Top values in precision and reliability

Temperature measurement with SITRANS T

siemens.com/processinstrumentation
Top process quality and efficiency are key factors for success in the process industry, and achieving them requires absolutely accurate and reliable process instrumentation. The best example of this is SITRANS T, our comprehensive product family for temperature measurement.

First choice for all requirements in the process industry
Whether as individual components or a complete solution, SITRANS T definitely has the right devices for your requirements. Our product family offers temperature sensors and transmitters for every application in the process industry, even under extreme conditions – including general purpose, intrinsically safe, and explosion-proof, and with globally recognized certificates. Naturally we will support you throughout the entire lifecycle of your devices with expert service and support.

Impressively communicative
With SITRANS T, you benefit from end-to-end ease of use and the highest transparency. Powerful software and a comprehensive communications capability ensure simple, highly efficient device integration and configuration.
Benefits at a glance

- Highest flexibility because devices are available as a complete measuring point or transmitter for head, rail, or field-mount installation
- Superior communications capability based on industrial standards such as 4–20 mA, HART, PROFIBUS PA, and FOUNDATION Fieldbus
- Simple integration into SIMATIC PCS 7 and all common process control systems
- Support for planning, parameterization, commissioning, diagnostics, and maintenance through SIMATIC PDM (Process Device Manager)
- Device operation via HART and PROFIBUS PA through the use of EDDs
- Devices for SIL applications usable up to level 2/3
SITRANS T
temperature measurement

As the perfect basis for highly precise and reliable temperature measurements, the solutions in the SITRANS T family are a good choice for a wide range of applications. They also support operation and monitoring on-site, since the process variables can be comfortably read on an optional display.

Benefits at a glance
- Broad portfolio support for all main applications
- Secure use in intrinsically safe and Ex d instrumented plants
- Modular system for easy configuration
- Support for 4 – 20 mA, HART, PROFIBUS PA, and FOUNDATION Fieldbus
- Extended diagnostics
- Maintenance benefits
SITRANS T is the first choice wherever intelligent processing of readings is required. The measurement status is easy to monitor remotely or locally. Functional safety permits SIL 2/3 applications. Safety and accuracy have been significantly improved with the option of connecting 2 x 4-wire resistance thermometers, as well as through simple sensor-transmitter matching. As an added benefit, maintenance is supported by a two-color diagnostics LED and test pins: suspect measurements can be detected at a glance – and with one touch, the current loop can be measured without any interruption.
High availability is ensured by the new 2 x 4-wire sensor with hot backup. Whether by wall mount or in the control cabinet – the temperature sensors offer flexible installation.

SITRANS T products are suitable for a variety of applications. Temperature sensors and head transmitters can be integrated directly into the process. Under adverse conditions, head transmitters can be decoupled from the process and easily replaced with sensors, remote field transmitters or rail transmitters.
Special devices for food and pharma

The SITRANS T clamp-on sensors for hygienic applications feature a wide range of appropriate process connections for classic temperature measurement. When it comes to accuracy and response time, they are comparable to built-in sensors. They offer obvious advantages, especially for small pipe diameters: no welding or welding validation, no process disturbance, easy pigging, and easy dismantling for recalibration.

SITRANS TS200

The compact SITRANS TS200 product series offers the same advantages as SITRANS TS100. The only difference is in the design: instead of a flexible cable, the system comes with a fixed connection (M12, Lemo, etc.).

SITRANS TS100

Whether as a basic or mineral-insulated version, SITRANS TS100 supports a wide field of applications and comes with a directly mounted cable. Compression or soldering fittings minimize installation work while the optional adapter simplifies surface measurement. The intrinsically safe version is approved for operation even in zone 0 without an additional thermowell. Here the sensor’s excellent response time truly pays off.

SITRANS TS500

SITRANS TS500 is available in intrinsically safe versions as well as Ex d and supports a wide field of measurements, from simple applications to solutions for harsh environments. It is designed as a modular system of tubular or barstock thermowell, extension, connection head, and optional transmitter and display. This allows standard components to be used for individual applications.

SITRANS TH

Despite their compact design for direct installation in the connection head, the transmitters offer a high degree of comfort and safety – for simple applications as well as for PROFIBUS and FOUNDATION Fieldbus installations.

SITRANS TF

Available in robust die-cast aluminum or long-lasting stainless steel 316 L, the field transmitter in high protection class IP66/67/68 is particularly suitable for use under harsh environmental conditions.

SITRANS TR

The rail transmitters offer the same features as SITRANS TH but are deployed close to the process in junction boxes or the control room, thus enabling centralized access to all connected measurement points.

SITRANS TF

Available in robust die-cast aluminum or long-lasting stainless steel 316 L, the field transmitter in high protection class IP66/67/68 is particularly suitable for use under harsh environmental conditions.

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## SITRANS TS at a glance:

<table>
<thead>
<tr>
<th>Type</th>
<th>SITRANS TS insert</th>
<th>SITRANS TS100/ SITRANS TS200</th>
<th>SITRANS TS300</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Measuring insert spares</td>
<td>Temperature sensors in cable version</td>
<td>Temperature sensors for food &amp; beverage/pharma</td>
</tr>
<tr>
<td></td>
<td>Mineral-insulated execution (MIC)</td>
<td>Mineral-insulated execution</td>
<td>In-pipe or clamp-on</td>
</tr>
<tr>
<td>Application</td>
<td>Spares</td>
<td>Plant and machinery construction, bearing temperature, surface measurement</td>
<td>Advanced hygienic requirements</td>
</tr>
<tr>
<td>Process connection</td>
<td>Compression or soldering fittings:</td>
<td>In-pipe: Clamp-flange, DIN 11851, Varivent, BioControl, Neumo, Ingold, spherical-welding sleeve Clamp-on: Collar 4…57 mm Strap up to 200 mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>G [1/4, 1/2’]; 1/2’ NPT; M8x1; M18x1.5 Surface mounting adapter for installation on pipes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificates</td>
<td>Europe+IEC EX:</td>
<td>Europe+IEC EX:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Intrinsic safety &quot;ia&quot;, &quot;ic&quot;</td>
<td>• Intrinsic safety &quot;ia&quot;, &quot;ic&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Flameproof enclosure &quot;d&quot;; dust protection by enclosure &quot;t&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>Direct sensor signal 4…20 mA (TH100/TH200) HART (TH300) PA (TH400) FF (TH400)</td>
<td>Direct sensor signal</td>
<td>Direct sensor signal 4…20 mA (TH100/TH200) HART (TH300) PA (TH400) FF (TH400)</td>
</tr>
<tr>
<td>Wetted material</td>
<td>SS similar 1.4404 (RTD), 2.4816 (thermocouple) (SS sim. 316L, INCONEL® Alloy 600)</td>
<td>SS similar 1.4404 (RTD), 2.4816 (thermocouple) (SS sim. 316L, INCONEL® Alloy 600)</td>
<td>In-pipe: 1.4404/316L Clamp-on: No wetted parts</td>
</tr>
<tr>
<td>Technical data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum response time $t_{0.5}$</td>
<td>2…6 s</td>
<td>2…6 s</td>
<td>5 s</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP54</td>
<td>SITRANS TS100: IP54 SITRANS TS200: IP54 (some connectors lower)</td>
<td>IP65 (IP54 for some head types)</td>
</tr>
</tbody>
</table>

* A combination of loads (temperature, flow, vibration, pressure) sometimes lowers these values significantly. Further temperature limits are the result of the thermowell materials used. (Example: 1.4571/316Ti is resistant to compression stress up to 450–550°C, material limit: 800°C)

** pending
**SITRANS TS500**

| Temperature sensors for installation in existing thermowells | Temperature sensors with tubular thermowell for low to medium process load | Temperature sensors with barstock thermowell for high process load | Protective tube made from solid material to DIN 43772 and ASME B40.9

Suitable for thermowells according to DIN 43772 as well as ASME B40.9-2001

Thermowell Form 2 or 3 (tapered) according to DIN 43772 and Form 2N with thread, flange, or without process connection

Thermowell according to DIN 43772, Form 4 for weld-in or Form 4F with flange

**Vessel and pipes**

| Compression fitting | Direct sensor signal | Connection to thermowell: M18x1.5; G 1/2", 1/2" NPT | For welding to DIN/ASME Thread G, R[1/2", \( \frac{3}{8}"", 1"]\]

Suitable for thermowells according to DIN 43772, Form 4 for weld-in or Form 4F with flange

**Europe+IEC EX:**

- • Intrinsic safety "ia", "ic"
- • Flameproof enclosure "d"; dust protection by enclosure "t"
- • Non-sparking "n"

**Direct sensor signal**

| 4...20 mA (TH100/TH200) HART (TH300) PA (TH400) FF (TH400) | 4...20 mA (TH100/TH200) HART (TH300) PA (TH400) FF (TH400) | 4...20 mA (TH100/TH200) HART (TH300) PA (TH400) FF (TH400) | 4...20 mA (TH100/TH200) HART (TH300) PA (TH400) FF (TH400)

| No wetted parts | 1.4404, 1.4571 (316L, 316Ti) | Form 4F: 1.4404, 1.4571 (316L, 316Ti) | 316L; CS; Hastelloy [C276, C22]; 304; 321; Monel; Duplex, Superdup. div. coatings

**Process connection**

| Compression or soldering fittings: | Spares Plant and machinery construction, bearing | Application Type SITRANS TS insert SITRANS TS100 /

(Example: 1.4571/316Ti is resistant to compression stress up to 450 – 550°C, material limit: 800°C)

Further temperature limits are the result of the thermowell materials used.

**Dust protection by enclosure "t"**—Intrinsic safety "ia", "ic"

**Europe+IEC EX:**

- • Intrinsic safety "ia", "ic"
- • Flameproof enclosure "d"; dust protection by enclosure "t"
- • Non-sparking "n"

**EUROPE**

**IP65 (IP54 for some head types)**

| IP65 (IP54 for some head types) | IP65 (IP54 for some head types) | All can be implemented, depending on installation

- **PT100 Basic:** –30... +400°C
- **PT100 Extend:** –196... +600°C

**Thermocouple:** –196... +1100°C (depends on shape)

Depends on type of thermowell

7...45 s 20...45 s Depends on shape

**TEMPERATURE LIMITS**

- **PT100 Basic:** –30... +400°C
- **PT100 Extend:** –196... +600°C

**Thermocouple:** –196... +1100°C

| (depends on type) | (depends on type) | (depends on type) | (depends on type) |

**DEGREE OF PROTECTION**

- **IP54 SITRANS TS100:** IP54

**TECHNICAL DATA**

- **SS similar 1.4404**

**OUTPUT**

- **Direct sensor signal**

**EUROPE+IEC EX:**

- 2 ... 6 s 2 ... 6 s 5 s

Thermocouple: –196... +1100°C

PT100 Extend: –196... +600°C

Thermocouple: –196... +1100°C

| (SS sim. 316L, INCONEL® Alloy 600) 2.4816 (thermocouple) | (RTD), SS similar 1.4404 | 4 ... 20 mA (TH100/TH200) HART (TH300) PA (TH400) FF (TH400) | 4 ... 20 mA (TH100/TH200) HART (TH300) PA (TH400) FF (TH400)

**MINERAL-INSULATED EXECUTION (MIC)**

- **Dust protection by enclosure "t"**

| 1RF150, 1.5RF150, 1.5RF300 | 1RF300, 1.5RF150, 1.5RF300 | 1RF300, 1.5RF150, 1.5RF300 | 1RF300, 1.5RF150, 1.5RF300

**IN-Pipe or clamp-on**

- **No wetted parts**

| 1.4404, 1.4571 (316L, 316Ti) | Form 4F additionally 1.7335, 1.5415 (A 182 F11, A 204 Gr. A) | 316L; CS; Hastelloy [C276, C22]; 304; 321; Monel; Duplex, Superdup. div. coatings

**Process connection**

- Compression fitting

- Welded thread

- Welded flange D25PN40, 1RF150, 1.5RF150, 1.5RF300

**Connection to thermowell:** M18x1.5; G 1/2", 1/2" NPT

| M18x1.5; G 1/2", 1/2" NPT | M18x1.5; G 1/2", 1/2" NPT | M18x1.5; G 1/2", 1/2" NPT | M18x1.5; G 1/2", 1/2" NPT

**Suitable for thermowells according to DIN 43772, Form 4 for weld-in or Form 4F with flange**

**EUROPE+IEC EX:**

- • Intrinsic safety "ia", "ic"
- • Flameproof enclosure "d"; dust protection by enclosure "t"
- • Non-sparking "n"

**Europe+IEC EX:**

- • Intrinsic safety "ia", "ic"
- • Flameproof enclosure "d"; dust protection by enclosure "t"
- • Non-sparking "n"
## SITRANS TH, TR, TW, and TF at a glance:

<table>
<thead>
<tr>
<th>Type</th>
<th>SITRANS TH100</th>
<th>SITRANS TH320 / SITRANS TH420</th>
<th>SITRANS TH400</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Installation</strong></td>
<td>In the connection head</td>
<td>Two-wire</td>
<td></td>
</tr>
<tr>
<td><strong>Input</strong> (connectable sensors)</td>
<td>PT100 resistance thermometers</td>
<td>Up to 2 sensors: Resistance thermometers, Thermocouples, Resistance-type sensors, DC sources</td>
<td>Resistance thermometers, Thermocouples, Resistance-type sensors, DC sources</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>4…20 mA</td>
<td>SITRANS TH320: 4…20 mA, HART 7 SITRANS TH420: HART 7</td>
<td>PROFIBUS PA version FOUNDATION Fieldbus version</td>
</tr>
<tr>
<td><strong>Local display</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>DC 8.5…36 V (30 V for Ex)</td>
<td>DC 7.5…48 V</td>
<td>DC 9…32 V (30 V for Ex and 17.5 V for FISCO)</td>
</tr>
<tr>
<td><strong>Housing material</strong></td>
<td>Molded plastic, embedded electronics</td>
<td>Molded plastic, embedded electronics</td>
<td>Molded plastic, embedded electronics</td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>–40…+85°C</td>
<td>–50…+85°C</td>
<td>–40…+85°C</td>
</tr>
<tr>
<td><strong>Degree of protection</strong></td>
<td>Enclosure: IP68 Terminal: IP00</td>
<td>Enclosure: IP68 Terminal: IP00</td>
<td>Enclosure: IP68 Terminal: IP00</td>
</tr>
<tr>
<td><strong>Certificates</strong></td>
<td>Europe (ATEX): Ex ia, ib, ic, Ex n USA (cFMus): I5, NI Canada (cFMus): I5, NI Other certificates: GOST, NEPSI, PESO</td>
<td>Ex: ATEX, IECEx, cFMus, cCSAus, EAC/EACEX, NEPSI, KCCI/KCs, Inmetro, SIL 2/3 Ex i, Ex nAlec, I5, NI, NIFW Zone 0/1/2, Division 1/2 Marine: DNV-GL, ABS, LR, BV</td>
<td>Europe (ATEX): Ex ia, Ex ib, Ex n USA (cFMus): I5, NI Canada (cFMus): I5, NI Other certificates: GOST, NEPSI, PESO</td>
</tr>
<tr>
<td><strong>Operator input</strong></td>
<td>SIMATIC PDM HART version PROFIBUS PA FOUNDATION Fieldbus Handheld 375 HART version FF version AMS HART version FF version SIPROM T and special modem * 4…20 mA version</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Local configuration using 4 push buttons</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SITRANS TR320 / SITRANS TR420

- **On DIN rail**
- **Field device**

<table>
<thead>
<tr>
<th>SITRANS TH100</th>
<th>SITRANS TH320</th>
<th>SITRANS TH420</th>
<th>SITRANS TR320</th>
<th>SITRANS TR420</th>
<th>SITRANS TF</th>
<th>SITRANS TF320</th>
<th>SITRANS TF420</th>
<th>SITRANS TO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Up to 2 sensors:</strong> Resistance thermometers Thermocouples Resistance-type sensors DC sources</td>
<td>Resistance thermometers Thermocouples Resistance sensors Direct current/voltage sources</td>
<td>Resistance thermometers Thermocouples Resistance sensors DC voltage sources</td>
<td>Field indicators (LCD only) PROFIBUS PA FOUNDATION field bus</td>
<td>SITRANS TF320: 4 ... 20 mA, HART 7 SITRANS TF420: HART 7</td>
<td>PROFIBUS DP</td>
<td>LCD for local operation</td>
<td></td>
<td><strong>4-channel transmitters for fiber Bragg grating (FBG) sensors (max. 48 per channel)</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>DC 7.5 ... 48 V</strong></th>
<th><strong>DC 11/13.5 ... 35 V</strong> (30 V for Ex and 17.5 V for FISCO)</th>
<th><strong>DC 10.5 ... 48 V</strong></th>
<th><strong>DC 24 V ± 20%</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Molded plastic, embedded electronics</td>
<td>Die-cast aluminum, coated, or stainless steel</td>
<td>Die-cast aluminum, coated, or stainless steel 316 L**</td>
<td>–50 ... +85°C</td>
</tr>
<tr>
<td>–50 ... +85°C</td>
<td>–40 ... +85°C</td>
<td>–50 ... +85°C</td>
<td>0 ... +50°C</td>
</tr>
<tr>
<td>IP20</td>
<td>IP67</td>
<td>IP66/67/68</td>
<td>IP20</td>
</tr>
<tr>
<td>Ex: ATEX, IECEx, cFMus, cCSAus, EAC/Ex, NEPSI, KCC/KCs, Inmetro, SIL 2/3</td>
<td>Ex: ATEX: Ex ia, Ex d, Ex n USA: XP/DIP/NI/S SIL 2 and SIL 2/3 (4 ... 20 mA/HART) Other certificates: GOST, INMETRO, NEPSI, KOSHA</td>
<td>Ex: ATEX, IECEx, cFMus, cCSAus, EAC/Ex, NEPSI, KCC/KCs, Inmetro, SIL 2/3 Ex i, Ex nA/ec, IS, NI, NIFW Zone 0/1/2, Division 1/2 Marine: DNV-GL, ABS, LR, BV</td>
<td>Ex: ATEX, IECEx, cFMus, cCSAus, EAC/Ex, NEPSI, KCC/KCs, Inmetro, SIL 2/3 Ex i, Ex nA/ec, IS, NI, NIFW Zone 0/1/2, Division 1/2 Marine: DNV-GL, ABS, LR, BV**</td>
</tr>
</tbody>
</table>

- **HART version**
  - HART / PROFIBUS PA / FOUNDATION Fieldbus
  - HART / FOUNDATION Fieldbus
  - HART / FOUNDATION Fieldbus

- **4 ... 20 mA version**
  - 4 ... 20 mA
  - 4 ... 20 mA

- **NEW**
Published by
Siemens AG 2018

Process Industries and Drives
Östliche Rheinbrückenstr. 50
76187 Karlsruhe
Germany

Article No.: PDPA-B10330-00-7600
Dispo 27900
WS 05184.0
Printed in Germany
© Siemens AG 2018

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