Specifications and information are subject to change without notice. Up-to-date address information is available on our website.
TT300 Series offers:
- ± 0.02% accuracy;
- Built-in thermocouples and RTDs linearization;
- Compact and lightweight;
- Interchangeable protocols.

The Smar TT300 Series is a transmitter mainly intended for measurement of temperature using RTDs or thermocouples. However, it can also accept other sensors with resistance or mV output such as pyrometers, load cells, resistance position indicators, etc. The TT300 Series accepts up to two sensors and may operate in one of the modes below*:
- Single channel with single sensor measurement;
- Dual channel with dual sensor measurement (except HART protocol device);
- Single channel with two sensors (same type) in differential measurement;
- Single channel with two sensors (same type) in backup measurement;
- Single channel with two sensors (same type) with maximum, minimum or average signal selection (only HART protocol device).

The Smar TT300 Series is a powerful and extremely versatile smart temperature transmitter. The digital technology used in the TT300 Series enables a single device to accept several types of sensors, wide ranges, single or multiple-ended measurement and an easy interface between the field and the control room. It also includes several features which reduce considerably the installation, operation and maintenance costs. The transmitter accepts two channels, i.e., two measurements. It reduces the cost per channel.

The TT300 Series is suitable for direct field installation, being weather proof and explosion proof, as well as intrinsically safe, for use in hazardous areas.

* Please consult your Smar representative to check the option availability.
**Programming and Diagnostics**

**TT300 Series** is available in three different technologies: HART® (TT301), FOUNDATION™ fieldbus (TT302), and PROFIBUS PA (TT303). These instruments can be configured with Smar software and other manufacturer configuration tools. Local adjustment is available in all TT300 Series. It is possible to configure zero and span, setpoint and other control functions using the magnetic tool (SD1). With Smar AssetView, an user-friendly Web Tool, user can access the plant assets anywhere and anytime using an Internet browser. It is designed for management and diagnostics of field devices to ensure reactive, preventive, predictive and proactive maintenance.

### HART® - TT301

**TT301** (HART® protocol) can be configured by:
- Smar CONF401 for Windows;
- Smar DDCON100 for Windows;
- Smar HPC301 and HPC401 for several models of Palm;
- Other manufacturers’ configuration tools based on DD (Device Description) or DTM (Device Type Manager), such as AMS™, FieldCare, PACTware™, HHT275, HHT375 and PRM Device Viewer.

For management and diagnostics, AssetView ensures continuous information monitoring.

### FOUNDATION™ fieldbus - TT302

**TT302** utilizes the FOUNDATION™ fieldbus H1 protocol, an open technology that allows any H1 enabled configuration tool to configure this device.

Syscon (System Configuration Tool) is a software tool used to configure, and operate the field devices. Syscon offers efficient and friendly interaction with the user, using Windows.

Configuration tools such as AMS™, FieldCare and HHT375 can configure TT302 devices. DD (Device Description) and CF (Capability File) files can be downloaded at either the Smar or Fieldbus Foundation™ website.

**TT302** supports complex strategies configuration due to the high capacity and variety of dynamic instantiable function blocks.

### PROFIBUS PA - TT303

**TT303** (PROFIBUS PA protocol) can be configured using configuring Smar Profibus View, Simatic PDM, FDT (Field Device Tool) and DTM (Device Type Manager) concept tools, such as FieldCare and PACTware™. It can also be integrated by any PROFIBUS System using the GSD (General Station Description) file.

PROFIBUS PA also has quality and diagnostics information, improving plant management and maintenance.

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Smar and SYSTEM302 are trademarks or registered trademarks of Smar Equipamentos Industriais Ltda. in Brazil and/or other countries. Other marks are the properties of their respective owners.
For an adequate communication, a minimum load of 250Ω is required between the configuration tool and the power supply.

* For some DP/PA couplers, the bus terminator is built-in.
HART® - TT301

FOUNDATION™ fieldbus - TT302

PROFIBUS - TT303
## Functional Specifications

<table>
<thead>
<tr>
<th>Inputs</th>
<th>See table 1, 2 and 3.</th>
</tr>
</thead>
</table>
| **Output and Communication Protocol** | **HART®**: 2-wire, 4-20 mA according to NAMUR NE43 specification, with super-imposed digital communication (HART® Protocol).  
| **Power Supply / Current Consumption** | **HART®**: 12 to 45 Vdc.  
**FOUNDATION™ fieldbus and PROFIBUS PA**: Bus powered: 9 - 32 Vdc.  
Quiescent current consumption: 12 mA. |
| **Indicator** | 4½-digit numerical and 5-character alphanumerical LCD indicator (optional). |
| **Hazardous Area Certifications** | **HART®, FOUNDATION™ fieldbus and PROFIBUS PA**: Intrinsic Safety (FM, CSA, NEMKO, EXAM, CEPEL, NEPSI), Explosion Proof (FM, CSA, NEMKO, CEPEL), Dust Ignition Proof (FM), Non-incendive (FM)  
**FOUNDATION™ fieldbus and PROFIBUS PA**: FISCO (FM, CSA, NEMKO, EXAM, CEPEL, NEPSI) and FNICO (FM, CSA, NEMKO, EXAM, CEPEL) |
| **European Directive Information** | **Authorized representative in European Community** Smar Gmbh-Rheingaustrasse 9-55545 Bad Kreuzanach  
**EMC Directive (89/336/EEC) - Electromagnetic Compatibility** The EMC test was performed according to IEC standard: IEC61326:2002. For use only in industrial environment.  
**ATEX Directive (94/9/EC) - Equipment and protective systems intended for use in potentially explosive atmospheres** This product was certified according European Standards at NEMKO and EXAM (former DMT). The certified body for manufacturing quality assessment is EXAM (number 0158).  
**LVD Directive 2006/95/EC - Electrical Equipment designed for use within certain voltage limits** According the LVD directive Annex II the equipment under ATEX “Electrical equipment for use in an explosive atmosphere” directive are excluded from scope from this directive. |
| **Zero and Span Adjustments** | Noninteractive, via local adjustment and digital communication. |
| **Failure Alarm (Diagnostics)** | Detailed diagnostics through communication for all protocols.  
**HART®**: In case of sensor or circuit failure, the self diagnostics drives the output to 3.6 or 21.0 mA, according to the user's choice and NAMUR NE43 specification.  
**FOUNDATION™ fieldbus**: For sensor circuit failures, events are generated and status is sent to link outputs. Detailed diagnostics are available in the contained parameters.  
**PROFIBUS PA**: For sensor or circuit failures, status is sent to link outputs. Detailed diagnostics are available in the contained parameters. |
| **Temperature Limits** | Ambient: -40 °C to 85°C (-40 to 185 °F)  
Storage: -40 °C to 100 °C (-40 to 212 °F)  
Digital Display: -20 °C to 80°C (-4 to 176 °F) (normal operation)  
-40 °C to 85°C (-40 to 185 °F) (without damage) |
### Technical Characteristics

| Turn-on Time | HART®: Performs within specifications in less than 5 seconds after power is applied to the transmitter.  
| Configuration | FOUNDATION™ fieldbus and PROFIBUS PA: Performs within specifications in less than 10 seconds after power is applied to the transmitter.  
| Humidity Limits | 0 to 100% Relative Humidity.  
| Damping Adjustment | User configurable from 0 to 32 seconds (via digital communication).  

### Performance Specifications

| Accuracy | See tables 1, 2 and 3.  
| Digital Stability | ±0.1% of reading or 0.1 °C (0.18 °F), whichever is greater, for 2 years for RTDs;  
| | ±0.1% of reading or 0.1 °C (0.18 °F), whichever is greater, for 1 year for thermocouples.  
| Temperature Effect | For a 10 °C variation:  
| | mV (-6 to 22 mV), TC (NBS: B, R, S,T): ± 0.03% of the input milivoltage or 0.002 mV whichever is greater;  
| | mV (-10 to 100 mV), TC (NBS: E, J, K, N; DIN: L, U): ± 0.03% of the input milivoltage or 0.01 mV whichever is greater;  
| | mV (-50 to 500 mV): ± 0.03% of the input milivoltage or 0.05 mV whichever is greater;  
| | Ohm (0 to 100Ω), RTD (GE: Cu10): ± 0.03% of the input resistance or 0.01Ω whichever is greater;  
| | Ohm (0 to 400Ω), RTD (Edison Curve #7: Ni120; IEC: Pt50, Pt100; JIS: Pt50, Pt100): ± 0.03% of the input resistance or 0.04Ω whichever is greater;  
| | Ohm (0 to 2000Ω), RTD (IEC: Pt500), RTD (IEC: Pt1000): ± 0.03% of the input resistance or 0.2Ω whichever is greater;  
| Power Supply Effect | ± 0.005% of calibrated span per volt.  
| Electromagnetic Interference Effect | Approved according to IEC 61326: 2002.  
| Electrical Connection | 1/2 - 14 NPT M20 X 1.5 PG 13.5 DIN  
| | 1/2 - 14 NPT X 3/4 NPT (316 SST) - with adapter  
| | 1/2 - 14 NPT X 3/4 BSP (316 SST) - with adapter  
| | 1/2 - 14 NPT X 1/2 BSP (316 SST) - with adapter  

**Note:** Explosion proof approvals do not apply to adapter, only to transmitter.
Physical Specifications

Mounting
Can be attached directly to the sensor. With an optional bracket can be installed on a 2" pipe or fixed on a wall or panel.

Approximate Weights
Without display and mounting bracket: 0.80 kg.
Add for digital display: 0.13 kg.
Add for mounting bracket: 0.60 kg.

Control Functions Characteristics (Optional)

HART®:
PID Control, Alarm and Setpoint Ramp Generator.

FOUNDATION™ fieldbus Function Blocks:

PROFIBUS PA Function Blocks:
Physical Block, Transducer, Display Transducer and Analog Input.

Note: Additional information can be found in the Function Blocks Instruction Manual.

Table 1 - Sensor Characteristics

<table>
<thead>
<tr>
<th>SENSOR</th>
<th>TYPE</th>
<th>RANGE °C</th>
<th>RANGE °F</th>
<th>MINIMUM SPAN °C</th>
<th>°C DIGITAL ACCURACY*</th>
<th>RANGE °C</th>
<th>RANGE °F</th>
<th>MINIMUM SPAN °C</th>
<th>°C DIGITAL ACCURACY*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cu 10 GE</td>
<td>-20 to 250</td>
<td>-4 a 482</td>
<td>50</td>
<td>± 1.0</td>
<td>-270 to 270</td>
<td>-486 to 486</td>
<td>50</td>
<td>± 2.0</td>
<td></td>
</tr>
<tr>
<td>Ni120 Edison Curve #7</td>
<td>-50 a 270</td>
<td>-58 a 518</td>
<td>5</td>
<td>± 0.1</td>
<td>-320 a 320</td>
<td>-576 a 576</td>
<td>5</td>
<td>± 0.5</td>
<td></td>
</tr>
<tr>
<td>Pt50 IEC</td>
<td>-200 to 850</td>
<td>-328 to 1562</td>
<td>10</td>
<td>± 0.25</td>
<td>-1050 to 1050</td>
<td>-1890 to 1890</td>
<td>10</td>
<td>± 1.0</td>
<td></td>
</tr>
<tr>
<td>Pt100 IEC</td>
<td>-200 to 850</td>
<td>-328 to 1562</td>
<td>10</td>
<td>± 0.2</td>
<td>-1050 to 1050</td>
<td>-1890 to 1890</td>
<td>10</td>
<td>± 1.0</td>
<td></td>
</tr>
<tr>
<td>Pt500 IEC</td>
<td>-200 to 450</td>
<td>-328 to 842</td>
<td>10</td>
<td>± 0.2</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Pt1000 IEC</td>
<td>-200 to 300</td>
<td>-328 to 572</td>
<td>10</td>
<td>± 0.2</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Pt50 JIS</td>
<td>-200 to 600</td>
<td>-328 to 1112</td>
<td>10</td>
<td>± 0.25</td>
<td>-800 to 800</td>
<td>-1440 to 1440</td>
<td>10</td>
<td>± 1.0</td>
<td></td>
</tr>
<tr>
<td>Pt100 JIS</td>
<td>-200 to 600</td>
<td>-328 to 1112</td>
<td>10</td>
<td>± 0.25</td>
<td>-800 to 800</td>
<td>-1440 to 1440</td>
<td>10</td>
<td>± 1.5</td>
<td></td>
</tr>
<tr>
<td>Pt100 MILT</td>
<td>-40 a 540</td>
<td>-40 a 1000</td>
<td>10</td>
<td>± 0.2</td>
<td>-580 a 580</td>
<td>-1040 to 1040</td>
<td>10</td>
<td>± 1.0</td>
<td></td>
</tr>
<tr>
<td>N120 MILT</td>
<td>-40 a 205</td>
<td>-40 a 400</td>
<td>5</td>
<td>± 0.13</td>
<td>-245 a 245</td>
<td>-440 a 440</td>
<td>5</td>
<td>± 0.5</td>
<td></td>
</tr>
<tr>
<td>Pt100 IEC</td>
<td>-200 a 850</td>
<td>-328 a 1562</td>
<td>10</td>
<td>± 0.2</td>
<td>-1050 a 1050</td>
<td>-1890 a 1890</td>
<td>10</td>
<td>± 1.0</td>
<td></td>
</tr>
<tr>
<td>Pt100 GOST</td>
<td>-200 a 850</td>
<td>-328 a 1562</td>
<td>10</td>
<td>± 0.2</td>
<td>-1050 a 1050</td>
<td>-1890 a 1890</td>
<td>10</td>
<td>± 1.0</td>
<td></td>
</tr>
<tr>
<td>Pt50 GOST</td>
<td>-200 a 850</td>
<td>-328 a 1562</td>
<td>10</td>
<td>± 0.2</td>
<td>-1050 a 1050</td>
<td>-1890 a 1890</td>
<td>10</td>
<td>± 1.0</td>
<td></td>
</tr>
<tr>
<td>Cu100 GOST</td>
<td>-50 a 200</td>
<td>-58 a 392</td>
<td>10</td>
<td>± 0.15</td>
<td>-350 a 350</td>
<td>-450 a 450</td>
<td>10</td>
<td>± 1.0</td>
<td></td>
</tr>
<tr>
<td>Cu50 GOST</td>
<td>-50 a 200</td>
<td>-58 a 392</td>
<td>10</td>
<td>± 0.15</td>
<td>-350 a 350</td>
<td>-450 a 450</td>
<td>10</td>
<td>± 1.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 - mV Sensor Characteristics

<table>
<thead>
<tr>
<th>SENSOR</th>
<th>RANGE mV</th>
<th>DIGITAL ACCURACY %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 400</td>
<td>± 0.02% or ± 0.01 mV</td>
<td></td>
</tr>
<tr>
<td>0 to 800</td>
<td>± 0.02% or ± 0.01 mV</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 - Ohm Sensor Characteristics

<table>
<thead>
<tr>
<th>SENSOR</th>
<th>DIGITAL ACCURACY %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 100</td>
<td>± 0.02% or ± 0.01 Ohm</td>
</tr>
<tr>
<td>0 to 400</td>
<td>± 0.02% or ± 0.04 Ohm</td>
</tr>
<tr>
<td>0 to 2000</td>
<td>± 0.02% or ± 0.20 Ohm</td>
</tr>
</tbody>
</table>

* Accuracy of value read on display and accessed by communication. The 4-20 mA accuracy is the digital accuracy ±0.03%.
** Not applicable for the first 20% of the range (up to 440 °C).
NA: Not applicable.
## MODEL TEMPERATURE TRANSMITTER

<table>
<thead>
<tr>
<th>MODEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT301</td>
<td>Hart® &amp; 4 to 20 mA</td>
</tr>
<tr>
<td>TT302</td>
<td>Foundation™ fieldbus</td>
</tr>
<tr>
<td>TT303</td>
<td>PROFBUS PA</td>
</tr>
</tbody>
</table>

### Ordering Code

#### COD. Local Indicator
- 0: Without Indicator
- 1: With Digital Indicator

#### COD. Mounting Bracket
- A: Flat, 304 SST bracket and 316 SST accessories (Without Bracket)
- 1: Carbon Steel Bracket
- 2: 316 SST Bracket
- 7: Carbon Steel Bracket with 316 SST Fasteners

#### COD. Housing Material (13) (14)
- H0: Aluminum (IP/TYPE)
- H1: 316 SST (IP/TYPE)
- H2: Aluminum for saline atmosphere (IPW/TYPEX) (15)
- H3: 316 SST for saline atmospheres (IPW/TYPEX) (15)

#### COD. Identification Plate (12)
- I1: Flat, 304 SST bracket and 316 SST accessories (Without Bracket)
- 1: 1/2 - 14 NPT (8)
- 2: 1/2 - 14 NPT X 3/4 NPT (316 SST) - With adapter (9)
- 3: 1/2 - 14 NPT X 1/2 BSP (316 SST) - With adapter (2)

#### COD. Identification Plate (12)
- I4: Certified (CEPEL, NEPSI, NEMKO, EEK-D)
- I5: CEPEL: Ex-d, Ex-ia
- I6: Without Certification
- I7: Copper Free Aluminium (IPW/TYPEX) (15)

#### COD. Tag Plate (12)
- J0: With tag, when specified (Default)
- J1: Blank
- J2: According to user’s notes

#### COD. Sensor Connection
- L2: 2-wire
- L3: 3-wire
- L4: 4-wire
- LF: Differential
- LD: Double 2-wire (3)
- LB: Backup

#### COD. PID Configuration - (4)
- M0: With PID (Default)
- M1: Without PID

#### COD. LCD1 Indication - (4)
- Y0: LCD1: Percentage (Default)
- Y1: LCD1: Temperature (Engineering Unit)
- Y2: LCD1: Current - 1 (mA)
- Y3: LCD1: According to user notes (1) (7)

#### COD. LCD2 Indication - (4)
- Y4: LCD2: Percentage (Default)
- Y5: LCD2: Temperature (Engineering Unit)
- Y6: LCD2: Current - 1 (mA)
- Y7: LCD2: According to user notes (1) (7)

#### COD. Paint (15)
- P0: Gray Mursel N 6,5 Polyester (Default)
- P1: Black Polyester
- P2: White Polyester
- P3: Yellow Polyester
- P4: Without Painting
- P5: Safety Blue Epoxy - Electrostatic Painting

#### COD. Sensor Type
- T1: RTD Cu0/10 - GE
- T2: RTD CuNi/10 - Edison Curve 87
- T3: RTD Pt100 - IEC
- T4: RTD PT100 - IEC
- T5: RTD PT500 - IEC
- T6: RTD Pt100 - JS
- T7: RTD PT100 - IEC (4)
- T8: 2K Ohm
- T9: 400 Ohm
- TA: Thermocouple type B - NBS

#### COD. Burn-out (4)
- BD: Down Scale
- BU: Up Scale

### Note:
- (1) Values limited to 4 ½ digits; units limited to 5 characters.
- (2) Not certified for use in hazardous locations.
- (3) Only available for TT302 and TT303.
- (4) Only available for TT301.
- (5) Only available for TT301 and TT302.
- (6) Not available for aluminum housing.
- (7) For TT301, this code will be available only if the chosen sensor is Ohm or mV special.
- (8) Certified for use in hazardous locations (CEPEL, CSA, FM, NEPSI, NEMKO, EXAM).
- (9) Certified for use in hazardous locations (CEPEL, CSA, FM).
- (10) Certified for use in hazardous locations (CEPEL, FM, NEPSI, NEMKO, EXAM).
- (11) Certified for use in hazardous locations (CEPEL, NEPSI, NEMKO, EXAM).
- (12) Rectangular plate in 316 SST.
- (13) IPX8 tested in 10 meters of water column for 24 hours.
- (14) Ingress Protection:
  - Type 4X: IP67
- (15) IPW/TYPE testes for 200 hours according to NBR 10964 / ASTMB 117 standard.
- 0.02% Accuracy
- Built-in thermocouples and RTD's linearization
- True non-interactive zero and span
- Local zero and span adjustment
- Remote configuration via Hand-Held Terminal or via PC
- Alphanumeric LCD indication
- Small and lightweight
- Explosion proof and weather proof housing approved (IP66/67 or IP66/68N)
- Intrinsically safe certification
- Signal isolation
- Configurable user unit
- Configurable local adjustment
- EMC (Electromagnetic Compatibility) according to IEC 61000-6-2-1999, IEC 61000-6-4-1987 and IEC 61332-2002
- While protection function
- Three technology optics: HART®, FOUNDATION® fieldbus, and PROFIBUS PA
- Sensor backup
- Universal input accepts several thermocouples, RTDs, nV and Ohm
- 4-20 mA consumption
- Self-diagnosis
- Up to 20 function blocks
- Dynamic block instantiation improves interchangeability
- Fieldbus Foundation® registered and ITK (Interoperability Test Kit) approved
- 12 mA consumption
- 2 analog input function blocks
- Integrated to Smar Profibus View and Simatic PDIK
- Support DTM and EDDL
- Profile 3.0 improves interchangeability
- PID control function
- Match sensor (Callender Van Dusen equation)
- Maximum, minimum and average input sensor selection, also working with two sensors simultaneously
- Pt100 included in sensor list
- Maximum, minimum and average input sensor selection, also working with two sensors simultaneously
- 3 years warranty
- Write protection function
- Configurable local adjustment
- Configurable user unit
- Universal input accepts several thermocouples, RTDs, nV and Ohm
- Sensor backup
- 4-20 mA consumption
- Self-diagnosis
- Dual channel
- 12 mA consumption
- 2 analog input function blocks
• 0.02% Accuracy;
• Built-in thermocouples and RTD's linearization;
• True non-invasive stress and span;
• Local zero and span adjustment;
• Remote configuration via Hand-Field Terminal or via PC;
• Alphanumeric LCD indication;
• Small and lightweight;
• Explosion proof and weather proof housing approved (IP66/68 or IP66/68W);
• Intrinsically safe certification;
• Signal simulation for loop tests;

HART® - 4 to 20 mA
• Excellent long term stability due to auto-zero at the input circuit;
• 2-wire, 4-20 mA output plus direct digital communication;
• Special 3-wire sensor characterization;
• Update output current in 0.5 s with 1.5 mA bit-resolution;
• Improved performance due to dedicated math coprocessor;
• Multiphase operation mode;

FOUNDATION™ fieldbus
• Self-diagnostic;
• Dual channel;
• 12 mA consumption;
• 18 different types of function blocks for control strategies and advanced diagnostics;
• Up to 20 function blocks;
• Execution of up to 29 external links;

PROFIBUS PA
• Self-diagnostic;
• Dual channel;
• 12mA consumption;
• 2 analog input function blocks;
• Signal isolation;
• Configurable user unit;
• Configurable local adjustment;
• EN61330-2-1999, IEC 61300-6-1:1497 and IEC 61326-2002;
• Write protection function;
• Three technology options: HART®, FOUNDATION™ fieldbus, and PROFIBUS PA;
• Sensor backup;
• Universal input accepts several thermocouples, RTD's, kV and Chn.

PID control function;
• Match sensor (Castelle Van Duijn equation);
• Maximum, minimum and average input sensor selection, also working with two sensors simultaneously;
• P/I/100 included in sensor list;
• Setpoint generator function;
• Pt100 included in sensor list;
• Maximum, minimum and average input sensor selection, also working with two sensors simultaneously;
• Three technology options: HART®, FOUNDATION™ fieldbus, and PROFIBUS PA;
• Signal isolation;
• Configurable user unit;
• Configurable local adjustment;
• EN61330-2-1999, IEC 61300-6-1:1497 and IEC 61326-2002;
• Write protection function;
• Three technology options: HART®, FOUNDATION™ fieldbus, and PROFIBUS PA;
• Sensor backup;
• Universal input accepts several thermocouples, RTD's, kV and Chn.