Instruction Manual (de/en) Edition 03/2004

sitrans tw

Vierleiter-Tragschienengerät
Four-wire mounting rail device
7NG3242 (deutsch/english)

SIEMENS

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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 immenently hazardous situation which, if not avoided, **will** result in death or serious inury.

WARNING

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

CAUTION

with a warning triangle means that failure to take the necessary safety precautions can cause minor injury.

CAUTION

without a warning triangle means that failure to take the necessary safety precautions can cause material damage.

ATTENTION

means that an undesirable result or condition may occur when the appropriate instruction is not observed.

NOTE

highlights important information on the product, using the product, or part of the documentation that is of particular importance and that will be of benefit to the user.

Siemens AG
Automation and Drives
Geschäftsgebiet Process Instrumentation
D-76181 Karlsruhe

Exclusion of liability

We have examined the document for compliance with the described hardware and software. Nevertheless, deviations cannot be ruled out totally so that we provide no guarantee for full correctness. The data in this document are checked regularly and the subsequent editions will contain the necessary corrections. We are grateful for any suggested improvements.

General Notes

This device has left the factory in a perfect condition as regards safety. The notes and warnings in these Operating Instructions must be observed by the user if this state is to be maintained and hazard-free operation of the device assured.

NOTE

For reasons of clarity the manual does not contain detailed information about all types of products and cannot take into account every conceivable case of installation, operation or maintenance.

If you require further information or should problems occur which are not explained in detail in the manual, you can consult your local Siemens branch to obtain the necessary information.

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A&D PI T FA
Östliche Rheinbrückenstraße 50
76187 Karlsruhe

May we also draw your attention to the fact that the contents of the manual are not part of a previous or existing agreement, approval or legal relationship or an amendment thereof. All obligations of the Siemens AG result from the contract of purchase which also contains the full and solely valid warranty agreement. These contractual warranty conditions are neither extended nor restricted by the contents of the manual.

The contents reflect the technical state at the time of going to print. Subject to technical modifications in the course of further development.

This module is applicable for both devices with Ex license and devices without Ex license.

Explanation of symbols ⚠ on the device means “Attention, observe the operating instructions”.

WARNING

When operating electrical equipment, certain parts of this equipment automatically carry dangerous voltages. Failure to observe these instructions could therefore lead to serious injury and / or material damage.

The device's power supply plug may never be plugged in or removed when the power is switched on. An appropriately labeled mains switch must be provided close by when the device is installed.

Because the device contains terminals which it is dangerous to touch, the device may only be installed in closed operations room, housings and cabinets to which only qualified personnel has access.

This device is to be installed within a closed housing which, in regard to its mechanical strength, conforms with the requirements of DIN EN 61010-1 or another production safety standard for electrical devices. Operation of this device is not permitted outside of an enclosure such as a switching cabinet or junction box for example.

Only appropriately qualified personnel may work on or in the vicinity of this device.

This personnel must be completely familiar with these operating instructions.

Devices with intrinsically safe type of protection lose their license when they are operated on other circuits than those specified by the EC type examination certificate (to be noted especially in chapter 6, page 125).

The perfect and safe operation of this equipment is conditional upon proper transport, proper storage, installation and assembly as well as on careful operation and commissioning.

The device may not be operated with the housing open.

The equipment may only be used for the purposes specified in this instruction manual.

All modifications to the device which are not explicitly allowed require the express approval of the manufacturer.

CAUTION

Modules which are sensitive to electrostatic charge may be destroyed by voltages which are far below the human level of perception. These voltages occur already when you touch a component or electrical connections of a module without first discharging yourself electrostatically. The damage incurred by a module as a result of an overvoltage is not usually immediately perceptible but only becomes noticeable after a long time in operation.

Qualified Personnel

are persons familiar with the installation, assembly, commissioning and operation of the product and who have the appropriate qualifications for their activities such as:

- training or instruction or authorization to switch on/off, ground, label and maintain circuits and devices or systems in accordance with the latest safety standards for electrical circuits.
- training or instruction according to the standards of safety engineering in the care and use of suitable safety equipment.
- training in first aid
- For devices with explosion protection: training or instruction or authorization to perform work on electrical circuits for systems where there is a risk of explosion.

Excluded Liability

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

Trademarks

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1 Technical Description

1.1 Application Range

The SITRANS TW 4-wire mounting rail device is a transmitter with universal input circuit for connecting to the following sensors and signal sources.

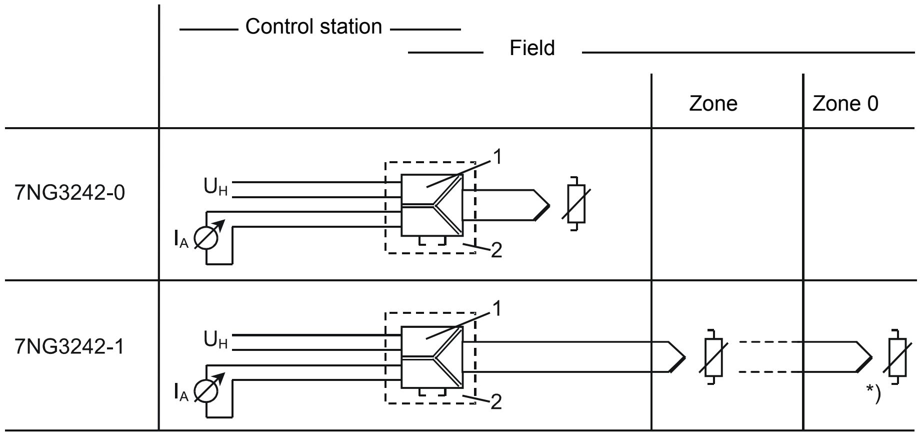
- Resistance thermometers
- Thermocouples
- Resistance transmitters/potentiometers
- mV transmitter
- As special version:
  - V-transmitters
  - Current sources

WARNING

The SITRANS TW, 4-wire mounting rail transmitter is a control stand instrument. It may only be mounted as an integrated component outside the hazardous area.

The transmitters with ”intrinsically safe type of protection” have EC test certification and comply with the appropriate harmonized European standards of the CENELEC. They can be used for measuring process variables in areas where there is a potential gas explosion hazard (zone 1, 0). Measuring of process variables in zone 0 is only permitted if the sensors are also approved for zone 0.

The transmitter may also be used for zone 20 and 21 areas where there is a potential dust explosion hazard. In these cases the devices which are connected to this circuit must meet the requirements of category 1D or 2D and be certified accordingly.



1 Transmitter
2 Field housing (if required, commercially available)
*) Only in connection with the prescribed protection requirements for the sensor

Figure 1 Areas of application of the transmitters in Ex and non-Ex versions

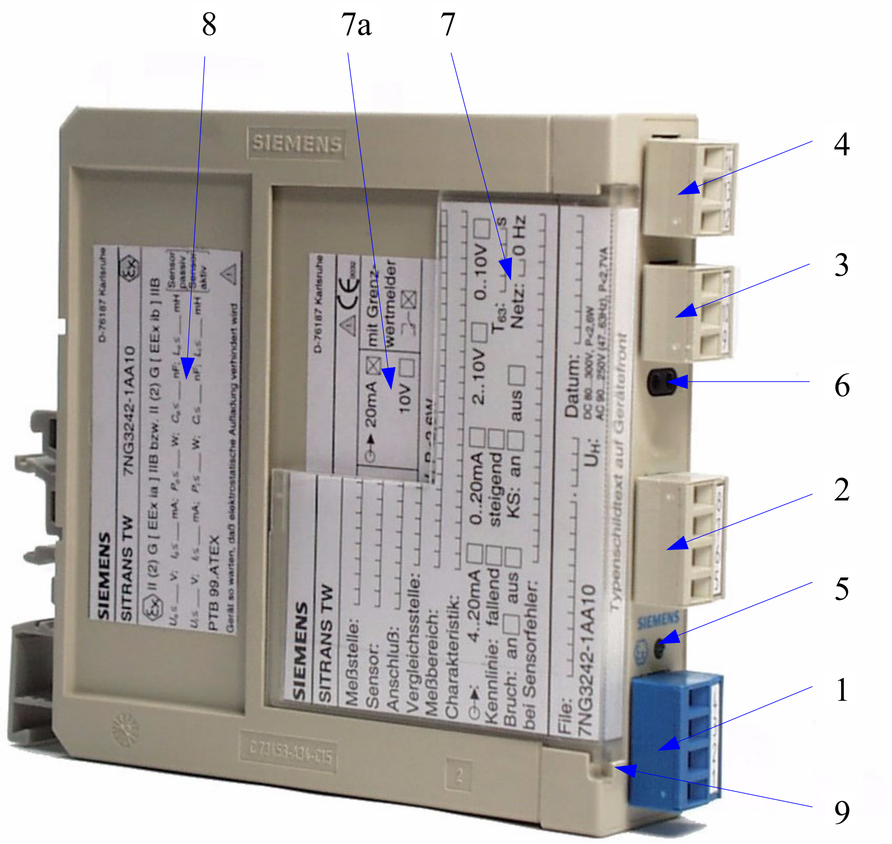
1.2 Product features

- Transmitters in four-wire technique with HART interface
- Housing for mounting on 35 mm DIN rail or 32 mm G-rail.
- Screw-type connector
- Electrical isolation of all circuits
- Output signal 0/4 ... 20 mA or 0/2 ... 10V
- Available with power supply units UC 230V or UC 24V
- Explosion protection [EEx ia] or [EEx ib] for 7NG3242-1 for measuring process variables in the Ex area with the appropriate device version (gas and dust Ex)
- Temperature linear characteristic for all temperature sensors
- User-specific characteristics
- Automatic correction of zero point and span
- Monitoring of the sensor and its supply cable for break and short-circuit
- Sensor error and / or limit value can be output by an optional sensor errorlimit value alarm (alarm relay)
- Hardware write protection for HART communication

1.3 Design and functional principle

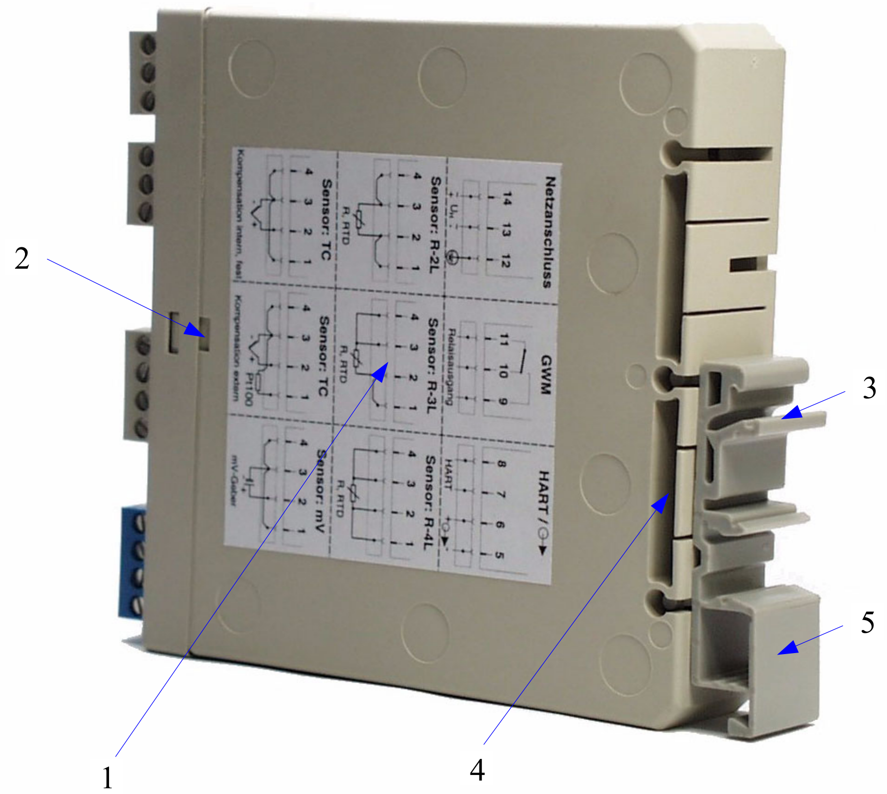
1.3.1 Design

The design of the SITRANS TW 4-wire mounting rail device is shown in figure 2 and figure 3, page 84.



1 Screw-type connector for input
2 Screw-type connector for output and HART modem for on-site operation.
3 Screw-type connector for relay output
4 Screw-type connector for power supply and PE connection
5 Operating display
6 Test jack for output signal current
7 Software rating plate with operating data (behind transparent cover)
7a Hardware rating plate with basic data (see figure 4, page 85 for example)
8 Rating plate Ex parameters
9 Release catch for the transparent cover

Figure 2 Front view of SITRANS TW, 4-wire mounting rail device



1 Plate for pin assignment of the screw-type connector
2 Release catch for the housing front
3 DIN rail adapter
4 Releasing the DIN rail adapter from the housing
5 Releasing the DIN rail adapter from a G or H rail

Figure 3 Rear view of SITRANS TW, 4-wire mounting rail device transmitter

1.3.2 Hardware rating plate

The following figure shows an example of a hardware rating plate.

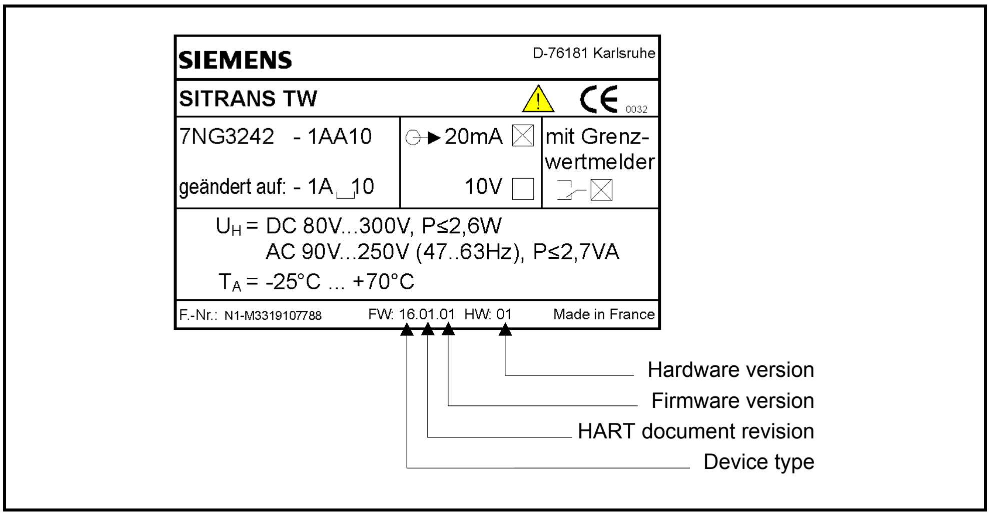


Figure 4 Example of a hardware rating plate

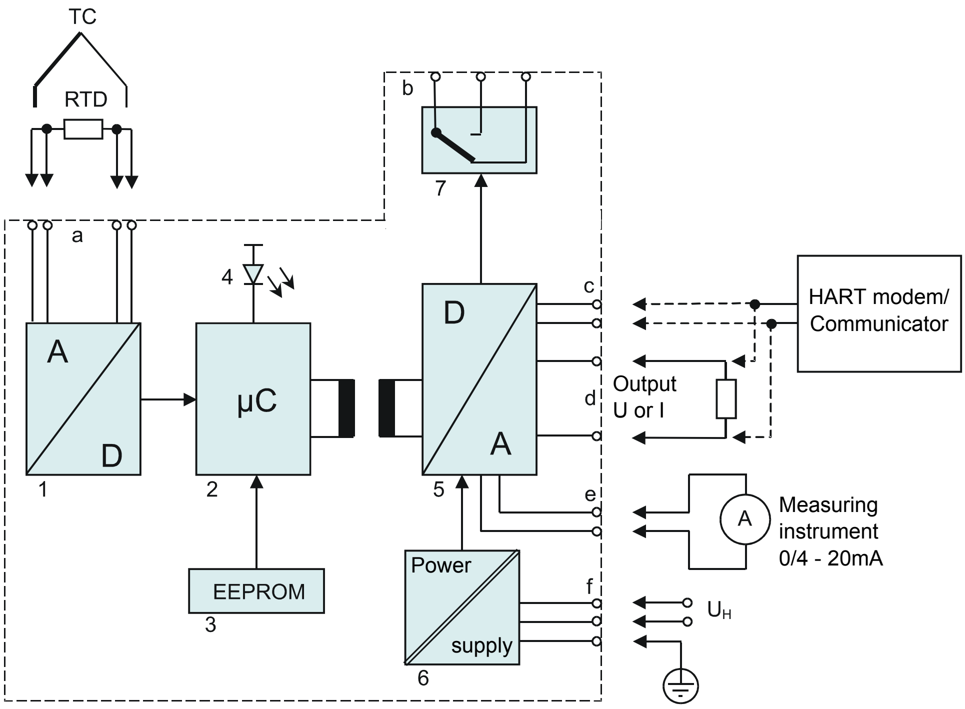
1.3.3 Function principle

The measuring signal supplied by a resistance transmitter (two, three or four-wire circuit), voltage transmitter, current transmitter or thermocouple is converted into a digital signal in an analog-digital converter (1, figure 5, page 86). This is evaluated in a microcontroller (2) corrected according to the sensor characteristic and converted into an output current (0/4 ... 20 mA) or an output voltage (0/2 ...10V) in a digital-analog converter (5). The sensor characteristics and the data necessary for parameterization of the transmitter are stored in a non-volatile memory (3).

AC and DC voltages can be used as a power supply (f). A bridge rectifier in the power supply unit allows the power supply to be connected without paying attention to the polarity. The device must be connected to a PE conductor for safety reasons.

The HART modem or a HART communicator enables parameterization of the transmitter by a protocol according to the HART specification. The transmitter can be parameterized directly at the measuring point by the HART output terminals (c).

The operating display (4) signals the undisturbed or disturbed operating state of the transmitter. A message relay (7) enables signaling of sensor errors and / or dropping below or exceeding of the limit value. The 0/4 ... 20 mA current can be checked with a measuring instrument through the test jack(s) at current output.



1 analog-digital converter
2 microcontroller
3 non-volatile memory
4 operating display
5 digital-analog converter
6 power supply unit
7 message relay
a sensor connection
b message relay output for sensor error / limit value alarm
c HART output terminals for connecting on-size parameterization
d analog measuring output (current or voltage output)
e test socket (only for current output)
f connection of power supply and PE conductor

Figure 5 Block diagram SITRANS TW transmitter, 4-wire mounting rail device

2 System integration

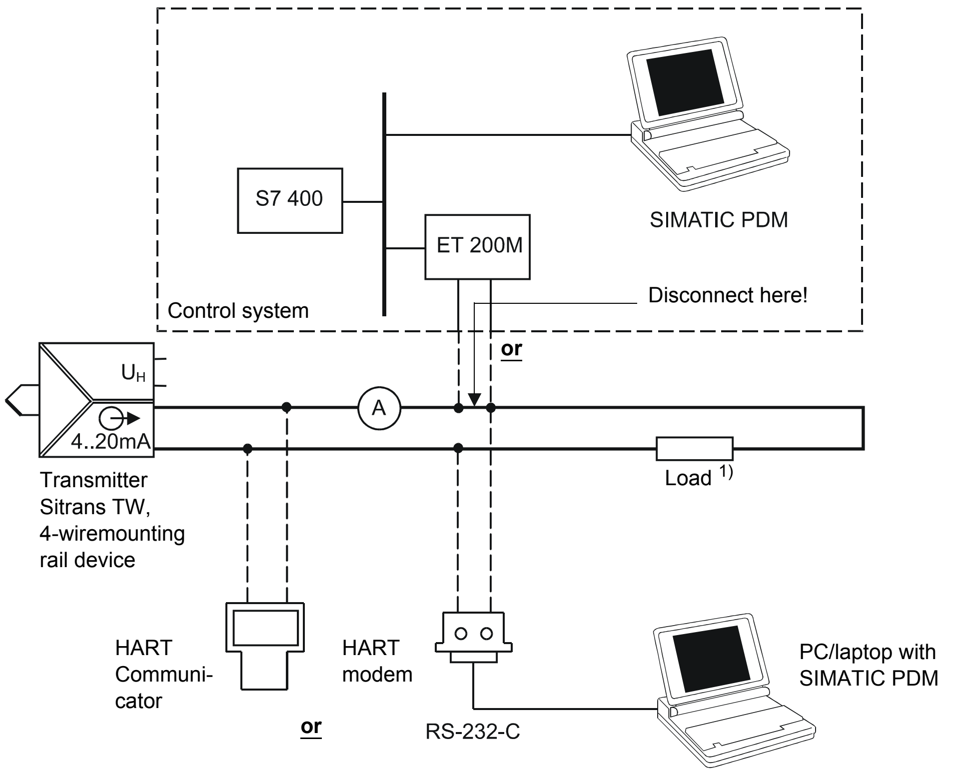
2.1 System configuration

The SITRANS TW transmitter, 4-wire mounting rail device can be used in a number of system configurations as a stand-alone version or as part of a complex system landscape such as SIMATIC S7.

The whole range of functions of the device is available by means of HART communication.

Communication via the HART interface can take place optionally with:

- HART-Communicator
- HART modem with following PC/laptop on which suitable software such as SIMATIC PDM is available
- a HART-capable control system (such as SIMATIC S7 with ET200M)



1) When using with HART communication, the load resistance must be at least 230Ω

Figure 6 Examples for possible system configurations

2.2 Operating software SIMATIC PDM

SIMATIC PDM is a software package for configuring, parameterizing, commissioning, diagnosing and maintaining the SITRANS TW, 4-wire mounting rail device and other process devices.

SIMATIC PDM contains a simple process monitoring of the process values, alarms and status signals of the device.

There are two versions which run under Windows NT or Windows 95/98.

- SIMATIC PDM (stand-alone)
- SIMATIC PDM integrated

See the SIMATIC PDM operating manual or the FI01 catalog for further information.

Support questions should be directed to:

- Hotline 0180 - 5050222
- Mail: techsupport@ad.siemens.de

3 Hardware functions

3.1 Operating display

The green operating indicator (5, figure 2, page 83) signals the following operatingstates:

- no power supply : operating indicator does not light
- faultless operation : operating indicator lights
- faulty operation : operating indicator flashes
  - Diagnostic alarm:
    - → sensor error : flashing frequency = 1Hz (priority 1)
    - → hardware- / firmware error : flashing frequency = 1Hz (priority 1)
  - Diagnostic warning
    - → limit value exceeded / dropped below : flashing frequency = 5Hz (priority 2)
    - → output saturation warning : flashing frequency = 1Hz (priority 3)
    - → measured value outside sensor limits : flashing frequency = 1Hz (priority 4)

If several errors occur simultaneously, flashing follows the given order of priority (priority 1 = highest priority)

3.2 test jack for output signal

- The test socket (6, figure 2, page 83) is used to check the 0/4 ... 20 mA current with a measuring instrument at current output. The connection is made by 2 mm test jack plugs. The voltage drop at the ammeter may not exceed 0.3V at 23 mA output current.
- The test jack has no function for voltage output.
- If the analog output is in the current output 0 ... 20 mA mode or current output 0 ... 10V mode, the test jack must be bridged at 0 mA or at 0V for correct HART communication. A suitable short-circuit connector can be ordered as an accessory as follows:
  - Add the suffix S01 to the order number of the SITRANS TW or
  - order as accessory with order number 7NG3092-8AP

3.3 Sensor error / limit value alarm

The sensor error / limit value alarm can be parameterized as follows (pin assignment of the relay output, see figure 19, page 127).

- Idle current principle
  - Device switched off : Terminals 10 and 11 connected
  - Device switched on and no error : Terminals 9 and 11 connected
  - Device switched on and error : Terminals 10 and 11 connected
- Open circuit principle:
  - Device switched off : Terminals 10 and 11 connected
  - Device switched on and no error : Terminals 10 and 11 connected
  - Device switched on and error : Terminals 9 and 11 connected

3.4 Connection HART communication

- The HART modem or HART Communicator should be conn ected as follows depending on the type of analog output (current or voltage output) (see figure 19 for pin assignment of the analog output / HART connection).

Communication with HART modem / HART communicator	Current output	Voltage output
HART connection at terminal 5 and 6 → R_{load} for HART modem → R_{load} for HART Communicator	available 230 ... 500Ω 230 ... 650Ω	not available
HART connection at terminal 7 and 8 → R_{load} for HART modem → R_{load} for HART Communicator	available none[1) 2)] none[1) 2)]	available none[1)] none[1)]

1) No load may be connected between terminals 7 and 8.
2) A load (max. 650Ω) must be connected between the terminals 5 and 6.

- If the analog output is in the current output 0 ... 20 mA mode or current output 0 ... 10V mode, the test jack (6, figure 2, page 83) must be bridged at 0 mA or at 0V for correct HART communication. A suitable short-circuit connector can be ordered as an accessory as follows:
  - Add the suffix S01 to the order number of the SITRANS TW or
  - order as accessory with order number 7NG3092-8AP

3.5 Hardware modification

WARNING

The module contains components which are vulnerable to static. Observe the safety precautions!

ATTENTION

Hardware parameterizations on the device must be documented on the hardware rating plate with a waterproof and smear-proof felt-tipped pen. The hardware rating plate is located under the replaceable rating plate with the operating data.

WARNING

Only hardware modifications may be made which are also described in the following chapters. Otherwise Ex devices lose their Ex license.

3.5.1 Opening and closing the transmitter

Switch off the power supply. Pull out the screw-type connector (1-4, figure 2, page 83). Re lease the DINrail adapter (3, figure 3, page 84) by pressing the locking catch (4, figure 3, page 84) and pushing to the side. Pull out the transparent cover for the type plate with the operating data as described in chapter 3.5.2, page 92. Release the front of the housing (2, figure 3, page 84), pull off the front and pull out the module.

The transmitter is closed in reverse order. You must ensure that the housing is sealed properly and the panel snaps in place. No conductive parts may be left loose inside the device.

3.5.2 Removing and inserting the rating plate

Lift the transparent cover for the rating plate with the operating data (7, figure 2, page 83) at the position (9, figure 2) with a small screwdriver towards the front until it snaps out on the opposite side and pull it out. The inserted rating plate is exchangeable. There is a label carrying the basic data of the transmitter underneath this rating plate on the housing. Fold a new operating data rating plate in the appropriate marked place and then insert it in the grooves in the transparent cover.

After pushing the transparent cover back in, it must snap in when pressing at position (9, figure 2) and the opposite side.

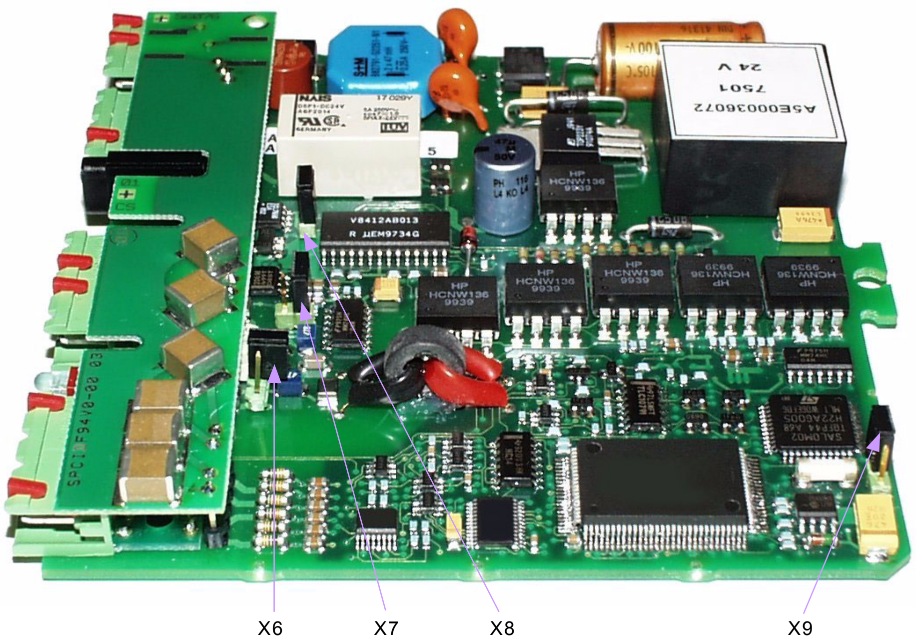
3.5.3 Switching over current output to voltage output

- Set the plug-in jumpers X6, X7, X8 (figure 7, page 93) according to the following table:

plug-in jumper	Current output	Voltage output
X6	open	closed
X7	open	closed
X8	closed	open

- Then set the type of analog output set in the hardware in the software as well with the operating software SIMATIC PDM or with the HART communicator.
- Label the hardware rating plate according to the following table

	Device order no.	Output type
Current output	7NG3242-xx**A**xx	Mark 20mA
Voltage output	7NG3242-xx**B**xx	Mark 10V



X6 plug-in jumper for output type (current or voltage)
(X6 may also be a bent plug-in jumper in some versions of the device)
X7 plug-in jumper for output type (current or voltage)
X8 plug-in jumper for output type (current or voltage)
X9 plug-in jumper for HART write protection

Figure 7 Hardware options of the SITRANS TW, 4-wire mounting rail device

NOTE

Switching from the current output to voltage output and vice versa does not affect the accuracy of the output stage.

3.5.4 HART write protection

Parameterization of the transmitter can be prevented by plugging in the bridge X9 (figure 7, page 93).

plug-in jumper	write protection on	write protection off
X9	closed	open (as-delivered state)

3.6 External reference point compensation with reference point terminal 7NG3092-8AV

3.6.1 Application and use

This serves as a reference point terminal in devices with the order designation 7NG3242-****0 in the thermocouple measuring mode with external reference point compensation.

The basic accuracy of the reference point terminal is 0.5 °C (PT100 DIN IEC 751, limit class B).

For applications with reduced accuracy requirements of the reference point measurement (≤ 3 °C) the internal reference point compensation of the device can also be used.

WARNING

In devices with "intrinsically safe" type of protection, make sure that the reference point teminal 7NG3092-8AV and the input plug are mounted firmly in the blue cable housing enclosed ex-factory before putting the devices into operation.

3.6.2 Connection and wiring

The reference point terminal and the thermocouple must be mounted on the input plug (terminal 1-4) of the SITRANS TW as shown in figure 8.

The wiring of terminals 3 and 4 (chapter 6.4.2, page 130) in the circuit type thermocouple with external thermocouple with external compensation is omitted. It is already implemented in the reference point terminal.

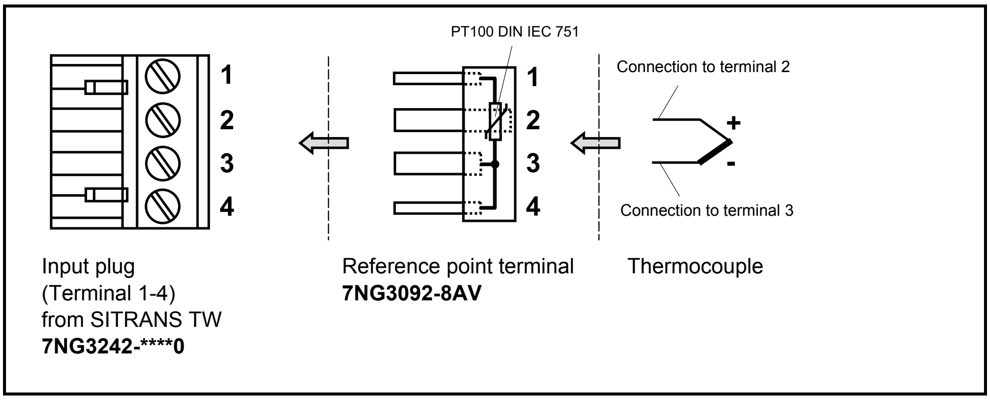


Figure 8 Connection of reference point terminal and thermocouple

3.6.3 Software parameterization

“External PT100” should be selected in the parameterization software (HART-Communicator or SIMATIC PDM) as the type of reference point compensation.

3.6.4 Order

- Add code S02 or 23 to the order number of the SITRANS TW
- Order as accessory under order number 7NG3092-8AV

3.7 Current/voltage measurement by U/I input plug 7NG3092-8AW

3.7.1 Application and use

It serves in devices with the ordering designation 7NG3242-0***0 as a measuring set for:

- voltage measurement in the measuring range: -1.2 to 10 V DC or
- current measurement in the measuring range: -12 to 100 mA DC

The basic accuracy of the U/I input plug is: 0,1 %.

The minimum span is for:

- voltage measurement (measuring range -1.2 to 10 V): 0.05 V
- current measurement (measuring range -12 to 100 mA): 0.41 mA

WARNING

The U/I input plug may not be used in hazardous (explosive) areas.

3.7.2 Connection and wiring

The U/I input plug must be mounted on the input plug (terminal 1-4) of the SITRANS TW as shown in figure 9.

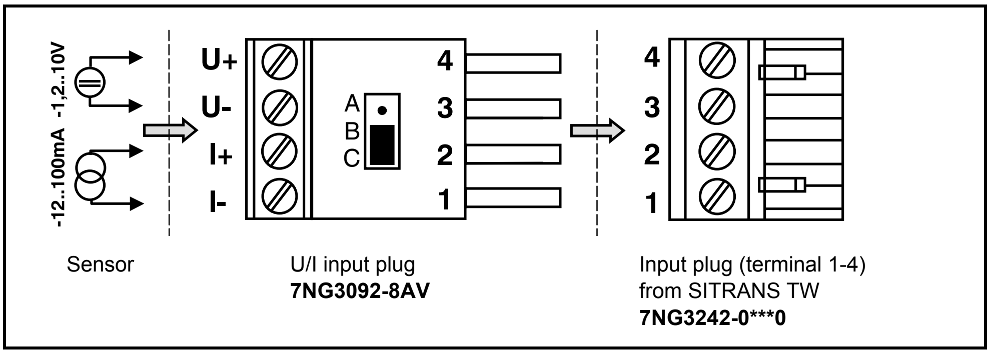


Figure 9 Connection of U/I input plug to SITRANS TW

The hardware parameterization must be done as follows:

Measuring range	Jumper position
Voltage (-1.2 to 10 V)	A-B
current (-12 to 100 mA)	B-C (default)

3.7.3 Internal structure

A voltage divider (R1, R2) is used in the U/I input plug to adapt the measuring voltages (-1.2 to 10 V) to the input measuring range of the SITRANS TW and a current shunt (R3) to adapt the measuring currents (-12 to 100 mA).

The circuit diagram of the U/I input plug is shown in figure 10.

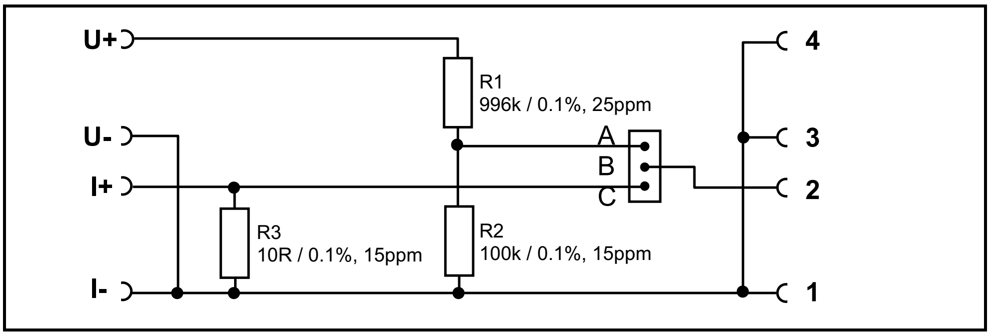


Figure 10 Circuit diagram U/I input plug

3.7.4 Software parameterization

The following order must be observed for the parameterization of the plug:

1. HART-Communicator
   - Selection sensor class = mV transmitter
   - Selection sensor type = -120 to 1000 mV
   - Input of following special characteristic pairs:

Measuring range	Value pairs	
-1.2 to 10 V	X1 = -109.4891 mV X2 = 912. 4088 mV	Y1 = -1.2000 V Y2 = 10.0000 V
-12 to 100 mA	X1 = -120 mV X2 = 1000 mV	Y1 = -12 mA Y2 = 100 mA

   - Selection type of linearization = special characteristic

2. SIMATIC PDM
   - Selection sensor class = mV transmitter
   - Selection sensor type:

Measuring range	Sensor type
-1.2 to 10 V -12 to 100 mA	-1.2 to 10 V (with U/I plug (7NG3092-8AW) -12 to 100 mA (with U/I plug 7NG3092-8AW)

   - The corresponding special characteristic pairs and the type of linearization are set automatically by SIMATIC PDM.

3. If the U/I input plug is o be used in connection with another ("customer-specific") special characteristic, the voltage divider R1, R2 or the current shunt R3 of the U/I input plug must be taken into account in the characteristic input (see circuit diagram figure 10).

4. In voltage measurement (measuring range –1.2 to 10 V), all input signals X_i must be multiplied with the voltage divider:

$$R_T = \frac{R2}{R1+R2} = \frac{100\ k\Omega}{996\ k\Omega + 100\ k\Omega} = 0{,}09124087$$

The characteristic input values $X_{SKL,i}$ must be specified in the unit mV.

Example: (V-signal corresponds to the physical oxygen content [%O2])

Sensor signal X_i **->** $X_{SKL,i}$ **(input values)**	**Linearized signal** $Y_{SKL,i}$ **(input values)**
X_1: 1 V -> $X_{SKL,1}$: 91.2409 mV	$Y_{SKL,1}$: 3**
X_2: 7 V -> $X_{SKL,2}$: 638.6861 mV	$Y_{SKL,2}$: 21**
X_n: 8 V -> $X_{SKL,n}$: 729.9270 mV	$Y_{SKL,n}$: 35**
The input values $X_{SKL,i}$ must be entered in the unit mV.	** corresponds to [%O2]

($\mathbf{X_{SKL,1}}$ = X_1 x R_T = 1 V x 0.09124087 = 0.09124087 V = **91.2409 mV**)

5. In current measurement (measuring range -12 to 100 mA), all input signals X_i must be multiplied with the current shunt $\mathbf{R_S}$ = R3 = **10** Ω. The characteristic input values $X_{SKL,i}$ must be specified in the unit mV.

   Example: (mA signal corresponds to physical height [m])

Sensor signal			**Linearized signal**
$\mathbf{X_i}$	**->**	$\mathbf{X_{SKL,i}}$ **(input values)**	$\mathbf{Y_{SKL,i}}$ **(input values)**
X_1: 10 mA	->	$X_{SKL,1}$: 100 mV	$Y_{SKL,1}$: 1**
X_2: 70 mA	->	$X_{SKL,2}$: 700 mV	$Y_{SKL,2}$: 5**
X_n: 80 mA	->	$X_{SKL,n}$: 800 mV	$Y_{SKL,n}$: 7**
The input values $X_{SKL,i}$ must be entered in the unit mV.			** corresponds to [m]

   ($\mathbf{X_{SKL,1}}$ = X_1 x R_S = 10 mA x 10 Ω = 10 mA x 10 V/A **= 100 mV**)

NOTE

A special characteristic is used device-internally when the U/I input plug is used. This overwrites an existing special characteristic in the device.

When operating the device with SIMATIC PDM, the PDM-Device Description Rev. 2 of SITRANS TW is required. (SIMATIC PDM 5.2 already contains the PDM-DD Rev. 2. An update for SIMATIC PDM 5.1 is available under **www.siemens.com/sitranst**) (-> Process Device Manager / -> Downloads)).

3.7.5 Order

- Add the code S03 to the order number of the SITRANS TW or
- order as an accessory with order number 7NG3092-8AW

4 Functions / Operation by HART

For operation via HART it is necessary to use a HART Communicator (see the appendix for menu structure) or a PC software such as SIMATIC PDM. Please consult the appropriate operating instructions or online help to find out how to operate this tool.

4.1 Operating data

The following operating data can be transmitted to the transmitter and requested from the transmitter.

- Identification
  - Specifications on operating reliability: Day, description, message, assembly number
  - Device data (these data are read only)
    - → Manufacturer and product name
    - → Order number, device serialnumber
    - → Data of power supply and hardware writeprotection
    - → Revision number (universal, field device, software and hardware revision)
- Specifications on the measuring method:
  - Sensor class and sensor type (e.g. resistance thermometer Pt100 or thermocouple type B)
  - Scaling factor of the sensor
  - Sensor characteristic (e.g. temperature linear or voltage linear)
  - Measuring range and unit
  - Mains frequency filter / measuring frequency
- Data of measuring connection
  - Connection type (standard, difference or average value circuit)
  - Connection type / sensor connection (two, three or four-wire circuit)
  - Resistors for line compensation
  - Offset in measuring signal
  - Additional data for the reference point in thermocouples (internal, external, fixed or none)
  - Enable / disable wire break and short-circuit test
- Data for output signal
  - Current or voltage output (0 ... 20mA, 4 ... 20mA, 0 ... 10V or 2 ... 10V) in connection with hardware modification according to chapter 3.5.3, page 92
  - Filter time constant for dampening for interference suppression
  - Behavior in event of line break, sensor short-circuit and hardware and firmware errors (e.g. output signal opening, closing or hold last value).
  - Output limit values (alarm and saturation limits)

- Certificates and licenses
  - Information whether or not the transmitter may be operated in intrinsically safe mode (this specification can only be read).
- Other parameterizable functions are e.g.:
  - Slave pointer functions
  - Simulation of measuring input, electronics temperature and analog output
  - Message relay settings
  - Line resistance measurement
  - Sensor trim function with selectable trim range within the measuring range limits
  - Trimming the analog output
  - Self-test function of hardware and firmware
  - Factory reset: Resetting of the operating data to the ex-factory state.

The operating data are stored in a non-volatile memory (EEPROM).

4.2 Parameterizable functions

4.2.1 Line break monitoring and short-circuit testing

A measuring channel-related line break monitoring can be carried out for resistance thermometers, resistance transmitters, thermocouples and mV transmitters. Line break testing is not possible in devices for measuring current or voltages > 1V (device order designation 7NG3242-xxxx[1-8]). If there is a line break, no reference temperature of the internal sensor (electronic temperature) can be determined.

A measuring channel-related short-circuit monitoring is only possible in resistance thermometers and resistance transmitters. The threshold value for the short-circuit test is freely parameterizable within the measuring limits.

4.2.2 Adjusting line resistances

It is possible to adjust line resistances for the following measurements:

- Resistance thermometer or resistance transmitter in two-wire circuit
- Resistance thermometer or resistance transmitter for forming difference or average value
- Thermocouple with external reference point with Pt100 in two-wire circuit

Adjustment takes place by numeric specification of the measured line resistance (sum of supply and return conductor) or by measuring directly with the operating software.

4.2.3 Measuring line resistances

Depending on the interface module (see chapter 6.4, page 129) line resistances can be measured on the measuring channel 1, measuring channel 2 or the line resistance to the external resistance thermometer (as a reference point to a thermocouple). To do this, the appropriate measuring channels must be short-circuited and the line resistance measuring parameters activated.

The measured resistance values are stored in the parameters for the line compensation.

4.2.4 Measured value offset

For application in which the process variable to be measured cannot be measured directly at the measuring point, a measuring channel-related offset behavior can be parameterized.

4.2.5 Scaling factor

The scaling factor serves for characteristic adaptation in series or parallel circuiting of resistance thermometers and thermocouples. It should be multiplied by their basic series. Values of 0.1 to 10.0 for resistance thermometers as well as values from 1 to 10 for thermocouples can be set for the scaling factor.

Example: 3 x Pt500 parallel: Scaling factor = 5/3 = 1.67 (basis is Pt100)

4.2.6 Reference selection for measuring by means of a thermocouple

The connection type of the resistance thermometer for reference point measurement for thermocouples can be selected. Use of the built-in Pt100 or an external Pt100 which is necessary when the measuring point is remote from the SITRANS T3K PA. An external reference point terminal is available as an accessory under order number 7NG3092-8AV. Information about using and connecting the reference point terminal on the SITRANS TW can be found in chapter 3.6, page 94.

4.2.7 Difference circuit / average value circuit

The difference and average value circuit connection have the following special features in comparison with the other connections (standard, sum, parallel):

Set start of scale and full scale

- First enter the start of scale and full scale for the two single sensors. The start of scale and full scale are identical for both sensors. Different measuring ranges cannot be parameterized for the single sensors.
- Then the start of scale and full scale for the difference or average value must be parameterized.

Sensor trimming

- The sensor trim is performed at the respective range limits of the two single sensors. The parameterized difference or the parameterized average value cannot be trimmed.

4.2.8 Mains frequency filter / measuring frequency

An interference suppression of the mains frequencies of 50Hz or 60Hz can be set with this filter. 10 Hz can also be selected as a special function. The selected mains frequency filter is equivalent to the measuring frequency used. If the 10 Hz mains frequency is used, greater accuracy at the cost of lower measuring speed is possible.

4.2.9 Electric damping

The filter time constant of the electric damping can be set in the range from 0 to 100 s.

4.2.10 Current transmitter / voltage transmitter

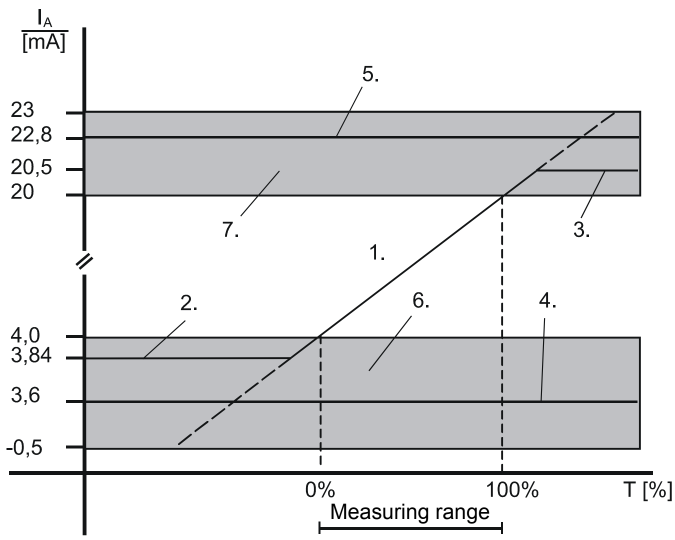
The transmitter can be switched to constant current or constant voltage operation for test purposes. In this case the output current or output voltage no longer correspond to the process variable.

4.2.11 Alarm current / alarm voltage

With this function the value of the lower and upper alarm current or the lower and upper alarm voltage can be set. Both signal a sensor error or a hardware / firmware error.

The value of the upper and lower alarm current / alarm voltage and the upper and lower limit of the linear modulation range are freely selectable within the given limits of the current modulation range / voltage modulation range. Figure 11, page 103 shows this by an example of the 4 ... 20mA current output.

The specified accuracy of the output signal only applies for the respective rated ranges.



1. linear modulation range
2. lower limit of the modulation range (default value)
3. upper limit of the modulation range (default value)
4. lower alarm current value (default value)
5. upper alarm current value (default value)
6. recommended setting range for lower alarm current range and lower modulationrange limit
7. recommended setting range for upper alarm current range and upper modulationrange limit

Figure 11 Current limits in output signal 4 ... 20mA

4.2.12 Sensor adjustment

With the sensor adjustment it is possible to set the characteristic of the sensor at two adjustment points. The results are then correct measured values at the adjustment points. The error percentage on the basis of the characteristic can be reduced by adjusting the sensor.

4.2.12.1 Trimming the lower sensor adjustment point

The process variable (e.g. temperature or resistance) at which the lower sensor-adjustment is made, is applied to the transmitter input. With SIMATIC PDM or the HART Communicator you instruct the transmitter to accept this process value. This represents an offset shift of the characteristic (B, figure 12, page 104).

4.2.12.2 Trimming the upper sensor adjustment point

The process variable (e.g. temperature or resistance) at which the upper sensor adjustment is made, is applied to the transmitter input. With SIMATIC PDM or the HART Communicator you instruct the transmitter to accept this process value. This makes a slope correction to the characteristic (C, figure 12). The lower sensor adjustment point is not affected.

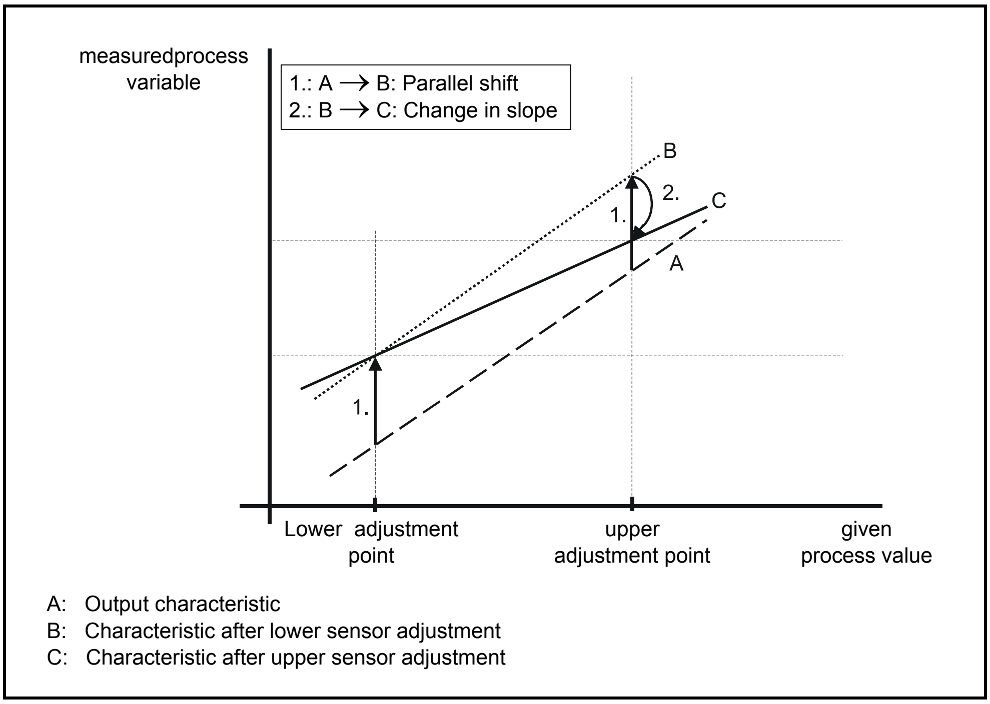


Figure 12 Sensor adjustment

NOTE

- The sensor adjustment is reset automatically after every parameterization of the sensor type.
- In the difference or average forming type of circuit (chapter 6.4, page 129) the sensor adjustment can be made for measuring channel 1 and for measuring channel 2.

4.2.13 Current transmitter adjustment / Voltage transmitter adjustment

The current output by the transmitter or the voltage output by the transmitter can be adjusted independently of the process circuit. This function is suitable for compensating inaccuracies in the operating sequence following the transmitter. The adjustment is only possible at 0/4 ... 20 mA or at 0/2 ... 10 V. Figure 13, page 106 shows the adjustment principle by an example of the 4 ... 20 mA current output.

Application example: Adjustment of the 4 ... 20 mA current output

The current should be measured as a voltage drop of 1 V to 5 V on a resistance of 250Ω ± 5 %. To compensate the tolerance of the resistance, set the current transmitter so that the voltage drop at 4mA is exactly 1V and at 20mA exactly 5 V.

ATTENTION

A multimeter which is used must have a higher class accuracy than the transmitter.

1. Adjustment at 4 mA:

Under menu item D/A adjustment you instruct the transmitter to output 4mA. You read the measured value on the voltmeter, calculate the current value from it and enter this, for example, via the SIMATIC PDM. The transmitter uses this value for current offset correction.

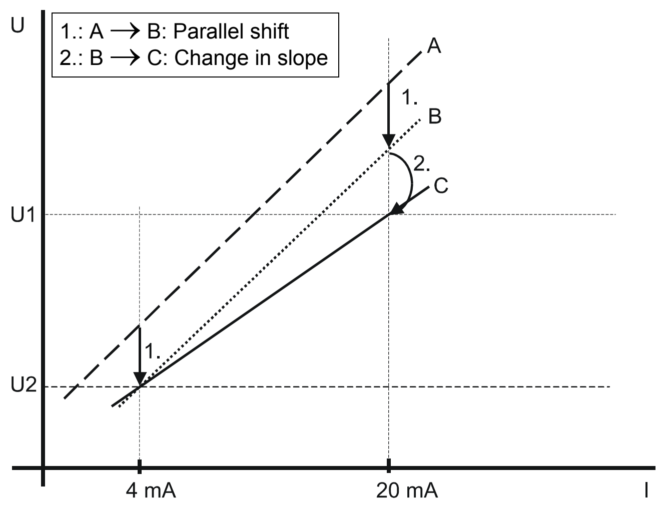
2. Adjustment at 20 mA:

Under menu item D/A adjustment you instruct the transmitter to output 20mA. You read the measured value on the voltmeter, calculate the current value from it and enter this, for example, via the SIMATIC PDM. The transmitter uses this value for current slope correction. The value for 4 mA is not changed.

Scaled D/A adjustment:

This transmitter offers the additional option of a scaled adjustment of the analog output.

Scaled under menu item DA adjustment the values read by the measuring instrument can be entered directly in SIMATIC PDM or in the HART communicator after entering the customerspecific scaling (for the example above it applies: lower scaled adjustmentpoint = 1V, upper scaled adjustment point = 5 V).



A: Output characteristic
B: Characteristic after current transmitter adjustment 4 mA
C: Characteristic after current transmitter adjustment 20 mA

Figure 13 Current transmitter adjustment Example 4 ... 20mA output

4.2.14 Special characteristic

The SITRANS TW offers the option of connecting a large number of sensors to the device for which a valid sensor characteristic is already stored in the device.

However, there are applications of sensors (e.g. Cu100) for which this device does not offer correction of a non-linear sensor characteristic as a standard function. However, in this case it is possible to store a customer-specific special characteristic in the device.

For the customer-specific characteristic correction, the device requires the value pairs (X-values, Y-values). These value pairs form vertex points between which the desired output characteristic is generated by linear interpolation from an input characteristic. The number of vertex points depends here on the parameterization software used.

- HART communicator Maximum number of parameterizable vertex points = 20
- SIMATIC PDM: Maximum number of parameterizable vertex points = 50

A customer-specific unit can be parameterized for the special characteristic figure 14, page 107 shows the principle of the customer-specific characteristic correction

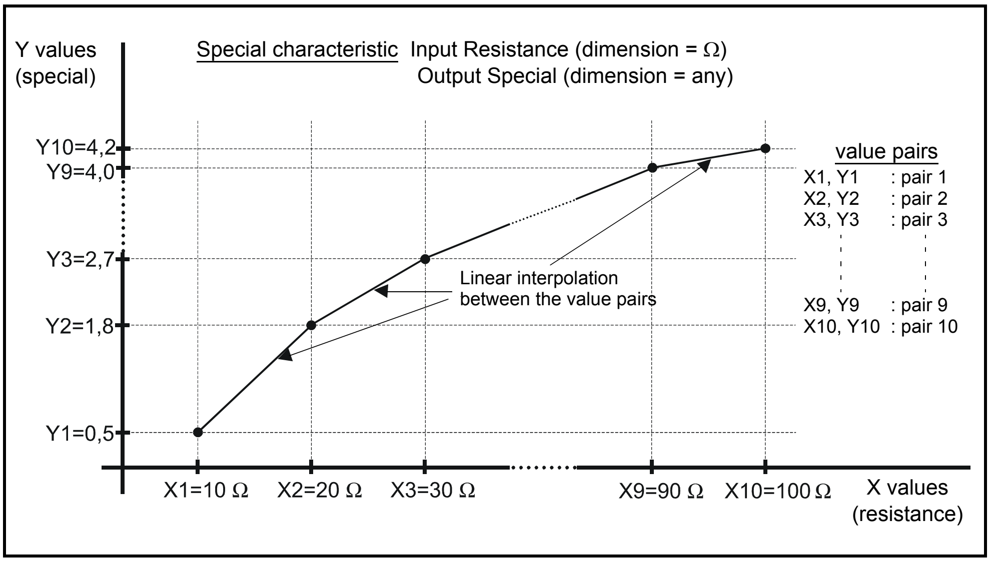


Figure 14 Principle of customer-specific characteristic correction

The following notes must be observed for the parameterization of the customer-specific special characteristic:

- General:
  - The number of value pairs must be determined before starting the characteristic input.
  - The X values must increase or decrease monotonously in the characteristic input.
  - The special characteristic linearization type may only be activated when a valid special characteristic is stored in the device.
  - If the type of linearization is set to special characteristic, the default characteristic unit is '**' in resistance, current and voltage measurement. The default setting can be changed but the measured values are still displayed with the default characteristic unit '**'.
- Characteristic input by HART communicator:
  - If the characteristic has already been input by SIMATIC PDM and more than 20 value pairs entered, only the first 20 value pairs can be read from the device with the HART communicator.
  - If a special characteristic is to be entered during the offline parameterization, all device variables must be activated to "Send" in the menu item *"1 Select all"* before beginning offline parameterization (menu item *"3 Individual processing"*).

4.2.15 Factory calibration

It is possible to reset the transmitter to its exfactorystate. You can select the scope of the recoverable parameters in a menu with SIMATIC PDM or the HART communicator in five steps:

1. Resetting the factory basic data except for the following parameters:
   → customer-specific sensor adjustment
   → customer-specific adjustment of the analog output
   → customer-specific alarm settings
   → customer-specific settings for the sensor error / limit value alarm
2. resetting the customer-specific sensor adjustment
3. resetting the customer-specific adjustment of the analog output
4. resetting the customer-specific alarm settings with the following parameters:
   → alarm type of the analog output
   → lower and upper alarm value of the analog output
   → lower and upper output limit of the analog output
5. resetting the customer-specific settings for the sensor error / limit value alarm with the following parameters:
   → lower and upper limit value limit
   → Hysteresis
   → switching delay
   → limit value alarm mode
   → alarm activation

4.2.16 Diagnostic functions

Communication with a HART interface enables numerous diagnostic functions to be activated and evaluated.

The diagnostic concept of the SITRANS TW is such that a diagnostic warning can be parameterized for diagnostic functions for monitoring limit values and a diagnostic alarm for diagnostic functions for monitoring error states. The diagnostic warning and diagnostic alarm can be output by:

→ HART communication
→ Analog output
→ message relay
→ Operating display (LED)

- **Diagnostic warning** The device transmits the diagnostic event that has occurred via HART. The analog output value remains unchanged. A warning via the built-in message relay (sensor error / limit value alarm) can be parameterized.

- **Diagnostic alarm:** The device goes into the alarm current / alarm voltage state. The diagnostic event is provided additionally via HART. The output via the message relay is parameterizable.

Table 1 gives a list of all parameterizable diagnostic functions. The standard setting for all warnings and alarms is off. The diagnostic warning and diagnostic alarm must be parameterized with the HART communicator or with SIMATIC PDM. If several errors occur simultaneously, the given priorities apply (priority 1 = highest priority)

Diagnostic function	Priority	Output of diagnostic function via			
		HART	Analogoutput	Message relay 4)	LED
Diagnostic alarm:					
Sensor error 1) 2)					
Sensor break	1	Status	to alarm value	yes	f = 1Hz
Sensor short-circuit	1	Status	to alarm value	yes	f = 1Hz
Hardware / firmware error 1) 3)					
RAM / ROM / EEPROM error	1	Status	to alarm value	yes	f = 1Hz
Checksum error	1	Status	to alarm value	yes	f = 1Hz
Electronic error	1	Status	to alarm value	yes	f = 1Hz
Enter special characteristic!	1	Status	to alarm value	no	f = 1Hz
Diagnostic warning					
Measured value below lower limit 1)	2	Status	unchanged	yes	f = 5Hz 5)
Measured value above upper limit 1)	2	Status	unchanged	yes	f = 5Hz 5)
Output saturation warning 1)	3	Status	unchanged	yes	f = 1Hz 5)
Measured value below sensor limit	4	Status	unchanged	no	f = 1Hz
Measured value above sensor limit	4	Status	unchanged	no	f = 1Hz

Table 1 Diagnostic functions

1) Output to message relay optional activation and deactivation of output in the Limit value mode menu item
2) Output to analog output Output can only be controlled by global activation and deactivation of the break and short-circuit detection
3) Output to analog output Parameterization not possible, the analog output is always set to alarm value in the event of an error
4) Time delay for response of the message relay is programmable
5) Flashing starts with a time delay (time delay is the same as was programmed for the message relay)

4.2.16.1 Message relay

The message relay can monitor different limit values and error states with simple limit value components. The components are switched on or off in SIMATIC PDM or in the HART communicator in the Limit value mode menu item. The following limit value components can be parameterized in all combinations.

a) Sensor error detection (break and / or short-circuit)
b) Monitoring of hardware and firmware errors
c) Monitoring of lower limit value
d) Monitoring of upper limit value
e) Monitoring of analog output for saturation

A switching delay tv of the message relay can be parameterized for parameterization of the limit value components. Exceeding / dropping below a limit value causes a delay until the alarm is triggered. There is no switching delay if the limit value is dropped below of / exceeded again. The switching delay helps to achieve suppression of brief exceeding / dropping below of limit values. A stable message behavior can be achieved in the event of fluctuations around the limit value by a hysteresis which is also parameterizable. Figure 15, page 111 shows examples of a limit value monitoring.

The message relay can be parameterized in the idle current principle and open circuit principle states (see also chapter 6.3, page 126). When operating with the HART communicator, the “Relay closes” parameter must be set as follows:

- with idle current principle “ON”
- with open circuit principle “OFF”

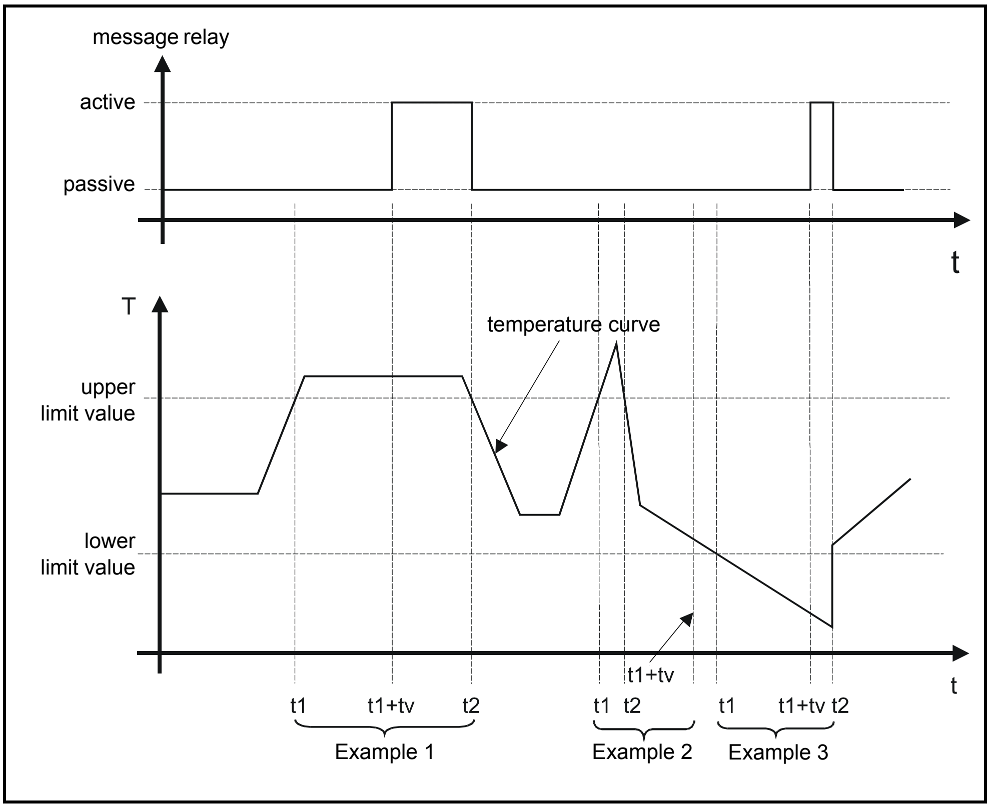


Figure 15 Examples for limit value monitoring (hysteresis = 0)

4.2.16.2 Operating hours counter

An electronic operating hours counter can be read out via HART (PDM or Communicator). The counter is activated the first time the transmitter is started. If the device is disconnected from its power supply the counter reading is stored automatically in the non-volatile memory. It can therefore access the latest counter reading the next time it is restarted. The operating hours counter cannot be reset.

4.2.16.3 Slave pointer

This device offers four pairs of slave pointers altogether with which the following measuring variables and positive peak values can be monitored:

- Slave pointer pair for primary measured value (e.g. temperature difference T1-T2 in two resistance thermometers in difference circuit)
- Slave pointer pair for secondary measured value (e.g. temperature of measuring channel 1 in two resistance thermometers in difference circuit)
- Slave pointer pair for tertiary measured value (e.g. temperature of measuring channel 2 for two resistance thermometers in difference circuit)
- Slave pointer pair for electronics temperature

Per measured value a resettable slave pointer saves the maximum and minimum peak values long-term in the non-volatile memory The values are then reavailable after restarting the device. The slave pointers are also updated during the simulation (see chapter 4.2.18, page 113). Figure 16, page 112 shows the principle of a slave pointer curve.

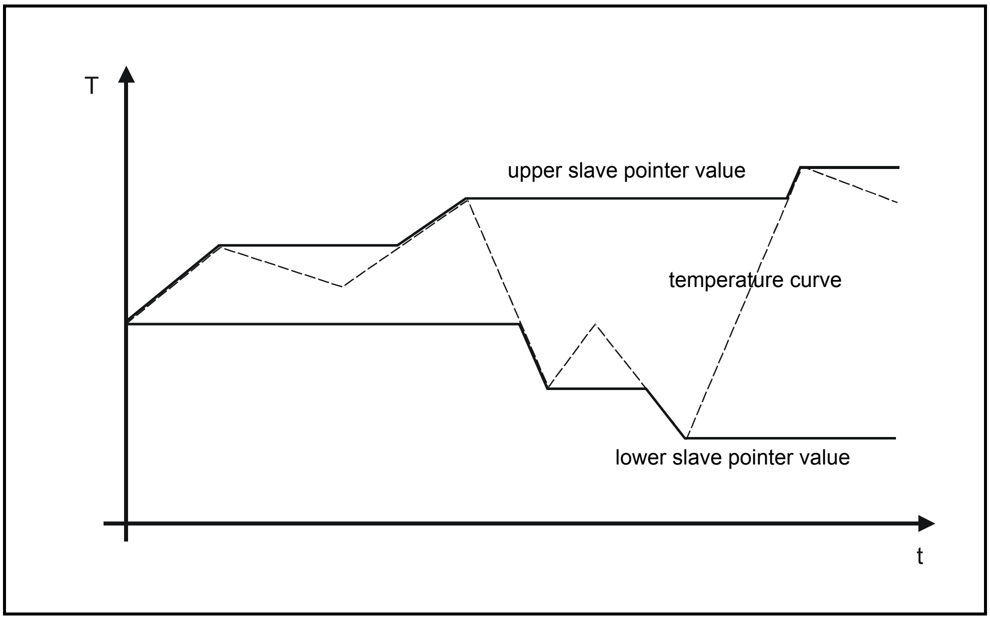


Figure 16   Principle display of slave pointers using temperature as an example

Resetting of the slave pointer takes place:

- automatically after another sensor type has been parameterized
- at the user's request

ATTENTION

After reparameterization of the type of connection and completion of the installation work, the customer must reset the slave pointers.

4.2.17 Test functions

The SITRANS TW offers the following test functions for testing the hardware and firmware:

- **Resetting the SITRANS TW electronics:**
  Resetting the SITRANS TW electronics causes a RESET of the microcontroller which is comparable with switching the power supply off and back on.
- **Self test:**
  The microcontroller executes extensive hardware and firmware diagnostic routines.

4.2.18 Simulation

With the diagnostic function “Simulation”, (quasi) measured data can be received and processed without a process value being applied to the device. You can therefore run individual processes “cold” and thus simulate process states. In addition, the cables for the analog output and the message relay can be tested by applying simulation values.

The value to be simulated can be preset as a fixed value or in the form of a ramp function. The following simulations for measuring input and analog output are possible:

Measuring input:

- Fixed value simulation or ramp simulation for primary process variable
- Fixed value simulation or ramp simulation for electronics temperature

Measuring output:

- Fixed value simulation of the analog output

The simulation of primary process variable, electronics temperature and analog output is handled identically in parameterization and function so that only the general simulation methods “fixed value” and “ramp function” are explained below using the measuring input as an example.

For security reasons all the simulation data are only kept in the RAM. This means any simulation is switched off when the device is restarted.

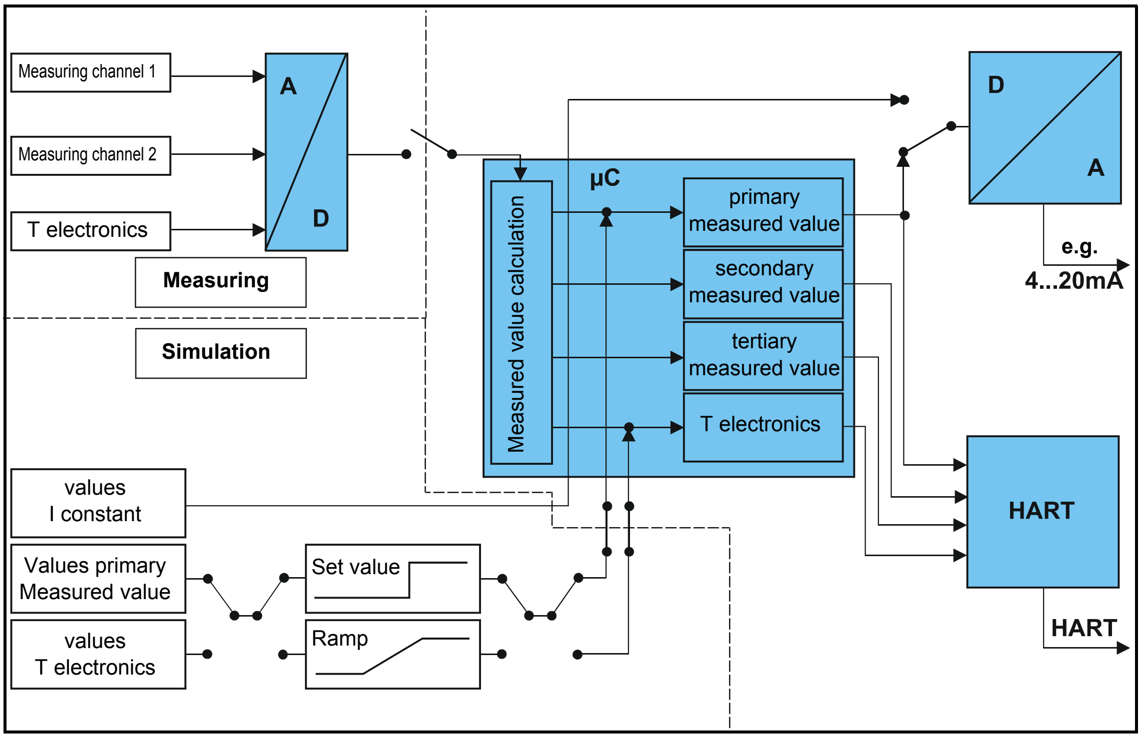


Figure 17 Principle circuit diagram simulation

4.2.18.1 General information

- As long as the simulation is switched on, the transmitter does not react to sensor input signals.
- No simulation is possible in difference or average circuit.
- If thermocouples are simulated, a fixed reference point temperature of 0°C is used for the simulation.
- Simulation of the electronics temperature has no influence on the analog output. It can only be observed through the HART communication interface.

4.2.18.2 Simulation of measuring input

Simulation as a fixed value

Under consideration of the physical unit, fixed simulation values can be parameterized for both simulation lines (primary measured value and electronics temperature). The analog output value is set according to the value defaulted for the primary measured value.

Simulation with a periodic ramp function

In addition to the adjustable fixed values a periodically recurring ramp function can also be parameterized for both simulation paths. A settable start and end value determines the respective limits between which the simulation values move with a rising and falling tendency. The step width can also be calculated with the settable number of steps.

$$Step\ width = \frac{end\ value - start\ value}{Number\ of\ steps}$$

The time between two consecutive simulation values is determined by the step duration.

In the simulation for the primary measured value, the analog output follows the simulated values.

4.2.19 Parameterization behavior

4.2.19.1 “Offline parameterization”

It is possible to parameterize the device with SIMATIC PDM or the HART communicator without a device being connected to the operating software. With this type of parameterization (”offline parameterization”) device-independent data can be created, saved and stored in individual devices. The following instructions must be observed for the “offline parameterization”.

- When sending the data records to the connected device, make sure that these meet all hardware requirements. (e.g. Is there a limit value alarm in the device? Is the device suitable for measuring currents?). Failure to observe this could lead to parameterization errors.
- This device allows “offline configuration” of all device parameters except the linearization type parameter. The linearization type can only be parametrized “online”. However, for the linearization type the device firmware sets a standard value after receiving the “offline” parameterization datarecord. This restriction does not apply when operating the device with SIMATIC PDM. However, the PDM-Device Description Rev. 2 is required. (SIMATIC PDM 5.2 already contains the PDM-DD Rev. 2. An update for SIMATIC PDM 5.1 is available under **www.siemens.com/sitranst**) (-> Process Device Manager / -> Downloads).)

4.2.19.2 “Cloning”

If several transmitters with the same parameterization data are to be installed, “device cloning” is a simple way of cutting down on setting work.

The following procedure is recommended for “device cloning”.

1. Parameterization of the reference transmitter according to the desired measuring task.
2. Reading out and possibly editing and saving the data record by the reference transmitter
3. Sending the reference data record to other transmitters

- HART communicator Special feature when “cloning” with special characteristic
  - If a special characteristic was entered before reading out the reference data record, the HART Communi cator must be switched off and back on before sending the data record to other devices.

4.3 Tips for HART communicator operation

4.3.1 Hotkey

Using the hotkey F7 of the HART communicator you can switch to a customer-specific hand-held menu. This enables frequently used functions to be combined in one menu group. This menu already contains the *“Set zero / span”* function as a standard. Other menu items can be added as you wish.

A detailed description of the hotkey can be found in the HART communicator documentation.

5 Technical data

Technical data	
Input	
Selectable filters for suppression of line frequencies	50 Hz, 60 Hz, also 10 Hz for special applications (line frequency filter is similar with measuring frequency)
Resistance thermometers	
• Measured variable	Temperature
• Measuring range	Parameterizable
• Span	Min. 25 °C (45 °F) x 1/scaling factor
• Input type	Pt100 (DIN IEC 751) Pt100 (JIS C1604-81) Ni100 (DIN 43 760) Special type ($R_{RTD} \le 500\ \Omega$) Multiples or parts of the defined characteristic values can be parameterized (e.g. Pt500, Ni120)
• Characteristic	Temperature-linear, resistance-linear or customer-specific
• Type of circuit	
- Standard circuit	One resistance thermometer in two-wire, three-wire or four-wire system
- Sum or parallel circuit	Series or parallel connection of several resistance thermometers of the same type in a two-wire system for generating the mean value of the temperature, or for adaptation of other types of sensors. This results in a scaling factor n, e.g. n=5 for Pt500 or n=1.2 for Ni120
- Mean-value circuit	Generation of mean value of two resistance thermometers in a two-wire system
- Difference circuit	Generation of difference between two resistance thermometers in a two-wire system. The difference can be selected as required, e.g. channel 2 - channel 1
• Connection	Two-wire, three-wire or four-wire system
- Two-wire system	Selectable line resistance
- Three-wire system	No balancing required if all line resistances are the same
- Four-wire system	No balancing required
• Measured current	≤ 0.55 mA (range-dependent, automatic setting by parameterization software)
• Measuring range limits	Depending on type of connected thermometer (defined range of resistance thermometer)
• Trimming range	Max. ± 5% of range limits
• Sensor breakage monitoring	Monitoring of all connections for open-circuit (function can be switched off)
• Sensor short-circuit monitoring	Parameterizable response threshold (function can be switched off)

Resistance-based sensors, potentiometers	
• Measured variable	Resistance
• Measuring range	Parameterizable
• Span	Min. 10 Ω
• Characteristic	Resistance-linear or customer-specific
• Type of circuit	
- Standard circuit	One resistance-based sensor in two-wire, three-wire or four-wire system
- Mean-value circuit	Generation of mean value of two resistance-based sensors in a two-wire system.
- Difference circuit	Generation of difference between two resistance-based sensors in a two-wire system. The difference can be selected as required, e.g. channel 2 - channel 1
• Connection	Two-wire, three-wire or four-wire system
- Two-wire system	Selectable line resistance
- Three-wire system	No balancing required if all line resistances are the same
- four-wire system	No balancing required
• Measured current	≤ 0.55 mA (range-dependent, automatic setting by parameterization software)
• Input range	0 to 6000 Ω; with mean-value and difference circuits: 0 to 3000 Ω
• Trimming range	Max. ± 5% of range limits
• Sensor breakage monitoring	Monitoring of all connections for open-circuit (function can be switched off)
• Sensor short-circuit monitoring	Parameterizable response threshold (function can be switched off)

Thermocouples	
• Measured variable	Temperature
• Measuring range	Parameterizable
• Span	Min. 50 °C (90 °F) x 1/scaling factor
• Measuring range limits	Depend. on type of thermocouple
• Thermocouple	Type B: Pt30%Rh/Pt6%Rh (DIN IEC 584) Type C: W5%-Re (ASTM 988) Type D: W3%-Re (ASTM 988) Type E: NiCr/CuNi (DIN IEC 584) Type J: Fe/CuNi (DIN IEC 584) Type K: NiCr/Ni (DIN IEC 584) Type L: Fe-CuNi (DIN 43 710) Type N: NiCrSi-NiSi (DIN IEC 584) Type R: Pt13%Rh/Pt (DIN IEC 584) Type S: Pt10%Rh/Pt (DIN IEC 584) Type T: Cu/CuNi (DIN IEC 584) Type U: Cu/CuNi (DIN 43 710) Special type (-10 mV ≤ U_{TC} ≤ 100 mV)
• Characteristic	Temperature-linear, voltage-linear or customer-specific
• Type of circuit	
- Standard circuit	One thermocouple with or without cold junction compensation
- Sum circuit	Series connection of several thermocouples of the same type for generating the mean value of the temperature with or without cold junction compensation; see "mV sources" for max. permissible thermoelectric voltage.

Technical data (continued)

Input (continued)	
- Mean-value circuit	Generation of mean value of the temperatures of two thermocouples. The internal temperature sensor is used for cold junction compensation.
- Difference circuit	Generation of difference between the temperatures of two thermocouples. The difference can be selected as required, e.g. channel 2 - channel 1. The internal temperature sensor is used for cold junction compensation.
• Cold junction compensation	None, internal measurement, external measurement or predefined fixed value
• Trimming range	Max. ± 5% of range limits
• Sensor current	Approx. 180 µA
• Sensor breakage monitoring	Function can be switched off
mV sources	
• Measured variable • Measuring range • Span	DC voltage Parameterizable Min. 4 mV
• Input range	-120 to +1000 mV
• Characteristic	Voltage-linear or customer-specific
• Overload limit of inputs	Max. ± 3.5 V
• Input resistance	≥ 1 MΩ
• Sensor current	Approx. 180 µA
• Trimming range	Max. ± 5% of range limits
• Sensor breakage monitoring	Function can be switched off
V sources	
• Measured variable • Measuring range	DC voltage Parameterizable
• Characteristic	Voltage-linear or customer-specific
• Input range/span	Input range / Min. span
- Devices with 7NG3242-xxxx**1** or 7NG3242-xxxx**0** with U/I plug	-1.2 V to +10 V / 0.04 V
- Devices with 7NG3242-xxx**2**	-12 V to +100 V / 0.4 V
- Devices with 7NG3242-xxx**3**	-120 V to +140 V / 4.0 V
• Trimming range	Max. ± 5% of range limits
• Sensor breakage monitoring	Not possible
µA, mA sources	
• Measured variable • Measuring range • Characteristic	Direct current Parameterizable Current-linear or customer-specific
• Input range/span	Input range / Min. span
- Devices with 7NG3242-xxx**4**	-12 µA to +100 µA / 0.4 µA
- Devices with 7NG3242-xxx**5**	-120 µA to +1000 µA / 4 µA
- Devices with 7NG3242-xxx**6**	-1.2 mA to +10 mA / 0.04 mA
- Devices with 7NG3242-xxx**7** or 7NG3242-xxxx**0** with U/I plug	-12 mA to +100 mA / 0.4 mA
- Devices with 7NG3242-xxx**8**	-120 mA to +1000 mA / 4 mA
• Trimming range	Max. ± 5% of range limits
• Sensor breakage monitoring	Not possible
Output	
Output signal	Load-independent direct current 0/4 to 20 mA, can be switched to load-independent DC voltage 0/2 to 10 V using plug-in jumpers.

• Rated range 0 to 20 mA	≙ 0 to 100%
- Rated current	I_{AN} = 20 mA
- Resolution	13900 steps (0 to 100%)
- Overload range	-0.5 to +23.0 mA, continuously adjustable (default range: -0.2 to 20.5 mA)
- Failure signal (with sensor fault)	-0.5 to +23.0 mA, continuously adjustable (default value: 0.5 or 22.8 mA)
- Load	≤ 650 Ω
- No-load voltage	≤ 30 V
• Rated range 4 to 20 mA	≙ 0 to 100%
- Rated current	I_{AN} = 20 mA
- Resolution	11000 steps (0 to 100%)
- Overload range	-0.5 to +23.0 mA, continuously adjustable (default range: 3.84 to 20.5 mA)
- Failure signal (with sensor fault)	-0.5 to +23.0 mA, continuously adjustable (default value: 3.6 or 22.8 mA)
- Load	≤ 650 Ω
- No-load voltage	≤ 30 V
• Rated range 0 to 10 V	≙ 0 to 100%
- Rated voltage	U_{AN} = 10 V
- Resolution	14800 steps (0 to 100%)
- Overload range	-0.25 to +10.75 V, continuously adjustable (default range: -0.1 to 10.25 V)
- Failure signal (with sensor fault)	-0.25 to +10.75 V, continuously adjustable (default value: -0.25 V or 10.75 V)
- Load resistance	≥ 1 kΩ
- Load capacitance	≤ 10 nF
- Short-circuit current	≤ 100 mA (not permanently short-circuit-proof)
• Rated range 2 to 10 V	≙ 0 to 100%
- Rated voltage	U_{AN} = 10 V
- Resolution	11900 steps (0 to 100%)
- Overload range	-0.25 to +10.75 V, continuously adjustable (default range: 1.92 to 10.25 V)
- Failure signal (with sensor fault)	-0.25 to +10.75 V, continuously adjustable (default value: 1.8 V or 10.75 V)
- Load resistance	≥ 1 kΩ
- Load capacitance	≤ 10 nF
- Short-circuit current	≤ 100 mA (not permanently short-circuit-proof)
• Residual ripple U_{pp}/I_{pp} (without HART communication)	≤ 0.5% of max. output voltage or max. output current
• Electric damping	
- Adjustable time constant T_{63}	0 to 100 s, in steps of 0.1 s
• Current source/voltage source	Continuously adjustable within the total operating range
Sensor fault / limit signalling	By operation indicator, relay output or HART interface
• Operation indicator	Flashing signal
- Limit violation	Flashing frequency 5 Hz
- Sensor fault	Flashing frequency 1 Hz
• Relay output	Either as NO or NC contact with 1 changeover contact
- Rating	≤ 150 W, ≤ 625 VA
- Switching voltage	≤ DC 125 V, ≤ AC 250 V
- Switching current	≤ DC 2.5 A
• Sensor fault	Signalling of sensor or line breakage and sensor short-circuit
• Limit monitoring	
- Operating delay	0 to 10 s
- Monitoring functions of limit module	- Sensor fault (breakage and/or short-circuit) - Upper/lower limit - Window (combination of upper and lower limits) - Limit and sensor fault detection can be combined
• Hysteresis	Parameterizable between 0 and 100% of measuring range

*) CAUTION: For devices with explosion protection the maximum permitted voltages and currents according to the EC-Type-Examination Certificate have to be observed.

Technical data (continued)

Power supply	
• Universal power supply unit	AC/DC 230 V or AC/DC 24 V
• Tolerance range for power supply *) - With AC/DC 115/230 V PSU - With AC/DC 24 V PSU	 DC 80 to 300 V; AC 90 to 250 V DC 18 to 80 V; AC 20.4 to 55.2 V (in each case interruption-resistant up to 20 ms in the complete tolerance range)
• Tolerance range for mains frequency	47 to 63 Hz
• Power consumption with - AC 230 V - DC 230 V - AC 24 V - DC 24 V	 Max. 5 VA Max. 5 W Max. 5 VA Max. 5 W
Electrical isolation	
• Electrically isolated circuits	Input, output, power supply and sensor fault/limit monitoring output are electrically isolated from one another. The HART interface is electrically connected to the output.
• Working voltage between all electrically isolated circuits	The voltage U_{rms} between any two terminals must not exceed 300 V
Test voltages	
• Power supply against input and output	U = 3.54 kV DC, 2 s
• Input against output and limit monitor	U = 2.13 kV DC, 2 s
• Output against limit monitor	U = 2.13 kV DC, 2 s
• Protective conductor against power supply, input, output and limit monitor	U = 0.71 kV AC, 2 s
Accuracy	
• Reference conditions - Power supply - Load with current output - Load with voltage output - Ambient temperature - External fields - Warming-up time	 Rated voltage ± 1% 650 Ω ± 1% 100 kΩ ± 1% 23 °C ± 1 K (73.4 °F ± 1.8 °F) None 0.5 h
• Error in measurement - Error of internal cold junction	 ≤ 3 °C ± 0.1 °C / 10 °C (≤ 5.4 °F ± 0.18 °F / 18 °F)
- Error of external cold junction terminal 7NG3092-8AV	≤ 0,5 °C ± 0,1 °C / 10 °C (≤ 0.9 °F ± 0.18 °F / 18 °F)
- Digital output	see table right
- Analog output I_{AN} or U_{AN}	≤ 0.05% of span in addition to digital error
• Influencing effects (referred to the digital output)	Compared to the max. span:
- Temperature drift	≤ 0.08% / 10 °C (≤ 0.08% / 18 °F) ≤ 0.2% in the range -10 to +60 °C (14 to 140 °F)
- Long-term drift	≤ 0.1% / year
• Influencing effects referred to the analog output I_{AN} or U_{AN}	Compared to the span:
- Temperature drift	≤ 0.08% / 10 °C (≤ 0.08% / 18 °F) ≤ 0.2% in the range -10 to +60 °C (14 to 140 °F)
- Power supply	≤ 0.05% / 10 V
- Load with current output	≤ 0.05% with change from 50 Ω to 650 Ω
- Load with voltage output	≤ 0.1% with change in load current from 0 mA to 10 mA
- Long-term drift (start-of-scale value, span)	≤ 0.03% / month
• Response time (T_{63} without electrical damping)	≤ 0.2 s

*) - If more than one device is operating in a closed cabinet, and if packed tightly together, operation under 50 °C for any length of time a minimum supply voltage under 24 VDC is recommended.

- If more than one device is to be operated in a closed cabinet at a minimum supply voltage of 18 VDC and an environmental temperature of 70 °C (158 °F), then minimum spacing between devices of at least 3 cm is required as well as additional ventilation.

• Error in measurement

Resistance thermometers

Input	Measuring range °C	(°F)	Max. perm. line resist. Ω	Digital error °C	(°F)
DIN IEC 751					
- Pt10	-200 to +850	(-328 to +1562)	20	3.0	(5.4)
- Pt50	-200 to +850	(-328 to +1562)	50	0.6	(1.1)
- Pt100	-200 to +850	(-328 to +1562)	100	0.3	(0.5)
- Pt200	-200 to +850	(-328 to +1562)	100	0.6	(1.1)
- Pt500	-200 to +850	(-328 to +1562)	100	1.0	(1.8)
- Pt1000	-200 to +850	(-328 to +1562)	100	1.0	(1.8)
JIS C 1604-81					
- Pt10	-200 to +649	(-328 to +1200)	20	3.0	(5.4)
- Pt50	-200 to +649	(-328 to +1200)	50	0.6	(1.1)
- Pt100	-200 to +649	(-328 to +1200)	100	0.3	(0.5)
DIN 43 760					
- Ni50	-60 to +250	(-76 to +482)	50	0.3	(0.5)
- Ni100	-60 to +250	(-76 to +482)	100	0.3	(0.5)
- Ni120	-60 to +250	(-76 to +482)	100	0.3	(0.5)
- Ni1000	-60 to +250	(-76 to +482)	100	0.3	(0.5)

Resistance-based sensor

Input	Measuring range Ω	Max. perm. line resist. Ω	Digital error Ω	
- Resistance (linear)	0 to 24	5	0.08	0.08
	0 to 47	15	0.06	0.06
	0 to 94	30	0.06	0.06
	0 to 188	50	0.08	0.08
	0 to 375	100	0.1	0.1
	0 to 750	100	0.2	0.2
	0 to 1500	75	1.0	1.0
	0 to 3000	100	1.0	1.0
	0 to 6000	100	2.0	2.0

Thermocouples

Input	Measuring range °C	(°F)	Digital error [1] °C	°F
- Type B	0 to +1820	(+32 to +3308)	3	(5.4)
- Type C	0 to +2300	(+32 to +4172)	2	(3.6)
- Type D	0 to +2300	(+32 to +4172)	1	(1.8)
- Type E	-200 to +1000	(-328 to +1832)	1	(1.8)
- Type J	-210 to +1200	(-346 to +2192)	1	(1.8)
- Type K	-200 to +1372	(-328 to +2501)	1	(1.8)
- Type L	-200 to +900	(-328 to +1652)	2	(3.6)
- Type N	-200 to +1300	(-328 to +2372)	1	(1.8)
- Type R	-50 to +1760	(-58 to +3200)	2	(3.6)
- Type S	-50 to +1760	(-58 to +3200)	2	(3.6)
- Type T	-200 to +400	(-328 to +752)	1	(1.8)
- Type U	-200 to +600	(-328 to +1112)	2	(3.6)

Voltage/current sources

Input	Measuring range mV	Dig. error µV
- mV sources (linear)	-1 to +16	35
	-3 to 32	20
	-7 to +65	20
	-15 to +131	50
	-31 to +262	100
	-63 to +525	200
	-120 to +1000	300
	Measuring range V	**Dig. error mV**
- V sources (linear)	-1.2 to +10	3
	-12 to +100	30
	-120 to +140	300
	Measuring range µA/mA	**Dig. error µA**
- µA/mA sources (linear)	-12 to +100 µA	0.05
	-120 to +1000 µA	0.5
	-1.2 to +10 mA	5
	-12 to + 100 mA	50
	-120 to +1000 mA	500

1) Accuracy data refer to the largest error in the complete measuring range

Technical data (continued)

Electromagnetic compatibility	According to EN 61 326 and NAMUR recommendation NE21 (HART transmission errors can occur in particularly disturbed environment. In this case special measures have to be taken.)
• Power supply interruption 20 ms	No influence
• Power supply dip	No influence
• Power supply fluctuation	No influence
• Transients	
- On power supply lines (symmetric = 1 kV, asymmetric = 2 kV)	No influence
- On input, output and limit monitor lines (symmetric = 0.5 kV, asymmetric = 1 kV)	No influence (does not apply to output lines for local parameterization)
• Burst	
- On power supply lines (2 kV)	≤ 0.75% of span of I_{AN} or U_{AN}
- On input, output and limit monitor lines via coupling tongs (1 kV)	≤ 0.25% of span of I_{AN} or U_{AN} (does not apply to output lines for local parameterization)
• Static discharge	
- via contact (6 kV)	Criterion B
- via air (8 kV)	Criterion B
• Conducted RF interferences (10 V in the range 9 kHz to 80 MHz)	
- On input, output and limit monitor lines	≤ 0.25% of span of I_{AN} or U_{AN}
- On output lines	≤ 0.5% of span of I_{AN} or U_{AN} (does not apply to output lines for local parameterization)
• Electromagnetic fields (10 V/m in the range 80 MHz to 2 GHz)	≤ 1% of span of I_{AN} or U_{AN}
• Emitted interference	
- Radiated	Limit class B - residence area
- Conducted	Limit class B - industrial area
Certificates and approvals	
• CENELEC	To DIN EN50 014: 1997, EN50 020: 1994
- Intrinsic safety to EN 50020	
For 7NG3242-x**A**xxx	II (1) G D [EEx ia/ib] IIB
For 7NG3242-x**B**xxx	II (1) G D [EEx ia/ib] IIC
- EC-type examination certificate	TÜV 01 ATEX 1675
U_o, I_o, C_o, L_o, U_i, I_i, C_i, L_i	see EC-type examination certificate
Rated operating conditions	
Installation conditions	
• Location (for devices with explosion protection)	
- Transmitter	Outside the potentially explosive atmosphere
- Sensor	Within the potentially explosive atmosphere zone 1 (also in zone 0 in conjunction with the prescribed protection requirements for the sensor)
Ambient conditions	
• Permissible ambient temperature	-25 to +70 °C (-13 to +158 °F) *)
• Permissible storage temperature	-40 to +85 °C (-40 to +185 °F)
• Climatic class	
- Relative humidity	5 to 95%, no condensation

Design	
• Weight	Approx. 0.24 kg (0.53 lb)
• Housing material	PBT, glass-fiber reinforced
• Degree of protection to IEC 529	IP 20
• Degree of protection to VDE 0100	Protection class I
• Type of installation	35-mm top hat rail (DIN EN 50 022) or 32-mm G-type rail (DIN EN 50 035)
• Electrical connection/process connection	Screw plug connectors, max. 2.5 mm² (0.00387 inch²)
• Test sockets	Permissible internal resistance of ammeter with current output < 15 Ω
External standards and guidelines	
• Insulation	
- Protection of input circuit against power supply circuit, output circuit and limit monitor circuit	Double or strengthened insulation to EN 61 010 Section D2, Table D12; overvoltage category III
- Protection of output circuit against power supply circuit	Double or strengthened insulation to EN 61 010 Section D2, Table D12; overvoltage category III
- Protection of output circuit against limit monitor circuit	Double or strengthened insulation to EN 61 010 Section D2, Table D10; overvoltage category II
- Protection of power supply circuit against PE circuit	Basic or additional insulation to EN 61 010-1 Section D2, Table D6; overvoltage category III
• Safety	To DIN 61 010-1
• Vibration resistance	KTA 3503 11/86
Parameterization interface	
• Protocol	HART, version 5.9
• Load with connection of	
- HART communicator	230 to 650 Ω
- HART modem	230 to 500 Ω
• HART-Communicator	Operating system 4.9, main memory ≥4 Mbyte, RAM ≥4 Kbyte
• PC/laptop requirements	IBM-compatible, main memory min. 32 Mbyte, hard disk min. 70 Mbyte, RS 232 interface, VGA graphics card
• Software for PC/laptop	Microsoft Windows 95/98/NT 4.0 and SIMATIC PDM version 5.1 and later

*) Permanent use within an ambient temperature of 70 °C (158 °F) may reduce life of the electronic.

5.1 Sensor types / Measuring range / Digital accuracy / Line resistance

Sensor type	Measuring range in °C	Accuracy in °C	maximum permissible line resistance in ohms	Current for break detection
Pt10 DIN-IEC	-200 to 850	3.00	20	I_1
Pt50 DIN-IEC	-200 to 850	0.60	50	I_1
Pt100 DIN IEC	-200 to 850	0.30	100	I_1
Pt200 DIN IEC	-200 to 850	0.60	100	I_1
Pt500 DIN IEC	-200 to 850	1.00	100	I_2
Pt1000 DIN IEC 751	-200 to 850	1.00	100	I_2
Pt10 JIS C 1604-81	-200 to 649	3.00	20	I_1
Pt50 JIS C 1604-81	-200 to 649	0.60	50	I_1
Pt100 JIS C 1604-81	-200 to 649	0.30	100	I_1
Ni50 DIN 43760	-60 to 250	0.30	50	I_1
Ni100 DIN 43760	-60 to 250	0.30	100	I_1
Ni120 DIN 43760	-60 to 250	0.30	100	I_1
Ni1000 DIN 43760	-60 to 250	0.30	100	I_2

Table 2 Resistance thermometer (line resistance = 1 x supply line + 1 x return line)

Sensor type	Measuring range in ohms	Accuracy in ohms	maximum permissible line resistance in ohms	Current for break detection
resistance (linear)	0 to 24	0.08	5	I_1
	0 to 47	0.06	15	I_1
	0 to 94	0.06	30	I_1
	0 to 188	0.08	50	I_1
	0 to 375	0.10	100	I_1
	0 to 750	0.20	100	I_1
	0 to 1500	1.00	75	I_1
	0 to 3000	1.00	100	I_2
	0 to 6000*)	2.00	100	I_2

*) not for difference or average circuit

Table 3 Resistance thermometer (line resistance = 1 x supply line + 1 x return line)

Sensor type	Measuring range in °C	Accuracy in °C*)	Current for break detection
Type B	0 to 1820	3	I_2
Type C	0 to 2300	2	I_2
Type D	0 to 2300	1	I_2
Type E	-200 to 1000	1	I_2
Type J	-210 to 1200	1	I_2
Type K	-200 to 1372	1	I_2
Type L	-200 to 900	2	I_2
Type N	-200 to 1300	1	I_2
Type R	-50 to 1760	2	I_2
Type S	-50 to 1760	2	I_2
Type T	-200 to 400	1	I_2
Type U	-200 to 600	2	I_2

*) The accuracy specification refers to the greatest error over the whole measuring range

Table 4 Thermocouples

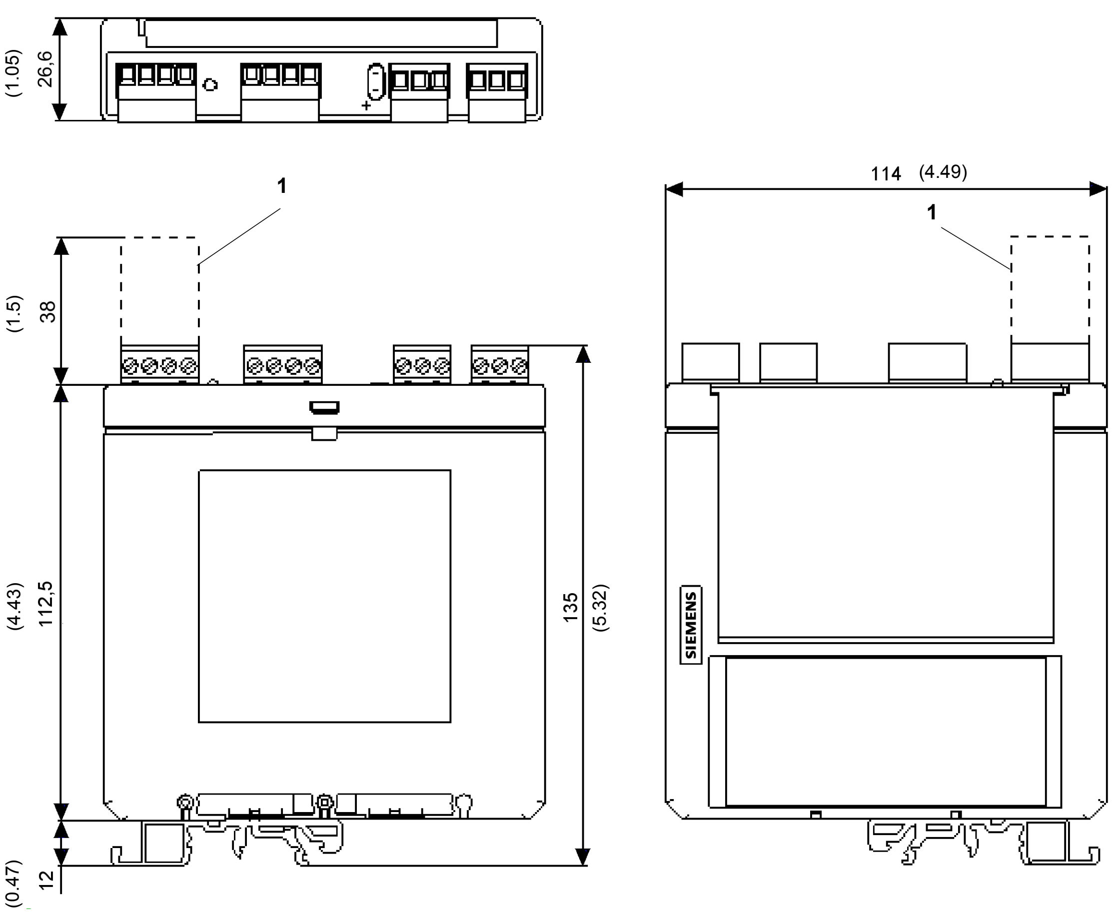
Sensor type	Setinput range	Accuracy	Current for break detection
mV transmitter (linear)	-1 to 16 mV	35 µV	I_2
	-3 to 32 mV	20 µV	I_2
	-7 to 65 mV	20 µV	I_2
	-15 to 131 mV	50 µV	I_2
	-31 to 262 mV	100 µV	I_2
	-63 to 525 mV	200 µV	I_2
	-120 to 1000 mV	300 µV	I_2
V-transmitter (linear)	-1,2 to 10 V	3 mV	No break detection
	-12 to 100 V	30 mV	No break detection
	-120 to 140 V	300 mV	No break detection
µA- / mA transmitter (linear)	-12 to 100 µA	0,05 µA	No break detection
	-120 to 1000 µA	0,5 µA	No break detection
	-1,2 to 10 mA	5 µA	No break detection
	-12 to 100 mA	50 µA	No break detection
	-120 to 1000 mA	500 µA	No break detection

Table 5 Voltage transmitter / current transmitter

Current for break detection	Limits for break detection	
I_1	Break on	2000 to 3100Ω
I_1	Break off	1800 to 2700Ω
I_2	Break on	10000 to 13000Ω
I_2	Break off	9000 to 12000Ω

Table 6 Limits for break detection

5.2 Dimensions



1 in devices with explosion protection

dimensions in mm (inch)

Figure 18 SITRANS TW, 4-wire mounting rail device

6 Installation and commissioning

6.1 Assembly

The installation location must be easily accessible and free from vibration. The permissible ambient temperatures (see Chapter 5, page 117 for further information) may not be exceeded. Protect the transmitter from heat radiation, rapid temperature fluctuations, heavy soiling and mechanical damage.

The desired operating data must be compared with the values specified on the device’s rating plate before installation.

The housing may only be opened to alter the hardware settings.

A distance of about 5 mm away from adjacent devices is recommended for better heat dissipation.

If more than one device is running in a cabinet read the notes and recommendations indicated on page 119 in the footnotes.

WARNING
It is not permitted to modify or add to the devices!

6.2 Installation and removal

The transmitter can be fixed either to a 35 mm DIN rail (DIN EN 5022) or a 32 mm G-rail (DIN EN 50035). The device is removed from the rail as shown in (figure 3, page 84). The fastening element for the transmitter (DIN rail adapter) is removable (3, figure 3). After pressing the catch (4, figure 3) the fastening element can be pushed sideways out of its guide. It can be pushed into either the top or bottom guide on the housing. The release catch (5, figure 3) must be at the bottom or top edge of the housing.

The transmitter may only be installed in closed operation rooms, housings and cabinets.

Field housings or switch cabinets must be used to install transmitters in the field. The size, type of protection and material must be adapted to the respective requirements.

The ambient conditions specified in the technical data (Chapter 5, page 117) must be observed.

6.3 Electrical connection

WARNING

The specifications of the examination certificate valid in your country must be observed.
Laws and regulations valid in your country must be observed for the electrical installation in explosion hazardous areas. In Germany these are for example:

- Working reliability
- Regulations for installing electrical equipment in hazardous areas DIN EN 60079-14.

A distance of 50 mm must be kept between the connections of the intrinsically safe circuit and the non intrinsicallysafe connections by isolated assembly or partitions (use the supplied blue cable housing for input plug).

The potential of the input circuit related to the PE conductor must be limited to 50V if the device is supplied from the mains.

A PE conductor must be connected to the device. The following points should be considered in the electrical installation of the PE conductor:

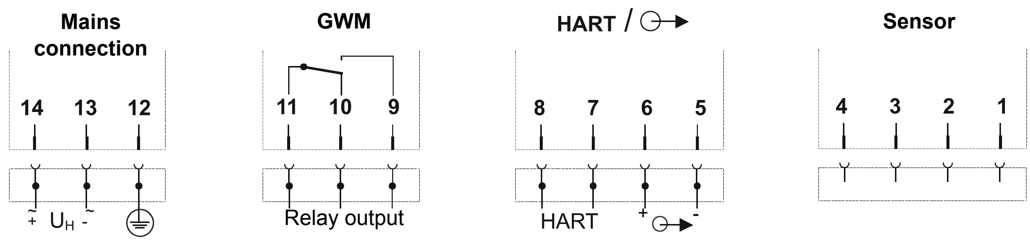
- The PE conductor terminal may be a potential source of danger if not installed properly.

The specifications of the EC test certificate must be observed when connecting sensors, leads and devices for use in Ex areas. The specifications regarding permissible external capacitances, inductances and the permissible values for U_m*) must be observed in particular.

*) U_m is the maximum voltage (AC or DC) which, according to EN 50020, may be applied to non-intrinsically safe connecting parts without affecting the intrinsic safety.

- The electrical connection (1-4, figure 2, page 83) is made by four removable screw-type connectors. The maximum cable cross section is 2.5mm². The wires may not be stripped more than 10 mm. Solid wire or strands with end ferrules must be used.
- Cables carrying dangerous voltages and cables carrying safe voltages must be laid separately or doubly insulated.
- The pin assignment for input, outputs and power supply is shown in figure 19, page 127. The different versions for the input wiring of the sensor are shown in Chapter 6.4, page 129.
- In devices with “intrinsically safe” type of protection, the blue cable housing must be mounted tight on the input plug on completing installation as a strain relief for the input cables.
- There is no need to pay attention to polarity when connecting the power supply to terminals 13 and 14. The device is reverse polarity protected.
- Terminal 12 must be connected to the PE conductor for safety reasons.
- The power supply plug (terminal 12 to 14) may never be plugged in or removed when the power is switched on. The device must be protected by a mains switch close by which is appropriately labeled.

- All screw-type connectors are mechanically coded at the factory to prevent confusing them (figure 20, page 128). The connector coding also ensures:
  - **Input circuit**: Incorrect connection of screw-type connectors for Ex circuits and non-Ex circuits is prevented.
  - **Power supply**: Incorrect connection of screw-type connectors to a power supply not suitable for the device is prevented.
- The specified data for the electrical connection (Chapter 5, page 117) must be observed.

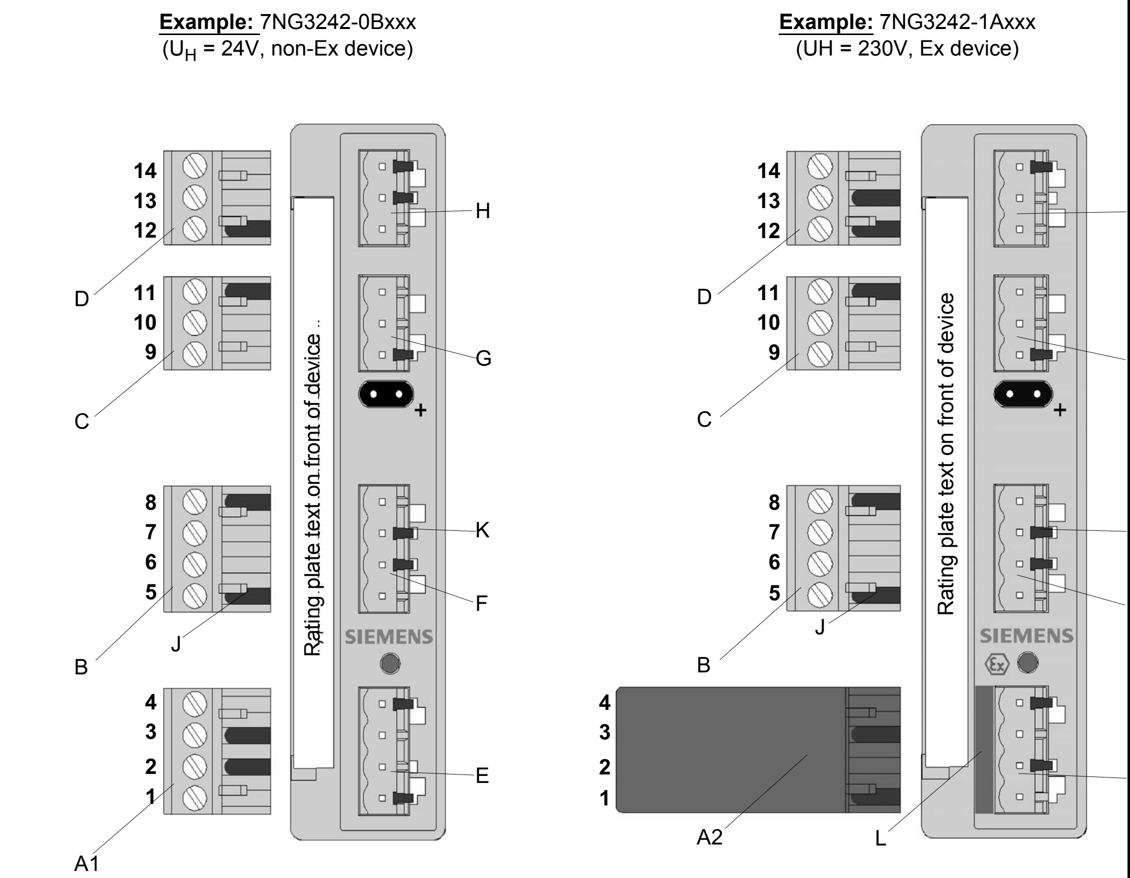


1 - 4	: Measuring input (wiring variations, see Chapter 6.4, page 129)
5 - 6	: Analog output (U or I output can be parameterized by plug-in jumpers, see Chapter 3.5.3, page 92)
7 - 8	: Connection of HART communication for on-site parameterization
9 - 11	: Output sensor error / limit value alarm as a relay contact (parameterization behavior see below or Chapter 3.3, page 90)
12	: PE conductor connection
13 - 14	: Input power supply (reverse polarity protected)

Figure 19 Wiring diagram input, outputs, power supply

Relay output:

- Idle current principle (relay opens in case of error)
  - Device switched off : Terminals 10 and 11 connected
  - Device switched on and no error : Terminals 9 and 11 connected
  - Device switched on and error : Terminals 10 and 11 connected
- Open circuit principle (relay closes in case of error)
  - Device switched off : Terminals 10 and 11 connected
  - Device switched on and no error : Terminals 10 and 11 connected
  - Device switched on and error : Terminals 9 and 11 connected



A1 screw-type connector for input in non-Ex devices
A2 screw-type connector (blue) in cable housing (blue) for input in Ex devices
B screw-type connector for output and HART modem for on-site operation.
C screw-type connector for relay output
D screw-type connector for power supply and PE connection
E pin strip in device for input
F pin strip in device for output and HART modem for on-site operation.
G pin strip in device for relay output
H pin strip in device for power supply and PE conductor connection
J coding profile in the screw-type connector
K coding tab in the pin strip
L blue marking of the Ex connection in Ex devices

Note: pin assignment of individual screw-type connectors, see fig. 16

Figure 20 Coding of the screw-type connectors

WARNING

In devices with “intrinsically safe” type of protection, make sure the blue cable housing delivered ex-factory is firmly mounted on the input plug before commissioning the devices.

NOTE

It applies generally for laying connecting cables and signals names for EMC reasons:

- Lay signal cables separately from cables with voltages of > 60V
- Use cables with twisted wires
- Avoid the vicinity of large electrical installations or use screened cables

6.4 Sensor input wiring

6.4.1 General

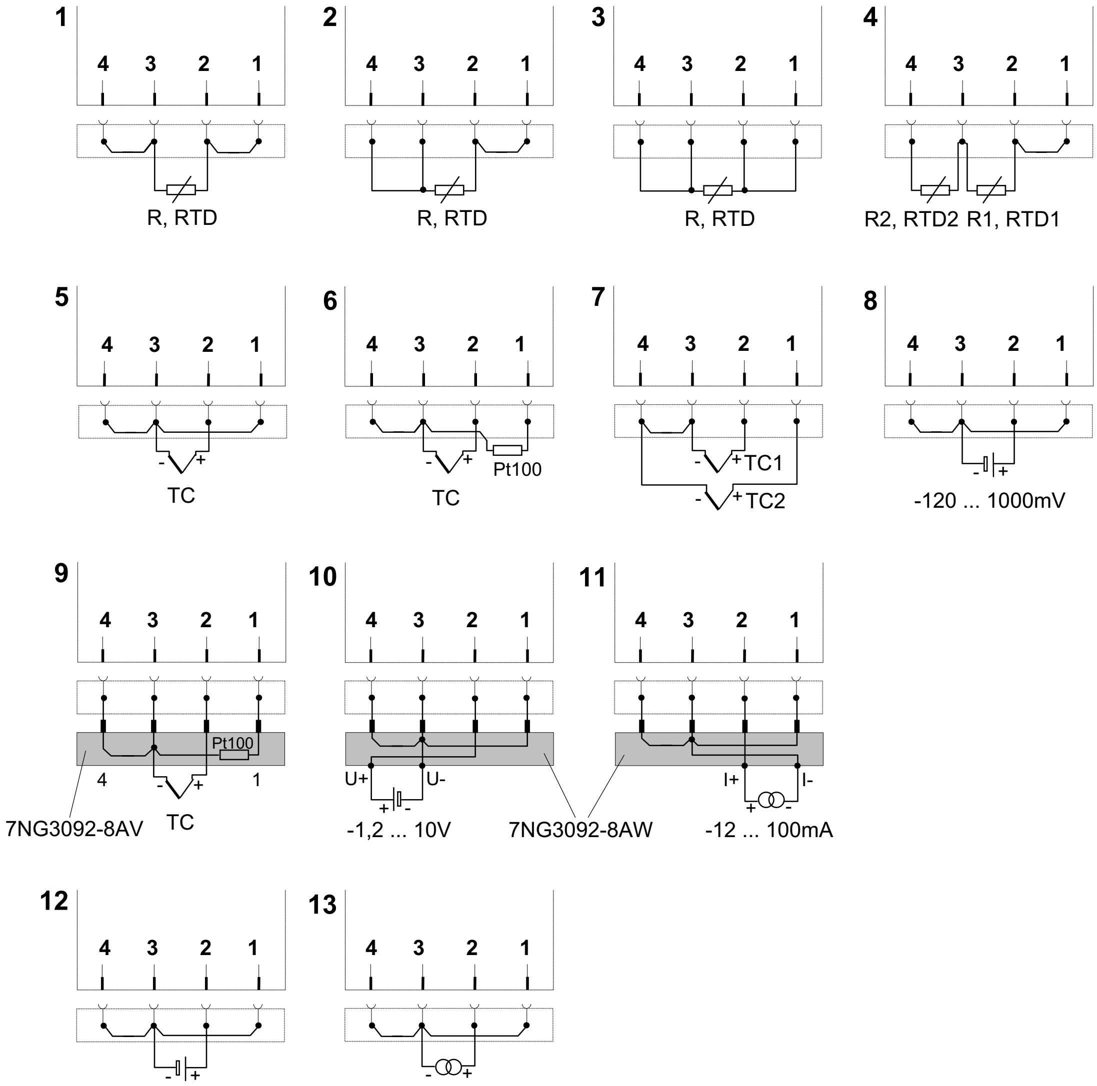
The following information refers to Chapter 6.4.2, page 130.

- **Measuring channel 1**: Measuring variable between terminals 2 and 3 on the input plug
- **Measuring channel 2**: Measuring variable between the terminals
  → 3 and 4 on the input plug in connection no. 4
  → 1 and 4 on the input plug in connection nos. 6 and 7
- In difference and average circuits, the measured value calculation is determined by the type of measurement. Otherwise the measured value is determined by measuring channel 1. The following coding is used for the type of measurement.

Measuring type	Measured value calculation
single-channel	Measuring channel 1
difference circuit 1	measuring channel 2 – measuring channel 1
difference circuit 2	measuring channel 2 – measuring channel 1
average value	½ x (measuring channel 1 + measuring channel 2)

- The short-circuit bridges drawn in the connections must be inserted on site on the systemside.

6.4.2 Sensor input wirings



Sensor interfaces for devices with order number: 7NG3242-xxxx**0**		
Resistance thermometer, resistance transmitter, potentiometer		
	1	Two-wire circuit Resistance for line compensation is parameterizable
	2	Three-wire circuit
	3	Four-wire circuit
	4	Difference/average value circuit: 2 resistors parameterizable for line compensation
Thermocouples		
	5	Determining the comparative temperature with built-in Pt100 or with fixed reference temperature
	6	Determining the comparative temperature with external Pt100, resistance for line compensation is programmable
	7	Difference / average circuit with internal comparative temperature
mV transmitter		
	8	Two-wire circuit
with accessories		
	9	Determining the reference temperature with reference point terminal 7NG3092-8AV
	10	Voltage measurement -1.2 to 10 V with U/I input plug 7NG3092-8AV
	11	Current measurement -12 to 100 mA with U/I input plug 7NG3092-8AV
Sensor input wirings for devices with order number: 7NG3242-xxxx**[1-3]**		
V transmitter		
	12	Two-wire circuit
Sensor input wirings for devices with order number: 7NG3242-xxxx**[4-8]**		
µA- / mA transmitter		
	13	Two-wire circuit

Table 7 Sensor interfaces

6.5 Commissioning

The software operating data of the transmitter must be set to meet the requirements of the current measuring job and must correspond to specifications on the software rating plate. If the software operating data do not match the data on the software rating plate, the rating plate must be corrected or replaced by a new one (Chapter 3.5.2, page 92).

The hardware operating data must also match the data on the hardware rating plate. If changes are made to the hardware parameterization (switching over from current to voltage or vice versa), the current state on the hardware rating plate must be documented (see Chapter 3.5.3, page 92).

The transmitter is in operation after approx. 5 seconds when the power supply is switched on.

WARNING

- The following applies for devices with “intrinsically safe” type of protection: Only intrinsically safe circuits can be connected to the transmitter input.
- The “intrinsically safe” protection type is no longer effective in the case of improper feeding (see also warnings on page 126).

6.6 As-delivered state of the operating data

The basic operating data and the specifications for hardware options are on a permanently attached hardware rating plate (7a, figure 2, page 83) under the replaceable software rating plate (7, figure 2, page 83).

The as-delivered state of the rating plate with the software operating data (7, figure 2, page 83) depends on whether standard devices or customized devices are ordered. The transmitter is delivered as follows depending on the order:

6.6.1 Operating data according to ex-factory basic setting (standard device)

Operating data deviating from the presetting must be adapted to the respective measuring job by the customer before commissioning the transmitter.

A replaceable blank rating plate (7, figure 2, page 83) is used for manual entry of the entered operating data or can be replaced by one the user has printed.

6.6.2 Factory set customer-specific operating data

The device is ready for operation for the respective measuring job after installation and electrical connection The set operating data are documented on the software ratingplate (7, figure 2, page 83).

7 Service and maintenance

The transmitter is maintenance free. Dry cleaning is permitted.

8 Ordering data

Ordering information

The Order No. generated according to the following classification describes a fully-functioning transmitter. The selection of the operating data (type of source, measuring range, characteristic etc.) is made according to the following rules:

- Operating data already set in factory to default values:
  The default settings can be obtained from the list of parameterizable operating data (see page 142). The default settings can be adapted by the customer to the specific measuring requirements.
- Operating data set on delivery according to customer requirements:
  Supplement the Order No. by "-Z", and add the Order code "Y01". The operating data to be set can be obtained from the list of parameterize operating data. The Order codes A ■■ to K ■■ for operating data to be set need only be specified in the order if they deviate from the default setting.
  The default setting is used if no Order code is specified for operating data.

The set operating data are documented on the transmitter's rating plate.

Examples for ordering

Desired transmitter	**Parameter:**		**Ordering design.**
	Standard	**Special**	
Example 1: SITRANS TW, transmitter in four-wire system • With CENELEC explosion protection • AC/DC 230 V power supply • Current output • Without sensor fault/limit monitor			7NG3242-1AA00 (hold in stock)
- Pt100 sensor, three-wire system	X		
- Measuring range 0 to 150 °C	X		
- Temperature-linear characteristic	X		
- Filter time 1 s	X		
- Output 4 to 20 mA, line filter 50 Hz	X		
- Output driven to full-scale in event of line breakage	X		
Example 2: SITRANS TW, transmitter in four-wire system • Without explosion protection • AC/DC 24 V power supply • Voltage output • Without sensor fault/limit monitor			7NG3242-0BB10-Z Y01 + S76 + A05 + Y30 + H10 Y30: MA=0; ME= 950; D=C
- Rating plate in English		S76	
- NiCr/Ni sensor, type K		A05	
- Internal cold junction	X		
- Measuring range 0 to 950 °C		Y30	
- Temperature-linear characteristic	X		
- Filter time 1 s	X		
- Output 0 to 10 V, line filter 50 Hz		H10	
- Output driven to full-scale in event of like breakage	X		
- Limit monitoring switched off	X		
Example 3: SITRANS TW, transmitter in four-wire system • Without explosion protection • AC/DC 24 V power supply • Current output • Without sensor fault/limit monitor			7NG3242-0BA01-Z Y01 + A40 + Y32 + G07 + H11 + J03 Y32: MA=0; ME= 5; D=V
- Voltage input, measuring range -1.2 V to 10 V		A40	
- Measuring range 0 to 5 V		Y32	
- Source-proportional characteristic	X		
- Filter time 10 s		G07	
- Output 0 to 20 mA, line filter 60 Hz		H11	
- No monitoring for sensor fault	(X)	J03	

Ordering data	Order No.
SITRANS TW universal transmitter for rail mounting, in four-wire system (order Instruction manual separately)	**7NG3242 -■■■■■**
Explosion protection	
• Without	**0**
• For inputs [EEx ia] or [EEx ib]	**1**
Power supply	
• AC/DC 115/230 V	**A**
• AC/DC 24 V	**B**
Output signal	
• 0/4 to 20 mA (can be switched to 0/2 to 10 V)	**A**
• 0/2 to 10 V (can be switched to 0/4 to 20 mA	**B**
Sensor fault/limit monitor	
• Without (retrofitting not possible)	**0**
• Relay with changeover contact	**1**
Input for	
• Temperature sensors, resistance-based sensors and mV sources with meas. range -120 to 1000 mV DC and with U/I plug	**0**
• Voltage input (V sources) [1] Measuring range:	
-1.2 to +10 V DC	**1**
-12 to +100 V DC (not Ex version)	**2**
-120 to +140 V DC (not Ex version)	**3**
• Current input (µA, mA sources) [1] Measuring range:	
-12 to +100 µA DC	**4**
-120 to +1000 µA DC	**5**
-1.2 to +10 mA DC	**6**
-12 to +100 mA DC	**7**
-120 to +1000 mA DC	**8**

Additional data	**Order code**
Please add "**-Z**" to Order No., add Order codes and, if necessary, specify further Order codes (see pages 142 to 143).	
Set operating data acc. to requirements (see pages 142 to 143).	**Y01**
Meas. point description (max. 16 char.)	**Y23**
Text on front of device (max. 32 char.)	**Y24**
HART tag (max. 8 characters)	**Y25**
With test report	**P01**
With shorting plug to HART communication for 0 mA or 0 V	**S01**
With plug for external cold junction compensation	**S02**
With U/I plug (-1,2 V DC to 10 V DC or -12 mA DC to 100 mA DC)	**S03**
Rating plate description (only in conjunction with Order code Y01)	
• Italian	**S72**
• English	**S76**
• French	**S77**
• Spanish	**S78**

[1]) Observe max. values with Ex version.

Accessories (if required)	Order-No.
Instruction Manual for SITRANS TW	
• German/English	**A5E00054075**
• Italian/French/Spanish	**A5E00064515**
Cold junction terminal	**7NG3092-8AV**
U/I plug (-1,2 V to +10 V DC or -12 mA to +100 mA DC)	**7NG3092-8AW**
Interface for SIMATIC PDM (HART modem)	**7MF4997-1DA**
HART communicator with battery, charger for 230 V AC Type of protection intrinsic safety EEx ia IIC T4, with carrying case, 4 MB memory, with Device Descriptions (DDs) of the Siemens devices	
Language	
• German	**7MF4998-8KF**
• English	**7MF4998-8KT**

ATTENTION

Transmitters ordered with voltage input (V-transmitter) or current input (µA-, mA transmitter) can only be used in the measuring range specified in the ordering scheme. No sensor error monitoring is possible.

WARNING

In transmitters with voltage or current input and with explosion protection, the maximum permissible voltages and currents according to the certificate of conformity must be observed.

8.1 List of parameterizable operating data

(Order codes A _ _ to K _ _)

■ Operating data according to default setting

Order No. with Order code: 7NG3242 - ■■■■■ -Z Y01

Order codes: A ■■ + B ■■ to K ■■

Sensor

Thermocouples Type		Code	Circuit		Code	Cold junction compensation	Code
B: Pt30%Rh/Pt6%Rh	0 to 1820 °C	**A00**	Standard		**B01**	None	**C00**
C: W5%Re	0 to 2300 °C	**A01**	Sum	n[2]) = 2	**B02**	Internal	**C10**
D: W3%Re	0 to 2300 °C	**A02**		n = 3	**B03**	Fixed val.	
E: NiCr/CuNi	-200 to +1000 °C	**A03**		n = 4	**B04**	0 °C	**C20**
J: Fe/CuNi (IEC)	-210 to +1200 °C	**A04**		n = 5	**B05**	20 °C	**C22**
K: NiCr/Ni	-200 to +1372 °C	**A05**		n = 6	**B06**	50 °C	**C25**
L: Fe/CuNi (DIN)	-200 to +900 °C	**A06**		n = 7	**B07**	60 °C	**C26**
N: NiCrSi/NiSi	-200 to +1300 °C	**A07**		n = 8	**B08**	70 °C	**C27**
R: Pt13%Rh/Pt	-50 to +1760 °C	**A08**		n = 9	**B09**	Special value [14])	**Y10**
S: Pt10%Rh/Pt	-50 to +1760 °C	**A09**		n = 10	**B10**		
T: Cu/CuNi (IEC)	-200 to +400 °C	**A10**	Difference [3])	Diff1 Diff2	**B31** **B32**	External meas. [14]) (via Pt100 DIN IEC 751)	**Y11**
U: Cu/CuNi (DIN)	-200 to +600 °C	**A11**	Mean-value [3])	MW	**B41**		

Resistance thermometers (see Technical data for max. permissible line resistances)		Code	Circuit		Code	Connection	Code	Line resistance[7])	Code
			Standard		**B01**	Two-wire system	**C32**	0 Ω	**D00**
Pt100 (DIN IEC)	-200 to +850 °C	**A20**	Sum	n [4]) = 2 to n = 10	**B02** ... **B10**	Three-wire system	**C33**	10 Ω	**D10**
Pt100 (JIS)	-200 to +649 °C	**A21**				Four-wire system	**C34**	20 Ω	**D20**
Ni100 (DIN)	-60 to +250 °C	**A22**	Parallel	n [5]) = 0.1 n = 0.2 n = 0.5	**B21** **B22** **B25**			50 Ω	**D50**
								Special value [14])	**Y20**
			Special value [6]) [14])		**Y00**				
			Difference [3])	Diff1 Diff2	**B51** **B52**				
			Mean-value [3])	MW	**B61**				

Measuring ranges (thermocouples and resistance thermometers)		Code
-30 to	+60 °C	**E00**
-20 to	+20 °C	**E01**
0 to	40 °C	**E02**
0 to	60 °C	**E03**
0 to	80 °C	**E04**
0 to	100 °C	**E05**
0 to	120 °C	**E06**
0 to	150 °C	**E07**
0 to	200 °C	**E08**
0 to	250 °C	**E09**
0 to	300 °C	**E10**
0 to	350 °C	**E11**
0 to	400 °C	**E12**
0 to	450 °C	**E13**
0 to	500 °C	**E14**
0 to	600 °C	**E15**
0 to	700 °C	**E16**
0 to	800 °C	**E17**
0 to	900 °C	**E18**
0 to	1000 °C	**E19**
0 to	1200 °C	**E20**
0 to	1400 °C	**E21**
0 to	1600 °C	**E22**
0 to	1800 °C	**E23**
50 to	100 °C	**E24**
50 to	150 °C	**E25**
100 to	200 °C	**E26**
100 to	300 °C	**E27**
100 to	400 °C	**E28**
200 to	300 °C	**E29**
200 to	400 °C	**E30**
200 to	500 °C	**E31**
300 to	600 °C	**E32**
500 to	1000 °C	**E33**
600 to	1200 °C	**E34**
800 to	1600 °C	**E35**
Special range[14])		**Y30**

Resistance-based sensors, potentiometers (see Technical data for max. permissible line resistances)	Code	Circuit		Code	Connection	Code	Line resistance[7])	Code	Meas. ranges	Code
	A30	Standard		**B01**	Two-wire system	**C32**	0 Ω	**D00**	0 to 100 Ω	**E40**
		Difference [3])	Diff1 Diff2	**B51** **B52**	Three-wire system	**C33**	10 Ω	**D10**	0 to 200 Ω 0 to 500 Ω	**E41** **E42**
		Mean-value [3])	MW	**B61**	Four-wire system	**C34**	20 Ω	**D20**	0 to 1000 Ω 0 to 2500 Ω	**E43** **E44**
							50 Ω	**D50**	0 to 5000 Ω [8]) 0 to 6000 Ω [8])	**E45** **E46**
							Special value [14])	**Y20**	Special range[14])	**Y31**

mV, V, µA, mA sources [1]) — **A40**

Measuring range with Order Nos. 7NG 3242 - ■■■■ [0 - 8] - Z

0	1[9])	2[9])	3[9])	4[9])	5[9])	6[9])	7[9])	8[9])	
mV	V	V	V	µA	µA	mA	mA	mA	
-120 to +1000	-1,2 to +10	-12 to +100	-120 to +140	-12 to +100	-120 to +1000	-1,2 to +10	-12 to +100	-120 to +1000	**E50**
								Special range [14])	**Y32**

[1]) The max. permissible currents and voltages according to the conformity certificate must be observed in devices with explosion protection.
[2]) *n* = number of thermocouples to be connected in series.
[3]) See "Sensor input connections" for meaning of type of circuit (see page 133).
[4]) *n* = number of resistance thermometers to be connected in series.
[5]) 1/n = number of resistance thermometers to be connected in parallel.
[6]) Combination of series and parallel connection of resist. thermometers.
[7]) Line resistance of channels 1 and 2; see Technical data for max. permissible line resistance.
(only with C32, not with C33 and C34)
[8]) This range does not apply to mean-value and difference circuits.
[9]) Without detection of line breakage.
[14]) Operating data, special ranges, see page 144.

List of parameterizable operating data (Order codes A ■■ to K ■■) (continued)

■ Operating data according to default setting

Order No. with Order code: 7NG3242 - ■■■■■ -Z Y01

Order codes: A ■■ + B ■■ +...

Sensor

Thermocouples Type	Range	Code	Characteristic	Code	Filter time [10]	Code	Output signal and line filter [11]	Code	Failure signal	Code	Limit monitor [13]	Code
B: Pt30%Rh/	0 to 1820 °C	A00	Temperature-linear	F00	0 s	G00	4 to 20 mA or 2 to 10 V with line filter:		Failure signal with line breakage/fault:		Limit monitoring ineffective (but sensor fault signalling with closed-circuit operation)	K00
C: W5%Re	0 to 2300 °C	A01	Voltage-linear	F10	0.1 s	G01						
D: W3%Re	0 to 2300 °C	A02			0.2 s	G02	50 Hz	H00	Driven to full-scale	J00		
E: NiCr/CuNi	-200 to +1000 °C	A03			0.5 s	G03	60 Hz	H01	Driven to zero	J01		
J: Fe/CuNi (IEC)	-210 to +1200 °C	A04			1 s	G04	10 Hz [12]	H02	Hold last value	J02		
K: NiCr/Ni	-200 to +1372 °C	A05			2 s	G05	0 to 20 mA or 0 to 10 V with line filter:		No monitoring	J03	Effective [14]	Y70
L: Fe/CuNi (DIN)	-200 to +900 °C	A06			5 s	G06			Safety value [14]	Y60		
N: NiCrSi/NiSi	-200 to +1300 °C	A07			10 s	G07	50 Hz	H10				
R: Pt13%Rh/Pt	-50 to +1760 °C	A08			20 s	G08	60 Hz	H11				
S: Pt10%Rh/Pt	-50 to +1760 °C	A09			50 s	G09	10 Hz [12]	H12				
T: Cu/CuNi (IEC)	-200 to +400 °C	A10			100 s	G10						
U: Cu/CuNi (DIN)	-200 to +600 °C	A11			Special time [14]	Y50						

Resistance thermometers (see Technical data for max. permissible line resistances)	Range	Code	Characteristic	Code	Failure signal	Code
			Temperature-linear	F00	Failure signal with line breakage/fault:	
Pt100 (DIN IEC)	-200 to +850 °C	A20	Resistance-linear	F20	Driven to full-scale	J00
Pt100 (JIS)	-200 to +649 °C	A21			Driven to zero	J01
Ni100 (DIN)	-60 to +250 °C	A22			Hold last value	J02
					No monitoring	J03
					Safety value [14]	Y60
					Failure signal with line breakage or short-circuit/fault:	
					Driven to full-scale	J10
					Driven to zero	J11
					Hold last value	J12
					No monitoring	J13
					Safety value [14]	Y61

Resistance-based sensors, potentiometers (see Technical data for max. permissible line resistances)	Code	Characteristic	Code	Failure signal	Code
	A30	Resistance-linear	F20	Failure signal with line breakage/fault:	
				Driven to full-scale	J00
				Driven to zero	J01
				Hold last value	J02
				No monitoring	J03
				Safety value [14]	Y60

mV, V, µA, mA sources	Code	Characteristic	Code
	A40	Source-proportional	F30

10) Software filter to smooth the result.
11) Filter to suppress line disturbances on the measured signal.
12) For special applications
13) If signalling relay present.
14) Operating data, special ranges, see page 144.

8.1.1 List of operating data, special ranges

		Factor N for multiplication with the standard series of resistance thermometers
Y00:	N =	(value range: [0,10 ... 10,00])
		1. Example: 3 x Pt500 parallel: N = 5/3 = 1,67; 2. example: Ni120: N= 1,2
		Temperature TV of the fixed reference point
Y10:	TV =	(value range depending on reference point unit)
	D =	Unit (value range: [C, K, F, R])
		Line resistance RL in ohms for compensating the reference point line of the
Y11:	RL =	external Pt100 DIN IEC 751 (value range: [0,00 ... 100,00])
		Line resistances RL of measuring channel 1 and measuring channel 2 in ohms if the resistance thermometer or resistance transmitter is connected in a two-wire circuit (value range depending on the sensor type: [0,00 ... 100,00])
Y20:	RL1 =	Line resistance RL of measuring channel 1
	RL2 =	Line resistance RL of measuring channel 2
		Start of scale MA for thermocouples or resistance thermometers
Y30:	MA =	(value range depending on sensor type)
		Full scale ME for thermocouples or resistance thermometers
	ME =	(value range depending on sensor type)
	D =	Unit (value range: [C, K, F, R])
		Start of scale MA for resistance transmitters or potentiometers in ohms
Y31:	MA =	(value range: [0,00 ... 6000,00])
		Full scale ME for resistance transmitters or potentiometers in ohms
	ME =	(value range: [0,00 ... 6000,00])
		Start of scale MA for mV, V, μA or mA transmitter
Y32:	MA =	(value range depending on sensor type: [-120,00 ... 1000,00])
		Full scale ME for mV, V, μA or mA transmitter
	ME =	(value range depending on sensor type: [-120,00 ... 1000,00])
	D =	Unit (mV → MV, μA, → UA, mA → MA); (value range: [MV, V, UA, MA])
Y50:	T63 =	Setting time T63 of the software filter in seconds (value range: [0,0 ... 100,0])
		Safety value S of the measuring output in mA or in V according to the set output type (value range for current output: [-0,50 ... 23,00]; Value range for voltage output: [-0,25 ... 10,75])
Y60:	S =	Safety value S at sensor line break
Y61:	S =	Safety value S at sensor line break or short-circuit
Y70:	LL =	Lower limit value (unit as specified by measuring range)
	UL =	Upper limit value (unit as specified by measuring range)
	H =	Hysteresis (unit as specified by measuring range)
		switch sensor error detection on / off additionally to the limit value function
	K =	Y=on; N=off (standard = Y)
	A =	Relay output type: A=open circuit principle; R=idle current principle (standard = R)
		Switching delay T of the relay output in seconds
	T =	(value range: [0,0 ... 10.0]) (standard = 0.0)

8.2 Accessories and spare parts

8.2.1 Accessories

Designation	Order number
Parameterization software SIMATIC PDM V5.2 for operation and parameterization including communication by HART modem	6ES7658-3AX02-0YC0

For further options about SIMATIC PDM please refer to our catalog FI 01.

Support questions should be directed to:
Hotline 0180 - 5050222
Mail: techsupport@ad.siemens.de

For further information, our internet address:
www.siemens.com/processinstrumentation

See page 136 for other accessories.

8.2.2 Spare Parts

Designation	Order number
for Ex and non-Ex device versions	
1 x housing fixing element	7NG3092-8AG
1 x transparent cover for type plate	7NG3092-8AN
1 screw-type connector, 3-pin (terminals 9-11)	7NG3092-8AR
1 screw-type connector, 3-pin (terminals 12-14)	7NG3092-8AA
1 screw-type connector, 4-pin (terminals 5-8)	7NG3092-8AB
25 x plug-in jumper for selecting type of output signal or for HART write protection	7NG3092-8AH
1 x short-circuit plug for current test jack	7NG3092-8AP
1 x coding profile for screw-type connector for 6 coding positions	7NG3092-8AJ
1 x coding tab for pin strip for 6 coding positions	7NG3092-8AK
12 x dummy parts for pin strip	7NG3092-8AL
for Ex device versions	
1 x housing front (Ex)	7NG3092-8AE
1 screw-type connector, 4-pin (color blue, terminals 1-4)	7NG3092-8AC
1 x cable housing for screw-type connector 4-pin (color blue)	7NG3092-8AF
for non-Ex device versions	
1 x housing tube (non-Ex)	7NG3092-8AM
1 x housing front (non-Ex)	7NG3092-8AD
1 screw-type connector, 4-pin (color gray, terminals 1-4)	7NG3092-8AS

9 Certificates

The certificates are enclosed as a collection of loose leaves in the device.

10 Appendix

HART Communicator, HART Rev. 5.9
Online operating structure by example of: resistance thermometer, standard circuit, 2-wire connection, 4 ... 20mA output

*) Display of measured values

- 2 Online
  - 1 MV *)
  - 2 Configuration
    - 1 Process variables *)
      - 1 MV
      - 2 % MR
      - 3 Offset1
      - 4 AOut
    - 2 Diagnostics/Service
      - 1 Diagnosis
        - 1 Slave pointer
          - 1 Slave point. Input
            - 1 Input max.
            - 2 Input min
            - 3 Input S1 max
            - 4 Input S1 min
            - 5 Input S2 max
            - 6 Input S2 min
            - 7 Resetting
              - 1 Max (PV&S1&S2)
              - 2 Min (PV&S1&S2)
              - 3 Min&Max (PV&S1&S2)
          - 2 Slave point. E1 temp
            - 1 El temp max
            - 2 El temp min
            - 3 Resetting
              - 1 Max
              - 2 Min.
              - 3 Max&Min
        - 2 Op. hrs. counter El
        - 3 Status
          - 1 Total status
            - Sensor error
            - Hardw/Firmw error
            - Diagnostic warning
            - Simulation mode
          - 2 Sensor status
            - Sensor break
            - Sensor short-circuit
          - 3 Hardw/Firmw status
          - 4 Diag warn status
          - 5 Simulation status
            - Sensor simu
            - El temp simu
      - 2 Simulation/Test
        - 1 Simulation
          - 1 Analog output
            - 1 4 mA
            - 2 20 mA
            - 3 Other value
            - 4 End
          - 2 Inputs
            - 1 Input
              - 1 Input FIXED
              - 2 Input RAMP
              - 3 Input OFF
            - 2 E1 temp
              - 1 El temp FIXED
              - 2 El temp RAMP
              - 3 El temp OFF
            - 3 Display process var.
            - 4 All simus OFF
        - 2 Test
          - 1 Self test
          - 2 Resetting
      - 3 Limit value alarms
        - 1 Low limit
        - 2 High limit
        - 3 Hysteresis
        - 4 Switching delay
        - 5 Limit value mode
          - Sensor error
          - Hardw/Firmw error
          - MV<lower limit value
          - MV>upper limit value
          - AOut sat warn
          - Switching delay
          - Relay closes
        - 6 Alarm activation
          - Limit value alarms
      - 4 Monitor
        - 1 Limit
        - 2 Sensor short-circuit 1
        - 3 Sensor break 1
      - 5 Measure ln resistance
      - 6 Calibration
        - 1 Sensor adjustment
          - 1 Low sensor adjustm
          - 2 Upper sensor adjustm
        - 2 Sys out adjust
          - 1 D/A adjust
          - 2 D/A adjust scaled
      - 7 Reset factory param
        - 1 Factory setting
        - 2 Sensor adjustment
        - 3 DAU adjustment
        - 4 Alarms
        - 5 LV alarm
      - 8 All measured values
        - 1 MV
        - 2 E1 temp
        - 3 AOut
    - 3 Brief setup
      - 1 Auto setup
      - 2 Lineariz. type
        - 1 Linear to input
        - 2 Linear temperature
      - 3 Unit
        - °C
        - °F
        - °Rk
        - K
      - 4 Set zero/span
        - 1 MA
        - 2 ME
        - 3 USL
        - 4 OSL
        - 5 Smallest span
        - 6 Process preset
          - 1 4 mA
          - 2 20 mA
          - 3 Exit
      - 5 Damping
      - 6 TAG

2 Online	1 Measured val.						
	2 Configuration						
		4 Complete setup	1 Sensor parameter	1 Process sensor	1 Offset sensor 1		
					2 Sensor setup	1 NOTE>>	
						2 Sensor class	Resist transmitter
							Resist thermom
							mV transmitter
							Thermocouple
						3 Sensor type	Pt100, a=385
							Pt100, a=392
							Ni100
							Special resist ther
						4 Unit	°C
							°F
							°Rk
							K
						5 Interface module	Standard interface module
							Difference(S1-S2)
							Difference(S2-S1)
							Average value
						6 Sensor connection	Two-wire
							Three-wire
							Four-wire
						7 Scaling factor	
						8 Line resistance 1	
						9 Measure ln resistance	
					3 Sensor information	1 Sensor class	
						2 Sensor connection	
						3 Interface module	
						4 Sensor type	
						5 USL	
						6 OSL	
						7 Smallest span	
				2 E1 temp sensor	1 E1 temp		
			2 Signal parameter	1 Process variables	1 MV		
					2 % MR		
					3 Offset 1		
					4 AOut		
				2 Set zero/span	1 MA		
					2 ME		
					3 USL		
					4 ODL		
					5 Smallest span		
					6 Process preset	4 mA	
						20 mA	
						Exit	
				3 Damping			
				4 Lineariz. type	Linear to input		
					Linear temperature		
				5 Special characteristic	1 Input characteristic		
					2 Display characteristic		
				6 Measuring frequency	50 Hz		
					60 Hz		
					10 Hz		
			3 Output parameter	1 Analog output	1 AOut		
					2 % MR		
					3 Alarms	1 AOut alarm type	top
							bottom
							Hold last value
						2 Low alarm value	
						3 Upper alarm value	
					4 Low AOut limit		
					5 Up AOut limit		
					6 AOut type	mA	
						Volt	
					7 AOut mode	4..20 mA	
						0..20 mA	
				2 HART output	1 Call address		
					2 Num. call pream.		
					3 Num. reply pream.		
			4 Device information	1 TAG			
				2 Manufacturer			
				3 Model			
				4 Curr. order no.:			
				5 Device serial no.			
				6 MM/DD/YY			
				7 Write protection			
				8 Description			
				9 Message			
				Assembly no.			
				Explosion protection			
				Power supply			
				Revision numbers	1 Universal rev.		
					2 Field devices rev.		
					3 Software Rev.		
					4 Hardware Rev.		
		5 Overview					

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