Disclaimer of Liability
We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Siemens AG 1999
Technical data subject to change.

Haftungsausschluss

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Technische Änderungen bleiben vorbehalten
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Classification of Safety Related Notices

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:

⚠️ **DANGER**
indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠️ **WARNING**
indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠️ **CAUTION**
used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

⚠️ **CAUTION**
used without safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

**NOTICE**
indicates a potential situation which, if not avoided, may result in an undesirable result or state.

**NOTE**
indicates a reference to a possible advantage when this recommendation is followed.
NOTE
These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency that may arise during installation, operation or maintenance. Should further information be desired or should particular problems arise that are not covered sufficiently for the Purchaser's purposes, the matter should be referred to the local Siemens Sales Office.
The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The Sales Contract contains the entire obligations of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

WARNING
This device may only be assembled and operated after qualified personnel has ensured, by providing suitable power supplies, that no hazardous voltages can get into the device in normal operation or in the event of a failure of the system or parts thereof. The device may be operated with high pressure and aggressive media. Therefore serious injuries and/or considerable material damage cannot be ruled out in the event of improper handling of the device. Trouble-free and reliable operation of this device is conditional upon the proper storage, installation and assembly as well as careful operation and maintenance.
Qualified person

For the purposes of this manual, a qualified person is one who is familiar with the installation, commissioning and operation of this equipment. In addition, the person must be:

- Trained and authorised to operate and service equipment/systems in accordance with established safety practices relating to electrical circuits, high pressures and aggressive media.
- Trained in the proper care and use of protective equipment in accordance with established safety practices.
- In the case of explosion-protected devices: trained or instructed or authorised to perform work on electrical circuits for explosion-protected systems.
- Trained in rendering first aid.

---

**NOTE**

The general regulations for system operating must be observed for operation and maintenance of the transmitter.

The contents reflect the technical state at the time of going to print.

Subject to technical modifications in the course of further development.

---

**Excluded Liability:**

The user is responsible for all changes made on the device, provided that these are not explicitly mentioned in the instruction manual.
1 Technical Description

1.1 Range of Application

The SITRANS T3K PA transmitter can be used in all branches. Its compact size enables it to be installed in the terminal housing with raised cover type B (DIN 43729) or higher. The following sensors/signal sources can be connected through its universal input module:

- Resistance thermometer
- Thermocouples
- Resistance based sensor/potentiometer
- DC voltage sources

The useful data – measured values with status as a quality specification and other parameters – are provided on the PROFIBUS-PA (see chapter 1.3.2, page 64 und chapter 7, page 104).

Transmitter in the version ”Ignition protection type non-incendive” can be mounted inside areas with an explosion hazard (zone 2). Transmitter in the ”intrinsically safe ignition protection type” can be mounted in areas with an explosion hazard (zone 1) and be used for feeding sensors at zone 0. The conformity declarations comply with the European standard (CENELEC).

1.2 Product features

- Transmitter with bus connection according to IEC 61158-2 and EN 50170, part 4
- Data transmission and transmitter supply via common bus link
- Installation in terminal housing type B with raised cover (DIN 43729) or higher
- Can communicate through PROFIBUS-PA (profile B, version 3.0); sensor, measuring range and much more can therefore be programmed.
- Quality data for the measured values: status with 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 Ex-area
1.3 PROFIBUS connection

The PROFIBUS (Process Field Bus) is an open communication system for automation technology. A detailed description of its properties can be found in chapter 7, page 104. The most important information for operation is listed below:

1.3.1 Setting the PROFIBUS address

The PROFIBUS address is set to 126 as standard. It can be set to another value by the parameter setting tool, e.g. SIMATIC PDM. The set PROFIBUS address may only be assigned once on the same bus system.

1.3.2 Useful data about PROFIBUS

Floating point representation of the measured value

<table>
<thead>
<tr>
<th>Bits</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bytes</td>
<td>VZ</td>
<td>2^7</td>
<td>2^6</td>
<td>E</td>
<td>2^5</td>
<td>2^4</td>
<td>2^3</td>
<td>2^2</td>
</tr>
<tr>
<td>2</td>
<td>E</td>
<td>2^0</td>
<td>2^-1</td>
<td>2^-2</td>
<td>M</td>
<td>2^-3</td>
<td>2^-4</td>
<td>2^-5</td>
</tr>
<tr>
<td>3</td>
<td>2^-8</td>
<td>2^-9</td>
<td>2^-10</td>
<td>M</td>
<td>2^-10</td>
<td>2^-12</td>
<td>2^-13</td>
<td>2^-14</td>
</tr>
<tr>
<td>4</td>
<td>2^-16</td>
<td>2^-17</td>
<td>2^-18</td>
<td>M</td>
<td>2^-19</td>
<td>2^-20</td>
<td>2^-21</td>
<td>2^-22</td>
</tr>
</tbody>
</table>

VZ: sign; 0 = positive, 1 = negative
M: Mantissa
E: Exponential

The useful data are continuously updated by the cyclic service of PROFIBUS. This is the measured value in SITRANS T3K PA. It can be a temperature, resistance or voltage value depending on the configuration. The measured value is divided into a floating point value (4 bytes) and the appropriate quality indicator (1 byte).
1.3.3 Status

The status provides information about the quality of the measured value (data according to PROFIBUS-PA General Requirements, see appendix 3, page 113 "Literature and Catalogs" /10/) and has the following structure:

<table>
<thead>
<tr>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Sub-status</td>
<td>Limit value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Quality** (bits 6 and 7), global information about order:
  - 0 = Poor
  - 1 = Uncertain
  - 2 = Good
  - 3 = Good (cascade) (not relevant for transmitters)

- **Sub-status**: Additional information on quality

- **Limit value** (bits 0 and 1)
  - 0 = Good
  - 1 = Lower limit reached, exceeded or at limited to lower limit value. This also includes short-circuit.
  - 2 = Upper limit reached, exceeded or limited to upper limit value. This also includes open circuit.
  - 3 = Value is fixed, no measured value
Different codings for the respective quality specification.

<table>
<thead>
<tr>
<th>Dec</th>
<th>Hex</th>
<th>Cause</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>04</td>
<td>Parameters do not match. Dynamic value is incorrect.</td>
<td>Check the parameters.</td>
</tr>
<tr>
<td>15</td>
<td>0F</td>
<td>Device error detected, e.g. memory error. The transmitter is switched</td>
<td>Change the transmitter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>off with certain memory errors.</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>10</td>
<td>Connected sensor shows error.</td>
<td>Check wiring and sensor.</td>
</tr>
<tr>
<td>17</td>
<td>11</td>
<td>Short-circuit detected.</td>
<td>Check wiring to sensor.</td>
</tr>
<tr>
<td>18</td>
<td>12</td>
<td>Open circuit or sensor break detected.</td>
<td>Check wiring and sensor.</td>
</tr>
<tr>
<td>31</td>
<td>1F</td>
<td>1) Transmitter out of order. Parameterizable equivalent value behavior.</td>
<td>2) Three cases can be selected: 1. Through connect parameterized equivalent value. 2. Hold last valid value (default value). 3. Through connect bad value/status</td>
</tr>
</tbody>
</table>

Table 1 Status coding for "Poor quality"
### Status coding for "Uncertain quality"

<table>
<thead>
<tr>
<th>Dec</th>
<th>Hex</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>68</td>
<td>44</td>
<td>The range has been changed and the transmitter supplies the last useful value.</td>
<td>Wait until the transition phase is over and then re-enter the measured value.</td>
</tr>
<tr>
<td>71</td>
<td>47</td>
<td>The new measured value is bad therefore the transmitter supplies the last valid value.</td>
<td>Check the measured value entry and the sensor connection.</td>
</tr>
<tr>
<td>75</td>
<td>48</td>
<td>The new measured value is bad therefore the transmitter supplies the parameterized equivalent value.</td>
<td>Check the measured value entry and the sensor connection.</td>
</tr>
<tr>
<td>79</td>
<td>4F</td>
<td>After switching on the power supply the transmitter supplies the parameterized equivalent value.</td>
<td>Reject the measured value in the user program if necessary.</td>
</tr>
<tr>
<td>81</td>
<td>51</td>
<td>The sensor’s measured value is inaccurate, value is below the sensor characteristic.</td>
<td>Check the parameterization and polarity of the sensor.</td>
</tr>
<tr>
<td>82</td>
<td>52</td>
<td>The sensor’s measured value is inaccurate, value above the sensor characteristic.</td>
<td>Check the parameterization and polarity of the sensor.</td>
</tr>
</tbody>
</table>

Table 2  Status coding for "Uncertain quality"
### Status coding for "Good quality"

<table>
<thead>
<tr>
<th>Dez</th>
<th>Hex</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>128</td>
<td>80</td>
<td>ok, normal operation</td>
<td>Now you can evaluate the measured values.</td>
</tr>
<tr>
<td>132</td>
<td>84</td>
<td>Display active block alarm: A parameter relevant to the behavior of the slave has been changed.</td>
<td>Wait with the evaluation of the measured values until the system has switched back on (display goes out after 10 seconds).</td>
</tr>
<tr>
<td>137</td>
<td>89</td>
<td>Dropped below warning limit</td>
<td>React in the user program</td>
</tr>
<tr>
<td>138</td>
<td>8A</td>
<td>Warning limit exceeded</td>
<td>React in the user program</td>
</tr>
<tr>
<td>141</td>
<td>8D</td>
<td>Dropped below alarm limit</td>
<td>React in the user program</td>
</tr>
<tr>
<td>142</td>
<td>8E</td>
<td>Alarm limit exceeded</td>
<td>React in the user program</td>
</tr>
</tbody>
</table>

Table 3  
Good quality specification

### 1.3.4 Diagnostics

A diagnostics message is sent in place of the classic measured value when a diagnostic comes or goes. The diagnostic can be read out on the master class 1 if the station is switched "online" (station is the hierarchical level below a project in the SIMATIC Manager, see appendix 3, page 113, "Literature and Catalogs" /2/):

- under module status
- in the DP-Slave diagnostics register

The SITRANS T3K PA supplies diagnostic data in the following form:

| Input (master view): diagnostics according to PROFIBUS-DP (DDLM_Slave_Diag) |
|-------------------------------|-------------------------------|
| Start address | Standard DP diagnostic | Status coding according to DP/V1 (quality indicator) |
| 0 | Station_status_1 | Diagnostic object of the physical block |
| 1 | Station_status_2 | |
| 2 | Station_status_3 | |
| 3 | Diag_Master_Add | |
| 4 | Ident_Number | |
| 5 | Ident_Number | |
| 6 | Header | |
| 7 | Status_Type | |
| 8 | Slot_Number | |
| 9 | Specifier 1) | |
| 10 | Diagnostic (0) | |
| 11 | Diagnostic (1) | |
| 12 | Diagnostic (2) | |
| 13 | Diagnostic (3) | |

1) Specifier:  
1: Error appears = Incoming event  
2: Error disappears = Outgoing event
The diagnostic object consists of 4 bytes. Only two bytes are relevant for SITRANS T3K PA. The two bytes have the following meaning:

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bit</th>
<th>Meaning when &quot;1&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Electronic temperature too high</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Measurement failure</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Memory error</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>–</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Byte</th>
<th>Bit</th>
<th>Meaning when &quot;1&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Configuration invalid</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Restart</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Coldstart</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Ident_Number violation = (GSD)</td>
</tr>
</tbody>
</table>

The basic English texts originate from the device data file (GSD, see appendix 2, page 111 "Device data file")

1.3.5 Acyclic services

Using the acyclic services you can read every readable parameter of the PROFIBUS profile or write every writable parameter with the appropriate access authorization.

The parameters of the PROFIBUS and its attributes (read and/or write) are listed in appendix 4, page 115 "PA profile table of SITRANS T3K PA".
1.4 Operation principle

The measuring signal supplied by a resistance based sensor (two, three or four wire connection), voltage based sensor or thermocouple is amplified in the input stage. The voltage proportional to the input variable is then converted into digital signals in an analog/digital converter. They are converted according to the sensor characteristic in the microprocessor. Furthermore, the microprocessor interprets the bus commands, initiates device-internal actions and provides measured values, status and device data by electrical isolation on the bus.

![Block diagram function of the SITRANS T3K PA](image)

The SITRANS T3K PA contains the following integrated device protection functions:

- Electrical current limiting:
  Avoids bus overloading in the event of a fault; the data traffic of the other, undisturbed users is maintained

- Reverse polarity protection:
  Enables any connection of the bus lines

- EMC filter:
  Prevents malfunctions in the case of electromagnetic interference
1.5 Technical Data

Input
Selectable filters for suppressing line frequencies
50/60 Hz (additional 10 Hz for special applications)

Resistance thermometer
Sensor type
Pt10, Pt50, Pt100, Pt200, Pt1000 (IEC 751, DIN 43760, JIS C 1604-97, BS 1904)
Pt10, Pt50, Pt100 (JIS C 1604-81):
Ni50, Ni100, Ni120, Ni1000 (DIN 43760)

Measuring type
Standard (logic channel 1),
Averaging connection or differentiating connection (of 2 channels)

Standard
1 resistance thermometer in two, three or four-wire circuit

Averaging connection
Averaging connection between two resistance thermometers in two-wire circuit,
parameterizable equivalent value behavior (e.g. the value of the other channel is output when the channel is defective)

Differentiating connection
Differentiating connection between two resistance thermometers in two-wire circuit, difference is parameterizable (e.g. channel 2 – channel 1).

Series or parallel circuit
Series or parallel circuiting of several resistance thermometers in two-wire circuit,
e.g. to adapt other transmitter types, is implemented as an additional function. This gives a scaling factor.

Adjustment at
Two-wire circuit
Line resistance parameterizable ≤ 5 % of the measuring range

Three-wire circuit
No adjustment necessary. The line resistances must be equal between the respective sensor connection and the appropriate connection on the transmitter.

Four-wire circuit
No adjustment necessary.

Sensor current
≤ 0.55 mA

Range limits
Depending on the connected sensor type (defined range of the sensor)
<table>
<thead>
<tr>
<th>Trimming range</th>
<th>Parameterizable for application within the measuring range program: Basis for the trimming functions (see chapter 3, page 88).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>Temperature linear</td>
</tr>
<tr>
<td><strong>Resistance based sensor</strong></td>
<td></td>
</tr>
<tr>
<td>Sensor type</td>
<td>Linear: 1 resistance based sensor in two, three or four-wire circuit</td>
</tr>
<tr>
<td>Measuring type</td>
<td>Standard (logic channel 1), averaging connection or differentiating connection (of 2 channels)</td>
</tr>
<tr>
<td>Standard</td>
<td>1 resistor in two, three or four-wire circuit</td>
</tr>
<tr>
<td>Averaging connection</td>
<td>Averaging connection between two resistors in two-wire circuit, parameterizable equivalent value behavior (e.g. the value of the other channel is output if the channel is defective)</td>
</tr>
<tr>
<td>Differentiating connection</td>
<td>Differentiating connection between two resistors in two-wire circuit, difference is parameterizable (e.g. channel 2 – channel 1)</td>
</tr>
<tr>
<td>Series or parallel circuit</td>
<td>Series or parallel circuit of several resistors in two-wire circuit, e.g. to adapt other transmitter types is implemented as an additional function. This gives a scaling factor.</td>
</tr>
<tr>
<td>Adjustment at</td>
<td></td>
</tr>
<tr>
<td>Two-wire circuit</td>
<td>Parameterizable line resistance ≤ 5 % of the measuring range</td>
</tr>
<tr>
<td>Three-wire circuit</td>
<td>No adjustment necessary. The line resistances between the respective sensor connection and the appropriate connection to the transmitter must be the same.</td>
</tr>
<tr>
<td>Four-wire circuit</td>
<td>No adjustment necessary.</td>
</tr>
<tr>
<td>Sensor current</td>
<td>≤ 0.55 mA</td>
</tr>
</tbody>
</table>
Input range
9 resistance ranges selectable:
0 to 24 Ω
0 to 47 Ω
0 to 94 Ω
0 to 188 Ω
0 to 375 Ω
0 to 750 Ω
0 to 1500 Ω
0 to 3000 Ω
0 to 6000 Ω (not for averaging connection or differentiating connection)

Characteristic
Resistance linear

Thermocouples
Sensor type
Thermopairs
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 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 T: Cu-CuNi      DIN 43710
Type U: Cu-CuNi      DIN 43710

Measuring type
Standard with 1 thermocouple with reference point compensation or differentiating or averaging connection value forming
Standard 1 thermocouple with or without reference point compensation.

Averaging connection
Averaging connection between the temperatures of two thermocouples. The equivalent value behavior is parameterizable (e.g. the value of the other channel is output when the channel is defective). The internal sensor is used for reference point compensation.

Differentiating connection
Differentiating connection between the temperatures of two thermocouples. The difference is parameterizable (e.g. channel 2 – channel 1). The internal sensor is used for reference point compensation.
### Reference point compensation

**Type specification**
- No compensation (2 channels)
- Internal acquisition with integrated or with external sensor: for the "external sensor" case a manufacturer-specific PA-parameter must be set (default value: internal sensor); see chapter 3.8, page 91.
- Externally specified reference point temperature can be set as a fixed value

<table>
<thead>
<tr>
<th>Measuring range</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depending on connected sensor type</td>
<td>Temperature linear</td>
</tr>
</tbody>
</table>

### Millivolt transmitter

**Sensor type**
- Linear

**Standard**
- 1 millivolt transmitter (logic channel 1)

**Input range**
- 7 voltage ranges selectable:
  - -1 to 16 mV
  - -3 to 32 mV
  - -7 to 65 mV
  - -15 to 131 mV
  - -31 to 262 mV
  - -63 to 525 mV
  - -120 to 1000 mV

**Overloadability of the input**
- max. 3.5 V

**Characteristic**
- Voltage linear

**Input resistance**
- ≥ 1 MΩ

**Sensor current**
- 180 μA

### Measuring accuracy

**Reference conditions**
- Power Supply: 15 V ± 1 %
- Ambient temperature: 23 °C
- Warming-up time: 1 h

**Measuring error**
- See Table 4, page 77
- Error in the internal reference point: < 0.5 °C ± 0.1 %/10 °C
- Temperature drift: ± 0.05 %/10 °C FSR, 0.1 % in the range from −10 °C to 60 °C
Influence of the power supply on the measuring span

Long-term drift

< 0.005 %/V FSR  
< 0.1 %/year

**General / Output**

**Power supply**

Bus-powered

**Bus voltage**

9 to 32 V (not Ex)

9 to 24 V for intrinsically safe operation (see Ex certificate);
active internal inductance < 10 nH according to FISCO model);
active internal capacitance < 10 nH (according to FISCO model)

**Current consumption of the device**

< 11 mA

**Maximum current increase in the event of an error**

$I_{\text{max}} \leq 3$ mA

**Communication**

Layer 1 and 2 according to PROFIBUS-PA, transmission technology according to IEC 61158-2, EN 50170, Part 2; Slave function; Layer 7 (protocol layer) according to PROFIBUS-DP, standard EN 50170 with the extended PROFIBUS functions (all data acyclic, setting value, feedbacks and status additionally cyclic)

**C2 connections**

Four connections to master class 2 are supported;
automatic connection setup 60 s after break in communication

**Device profile**

PROFIBUS-PA Profile B, Version 3.0; over 200 parameters

**Device address**

126 in as-delivered state

**Temperature units**

Celsius, Kelvin, Fahrenheit, Rankine
**Electrical isolation**

Input and output are electrically isolated

Test voltage

500 V$_{ac}$, 50 Hz, 1 min

**Ambient conditions**

Ambient temperature range

$-40 \, ^\circ C$ to $+85 \, ^\circ C$ in T4 (in intrinsically safe operation (T6): $-40 \, ^\circ C$ to $+60 \, ^\circ C$)

Storage temperature range

$-40 \, ^\circ C$ to $+95 \, ^\circ C$

Relative humidity

0 to 98% condensing

**Electromagnetic compatibility**

Resistance to interference

According to EN 50082-2 and Namur NE21

Spurious emission

According to EN 50081-1

**Explosion protection**

CENELEC

- Type of protection according to IEC 79-15

II 3G Ex nL II T4/T5/T6

EC type examination certificate

planned

- Type of protection according to ATEX regulation 94/9/EG

II(1)2G EEx ia IIB/IIC T4/T5/T6

EN 50014

II(1)2G EEx ib IIB/IIC T4/T5/T6

EN 50020

EC type examination certificate

ZELM 99 ATEX 0001

Li

See type examination certificate

Ci

See type examination certificate

FM

- Type of protection according to FM

IS/I/1/ABCD/T6, I/O/AEx ia /IIIC/T6,

NI/2/ABCD/T6

**Housing**

Material

Plastic PA6 (polyamide, cast GF 20)

Weight

250 g

Cross section of connection cables

Max. 2.5 mm$^2$
## Sensor types/measuring range/accuracy

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>Measuring range °C</th>
<th>Accuracy °C</th>
<th>max. permissible line resistance in Ω</th>
<th>Current at break detection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IEC 751</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt10 DIN-IEC</td>
<td>−200 to 850</td>
<td>1,5</td>
<td>2,35</td>
<td>LM 1)</td>
</tr>
<tr>
<td>Pt50 DIN-IEC</td>
<td>−200 to 850</td>
<td>0,3</td>
<td>9,4</td>
<td>LM</td>
</tr>
<tr>
<td>Pt100 DIN-IEC</td>
<td>−200 to 850</td>
<td>0,15</td>
<td>18,75</td>
<td>LM</td>
</tr>
<tr>
<td>Pt200 DIN-IEC</td>
<td>−200 to 850</td>
<td>0,3</td>
<td>37,5</td>
<td>LM</td>
</tr>
<tr>
<td>Pt500 DIN-IEC</td>
<td>−200 to 850</td>
<td>0,5</td>
<td>37,5</td>
<td>SM 2)</td>
</tr>
<tr>
<td>Pt1000 DIN-IEC</td>
<td>−200 to 850</td>
<td>0,5</td>
<td>300</td>
<td>SM</td>
</tr>
<tr>
<td><strong>JIS C 1604-81</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt10</td>
<td>−200 to 649</td>
<td>1,5</td>
<td>2,35</td>
<td>LM</td>
</tr>
<tr>
<td>Pt50</td>
<td>−200 to 649</td>
<td>0,3</td>
<td>9,4</td>
<td>LM</td>
</tr>
<tr>
<td>Pt100</td>
<td>−200 to 649</td>
<td>0,15</td>
<td>18,75</td>
<td>LM</td>
</tr>
<tr>
<td><strong>DIN 43760</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ni50</td>
<td>−60 to 250</td>
<td>0,15</td>
<td>9,4</td>
<td>LM</td>
</tr>
<tr>
<td>Ni100</td>
<td>−60 to 250</td>
<td>0,15</td>
<td>18,75</td>
<td>LM</td>
</tr>
<tr>
<td>Ni120</td>
<td>−60 to 250</td>
<td>0,15</td>
<td>18,75</td>
<td>LM</td>
</tr>
<tr>
<td>Ni1000</td>
<td>−60 to 250</td>
<td>0,15</td>
<td>150</td>
<td>SM</td>
</tr>
</tbody>
</table>

Table 4  Resistance thermometer

1) LM = Large measuring current
2) SM = Small measuring current
### Sensor type

<table>
<thead>
<tr>
<th>Sensor type (linear)</th>
<th>Set input range in Ω</th>
<th>Accuracy Ω</th>
<th>max. permissible line resistance in Ω</th>
<th>Current at break detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance</td>
<td>0 bis 24</td>
<td>0,04</td>
<td>1,2</td>
<td>LM ¹)</td>
</tr>
<tr>
<td></td>
<td>0 bis 47</td>
<td>0,03</td>
<td>2,35</td>
<td>LM</td>
</tr>
<tr>
<td></td>
<td>0 bis 94</td>
<td>0,03</td>
<td>4,7</td>
<td>LM</td>
</tr>
<tr>
<td></td>
<td>0 bis 188</td>
<td>0,04</td>
<td>9,4</td>
<td>LM</td>
</tr>
<tr>
<td></td>
<td>0 bis 375</td>
<td>0,05</td>
<td>18,75</td>
<td>LM</td>
</tr>
<tr>
<td></td>
<td>0 bis 750</td>
<td>0,1</td>
<td>37,5</td>
<td>LM</td>
</tr>
<tr>
<td></td>
<td>0 bis 1500</td>
<td>0,7</td>
<td>75</td>
<td>LM</td>
</tr>
<tr>
<td></td>
<td>0 bis 3000</td>
<td>0,4</td>
<td>150</td>
<td>SM ²)</td>
</tr>
<tr>
<td></td>
<td>0 bis 6000 *)</td>
<td>1,2</td>
<td>300</td>
<td>SM</td>
</tr>
</tbody>
</table>

*) Not for difference and averaging circuit

**Table 5** Resistance based sensor

### Sensor type

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>Measuring range °C</th>
<th>Accuracy °C *)</th>
<th>Current at break detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typ B</td>
<td>100 bis 1820</td>
<td>3</td>
<td>SM ²)</td>
</tr>
<tr>
<td>Typ C</td>
<td>0 bis 2300</td>
<td>2</td>
<td>SM</td>
</tr>
<tr>
<td>Typ D</td>
<td>0 bis 2300</td>
<td>1</td>
<td>SM</td>
</tr>
<tr>
<td>Typ E</td>
<td>−200 bis 1000</td>
<td>1</td>
<td>SM</td>
</tr>
<tr>
<td>Typ J</td>
<td>−210 bis 800</td>
<td>1</td>
<td>SM</td>
</tr>
<tr>
<td>Typ K</td>
<td>−200 bis 1372</td>
<td>1</td>
<td>SM</td>
</tr>
<tr>
<td>Typ N</td>
<td>−200 bis 1300</td>
<td>1</td>
<td>SM</td>
</tr>
<tr>
<td>Typ R</td>
<td>−50 bis 1760</td>
<td>2</td>
<td>SM</td>
</tr>
<tr>
<td>Typ S</td>
<td>−50 bis 1760</td>
<td>2</td>
<td>SM</td>
</tr>
<tr>
<td>Typ T</td>
<td>−200 bis 400</td>
<td>1</td>
<td>SM</td>
</tr>
<tr>
<td>Typ L</td>
<td>−200 bis 900</td>
<td>2</td>
<td>SM</td>
</tr>
<tr>
<td>Typ U</td>
<td>−200 bis 600</td>
<td>2</td>
<td>SM</td>
</tr>
</tbody>
</table>

*) Precision is relative to the largest error in the entire measuring range

**Table 6** Thermocouples

### Limits at break detection:

**Large measuring current (LM)**
- Break on 2000 to 3100 Ω
- Break out 1800 to 2700 Ω

**Small measuring current (SM)**
- Break on 10000 to 13000 Ω
- Break out 9000 to 12000 Ω

¹) LM = Large measuring current
²) SM = Small measuring current
### Sensor type and Setup input range in mV

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>Setup input range in mV</th>
<th>Accuracy/μV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millivolt transmitter (linear)</td>
<td>–1 to 16</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>–3 to 32</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>–7 to 65</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>–15 to 131</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>–31 to 262</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>–63 to 525</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>–120 to 1000</td>
<td>150</td>
</tr>
</tbody>
</table>

Table 7  Voltage based sensor

### 1.6 Ordering data

<table>
<thead>
<tr>
<th>Name</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITRANS T3K PA temperature transmitter with PROFIBUS-PA for installation in the terminal housing, with electrical isolation</td>
<td>7NG3213-0NN00</td>
</tr>
<tr>
<td></td>
<td>7NG3213-1NN00</td>
</tr>
<tr>
<td></td>
<td>on request</td>
</tr>
<tr>
<td></td>
<td>7NG3213-3NN00</td>
</tr>
<tr>
<td>Operating manual SITRANS T3K PA Language: German/English</td>
<td>C79000-B7174-C55</td>
</tr>
</tbody>
</table>

Other orderable PA components, see appendix 3, page 113 "Literature and Catalogs" /3/.  

---

*Instruction Manual 7NG3213 SITRANS T3K PA C79000-B7174-C55-03*  
79
1.7 Dimensions

![Diagram of dimensions and measurement](image)

- Width: 56 mm
- Height: 33 mm
- Depth: 34 mm
- Diameter: 60 mm
- Diameter of 4 mm

All dimensions in mm

Figure 2 Dimensions
2 Installation

2.1 Installation in terminal housing

The SITRANS T3K PA measuring instrument must be installed in an housing. The type of protection and material of the housing must be adapted to the respective requirements.

The ambient conditions specified in the technical data (chapter 1.5, page 71) must be observed.
Screws for fastening the measuring instrument are enclosed.
The SITRANS T3K PA is fastened in the raised cover of the terminal housing.

![Figure 3 Fastening of the SITRANS T3K PA measuring instrument in the raised cover of the terminal housing]

**WARNING**

The housing must have at least IP54 protection according to IEC 529 when installing the device in an Ex area.
Electrostatic charging of the transmitter must be avoided. Install the transmitter in a metal housing or in a plastic housing with a surface resistance of $<10^9 \, \Omega$.  

---

SITRANS T3K PA
C79000-B7174-C55-03
2.2 Electrical Connection

---

**WARNING**

- The valid national regulations must be observed for electrical installation, in hazardous areas in particular
  - the directive governing electrical installations in hazardous areas (Elex V)
  - the condition for erecting electrical installations in hazardous areas (DIN VDE 0165 or DIN EN 60079-14) and
  - the certificate of conformity
  - the EC patent certificate
  - the power supplied by the coupler exceeded the specified maximum in the EC patent certificate for the SITRANS T3K PA. If these values are accidentally exceeded, the device may no longer be connected to intrinsically safe circuits.

- Only the circuits approved in the certificate of conformity may be used for supplying power.

---

Connecting the sensor

see Figure 5, page 85 "Sensor pin assignment"

---

Power Supply

Connect the wires of the power supply to the “+” and “−” terminals (the device is reverse polarity protected).

---

The following generally applies for laying the bus cable:

- Use only shielded, two-wire cables
- Only use the recommended cable types
- Lay cable separately from cable with voltages > 60 V.
- Avoid the vicinity of large electrical installations.
- The specifications only apply for properly executed installations.
The electrical connection should be made as follows:

– The sensor pin assignment for the various connections (two, three and four-wire circuits, difference/averaging circuit) can be seen in Figure 5, page 85.
– The connection is made exclusively by screw type terminals.
– Open the cover of the measuring point
– Strip the connecting cable about 150 mm.
– Separate the shield from the wire pair.
– Place the shield in the cable gland on the housing.
– Feed pre-assembled cable through the cable gland.
– Connect stripped wire ends at the terminals 5 and 6 (any polarity).
– Tighten nut and cable gland.
– Close cover of the measuring point.

Figure 4   Electrical Connection

The bus must be equipped with a bus termination at both ends for error-free communication. At the end next to the control system this is already provided by the bus termination in the coupler or link providing this is not switched off. An additional termination must be fitted at the remote end of the bus.

WARNING

Only approved bus terminations, branchers, cables etc. may be used in intrinsically safe circuits.
The specified interference immunity and spurious emission are only guaranteed if the bus shield is fully effective. This includes the connecting of shields with the metallic terminals of the SITRANS T3K PA but also the laying of shields to the terminal boxes, distributors, DP/PA couplers or DP/PA link.

A suitable potential equalizer must be provided to avoid potential differences between the individual system parts and thus endangering or affecting the functioning. You will find hints for dimensioning and execution in DIN VDE 0100 Part 410 and Part 540.

DIN VDE 0165 of 2/91 must be observed when setting up electrical installations in hazardous areas. Further information on PROFIBUS installation are available in the PNO guide, see appendix 3, page 113 "Literature and Catalogs" /1/.
The measured value is applied at logic channel 1. In difference and averaging circuit the measured value calculation is determined by the measuring type (see section "Measuring type coding" on the next page). You can get the measured values of the single channels from the secondary variables channel 1 and 2.

1) **Attention !**

Fit short-circuit bridges on the system side on site.

Figure 5  Sensor pin assignment
**Thermocouples**

1) Determining the comparative temperature with built-in Pt100 or external reference temperature

![Diagram](image1)

1) Determining the comparative temperature with external Pt100; resistance programmable for line compensation

![Diagram](image2)

1) Difference/averaging circuit with internal comparative temperature

![Diagram](image3)

**Millivolt transmitter**

1) Two-wire circuit without line compensation

![Diagram](image4)

**Measuring type coding**

R1, RTD1 or TC1 are used for determining the secondary variable 1 (Channel 1). R2, RTD2 or TC2 is used for measuring secondary variable 2 (Channel 2).

<table>
<thead>
<tr>
<th>Measuring type</th>
<th>Measured value calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single channel</td>
<td>Channel 1</td>
</tr>
<tr>
<td>Diff 1*)</td>
<td>Channel 1 – Channel 2</td>
</tr>
<tr>
<td>Diff 2*)</td>
<td>Channel 2 – Channel 1</td>
</tr>
<tr>
<td>Average 1*)</td>
<td>$\frac{1}{2} \times (\text{Channel 1} + \text{Channel 2})$</td>
</tr>
<tr>
<td>Average 2*)</td>
<td>$\frac{1}{2} \times (\text{Channel 1} + \text{Channel 2})$, in the case of an error as equivalent value Channel 1 or Channel 2</td>
</tr>
</tbody>
</table>

*) Diff = Difference circuit
Average = Averaging circuit

The measured value is applied at logic channel 1. In difference and averaging circuit the measured value calculation is determined by the measuring type (see above section "Measuring type coding"). You can get the measured values of the single channels from the secondary variables.

1) **Attention !**

Fit short-circuit bridges on the system side on site.

Figure 5  Sensor pin assignment (continued)
Figure 6  Configuration for PROFIBUS-PA field device
3 Commissioning and parameterizable functions

The operating data of the measuring instrument must be set according to the requirements of the current measuring task.

The cover of the terminal housing is closed after connecting the sensor and the power supply. Then the power supply is switched on. On completing the preparations the measuring instrument starts operating after a warm-up time of about 3 seconds. The connection is now set up in a PA-device. The device must be addressed under its PROFIBUS address. See the SIMATIC PDM help function for setting of the address.

Make sure the device addresses are set before operating two or more field devices on the bus. Every address may only be assigned once so that the addresses are unique. An address range of 1 to 125 is possible in principle; address 126 is set in the as-delivered state. Usually the lower addresses are assigned to the masters in PROFIBUS systems. We therefore recommend you to start with address 30 for the device address assignment. The addresses are assigned with the SIMATIC PDM software via the bus. In this case a new device is always connected to the bus and the new address set with the PC tool (node baptism). Then the next device is connected to the bus and the procedure is repeated.

We recommend you to note the address on the device with a smear-prof pen.

3.1 Functions

The setting possibilities via SIMATIC PDM and the views of the results are listed below:

- **Identification**
  - Specifications on operating reliability:
    - Tag, description and message
  - Specifications for the device, among others
    - Product name, serial number and ordering information, SW and HW revision

- **Input**
  - Specifications on the measuring method:
    - Characteristic type (sensor type or linear), scaling factor, unit
Specifications on the measuring channel and activation
- Measuring type: Standard (channel 1), differentiating and averaging connection, offset, connection type (two, three or four-wire circuit), resistors for line compensation, additional specifications for the reference point in thermocouples, mains frequency filters
- Enable/disable open circuit and short-circuit test
- Measured value scale as interface to the output unit

• Output
  - Output calibration
    New definition of the output range for the application (related to the unit in the output signal)
  - Output signal
    Redefinition of the unit for the application, furthermore filter time constant for attenuation of the interference suppression, parameterizable failure behavior, e. g. set equivalent value.
  - Output limit values
    Setting the alarm and warning limits

• Settings by menus or methods
  - Factory reset: Resetting of the parameters to the ex-factory state.
  - Resistance measurement
  - Sensor trimming function with selectable trimming range within the measuring range limits
  - Simulation: The measurement value (primary variable) or the entire device including output part can be simulated here.

• Certificates and licenses
  Setting whether or not the measuring instrument is to be operated in intrinsically safe operation.

• View of the measured values and diagnostic
  - Register for measured values:
    Primary variable and secondary variable (main measured value and channel-related measured value) related to the parameter settings described in the "Input" section (see above).
  - Register for output value:
    Converted primary variable (main measured value and channel-related measured values) as described in section "Output". Measured value scaling and output scaling are performed. The output value including status is sent cyclically to the process control system.
  - Diagnostic:
    Diagnostic messages according to chapter 1.3.4, page 68.
3.2 Status on the measured value status

Sensor cables and electronic circuits of the measuring instrument are continuously monitored. The status information is adapted accordingly in the case of a fault (see chapter 1.3, page 64).

3.3 Open circuit monitoring with short-circuit monitoring

The test can be enabled (+ in the following table) or disabled (– in the following table) by a PA parameter which enables a channel-related check for open circuit and short-circuit.

The following combinations are possible:
(channel assignment see Figure 5, page 85)

<table>
<thead>
<tr>
<th>Parameter code</th>
<th>Channel 1</th>
<th>Channel 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Open circuit</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Short-circuit</td>
<td>+</td>
<td>–</td>
</tr>
</tbody>
</table>

+ Check enabled
– Check disabled

Note on open circuit check:

If there is a open circuit, no reference temperature of the internal sensor (electronic temperature) can be determined.

Note on short-circuit check:

3 Ω is used as a threshold value for the short-circuit check. A line resistance below 3 Ω is interpreted as a short-circuit insofar as no sensor resistance is available. There is no short-circuit check in thermocouples and millivolt transmitter.
3.4 Line adjustment

A line adjustment is necessary at the following measurements:

- Two-wire resistance thermometer or resistance based sensor
- Differentiating or averaging connection for resistance thermometer or resistance based sensor
- Thermocouple with external reference point with Pt100 in two-wire circuit

The adjustment is made by numeric setting of the measured line resistance (sum, feed and return line).

3.5 Line resistance

Depending on the circuit you can measure the line resistances on channel 1 and channel 2 or the line resistance to the external RTD (as a reference point to a thermocouple). To do this, you have to short-circuit the appropriate channels and activate the parameter for line resistance measuring.

The measured resistance values are obtained in the parameters for the line compensation. In addition you receive the result whether the measurement has been made correctly and the measured resistances have been entered.

3.6 Mains frequency filter

With this filter you can set an interference suppression of the mains frequencies of 50 or 60 Hz. 10 Hz can also be set as a special function.

3.7 Scaling factor

This factor is used for characteristic adaptation, e.g. in the serial and parallel circuiting of sensors or resistance based sensors. Values of 0.1 to 10.0 can be set for the scaling factor.

3.8 Reference selection for measuring by means of a thermocouple

Here you can select the connection type of the RTD as a reference point for a measurement using a thermocouple: use the built-in RTD or an external one which is necessary when the measuring point is remote from the SITRANS T3K PA.
3.9 Trimming range specification

With this parameter you can specify the application-specific range limits within the absolute limits which are specified by the sensor type. The new range limits form the basis for the trimming function to reduce the characteristic error.

3.10 Trimming function

With the aid of the trimming function you can reduce the number of errors based on the characteristic. If, for example you are working in the range from 0 °C to 100 °C, you can move the characteristic of the selected sensor into this range by placing the trimming points at the limits of the selected range (see chapter 3.9):

– Selection of the lower trimming point (e.g. at 0 °C) and input of the correction value
– Selection of the upper trimming point (e.g. at 100 °C) and input of the correction value
– Repeat the procedure for channel 2 when you use differentiating or averaging connections
4 Operation

4.1 Operation with PC/Laptop via interface

4.1.1 Operation with PC/Laptop

PC/Laptop equipment:

- IBM-compatible,
- RAM ≥ 16 MByte,
- Hard disk,
- VGA graphics
- Connection CP5411 or CP5511 or CP5611,
- Windows 95 or Windows NT, SIMATIC PDM, STEP7

See the SIMATIC PDM help functions for operating instructions.

4.1.2 Operation/control with control system

For the connection setup to the field devices the control system requires the device-specific device data file GSD. The files of the Siemens devices are already stored in the Siemens control system.

If the GSD is required for other systems, this can be called as follows:

- Either through the Interface Center in Fuerth
  Mailbox +49 911 737972 or +49 911 97350
- or through the Internet address
  http://www.ad.siemens.de/csi_e/gsd

The device data file GSD is also attached to this operating manual in appendix 2, page 111, "Device data file".
5 Maintenance

The measuring instrument is maintenance free.
6 Certificates

6.1 EC declaration of conformity

SIEMENS

EG-Konformitätserklärung
EC Declaration of Conformity

No. 798.00 – 5/99

Hersteller: Siemens AG

Anschrift: Ostliche Rheinbrückenstr. 50, 76187 Karlsruhe

Adresse: Bundesrepublik Deutschland

Produktbezeichnung: Sitrans T3K PA

Produktbezeichnung: 7NG3213-xNN00

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender Europäischer Richtlinien überein:
The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

89/336/EWG Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit

Die Konformität mit den Richtlinien wird nachgewiesen durch die Einhaltung folgender Normen:
Conformity to the Directives is assured through the application of the following standards:

<table>
<thead>
<tr>
<th>Reference number</th>
<th>Ausgabedatum</th>
<th>Referenznummer</th>
<th>Ausgabedatum</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 50081-1</td>
<td>März ’93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EN 50082-2</td>
<td>März ’95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Karlsruhe, den 29.04.1999

Siemens AG

Dr. Weschenfelder, Produktsegmentleiter

Gittler, Betriebssleiter

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusage von Eigenschaften.

The declaration attests to the conformity to the specified directives but contains no assurance of properties. The only documentation accompanying the product shall be considered in detail.
EG-Declaration of Conformity
No. T3K-Ex 1 / 99

Manufacturer
Siemens Aktiengesellschaft
Organization Automation and Drives (A&D)
Devision Process Automation and Instrumentation

Address
Siemensallee 84
76187 Karlsruhe
Bundesrepublik Deutschland

Product Designation
Transmitter SITRANS T3K PA 7NG3213-1NN00

The designated product complies with the stipulations of the following European regulations

94/9/EEC Parliamentary regulations for alignment of legal regulations of the member states for equipment and safety systems for proper use in hazardous locations

Further specifications on the compliance with this regulation are contained in the appendix Ex

Attachment on the CE mark: 5/99
Siemens Aktiengesellschaft
Karlsruhe, den 11.05.99

Dr. Wesschenfelder, Produktsegmentleiter
Gittler, Betriebsleiter

Name, Function Signature Name, Function Signature

The appendix Ex is part of the declaration.
The declaration certifies the compliance with the named regulations but is no guarantee of properties in the sense of the product liability laws.
The safety instructions in the enclosed product documentation must be observed.
Appendix Ex
EG Declaration of Conformity
No. T3K-Ex 1 / 99

Product Designation: Transmitter SITRANS T3K PA 7NG 3213-1NN00

The compliance of the designated product with the stipulations of the regulation 94/9/EEC is proven by the observance of the following European standards:

Standards:

Reference number | Date | Reference number |
--- | --- | ---
50 014 | 1997 | |
50 020 | 1994 | |

EC-Type-Examination Certificate no.: ZELM 99 ATEX 0001

Report no.: ZELM Ex 00599 18003

The technical documents are archived under the number:
6.2 EC-Type-Examination Certificate ZELM 99 ATEX 0001

Prüf- und Zertifizierungsstelle

ZELM Ex

(1) EC-TYPE-EXAMINATION CERTIFICATE
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - Directive 94/9/EC

(3) EC-TYPE-EXAMINATION CERTIFICATE Number:

ZELM 99 ATEX 0001

(4) Equipment: Transmitter for temperature SITRANS T3K PA type 7NG3213 – 1NN00

(5) Manufacturer: Siemens AG

(6) Address: D-76181 Karlsruhe

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Prüf- und Zertifizierungsstelle ZELM Ex, notified body No. 0820 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report ZELM Ex 00599918003.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50 014: 1997 EN 50 020: 1994

10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

11) This EC-type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.

12) The marking of the equipment shall include the following:

II 2 (1) G EEx ia IIB/IIC T6 bzw. EEx ib IIB/IIC T6

Zertifizierungsstelle ZELM Ex

Braunschweig, April 28, 1999

Dipl.-Ing. Harald Zelm

Sheet 1/3

EC-type-examination Certificates without signature and stamp shall not be valid. The certificates may be cancelled only without alteration. Extracts or alterations are subject to approval by the Prüf- und Zertifizierungsstelle ZELM Ex. In case of dispute, the German text shall prevail.

Prüf- und Zertifizierungsstelle ZELM Ex • Siekgraben 56 • D-38124 Braunschweig

SITRANS T3K PA
C79000-B7174-C55-03
Prüf- und Zertifizierungsstelle
ZELM Ex

SCHEDULE

EC-TYPE-EXAMINATION CERTIFICATE ZELM 99 ATEX 0001

Description of equipment
The transmitter for temperature SITRANS T3K PA is a transmitter for temperature with Profibus-PA-communication interface. The transmitter is used for the measurement and conversion of the input variables into a normalized output signal. Direct voltage signals, resistance and temperature are detected as measured variable by means of resistance thermometers, thermocouples, resistance-type sensors and voltage sensors.
The transmitter for temperature is determined to mounting on a metallic case or an plastic case with a surface resistance < 10³ Ω which at least achieves the degree of protection IP54 in accordance with EN 60529:1991.

the temperature ranges depending on the temperature class are to be taken from the following table.

<table>
<thead>
<tr>
<th>Lower ambient temperature limit</th>
<th>Upper ambient temperature limit</th>
<th>temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>-40 °C</td>
<td>+60 °C</td>
<td>T 6</td>
</tr>
<tr>
<td>-40 °C</td>
<td>+70 °C</td>
<td>T 5</td>
</tr>
<tr>
<td>-40 °C</td>
<td>+85 °C</td>
<td>T 4</td>
</tr>
</tbody>
</table>

Electrical data
Auxiliary power-/ output signal circuit (terminal clamps 5 and 6) type of protection Intrinsic Safety EEx ia IIa/IIB resp. EEx ib IIa/IIB for connection to certified intrinsically safe circuits (for example FISCO – supply unit) with the following max. values:

<table>
<thead>
<tr>
<th>FISCO-supply unit</th>
<th>linear barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_{\text{max}}$</td>
<td>17.5 V</td>
</tr>
<tr>
<td>$P_{\text{max}}$</td>
<td>24 V</td>
</tr>
</tbody>
</table>

effective internal capacitance: $C_i \leq 1.1 \text{ nF}$
effective internal inductance: $L_i \leq 5.5 \text{ µH}$

type of protection Intrinsic Safety EEx ia IIa/IIB resp. EEx ib IIa/IIB sensor circuit (terminal clamps 1, 2, 3 and 4) maximum values:

$U_o = 5.4 \text{ V}$
$I_o = 25 \text{ mA}$
$P_o = 33 \text{ mW}$

(linear output characteristic)

IIC bzw. IIB
max. permissible external inductance 50 mH 120 mH
max. permissible external capacitance 65 µF 1000 µF

Sheet 2/3

EC-type-examination Certificates without signature and stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Prüf- und Zertifizierungsstelle ZELM Ex.

In case of dispute, the German text shall prevail.

Prüf- und Zertifizierungsstelle ZELM Ex • Siekgraben 96 • D-38124 Braunschweig
SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE ZELM 99 ATEX 0001

resp.
only for connection to certified intrinsically safe circuits with the following maximum value:

\[ U_i = 2 \, \text{V} \]

or

electrical equipment in accordance with section 5.4 of the EN 50020

The effective internal inductance and capacitance are negligibly small.

The sensor circuit is safely electrically isolated from the auxiliary power-/output signal circuit up to the total voltage of 30 V.

(16) Report No. ZELM Ex 0059918003

(17) Special conditions for safe use
not applicable

(18) Essential Health and Safety Requirements
met by standards

Zertifizierungsstelle ZELM Ex

Braunschweig, April 26, 1999

Dipl.-Ing. Harald Zalm

---

EC-type-examination Certificates without signature and stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Prüf- und Zertifizierungsstelle ZELM Ex.

In case of dispute, the German text shall prevail.

Prüf- und Zertifizierungsstelle ZELM Ex • Siegraben 58 • D-38124 Braunschweig
6.3 Statements of conformity
- to follow -

6.4 FM Certificate

FACTORY MUTUAL RESEARCH
151 Boston-Providence Temple
P.O. Box 9107
Norwood, MA 02062 USA
T: 781 762 4399 F: 781 762 9173 www.fmglobal.com

CERTIFICATE OF COMPLIANCE
HAZARDOUS (CLASSIFIED) LOCATION ELECTRICAL EQUIPMENT

This certificate is issued for the following equipment:

**SITRANS T3K PA 7NG3213-3N000, Temperature Transmitter**
IS I I A ABCD/1S T°C = -40°C to 80°C; T5 T°C = -40°C to 70°C;
T4 T°C = -40°C to 85°C- A5E00089770A...01; Entity;
I O AEx ia IIC/1S T°C = -40°C to 60°C; T5 T°C = -40°C to 70°C;
T4 T°C = -40°C to 85°C- A5E00089770A...01; Entity;
NI I I I / A ABCD/1S T°C = -40°C to 60°C; T5 T°C = -40°C to 70°C;
T4 T°C = -40°C to 85°C- A5E00089770A...01

Input Entity Parameters:

<table>
<thead>
<tr>
<th>With Linear Supply</th>
<th>Vmax (V)</th>
<th>Imax (mA)</th>
<th>Pi (W)</th>
<th>Cl (nF)</th>
<th>L (µH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminals 5 (+) and 6 (-)</td>
<td>A/B</td>
<td>24</td>
<td>250</td>
<td>1.2</td>
<td>1.1</td>
</tr>
</tbody>
</table>

FISCO Entity Parameters:

<table>
<thead>
<tr>
<th>With Rectangular Supply</th>
<th>Vmax (V)</th>
<th>Imax (mA)</th>
<th>Pi (W)</th>
<th>Cl (nF)</th>
<th>L (µH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminals 5 (+) and 6 (-)</td>
<td>A/B</td>
<td>17.5</td>
<td>280</td>
<td>4.9</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Maximum Output Entity Parameters:

<table>
<thead>
<tr>
<th>With Groups</th>
<th>Voc (V)</th>
<th>Isc (mA)</th>
<th>Po (mW)</th>
<th>Ca (µF)</th>
<th>La (mH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminals 1, 2, 3, and 4</td>
<td>A/B</td>
<td>5.4</td>
<td>25</td>
<td>33</td>
<td>65</td>
</tr>
<tr>
<td>Terminals 1, 2, 3, and 4</td>
<td>Cl/D</td>
<td>5.4</td>
<td>25</td>
<td>33</td>
<td>1000</td>
</tr>
</tbody>
</table>

3005167
Page 1 of 3
Equipment Ratings:
Intrinsically Safe Class I, Division 1, Groups A, B, C, & D; Class I, Zone 0 & 1 AEx ia Group IIIC; and Nonincendive Class I, Division 2, Groups A, B, C, & D.

Special Condition of use:
1) Shall be installed within an enclosure meeting the requirements of ANSI/ISA S82.02.01 or other applicable ordinary location standards

Approved for:
Siemens AG
Ostliche Rheinbrueckenstrasse 50
D-76181 Karlsruhe, Germany
Factory Mutual Research

This certifies that the equipment described has been found to comply with the following Factory Mutual Research Approval Standards and other documents:

<table>
<thead>
<tr>
<th>Class</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>3600</td>
<td>1998</td>
</tr>
<tr>
<td>3310</td>
<td>1989</td>
</tr>
<tr>
<td>3610</td>
<td>1999</td>
</tr>
<tr>
<td>3611</td>
<td>1999</td>
</tr>
</tbody>
</table>

Original Approval Job Identification: 3005167 Approval Granted: December 4, 2000

Subsequent Revision Reports / Date Approval Amended

Factory Mutual Research Corporation

[Signature]
William Calder, Instrumentation Section Manager
Approvals Division

[Signature] Date

3005167
Page 3 of 3
7 PROFIBUS

The PROFIBUS-PA (PA = Process Automation) is a variant of the PROFIBUS DP (DP = Decentral Peripheral) which is widely used in manufacturing engineering.

The PROFIBUS (Process Field Bus) is an open communication system for automation engineering and is used in its thousands all over the world. It is specified in the European standard EN 50170.

7.1 Transmission technology

The PROFIBUS PA has a special transmission technology and therefore satisfies the requirements of process automation and manufacturing engineering. This transmission technology is defined in the international standard IEC 61158-2. The low transmission speed reduces the power loss in relation to the PROFIBUS-DP and therefore enables an intrinsically safe technique for use in hazardous areas.

7.2 Topology

The bus topology can largely be selected freely so that line, star and delta structures as well as mixtures of these are possible. All types of field devices such as measuring instruments, actuators, analyzers etc. can be connected.

The main advantage is in:

- saving of installation costs
- possibility of further diagnostics with increase in the availability of system parts
- possibility of automatic tracing of system documentation
- possibility of system optimization in operation

Several PROFIBUS PA channels are usually connected with the fast PROFIBUS-DP by coupling units in an automation system. The process control system is also connected to this.

Both bus systems use a common protocol layer. The PROFIBUS-PA is therefore a "communication-compatible" expansion of the PROFIBUS-DP in the field.
Figure 7 shows the section of a typical PROFIBUS automation system. The control system consists of two masters with distributed tasks.

The master class 1 looks after the control and regulation functions, master class 2 enables operating and monitoring functions. A cyclic exchange of measuring and setting data takes place between master 1 and the field devices. Parallel to these data the status data of the field devices are evaluated in master class 1. Parameterization of the field devices or reading of further device information does not take place in cyclic operation.

The information necessary for setting up communication is in the control system through the stored, device-specific device data file GSD (see appendix 2, page 111, "Device data file").

In addition to cyclic operation, one or more class 2 masters have acyclic access to the field devices. Further information can be obtained from the devices or settings made in the devices with this type of communication.
7.3 Properties of the PROFIBUS-PA

The PROFIBUS-PA enables bidirectional communication of a bus master with the field devices via a screened two-wire line. At the same time the power is supplied to the two-wire field devices on the same lines (current I in Figure 7, page 105).

Profile

Supplementary to the EN standard 50170, the PNO (PROFIBUS User Organisation) has defined the functionality of the individual field device types in a so-called profile description. This profile defines minimum functional requirements and optional extensions. The device-internal "Device Management" supplies the configuration tool of the control system with all the necessary basic information for finding the profile parameters. With this a parametering tool can operate all profile-conform devices no matter of what type and manufacture.

Depending on the size of the system and thus the number of field devices, the system must be implemented with one or more PROFIBUS-PA channels. A PROFIBUS PA channel consists of the components shown in Figure 8.

[Diagram of PROFIBUS-PA architecture]

Legend:
T Terminating resistor
FD Field device
PC Personal Computer
PLS Process control system

Figure 8 PROFIBUS-PA architecture
Link

Control takes place with the central process control system PLS or with a PC when requirements are low.

As a rule the functions signal conversion DP-PA, bus feeding and bus termination are combined in a coupling module. Depending on the number of PROFIBUS-PA field devices to be operated in the automation system and the required timing, a DP/PA coupler or a more powerful DP/PA link in the case of higher requirements is used.

For transmission-technical reasons, a terminating resistor T must be fitted to the remote end of the bus. When using the recommended bus cable, the theoretically possible line length (sum of all line sections) is a maximum 1900 mm. Additionally the voltage drop over the lines supplying the field devices must also be taken into account in the planning.

The current requirements of the individual users and voltage drop on the cable must also be taken into account in the planning however. The individual field devices FD can be connected at almost any point in the bus system. See the "PNO Guide PROFIBUS-PA" for further information (see appendix 3, page 113, "Literature and Catalogs" /1/).

DP/PA-coupler or DP/PA-Link are supplied by a power supply unit with SELV (Safety Extra Low Voltage). This power supply must have adequate reserve to be able to bridge temporary mains interruptions.

The maximum number of devices that can be connected to a bus channel depends on their current consumption and the respective application conditions. When operating in the safe area, the couplers/links can feed up to 400 mA into the bus.

When operating in hazardous areas the intrinsic safety is only guaranteed if the maximum power supply fed into the bus does not exceed certain voltage and current values.

These are usually:

EEx ia IIC \( \text{Current } I_S < 110 \text{ mA, Voltage } U_0 < 15 \text{ V} \)

See appendix 3, page 113 "Literature and Catalogs" /1/ for further information.
WARNING

Only certified supply units (DP/PA coupler or DP/PA link may be used to feed the intrinsically safe PROFIBUSes. The requirements can be found in the Ex-conformity certificate (see chapter 6.2, page 98).

The number of devices which can be connected to a bus channel can be determined from the maximum current consumptions of the connected devices (according to standard $\geq 10$ mA per device) and the available current. A current reserve should be planned for safety reasons otherwise there is a risk that a defective device overloads the bus due to increased current consumption and the power supply and communication with all undisturbed users could break down. The size of the reserves depends on the current increase in the event of an error specified by the manufacturer.

Every device has its own address to be able to distinguish it from all the others. The address setting is described in the chapter 3, page 88.

You will find further information about components, installation regulations and configuration in the System Description Field Technology, see appendix 3, page 113 "Literature and Catalogs" /2/.
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Appendix/Anhang 2 Gerätestammdatei (GSD) / Device data file

;********************************************************************************
;** GSD Datei für SITRANS T3K PA, SIEMENS AG
;** MLFB: 7NG3213-***00
;** Stand: 11.02.1999
;** SIEM8090.GSD
;********************************************************************************

ProfiBus_DP
GSD_Revision = 2
Vendor_Name = "SIEMENS AG"
Model_Name = "SITRANS T3K PA"
Revision = "1.0"
Ident_Number = 0x8090
Protocol_Ident = 0
Station_Type = 0
FMS_supp = 0
Hardware_Release = "A01"
Software_Release = "Z01"
31.25_supp = 1
45.45_supp = 1
93.75_supp = 1
187.5_supp = 1
500_supp = 1
1.5M_supp = 1
3M_supp = 1
6M_supp = 1
12M_supp = 1
MaxTsdr_31.25 = 100
MaxTsdr_45.45 = 250
MaxTsdr_93.75 = 250
MaxTsdr_187.5 = 60
MaxTsdr_500 = 100
MaxTsdr_1.5M = 150
MaxTsdr_3M = 250
MaxTsdr_6M = 450
MaxTsdr_12M = 800
Redundancy = 0
Repeater_Ctrl_Sig = 0
24V_Pins = 0
Bitmap_Device = "SIE8090n"
Freeze_Mode_supp = 0
Sync_Mode_supp = 0
Auto_Baud_supp = 0
Set_Slave_Add_supp = 1
Min_Slave_Intervall = 250
Modular_Station = 0
Max_Diag_Data_Len = 14
Slave_Family = 12

;------- Description of device related diagnosis: -------------------

   Unit_Diag_Bit(16) = "Error appears"
   Unit_Diag_Bit(17) = "Error disappears"
   Unit_Diag_Bit(24) = "Hardware failure electronics"
   Unit_Diag_Bit(25) = "Hardware failure mechanics"
   Unit_Diag_Bit(26) = "Motor temperature too high"
   Unit_Diag_Bit(27) = "Electronic temperature too high"
   Unit_Diag_Bit(28) = "Memory error"
   Unit_Diag_Bit(29) = "Measurement failure"
   Unit_Diag_Bit(30) = "Device not initialized"
   Unit_Diag_Bit(31) = "Device initialization failed"
   Unit_Diag_Bit(32) = "Zero point error"
   Unit_Diag_Bit(33) = "Power supply failed"
   Unit_Diag_Bit(34) = "Configuration invalid"
   Unit_Diag_Bit(35) = "Restart"
   Unit_Diag_Bit(36) = "Coldstart"
   Unit_Diag_Bit(37) = "Maintenance required"
   Unit_Diag_Bit(38) = "Characteristics invalid"
   Unit_Diag_Bit(39) = "Ident_Number violation"
   Unit_Diag_Bit(55) = "Extension Available"

;-------------------------------

; Modules for Analog Input
Module = "Temperature (short) " 0x94
EndModule
Module = "Temperature (long) " 0x42, 0x84, 0x08, 0x05
EndModule

Hinweis:
Die fett gedruckten "UNIT_DIAG_BIT"s sind realisierte Diagnosebits.

Note:
The semibold "UNIT_DISG_BIT's" are implemented diagnostic bits.
### Appendix/Anhang 3 Literatur und Kataloge / Literature and Catalogs

<table>
<thead>
<tr>
<th>Nr./No.</th>
<th>Titel/Title</th>
<th>Herausgeber/Publisher</th>
<th>Bestellnummer/Order number</th>
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</thead>
<tbody>
<tr>
<td>/1/</td>
<td>PNO-Leitfaden PROFIBUS PA&lt;br&gt;Technical Guideline PROFIBUS PA User and Installation Guideline</td>
<td>PNO Technologiefabrik Haid-und-Neu-Str. 7 D-76131 Karlsruhe</td>
<td>2.091/2.092</td>
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<tr>
<td>Seite</td>
<td>Katalog</td>
<td>SIMATIC</td>
<td>Systeme</td>
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<td>---------</td>
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<td>/5/</td>
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<td>Automatisierungssysteme</td>
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</table>
### Appendix/Anhang 4 PA-Profiltable des SITRANS T3K PA

#### PA profile table of SITRANS T3K PA

<table>
<thead>
<tr>
<th>Class</th>
<th>Index</th>
<th>Index</th>
<th>Element</th>
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<th>Object</th>
<th>Parameter description</th>
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<th>Store (after profile)</th>
<th>Read/Write</th>
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<td>0</td>
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*) Slot 1
**) Rücksetzen auf Defaultwert bei Factory Reset / Reset on default value with Factory Reset

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<th>Object</th>
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*) Slot 1

**) Rücksetzen auf Defaultwert bei Factory Reset / Reset on default value with Factory Reset

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**) Rücksitzen auf Defaultwert bei Factory Reset / Reset on default value with Factory Reset
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*) Slot 1
**) Rücksetzen auf Defaultwert bei Factory Reset / Reset on default value with Factory Reset
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**) Rücksetzen auf Defaultwert bei Factory Reset / Reset on default value with Factory Reset
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</table>

1) Rücksetzen auf Defaultwert bei Factory Reset / Reset on default values with Factory Reset

2) Skizze 7K3213 gibt an, was Sie verändert haben, falls notwendig. / Sketch 7K3213 shows what you have changed, if necessary.
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<td>RJ_TYPE</td>
<td>Input / reference point type. For thermocouple characteristic type the reference point is defined here; Internal definition of the reference point temperature (e.g. with built-in or external Pt100) or default of a fixed external reference; Default value: 0, enable both</td>
<td>unsigned8</td>
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<td>r, w</td>
<td>0–2</td>
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<td>OPT</td>
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<td>35</td>
<td>0</td>
<td>EXTERNAL_RJ_VALUE</td>
<td>Input / Fixed (constant) reference temperature; External reference as reference point temperature (not Pt100); Default value: 0.0 °C</td>
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<td>1</td>
<td>S</td>
<td>r, w</td>
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<tr>
<td>MAND</td>
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<td>SENSOR_CONNECTION</td>
<td>Input / Connection type: Sensor connection in 2, 3 or 4-wire circuit; Default value: 3-wire circuit</td>
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<td>r, w</td>
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<td>COMP_WIRE1</td>
<td>Wire compensation 1: Value to compensate the wire resistance on channel 1; Default value: 0.0 W</td>
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<td>MEASURE_COMP_WIRE</td>
<td>Input / Wire resistance measurement: Trigger measurement of the resistance values for wire compensation; 0: no measurement (Default) 1: trigger measurement 2: measurement incorrect; Measurement correct: again on 0</td>
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<td>Input / Scaling factor: Scaling factor which enables a correction factor for parallel and series circuiting of sensors; Default value 1.0 (no correction)</td>
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<td>REFERENCE_CONNECTION</td>
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<td>N</td>
<td>r, w</td>
<td>x</td>
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<tr>
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<td>Input / Sensor trimming / lower trimming point 1: Low value for trimming process channel 1; Default value: -200 °C for Pt100</td>
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<td>View object 1 TB</td>
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</table>

*) Slot 1
**) Rücksetzen auf Defaultwart bei Factory Reset / Reset on default value with Factory Reset
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### SITRANS T3K PA

#### Betriebsanleitung/Instruction Manual

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</tbody>
</table>

**Note:**
- The table lists parameters for the SITRANS T3K PA, with descriptions and values provided for each parameter.
- The parameters include identification details, alarm modes, and other operational settings.
- Values are given in hexadecimal format for identification numbers and other parameters.

**Abbreviations:**
- STR. = String
- SIT. = Short Integer
- ALARM. = Alarm
- CURRENT_ALRM = Current alarm value
- UNKNWNLKED = Unknown value
- CE = Certificate
- SETE = Set entrance
- SETPM = Set permission
- CERTPM = Certificate permission

**Additional Information:**
- The table provides a comprehensive overview of the parameters and values for the SITRANS T3K PA, essential for configuring and operating the device.
- The hexadecimal values indicate specific identification and configuration settings.

---

**Function:**
- The provided parameters and values are crucial for configuring the SITRANS T3K PA to meet specific application requirements.
- Understanding the table is vital for effective operation and maintenance of the device.

---

**Footer:**
- The document is part of a larger instruction manual, providing detailed guidance for the SITRANS T3K PA.
- Additional sections cover installation, operation, and troubleshooting, ensuring comprehensive support for users.
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<td>Identification / Device / PROFIBUS ident Number: Definition which GSD-file is used as basis, Default value:</td>
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**| 196   | 26    | b/s    | reserviert durch PNO |              |                                         |               |        |                      |            |              |

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*) Slot 1
**) Rücksatzen auf Defaultwert bei Factory Reset / Reset on default value with Factory Reset
Fußnoten 1 bis 4 siehe letzte Seite / footnote 1 to 4 see last page
1) **Explanation of "Class":**
MAND: Absolutely mandatory parameter
BLOCK: Start of a new block
STD: Standard parameter of a block
OPT: Optional parameter
SPEC: Manufacturer-specific parameter

2) **Explanation of "Store" (after profile):**
C: Constant, storing in the ROM
D: Dynamic, storing in the RAM
N: Variable, storing in the EEPROM, when changed, the ST-REF counter will not be incremented
S: Variable, storing in the EEPROM, when changed, the ST-REF counter will not be incremented

3) The absolute address is made up of the slot number and the absolute index.

4) **Measuring type** | Measured value calculation
---|---
0 | Channel 1
128 | Channel 1 – Channel 2
129 | Channel 2 – Channel 1
192 | 1/2 (Channel 1 + Channel 2)
193 | 1/2 (Channel 1 + Channel 2) channel 1 or channel 2 as replacement value in the event of an error