  - Pt10, Pt50, Pt100, Pt200, Pt1000
  - Acc. to JIS C 1604-81 Pt10, Pt50, Pt100
  - Acc. to DIN 43760 Ni50, Ni100, Ni120, Ni1000

### Voltage measurement
- **Type of connection**: Standard (logic channel 1), generation of average value or difference (of 2 channels)
- **Sensor current**: ≤ 0.55 mA

### Resistance-based sensors
- **Measured variable**: Ohmic impedance
- **Measured range**: 9 resistance measuring ranges can be selected:
  - 0 ... 24 Ω
  - 0 ... 47 Ω
  - 0 ... 94 Ω
  - 0 ... 188 Ω
  - 0 ... 375 Ω
  - 0 ... 750 Ω
  - 0 ... 1500 Ω
  - 0 ... 3000 Ω
  - 0 ... 6000 Ω
- **Sensor type**: Linear: 1 resistance-based sensor in two, three or four-wire circuit

### Thermocouple elements
- **Measured variable**: Temperature
- **Measured range**: Depending on type of connected sensor (defined sensor range)
- **Sensor type**
  - Type B: Pt30Rh-Pt6Rh (DIN IEC 584)
  - Type C: W5-Re (ASTM 988)
  - Type D: W3-Re (ASTM 988)
  - Type E: NiCr-CuNi (DIN IEC 584)
  - Type J: Fe-CuNi (DIN IEC 584)
  - Type K: NiCr-Ni (DIN IEC 584)
  - Type L: Fe-CuNi (DIN 43710)
  - Type N: NiCrSi-NiSi (DIN IEC 584)
  - Type R: Pt13Rh-Pt (DIN IEC 584)
  - Type S: Pt10Rh-Pt (DIN IEC 584)
  - Type T: Cu-CuNi (DIN 43710)
  - Type U: Cu-CuNi (DIN 43710)

### Voltage measurement
- **Type of connection**: Standard with 1 thermocouple with cold junction compensation (logic channel 1) or generation of difference or average value
- **Cold junction compensation**: Type specification for
  - No compensation (2 channels)
  - Internal acquisition with integrated or external sensor: a manufacturer-specific PA parameter must be set for the "external sensor" case (default value: internal sensor)
  - Externally specified cold junction temperature can be set as a fixed value
  - mV Sensor
- **Measured variable**: DC voltage
- **Measured range**: 7 voltage measuring ranges can be selected:
  - -1 ... +16 mV
  - -3 ... +32 mV
  - -7 ... +65 mV
  - -15 ... +131 mV
  - -31 ... +262 mV
  - -63 ... +525 mV
  - -120 ... +1000 mV
- **Sensor type**: Linear
- **Voltage measurement**: Voltage-linear
- **Type of connection**: Normal connection with 1 mV sensor (logic channel 1)
- **Overload capacity of the input**: max. 3.5 mV
- **Input resistance**: ≥ 1 MΩ
- **Sensor current**: 180 µA

### Output
- **Bus voltage**: 9 ... 32 V (without Ex protection)
- **Active internal inductance**: L ≤ 10 nH (acc. to FISCO model)
- **Active internal capacitance**: C ≤ 5 nF (acc. to FISCO model)
- **Device profile**: PROFIBUS PA profile B, version 3.0, more than 200 parameters
- **Device address**: 126 when delivered
- **Communication**: Four connections to master class 2 are supported; automatic connection setup 60 s after break in communication; response time to master message typ. 10 ms

### Measuring accuracy
- **Influencing effects**
  - Error in the internal cold junction: < 0.25 °C (0.45 °F) ± 0.1%/10 °C (18 °F)
  - Temperature drift: ± 0.05%/10 °C (18 °F) FSR, 0.1% between -10 and +60 °C (14 and 140 °F)
  - Influence of the power supply on the span: < 0.005%/V FSR
  - Long-term drift: < 0.1%/year
SITRANS T measuring instruments for temperature
SITRANS T transmitters for mounting in sensor head

Measurement error

<table>
<thead>
<tr>
<th>Resistance thermometer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>IEC 751, DIN 43760, JIS C 1604-97, MS 1904</td>
</tr>
<tr>
<td>Pt10 DIN-IEC</td>
</tr>
<tr>
<td>Pt50 DIN-IEC</td>
</tr>
<tr>
<td>Pt100 DIN-IEC</td>
</tr>
<tr>
<td>Pt200 DIN-IEC</td>
</tr>
<tr>
<td>Pt500 DIN-IEC</td>
</tr>
<tr>
<td>Pt1000 DIN-IEC</td>
</tr>
<tr>
<td>JIS C 1604-81</td>
</tr>
<tr>
<td>Pt10</td>
</tr>
<tr>
<td>Pt50</td>
</tr>
<tr>
<td>Pt100</td>
</tr>
<tr>
<td>DIN 43 760</td>
</tr>
<tr>
<td>Ni50</td>
</tr>
<tr>
<td>Ni100</td>
</tr>
<tr>
<td>Ni120</td>
</tr>
<tr>
<td>Ni1000</td>
</tr>
</tbody>
</table>

Resistance-based sensors

<table>
<thead>
<tr>
<th>Input</th>
<th>Measured range</th>
<th>Max. parameterizable line resistance</th>
<th>Measurement error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ω</td>
<td>Ω</td>
<td>Ω</td>
</tr>
<tr>
<td>Resistance</td>
<td>0 ... 24</td>
<td>1.2</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>0 ... 47</td>
<td>2.35</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>0 ... 94</td>
<td>4.7</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>0 ... 188</td>
<td>9.4</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>0 ... 375</td>
<td>18.75</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>0 ... 750</td>
<td>37.5</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>0 ... 1500</td>
<td>75</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>0 ... 3000</td>
<td>150</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>0 ... 6000</td>
<td>300</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Thermocouple elements

<table>
<thead>
<tr>
<th>Input</th>
<th>Measured range</th>
<th>Measurement error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>°C (°F)</td>
<td>°C (°F)</td>
</tr>
<tr>
<td>Type B</td>
<td>100 ... +1820 (+212 ... +3308)</td>
<td>3 (5.4)</td>
</tr>
<tr>
<td>Type C</td>
<td>0 ... +2300 (+32 ... +4172)</td>
<td>2 (3.6)</td>
</tr>
<tr>
<td>Type D</td>
<td>0 ... +2300 (+32 ... +4172)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type E</td>
<td>-200 ... +1000 (-328 ... +1832)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type J</td>
<td>-210 ... +800 (-346 ... +1472)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type K</td>
<td>-200 ... +1372 (-328 ... +2502)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type L</td>
<td>-200 ... +900 (-328 ... +1652)</td>
<td>2 (3.6)</td>
</tr>
<tr>
<td>Type N</td>
<td>-200 ... +1300 (-328 ... +2372)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type R</td>
<td>-50 ... +1760 (-58 ... +3200)</td>
<td>2 (3.6)</td>
</tr>
<tr>
<td>Type S</td>
<td>-50 ... +1760 (-58 ... +3200)</td>
<td>2 (3.6)</td>
</tr>
<tr>
<td>Type T</td>
<td>-200 ... +400 (-328 ... +752)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type U</td>
<td>-200 ... +600 (-328 ... +1112)</td>
<td>2 (3.6)</td>
</tr>
</tbody>
</table>

1) Specified accuracy value refers to the largest error of the total measuring range.
SITRANS T measuring instruments for temperature
SITRANS T transmitters for mounting in sensor head

SITRANS T3K PA
with PROFIBUS PA connection

Voltage/current sources

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<tr>
<th>Input</th>
<th>Measuring range</th>
<th>Measurement error</th>
</tr>
</thead>
<tbody>
<tr>
<td>mV Sensor</td>
<td>-1 ... +16</td>
<td>10 µV</td>
</tr>
<tr>
<td></td>
<td>-3 ... +32</td>
<td>10 µV</td>
</tr>
<tr>
<td></td>
<td>-7 ... +65</td>
<td>10 µV</td>
</tr>
<tr>
<td></td>
<td>-15 ... +131</td>
<td>25 µV</td>
</tr>
<tr>
<td></td>
<td>-31 ... +262</td>
<td>50 µV</td>
</tr>
<tr>
<td></td>
<td>-63 ... +525</td>
<td>100 µV</td>
</tr>
<tr>
<td></td>
<td>-120 ... +1000</td>
<td>150 µV</td>
</tr>
</tbody>
</table>

Selection and Ordering data

Temperature transmitter
SITRANS T3K PA
with PROFIBUS PA for installation in the sensor head, with electrical isolation
(order instruction manual separately).

- without explosion protection  ➤  7NG3213-0NN00
- with explosion protection EEx ia/ib (ATEX) ➤ 7NG3213-1NN00
- with explosion protection (FM) intrinsic safety ➤ 7NG3213-3NN00

Further designs

Please add “Z” to Order No. and specify Order code(s) and plain text.

- Customer-specific setting of operating data  ➤ Y01

Accessories

Instruction manual for SITRANS T3K PA (German/English) ➤ C79000-B7174-C55
DIN rail adapter for head mounted transmitters (set of 5 pcs.) ➤ 7NG3092-8KA
SIMATIC PDM operating software see chapter 9
for additional PA components see catalog IK PI

► Available ex stock.

Dimensional drawings

Mounting on DIN rail

Mounting of transmitter on DIN rail, schematic diagram

DIN rail adaptor, dimensions in mm (inch)

Schematics

Connection diagram
SITRANS T measuring instruments for temperature
SITRANS T transmitters for mounting in sensor head

Sensor connection assignment

1) Important!
Fit short-circuit jumpers on site.
Overview

The SITRANS TH100 without electrical isolation and without universal sensor connection provides a low-cost alternative for Pt100 measurements.

For the parameterization, the SIPROM T software is used in combination with the modem for SITRANS TH100/TH200.

Its extremely compact design makes the SITRANS TH100 ideal for the retrofitting of measuring points or for the use of analog transmitters.

The transmitter is available as a non-Ex version as well as for use in potentially explosive atmospheres.

Benefits

- Two-wire transmitter
- Assembly in connection head type B (DIN 43729) or larger, or on a standard DIN rail
- Can be programmed, which means that the sensor connection, measuring range, etc. can also be programmed
- Intrinsically-safe version for use in potentially explosive areas

Function

Mode of operation

The measured signal supplied by a Pt100 resistance thermometer (2, 3 or 4-wire system) is amplified in the input stage. The voltage, which is proportional to the input variable, is then converted into digital signals by a multiplexer in an analog/digital converter.

They are converted in the microcontroller in accordance with the sensor characteristics and further parameters (measuring range, damping, ambient temperature etc.).

The signal prepared in this way is converted in a digital/analog converter into a load-independent direct current of 4 to 20 mA.

An EMC filter protects the input and output circuits against electromagnetic interferences.

Application

Used in conjunction with Pt100 resistance thermometers, the SITRANS TH100 transmitters are ideal for measuring temperatures in all industries. Due to its compact size it can be installed in the connection head type B (DIN 43729) or larger.

The output signal is a direct current from 4 to 20 mA that is proportional to the temperature.

Parameterization is implemented over the PC using the parameterization software SIPROM T and the modem for SITRANS TH100/TH200. If you already have a "modem for SITRANS TK" (Order No. 7NG3190-6KB), you can continue using this to parameterize the SITRANS TH100.

Transmitters of the "intrinsically-safe" type of protection can be installed within potentially explosive atmospheres. The devices comply with the Directive 94/9/EC (ATEX), as well as FM and CSA regulations.
### Technical specifications

**Input**
- **Resistance thermometer**
  - Measured variable: Temperature
  - Sensor type: PT100 to IEC 60751
  - Characteristic: Temperature-linear
  - Type of connection: 2, 3 or 4-wire circuit
  - Resolution: 14 bit
  - Measuring accuracy:
    - Span <250 °C (450 °F): < 0.25 °C (0.45 °F)
    - Span >250 °C (450 °F): < 0.1% of span
  - Repeatability: < 0.1 °C (0.18 °F)
  - Measuring current: approx. 0.4 mA
  - Measuring cycle: < 0.7 s
  - Range: -200 ... +850 °C (-328 ... +1562 °F)
  - Measured span: 25 ... 1050 °C (77 ... 1922 °F)
  - Unit: °C or °F
  - Offset: programmable: -100 ... +100 °C (-180 ... +180 °F)
  - Line resistance: Max. 20 Ω (total from feeder and return conductor)
  - Noise rejection: 50 and 60 Hz

**Output**
- **Output signal**: 4 ... 20 mA, two-wire
- **Power supply**: 8.5 ... 36 V DC (30 V for Ex)
- **Max. load**: \((U_{aux} - 8.5 V)/0.023 A\)
- **Overrange**: 3.6 ... 23 mA, continuously adjustable (default value: 3.84 ... 20.5 mA)
- **Error signal (in the event of sensor breakage)**: 3.6 ... 23 mA, continuously adjustable (default value: 3.6 mA or 22.8 mA)
- **Damping time**: 0 ... 30 s (default value: 0 s)
- **Protection**: Against reversed polarity
- **Resolution**: 12 bit
- **Accuracy at 23 °C (73.4 °F)**: < 0.1% of span
- **Temperature effect**: < 0.1%/10 °C (0.1%/18 °F)
- **Effect of auxiliary power**: < 0.01% of span/V
- **Effect of load impedance**: < 0.025% of max. span/100
- **Long-term drift**:
  - in the first month: < 0.025% of max. span
  - after one year: < 0.035% of max. span
  - after 5 years: < 0.05% of max. span
- **Ambient temperature**:
  - Temperature range: -40 ... +85 °C (-40 ... +185 °F)
  - Relative humidity: 98%, with condensation
- **Electromagnetic compatibility**: According to EN 61326 and NAMUR NE21

**Construction**
- **Approx. weight**: 50 g
- **Dimensions**: See dimension drawing
- **Material**: Molded plastic
- **Cross-section of cables**: Max. 2.5 mm² (AWG 13)
- **Degree of protection to EN 60529**:
  - Enclosure: IP40
  - Terminals: IP00

### Certificate and approvals

**Explosion protection ATEX**
- Intrinsically-safe type of protection
  - II 1G Ex ia IIC T6/T4
  - II 2(1)G Ex ia ib IIC T6/T4
- „Operating equipment that is non-ignitable and has limited energy“ type of protection
  - EC type test certificate: PTB 05 ATEX 2049X

**Explosion protection to FM for USA and Canada (cFMUS)**
- FM approval: PID 3024169
  - IS CI I, II, III, Div 1, GP ABCDFG T4/T5/T6
  - NI CI I, II, III, Div 2, GP ABCDFG T4/T5/T6
  - CI I, ZN 2, GP IEC T4/T5/T6

### Software requirements for SIPROM T

**PC operating system**: Windows ME, 2000 and XP; also Windows 95, 98 and 98SE, but only in connection with RS-232 modem.

**Factory setting**:
- Pt100 (IEC 751) with three-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Error signal in the event of sensor breakage: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

### Selection and Ordering data

<table>
<thead>
<tr>
<th>Order-No.</th>
<th>Further designs</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Order code</td>
</tr>
</tbody>
</table>
|            | "Operating equipment that is non-ignitable and has limited energy“ type of protection
  - II 1G Ex ia IIC T6/T4
  - II 2(1)G Ex ia ib IIC T6/T4
- „Operating equipment that is non-ignitable and has limited energy“ type of protection
  - EC type test certificate: PTB 05 ATEX 2049X

**SITRANS TH100 temperature transmitters for Pt100**
For installation in the connection head, Type B (DIN 43729)
- Two-wire system 4 ... 20 mA, programmable, without electrical isolation
- Not explosion-proof
- With explosion protection, “Intrinsic safety” and for zone 2
  - to ATEX
  - to FM (cFMUS)

**Order code**
- 7NG3211-0NN00
- 7NG3211-0AN00
- 7NG3211-0BN00

**Further designs**
- Customer-defined operating data
  - Test protocol (5 measuring points)
- Accessories
  - Modem for SITRANS TH100 and TH200 incl. SIPROM T parameterization software
    - with USB connection
    - with RS 232 connection
- CD for measuring instruments for temperature
  - With documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software
- DIN rail adapters for head transmitters
  - (Quantity delivered: 5 units)

**Available ex stock.**
Power supply units see "SITRANS I supply units and input isolators".
SITRANS T measuring instruments for temperature
SITRANS T transmitters for mounting in sensor head

SITRANS TH100, two-wire system (Pt100)

- **Dimensional drawings**

  ![Dimensional drawings](image)

  **SITRANS TH100, dimensions in mm (inch)**

- **Schematics**

  ![Schematics](image)

  **DIN rail adaptor, dimensions in mm (inch)**

  **SITRANS TH100, sensor connection assignment**
Overview

The smart solution - The transmitter SITRANS TH300 with the same capabilities as a SITRANS TH200 and a standardized HART interface.

This universal transmitter integrates your temperature measurement in the TIA concept (Totally Integrated Automation). This makes central engineering possible, bringing you time and cost benefits. SIMATIC PDM or another HART programming tool can be used for the configuration.

Benefits

- Two-wire transmitter
- Assembly in connection head type B (DIN 43729) or larger, or on a standard DIN rail
- Communication-capable (HART protocol rev. 5.9 for SITRANS TH300, proprietary protocol for SITRANS TH200); this enables programming of sensor connection, measuring range, etc.
- Electrically isolated
- Intrinsically-safe version for use in potentially explosive areas
- Two additional test pins for connection of a multimeter support the measurement of the current signal without interrupting the current loop
- Operational status indication (LED green or red)
- Special characteristic
- Diagnostic functions with SITRANS TH300 (slave pointer, operating hours counter, simulation)

Application

The SITRANS TH200 and SITRANS TH300 transmitters can be used in all industries. Due to their compact size they can be installed in the connection head type B (DIN 43729) or larger. The following sensors/signal sources can be connected over their universal input module:

- Resistance thermometer
- Thermocouple elements
- Resistance-based sensors/potentiometers
- DC voltage sources

The output signal is a direct current from 4 to 20 mA in accordance with the sensor characteristic.

Transmitters of the "Intrinsically-safe" type of protection can be installed within potentially explosive atmospheres (zone 0). The declarations of conformity comply with the IEC standard.

Function

Mode of operation

The signal output by a resistance-based sensor (two-wire, three-wire or four-wire system) or thermocouple is converted into a digital signal by an analog-to-digital converter. This is then evaluated in a microcontroller (C1), correct in accordance with the sensor characteristic and transmitted to the microcontroller (C2) over the electrical isolation. There, the analog output value is calculated, the function status is determined over LED, and the communication data are preprocessed. Over a digital/analog converter, the measured value is then converted to an output current of 4 to 20 mA. The power supply is located in the output signal circuit.

The SITRANS TH200 and SITRANS TH300 are parameterized and operated using a PC, which is connected to the two-wire system over a suitable interface module (SIPROM T modem or HART modem). A hand-held communicator can also be used to parameterize the SITRANS TH300. The signals required for communication according to the HART protocol rev. 5.9 are superimposed on the current signal in accordance with the FSK method (Frequency Shift Keying). The data specific to the transmitter and the data for parameterization are stored in two non-volatile memories (EEPROM).

Function diagram for SITRANS TH200 and SITRANS TH300
### Technical specifications

#### Input

**Resistance thermometer**
- **Measured variable**: Temperature
- **Sensor type**:
  - to IEC 60751: Pt25 ... Pt1000
  - to JIS C 1604; a=0.00392 K⁻¹: Pt25 ... Pt1000
  - to IEC 60751: Ni25 ... Ni1000
- **Special type**: Over special characteristic (max. 30 points)
  - **Sensor factor**: 0.25 ... 10 (adaptation of the basic type, e.g. Pt100 to version Pt25 ... Pt1000)
- **Units**: °C or °F

**Connection**
- **Standard connection**: 1 resistance thermometer (RTD) in 2-wire, 3-wire or 4-wire system
  - **Generation of average value**: 2 identical resistance thermometers in 2-wire system for generation of average temperature
  - **Generation of difference**: 2 identical resistance thermometers (RTD 1 - RTD 2 or RTD 2 - RTD 1)

**Interface**
- **Two-wire system**: Parameterizable line resistance 100 (loop resistance)
- **Three-wire system**: No balancing required
- **Four-wire system**: No balancing required
- **Response time**: ≤ 250 ms for 1 sensor with open-circuit monitoring

**Open-circuit monitoring** can be switched off
**Short-circuit monitoring** can be switched off (value is adjustable)

**Range** Parameterizable
- Max. 0 Ω ... 2200 Ω (see Table "Digital measuring errors")
- Min. measured span: 5 Ω ... 25 Ω (see Table "Digital measuring errors")

**Characteristic** Resistance-linear or special characteristic

#### Thermocouple elements

- **Measured variable**: Temperature
- **Sensor type (thermocouples)**:
  - Type B: Pt30Rh-Pt6Rh to DIN IEC 584
  - Type C: W5%-Re to ASTM 988
  - Type D: W3%-Re to ASTM 988
  - Type E: NiCr-CuNi to DIN IEC 584
  - Type J: Fe-CuNi to DIN IEC 584
  - Type K: NiCr-Ni to DIN IEC 584
  - Type L: NiCrSi-NiSi to DIN IEC 584
  - Type R: Pt13Rh-Pt to DIN IEC 584
  - Type S: Pt10Rh-Pt to DIN IEC 584
  - Type T: Cu-CuNi to DIN IEC 584
  - Type U: Cu-CuNi to DIN 43710
- **Units**: °C or °F

**Connection**
- **Standard connection**: 1 thermocouple (TC)
  - **Generation of average value**: 2 thermocouples (TC)
  - **Generation of difference**: 2 thermocouples (TC) TC1 - TC2 or TC2 - TC1

**Response time**: ≤ 250 ms for 1 sensor with open-circuit monitoring

**Cold junction compensation** can be switched off

**Range** Parameterizable (see table "Digital measuring errors")
- Min. measured span: Min. 50 ... 100 °C (90 ... 180 °F) (see table "Digital measuring errors")

**Characteristic** Temperature-linear or special characteristic

#### Resistance-based sensors

- **Measured variable**: Actual resistance
- **Sensor type**: Resistance-based, potentiometers
- **Units**: Ω

**Connection**
- **Normal connection**: 1 resistance-based sensor (R) in 2-wire, 3-wire or 4-wire system
- **Generation of average value**: 2 resistance-based sensors in 2-wire system for generation of average value
- **Generation of difference**: 2 resistance thermometers in 2-wire system (R1 - R2 or R2 - R1)

**Interface**
- **Two-wire system**: Parameterizable line resistance 100 (loop resistance)
- **Three-wire system**: No balancing required
- **Four-wire system**: No balancing required

**Sensor current**: ≤ 0.45mA
**Response time**: ≤ 250 ms for 1 sensor with open-circuit monitoring

**Open-circuit monitoring** can be switched off
**Short-circuit monitoring** can be switched off (value is adjustable)

**Range** Parameterizable
- Max. 0 Ω ... 1100 mV
- Min. measured span: 2 mV or 20 mV
SITRANS T measuring instruments for temperature
SITRANS T transmitters for mounting in sensor head

Factory setting:
- Pt100 (IEC 751) with three-wire circuit
- Measuring range: 0 ... 100 °C (32 ... 212 °F)
- Fault current: 22.8 mA
- Sensor offset: 0 °C (0 °F)
- Damping 0.0 s

Measuring accuracy
- Digital measuring errors: See Table "Digital measuring errors"
- Reference conditions:
  - Power supply: 24 V ± 1%
  - Load: 500
  - Storage temperature: 23 °C
  - Warming-up time: > 5 min
- Error in the analog output (digital/analog converter): < 0.1% of span
- Error due to internal cold junction: < 0.5 °C (0.9 °F)
- Temperature effect: < 0.1% der max. span/10°C (18 °F)
- Power supply effect: < 0.005% of span/V
- Effect of load impedance: < 0.012% of span/100 Ω
- Long-term drift:
  - in the first month: < 0.02% of max. span
  - after one year: < 0.03% of max. span
  - after 5 years: < 0.04% of max. span

Rated conditions
- Ambient temperature: -40 ... +85 °C (-40 ... 185 °F)
- Storage temperature: -40 ... +85 °C (-40 ... 185 °F)
- Relative humidity: < 98%, with condensation
- Electromagnetic compatibility: acc. to DIN EN 61326 and NE21

Construction
- Material: Molded plastic
- Approx. weight: 50 g (0.11 lb)
- Dimensions: See "Dimension drawings"
- Cross-section of cables: Max. 2.5 mm² (AWG 13)
- Degree of protection to EN 60529
  - Enclosure: IP40
  - Terminals: IP00

Measuring errors to IEC 60751

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Digital accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>To IEC 60751</td>
<td></td>
</tr>
<tr>
<td>Pt25</td>
<td>-200 ... + 850</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +1562)</td>
</tr>
<tr>
<td>Pi50</td>
<td>-200 ... + 850</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +1562)</td>
</tr>
<tr>
<td>Pt100 .. Pt200</td>
<td>-200 ... + 850</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +1562)</td>
</tr>
<tr>
<td>Pi500</td>
<td>-200 ... + 850</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +1562)</td>
</tr>
<tr>
<td>Pt1000</td>
<td>-200 ... + 350</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +662)</td>
</tr>
</tbody>
</table>

Measuring errors to JIS C1604-81

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Digital accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>To JIS C1604-81</td>
<td></td>
</tr>
<tr>
<td>Pt25</td>
<td>-200 ... + 649</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +1200)</td>
</tr>
<tr>
<td>Pt50</td>
<td>-200 ... + 649</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +1200)</td>
</tr>
<tr>
<td>Pt100 .. Pt200</td>
<td>-200 ... + 649</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +1200)</td>
</tr>
<tr>
<td>Pt500</td>
<td>-200 ... + 649</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +1200)</td>
</tr>
<tr>
<td>Pt1000</td>
<td>-200 ... + 350</td>
</tr>
<tr>
<td></td>
<td>(-328 ... +662)</td>
</tr>
<tr>
<td>Ni 25 .. Ni1000</td>
<td>-60 ... + 250</td>
</tr>
<tr>
<td></td>
<td>(-76 ... +482)</td>
</tr>
</tbody>
</table>

Input Range Min. measured span Digital accuracy

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
<td>0.2 (0.36)</td>
<td></td>
</tr>
<tr>
<td>-200</td>
<td>+ 350</td>
<td>0.15 (0.27)</td>
<td></td>
</tr>
<tr>
<td>-200</td>
<td>+ 1200</td>
<td>0.1 (0.18)</td>
<td></td>
</tr>
<tr>
<td>-200</td>
<td>+ 1200</td>
<td>0.15 (0.27)</td>
<td></td>
</tr>
<tr>
<td>-60</td>
<td>+ 250</td>
<td>0.1 (0.18)</td>
<td></td>
</tr>
</tbody>
</table>
SITRANS T measuring instruments for temperature

SITRANS T transmitters for mounting in sensor head

### Resistance-based sensors

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Min. measured span</th>
<th>Digital accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance</td>
<td>0 ... 390</td>
<td>5</td>
<td>0,05</td>
</tr>
<tr>
<td>Resistance</td>
<td>0 ... 2200</td>
<td>25</td>
<td>0,25</td>
</tr>
</tbody>
</table>

### Thermocouple elements

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Min. measured span</th>
<th>Digital accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type B</td>
<td>0 ... 1820 (^\circ)C (32 ... 3308 (^\circ)F)</td>
<td>100 (180)</td>
<td>2 (5.4)</td>
</tr>
<tr>
<td>Type C (W5)</td>
<td>0 ... 2300 (^\circ)C (32 ... 4172)</td>
<td>100 (180)</td>
<td>2 (3.6)</td>
</tr>
<tr>
<td>Type D (W3)</td>
<td>0 ... 2300 (^\circ)C (32 ... 4172)</td>
<td>100 (180)</td>
<td>2 (3.6)</td>
</tr>
<tr>
<td>Type E</td>
<td>-200 ... +1000 (^\circ)C (328 ... +1832)</td>
<td>50 (90)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type J</td>
<td>-210 ... +1200 (^\circ)C (346 ... +2192)</td>
<td>50 (90)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type K</td>
<td>-230 ... +1370 (^\circ)C (382 ... +2498)</td>
<td>50 (90)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type L</td>
<td>-200 ... +900 (^\circ)C (328 ... +1652)</td>
<td>50 (90)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type N</td>
<td>-200 ... +1300 (^\circ)C (328 ... +2372)</td>
<td>50 (90)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type R</td>
<td>-50 ... +1760 (^\circ)C (58 ... +3200)</td>
<td>100 (180)</td>
<td>2 (3.6)</td>
</tr>
<tr>
<td>Type S</td>
<td>-50 ... +1760 (^\circ)C (58 ... +3200)</td>
<td>100 (180)</td>
<td>2 (3.6)</td>
</tr>
<tr>
<td>Type T</td>
<td>-200 ... +400 (^\circ)C (328 ... +752)</td>
<td>40 (72)</td>
<td>1 (1.8)</td>
</tr>
<tr>
<td>Type U</td>
<td>-200 ... +600 (^\circ)C (328 ... +1112)</td>
<td>50 (90)</td>
<td>2 (3.6)</td>
</tr>
</tbody>
</table>

### mV Sensor

<table>
<thead>
<tr>
<th>Input</th>
<th>Range</th>
<th>Min. measured span</th>
<th>Digital accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>mV Sensor</td>
<td>-10 ... +70</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>mV Sensor</td>
<td>-100 ... +1100</td>
<td>20</td>
<td>400</td>
</tr>
</tbody>
</table>

The digital accuracy is the accuracy after the analog/digital conversion including linearization and calculation of the measured value.

An additional error is generated in the output current 4 to 20 mA as a result of the digital/analog conversion of 0.1% of the set span (digital-analog error).

The total error under reference conditions at the analog output is the sum from the digital error and the digital-analog error (poss. with the addition of cold junction errors in the case of thermocouple measurements).

### Selection and Ordering data

**Temperature transmitter SITRANS TH200**

For installation in connection head, type D (DIN 43729)

Two-wire system 4 ... 20 mA, programmable, with electrical isolation

- Not explosion-proof
- With explosion protection, "Intrinsic safety" and zone 2
- to ATEX
- to FM (cFM US)

**Temperature transmitter SITRANS TH300**

For installation in connection head, type D (DIN 43729)

Two-wire system 4 ... 20 mA, communication-capable acc. to HART, with electrical isolation

- Not explosion-proof
- With explosion protection; type of protection: "Intrinsic safety" and EEx n
- to ATEX
- to FM (cFM US)

### Further designs

Please add "-Z" to Order No. and specify Order code(s)

**Customer-specific setting of operating data (specify operating data in plain text)**

- With test protocol (5 measuring points)

**Order code**

- Y01
- C11

### Accessories

**Modem for SITRANS TH100 and TH200 incl. SIPROM T parameterization software**

- With USB connection
- With RS 232 connection

**CD for measuring instruments for temperature**

With documentation in German, English, French, Spanish, Italian, Portuguese and SIPROM T parameterization software

**HART modem**

- With RS 232 connection
- With USB connection

**SIMATIC PDM operating software**

**DIN rail adapters for head transmitters**

(Quantity delivered: 5 units)

- Available ex stock.

D) Subject to export regulations AL:N, ECCN: EAR99H.

Power supply units see "SITRANS I supply units and input isolators".
SITRANS T measuring instruments for temperature
SITRANS T transmitters for mounting in sensor head

**SITRANS TH200/TH300, two-wire system**

### Dimensional drawings

**Mounting on DIN rail**

SITRANS TH200/TH300, mounting of transmitter on DIN rail

DIN rail adaptor, dimensions in mm (inch)

SITRANS TH200/TH300, dimensions and pin assignment, dimensions in mm (inch)

1(+), and 2(-) Auxiliary power supply \( U_{aux} \), output current \( I_{out} \)
3, 4, 5 and 6 Pt100 sensor (for connections, see Sensor connection assignment)
Test (+), Test (-) Measurement of the output current with a multimeter

(1) Test terminal
(2) Mounting screw M4x28
(3) LED for operation indication
(4) Internal diameter of center hole 6.3 (0.25)
SITRANS T measuring instruments for temperature
SITRANS T transmitters for mounting in sensor head

SITRANS TH200/TH300, two-wire system

Schematics

<table>
<thead>
<tr>
<th>Resistance thermometer</th>
<th>Resistance</th>
<th>Thermocouple</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-wire system ¹)</td>
<td>Two-wire system ⁵)</td>
<td>Cold junction compensation</td>
</tr>
<tr>
<td>Three-wire system</td>
<td>Three-wire system</td>
<td>Internal/fixed value</td>
</tr>
<tr>
<td>Four-wire system</td>
<td>Four-wire system</td>
<td>Cold junction compensation with external Pt100 in two-wire system ¹)</td>
</tr>
<tr>
<td>Generation of average value / difference ¹)</td>
<td>Generation of average value / difference ¹)</td>
<td>Generation of average value / difference with internal cold junction compensation</td>
</tr>
</tbody>
</table>

¹) Programmable line resistance for the purpose of correction.

Voltage measurement

Current measurement

Connection of auxiliary power supply (Uaux)
Overview

The field transmitter for tough industrial duty

The temperature transmitter SITRANS TF works where others feel uncomfortable. These field transmitters are equipped namely with protection type IP68.

SITRANS TF comes in robust die-cast aluminium or in durable stainless steel. It converts signals from resistance thermometers, resistance-based sensors, thermocouples and voltage-based sensors into a load-independent direct current corresponding to the sensor characteristic. The offset mounted sensor prevents the transmitter from heating up at high temperature. Vibrations and oscillations due to long neck tubes and protective do not occur with SITRANS TF.

In the case of hard to reach measuring points you can mount the SITRANS TF in offset positions offering easy access and have the measured value shown on the freely programmable digital indicator.

The SITRANS TF can be used in a version without a transmitter as a user-friendly indicating device for all 4 to 20 mA signals. All versions of the SITRANS TF are also available in an intrinsically safe or flameproof design.

Application

SITRANS TF temperature transmitters with "Non incendive" type protection can be operated within potentially explosive atmospheres (zone 2).

SITRANS TF temperature transmitters with "Non incendive" or "Flame-proof enclosure" type protection can be operated within potentially explosive atmospheres (zone 1).

Function

The communication capability via the HART protocol V 5.7 of the SITRANS TF permits parameterization using a PC or HART communicator (hand-held communicator).

Parameterization is carried out using a PC for SITRANS TF with the integrated and programmable SITRANS TK.

The SITRANS TK-H transmitter is parameterized and operated using a PC (6) connected to the two-wire line via the interface module for SIPROM software (HART modem, 7). A hand-held communicator can also be used for this purpose. The signals needed for communication in conformity with the HART protocol V 5.7 are superimposed on the output current (4 to 20 mA). The power supply (5) is located in the output signal circuit.

The signal prepared in this way is converted in the digital/analog converter (4) into a load-independent direct current (4 to 20 mA). The signal supplied by a resistance-based sensor (two, three or four-wire circuit) or a thermocouple element is amplified in the input stage. The voltage proportional to the input variable is then converted into digital signals in the analog/digital converter (1). These signals are forwarded electrically isolated (2) to the microprocessor (3). They are converted there in accordance with the sensor characteristic and further parameters (damping, ambient temperature etc.).

Technical specifications

**Input**

- **Resistance thermometer**
  - Measured variable: Temperature
  - Sensor type:
    - Acc. to DIN IEC 751
    - Pt25 ... Pt1000
    - Acc. to JIS C 16044
    - Pt25 ... Pt1000
    - Acc. to DIN IEC 75
    - Ni25 ... Ni1000
    - Cu25 ... Cu1000

- **Voltage measurement**
  - Temperature-linear
  - Type of connection: 2, 3 or 4-wire circuit
  - Resistance-based sensors
    - Measured variable: Ohmic impedance
    - Measuring range limits: 2200 Ω
    - Voltage measurement: Resistance-linear or programmable (TK)
    - Type of connection: 2, 3 or 4-wire circuit
### SITRANS T measuring instruments for temperature

#### SITRANS T transmitter for field mounting / field indicator

**Thermocouple elements**

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>Temperature</th>
</tr>
</thead>
</table>

**Sensor type**

- Acc. to DIN IEC 584-1: Type B, E, J, K, N, R, S, T
- Acc. to DIN 43710: Type L, U
- Acc. to ASTM 988: Type C, D

**Voltage measurement**

Temperature-linear

**Cold junction compensation**

Internal, external with Pt100 or external with a fixed value

**mV Sensor**

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>DC voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range limits</td>
<td>1100 mV</td>
</tr>
<tr>
<td>Voltage measurement</td>
<td>Voltage-linear or programmable (TK)</td>
</tr>
<tr>
<td>Overload capacity of the input</td>
<td>-0.5 ... +35 V DC</td>
</tr>
<tr>
<td>Input resistance</td>
<td>≥ 1 MΩ</td>
</tr>
</tbody>
</table>

**Output**

| Output signal | 4 ... 20 mA, 2-wire |
| Communication for SITRANS TK-H | Acc. to HART V 5.x |

**Measuring accuracy**

Digital measuring errors: See "Digital measuring errors"

- Error in the analog output: < 0.1% of span
- Error in the internal cold junction: < 0.5 K (0.9 °F)
- Temperature drift: ±0.01%/°C (0.0056%/°F), typ. ±0.003%/°C (0.0016%/°F)
- Influence of the power supply on the span and zero point: < 0.005% of span/V
- Long-term drift: < 0.03% in first month

**Rated conditions**

**Ambient conditions**

- Ambient temperature: -40 ... +85 °C (-40 ... +185 °F)
- Condensation: Permissible

**Electromagnetic compatibility**

- Interference immunity: According to EN 50 082-2 and NAMUR NE21
- Emitted interference: According to EN 50 081-2

**Degree of protection to EN 60 529**

| IP68 |

**Design**

<table>
<thead>
<tr>
<th>Weight</th>
<th>Approx. 1.5 kg (3.3 lb) (without options)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>see &quot;Dimension drawings&quot;</td>
</tr>
<tr>
<td>Enclosure material</td>
<td>Die-cast aluminum, low in copper, GD-AISI 12, polyester-based lacquer, stainless steel rating plate</td>
</tr>
<tr>
<td>Electrical connection, sensor connection</td>
<td>Screw terminals, cable inlet via M20 x 1.5 or ½-14 NPT threaded gland</td>
</tr>
<tr>
<td>Mounting bracket (optional)</td>
<td>Steel, galvanized and chrome-plated or stainless steel</td>
</tr>
<tr>
<td>Digital display (optional)</td>
<td>In current loop</td>
</tr>
<tr>
<td>Display</td>
<td>Max. 5 digits</td>
</tr>
<tr>
<td>Display range</td>
<td>-99 999 ... + 99 999</td>
</tr>
<tr>
<td>Units</td>
<td>Any</td>
</tr>
<tr>
<td>Setting: Zero point, upper range value and unit</td>
<td>With 3 keys</td>
</tr>
</tbody>
</table>

**Power supply**

<table>
<thead>
<tr>
<th>Without digital display</th>
<th>6.5 ... 35 V DC (28 V for EEx ia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For SITRANS TK-H</td>
<td>12 ... 35 V DC (28 V for EEx ia)</td>
</tr>
<tr>
<td>With digital display</td>
<td>9.3 ... 35 V DC (28 V for EEx ia)</td>
</tr>
<tr>
<td>For SITRANS TK-H</td>
<td>14.8 ... 35 V DC (28 V for EEx ia)</td>
</tr>
</tbody>
</table>

**Electrical isolation**

- Between input and output

**Test voltage**

\[ U_{\text{test}} = 3.75 \text{ kV}, 50 \text{ Hz}, 1 \text{ min} \]

**Insulation**

| 500 V AC |

**Certificate and approvals**

**Explosion protection ATEX**

- "Intrinsic. safe" type of protection
- EC-Type Examination Certificate ZELM 99 ATEX 0007
- "Flame-proof enclosure" type of protection
- EC-Type Examination Certificate CESI 99 ATEX 079

**Explosion protection (German Technical Inspectorate)**

- Ex tested for zone 2n
- Conformity statement: In preparation
- Explosion protection to FM Certificate of Compliance 3017742
- Identification (XP, DIP, NI, S)
  - XP / I / 1 / BCD / T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F), Type 4X
  - DIP / II, III / 1 / EFG / T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F), Type 4X
  - NI / I / 2 / ABCD / T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F), Type 4X
  - S / II, III / 2 / FG / T5 Ta = 85 °C (185 °F), T6 Ta = 50 °C (112 °F), Type 4X

**Hardware and software requirements for the parameterization software SIPROM TK for SITRANS TK**

**Personal computer**

- CPU of type 486 upwards, compatible with industrial standard
- 3.5" diskette drive
- Hard disk with 5 MB vacant space
- min. 4 MB RAM
- VGA graphics adapter (or compatible) with at least 16 colors
- One vacant serial port
- Mouse or compatible pointing device and printer (recommended)

**PC operating system**

MS-DOS V 5.0 upwards, MS-Windows V 3.1 upwards

**SIMATIC PDM for SITRANS TK-H**

- see Chapter 9

**Communication**

- Load for HART connection 230 ... 1100 Ω
- Two-core shielded: ≤ 3.0 km (1.86 mi)
- Multi-core shielded: ≤ 1.5 km (0.93 mi)
- Protocol: HART protocol, version 5.x

**Factory setting (transmitter):**

- Pt100 (IEC 751) with three-wire circuit
- Measuring range: 0 ... 100 °C
- Output with sensor breakage: 23 mA
Digital measuring errors

<table>
<thead>
<tr>
<th>Input</th>
<th>Measured range</th>
<th>Min. measured span</th>
<th>Digital accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance</td>
<td>0 ... 390</td>
<td>5</td>
<td>0.05</td>
</tr>
<tr>
<td>Resistance</td>
<td>0 ... 2200</td>
<td>25</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Resistance thermometer

<table>
<thead>
<tr>
<th>Input</th>
<th>Measured range</th>
<th>Min. measured span</th>
<th>Digital accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt25 ... Pt500</td>
<td>-200 ... +850</td>
<td>10 (18)</td>
<td>0.1 (0.18)</td>
</tr>
<tr>
<td>Pt501 ... Pt1000 IEC</td>
<td>-200 ... +350</td>
<td>10 (18)</td>
<td>0.1 (0.18)</td>
</tr>
<tr>
<td>Ni25 ... Ni1000</td>
<td>-50 ... +250</td>
<td>10 (18)</td>
<td>0.1 (0.18)</td>
</tr>
<tr>
<td>Cu25 ... Cu1000</td>
<td>-50 ... +250</td>
<td>10 (18)</td>
<td>0.1 (0.18)</td>
</tr>
</tbody>
</table>

Voltage source

<table>
<thead>
<tr>
<th>Input</th>
<th>Measured range</th>
<th>Min. measured span</th>
<th>Digital accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>mV Sensor</td>
<td>-10 ... +70</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>mV Sensor</td>
<td>-100 ... +1100</td>
<td>20</td>
<td>400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thermocouple elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Type B</td>
</tr>
<tr>
<td>Type C</td>
</tr>
<tr>
<td>Type D</td>
</tr>
<tr>
<td>Type E</td>
</tr>
<tr>
<td>Type J</td>
</tr>
<tr>
<td>Type K</td>
</tr>
<tr>
<td>Type L</td>
</tr>
<tr>
<td>Type N</td>
</tr>
<tr>
<td>Type R</td>
</tr>
<tr>
<td>Type S</td>
</tr>
<tr>
<td>Type T</td>
</tr>
<tr>
<td>Type U</td>
</tr>
</tbody>
</table>

Dimensional drawings

1. Sensor connection (screwed gland M20x1.5 or ¼-14 NPT)
2. Blanking plug
3. Electrical connection (screwed gland M20x1.5 or ¼-14 NPT)
4. Terminal side, output signal
5. Terminal side, sensor

Siemens FI 01 · 2007, US Edition
### Selection and Ordering data

#### Temperature transmitter in field housing

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7NG313...-AB...</td>
<td>Two-wire system 4 ... 20 mA, with electrical isolation, with instruction manual</td>
</tr>
</tbody>
</table>

#### Integrated transmitter

- SITRANS TK, programmable
  - without Ex protection
    - 10
  - with EEx ia
    - 11
  - total device SITRANS TF EEx d 1)
    - 14
  - total device SITRANS TF according to FM (XP, DIP, NI, S) 1)
    - 15
- SITRANS TK-H, communication capability according to HART V 5.x
  - without Ex protection
    - 20
  - with EEx ia
    - 21
  - total device SITRANS TF EEx d 1)
    - 24
  - total device SITRANS TF according to FM (XP, DIP, NI, S) 1)
    - 25

#### SITRANS TF field indicator

<table>
<thead>
<tr>
<th>Order No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7NG313...-AB...</td>
<td>with instruction manual</td>
</tr>
</tbody>
</table>

#### Housing

- die-cast aluminium
  - A
- stainless steel precision casting
  - E

#### Connections/cable inlet

- screwed glands M20x1.5
  - B
- screwed gland s ½-14 NPT
  - C

#### Digital indicator

- without
  - 0
- with
  - 1

#### Mounting bracket and securing parts

- without
  - 0
- made of steel
  - 1
- made of stainless steel
  - 2

#### Further designs

Please add “-Z” to Order No. and specify Order code(s) and plain text.

#### Inscription on measuring-point label

- measuring range (max. 27 characters)
  - Y22
- meas. point description (max. 16 char.)
  - Y23
- measuring-point text (max. 27 charac.)
  - Y24

#### Customer-specific setting of operating data

- Y01

---

### Accessories

- SIPROM TK parameterization software for SITRANS TK
  - German/English/French
  - 7NG3190-8KB

- Modem for SITRANS TK
  - 7NG3190-6KB

- Instruction Manual SITRANS TF
  - German/English (included in delivery)
  - A5E00046014

- SIMATIC PDM parameterization software also for SITRANS TK-H
  - see Chapter 9

- HART modem
  - with RS232 interface
    - 7MF4997-1DA
  - with USB interface
    - 7MF4997-1DB

- Mounting bracket and securing parts
  - made of steel for 7NG313...1..B..:
    - 7MF4997-1AC
  - made of steel for 7NG313...1..C..:
    - 7MF4997-1AB
  - made of stainless steel for 7NG313...1..B..:
    - 7MF4997-1AJ
  - made of stainless steel for 7NG313...1..C..:
    - 7MF4997-1AH

- Digital indicator 1)
  - 7MF4997-1BS

D) Subject to export regulations AL:N, ECCN: EAR99H.

Available ex stock.

Power supply units see “SITRANS I supply units and input isolators”.

1) Upgrading of devices with Ex protection is not possible

---

1) Without cable gland.
SITRANS T measuring instruments for temperature
SITRANS T transmitter for field mounting / field indicator

SITRANS TF
two-wire system

Schematics

Sensor connection assignment

Potentiometer

Resistance

Current measurement

Voltage measurement

**Note:**
Line resistance (per wire in the case of 3 or 4-wire connections)

- T > 600 °C (> 1112 °F): max. 10 Ω
- T < 600 °C (< 1112 °F): max. 30 Ω

1) Line resistance for compensation is programmable.
2) Resistance between start of resistance and sliding contact.
**Overview**

The temperature transmitter SITRANS TF2 integrates three elements in one device:
- a Pt100 resistance thermometer in a stainless steel protective tube,
- a stainless steel housing with a high degree of protection, and
- a built-in transmitter with LCD and three keys for parameterization.

It is used to indicate and monitor the temperature measured at the point of installation.

The SITRANS TF2 is available in an axial and a radial version.

**Benefits**

- Robust stainless steel housing with two connection versions
- High measuring accuracy
- Precise display with a resolution of 1/100 °C in the highest measuring range
- Measuring ranges from -50 to +200 °C (-58 ... +392 °F) parameterizable
- Customer-specific lengths and materials possible for the protective tube
- Stainless steel protective tube with high resistance to chemicals
- Signaling of limit violation in the LCD as well as with a red LED

**Application**

The SITRANS TF2 is used for indicating and monitoring a temperature variable at the point of installation. Applications are all process engineering branches, e.g.:
- Chemical industry
- Energy industry
- Long-distance heating
- Water supply
- Sewage works
- Food industry
- Steelworks and the cement industry
- Pharmaceutical industry
- Biotechnology

**Design**

The SITRANS TF2 has a stainless steel housing (diam. 80 mm) with protective glass. The stainless steel protective tube with screw socket contains the temperature sensor Pt100. By using stainless steel for the protective tube it displays high chemical resistance, which means that the temperature sensor is well protected against external effects.

The protective tube is supplied as standard in lengths of 170 mm or 260 mm; a customer-specific version is also possible. Similarly, the protective tube can be supplied in the material of the customer's choice.

At the rear of the housing is the electrical connection for the voltage supply using a current loop of 4 to 20 mA. The connection is made with plug connectors to EN 175301-803A.

At the front of the housing is the 5-digit display behind a glass cover. Underneath the display are the 3 keys for parameterizing the SITRANS TF2. Above the display are a green and a red LED for indicating the operating status.

The SITRANS TF2 is available in two versions (see "Dimensional drawings"):
- In the radial version (type A) the display is fitted in parallel with the protective tube. The display can be rotated by up to ±120° relative to the protective tube.
- In the axial version (type B) the display is at right angles to the protective tube. The display can be rotated by 360° relative to the protective tube.

**Function**

**Mode of operation**

The outside lying temperature sensor Pt100 is supplied with current from the constant current course $I_C$. A temperature-related voltage drop is thus created over the sensor.

The voltage drop is converted on the analog/digital converter (A/D) into a digital signal.

In the microcontroller ($\mu$C) the digital signal is linearized and evaluated in accordance with the data saved in the EEPROM. The processed data are shown in the display.

In addition the values are converted on the digital/analog converter (D/A) and the voltage/current transformer (U/I) into a temperature-linear current signal $I_A$ (4 to 20 mA).
**Display**

The SITRANS TF2 has a 5-digit display behind a glass cover. The following data are shown on the display:

- Measured temperature
- Unit (°C, °F, °R, or °K and mA or %)
- Limit violation, indicated by LED and arrow symbols in the display

**Settings**

The SITRANS TF2 is set using the 3 input keys behind the glass cover underneath the display.

The key ‘M’ is used to select the operating mode. Following modes of operation are available:

- Measured value
- Password
- Unit of measurement
- Start of scale and end
- Upper and lower limit value
- Offset
- Output current calibration
- Upper and lower current saturation limit
- Electrical damping

The other two keys are used to set the values in the individual operating modes.

**Monitoring**

Two LED indicators are fitted above the display to monitor the set range and the status:

- The green LED signals that the measured temperature lies within the set limits.
- The red LED lights up when the measured temperature lies outside the set limits and when there is an error.

**Technical specifications**

**Measuring principle**

Resistance thermometer Pt100 class B acc. to DIN IEC 751

**Input**

- Measured variable: Temperature
- Max. measuring range: -50 °C ... +200 °C (-58 ... +392 °F)
- Min. measured span: 50 K (90 °F)

**Output**

- Output signal: 4 ... 20 mA, 2-wire
- Lower current limit: min. 3.6 mA
- Upper current limit: max. 23 mA
- Output protected against: reversed polarity, overvoltage and short-circuiting
- max. load: \((U_{\text{H}} \cdot 12 \text{ V}) / 0.023 \text{ A}\)
- Voltage measurement: Temperature-linear

**Measuring accuracy**

Error in measurement at 23 °C ± 5 K (73.4 ± 9 °F)

- Measuring cycle time: ≤ 100 ms
- Temperature effect: < ± 0.15%/10 K (< ± 0.15%/18 °F)
- Power supply effect: < ± 0.01% of full-scale value / V
- Vibration influence: < ± 0.05%/g to 500 Hz in all directions (to IEC 68-2-64)

**Rated conditions**

<table>
<thead>
<tr>
<th>Ambient conditions</th>
<th>Ambient temperature: -25 ... +85 °C (-13 ... +185 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td>Temperature range for best readability: -10 ... +70 °C (14 ... 158 °F)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 ... +85 °C (-40 ... +185 °F)</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP65 to EN 60529</td>
</tr>
</tbody>
</table>

**Electromagnetic compatibility**

EN 61326/A2 Appendix A (2001)

<table>
<thead>
<tr>
<th>Displays and controls</th>
<th>Display: LCD, max. 5 digits, digit height 9 mm (0.354 inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution at max. measuring range: 0.01 °C (0.01 °F)</td>
<td></td>
</tr>
<tr>
<td>Decimal point: Freely parameterizable</td>
<td></td>
</tr>
<tr>
<td>Limit values: Freely parameterizable</td>
<td></td>
</tr>
<tr>
<td>Limit violation display: Red LED and message on LCD (↑ symbol / ↓ symbol in case of limit violation in upward / downward direction)</td>
<td></td>
</tr>
<tr>
<td>Parameterization: With 3 keys</td>
<td></td>
</tr>
<tr>
<td>Units: mA or % or Ω or physical variable: °C, °F, °R, K</td>
<td></td>
</tr>
<tr>
<td>Damping: Between 0.1 and 100 s (increment: 0.1 s) freely parameterizable</td>
<td></td>
</tr>
</tbody>
</table>

**Design**

- Weight: 0.7 kg (= 1.54 lb)
- Non-wetted parts materials:
  - Field housing: Diam. 80 mm (diam. 3.15 inch), stainless steel, mat. No. 1.4016
  - Cover: Stainless steel, mat. No. 14016 with glass
- Wetted parts materials:
  - Protective tube: To DIN 43772 form 8 (March 2000), diam. 14 x 1.5 mm (diam. 0.55 x 0.06 inch)
  - Material: Stainless steel (mat. No. 1.4571/316Ti)
  - Protective tube screw socket: G½B to DIN 3852-2 form A or ½"-14 NPT
  - Material: Stainless steel (mat. No. 1.4571/316Ti)
- Measuring insert: Length to fit the ordered protective tube, stainless steel
- Connection of display to the protective tube:
  - Radial (type A), can be swiveled by max. ±120° (α)
  - Axial (type B), can be swiveled by max. ±360°
- Length of the protective tube \((U_{\text{H}})\): see Ordering data
- Electrical connection: Using 2-pole plug connector made of plastic with M16x1.5-cable entry to EN 175301-803A or ½"-14 NPT

**Power supply**

- Terminal voltage on temperature transmitter \((U_{\text{H}})\): 12 ... 30 V DC
- Operating limits:
  - Pressure: max. 40 bar (580 psi)
SITRANS T measuring instruments for temperature
SITRANS T transmitter for field mounting with temperature sensor

SITRANS TF2
two-wire system

### Selection and ordering data

<table>
<thead>
<tr>
<th>Temperature transmitter SITRANS TF2, field device</th>
<th>Order No.</th>
<th>Order code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature transmitter SITRANS TF2, field device</td>
<td>7NG3140-0-</td>
<td>1 0 0 0 0 0</td>
</tr>
</tbody>
</table>

Temperature transmitter with LCD in stainless steel housing, degree of protection IP65, stainless steel protective tube, resistance thermometer with Pt100 sensor, measuring range -50 ... +200 °C (-58 ... +392 °F), local parameterization, output signal 4 ... 20 mA.

### Display / cable entry

- Radial version (type A), parallel to protective tube / M16x1.5
- Axial version (type B), at right angles to protective tube / M16x1.5
- Radial version (type A), parallel to protective tube / ½"-NPT
- Axial version (type B), at right angles to protective tube / ½"-NPT

### Process connection

- Connection shank G½B
- Connection shank ½"-14 NPT
- Other version (on request) add Order code and plain text: connection shank: ...

### Length of the protective tube (U₁)

- 170 mm (6.70 inch)
- 260 mm (10.24 inch)
- 4.5" (114 mm)
- 7.5" (190 mm)
- 10.5" (266 mm)
- Other version (on request) add Order code and plain text: length: ...

### Material of the protective tube

- Stainless steel (mat. No. 1.4571/316Ti)
- Other version (on request) add Order code and plain text: mat. No.: ...

Available ex stock

### Additional data

Add "Z" to Order No. and specify Order code and plain text
- Measuring range to be set Y01: .......................

### Schematics

SITRANS TF2, connection diagram

### Dimensional drawings

SITRANS TF2, dimensions in mm (inches)