SITRANS T Temperature Transmitters SITRANS I Supply Units

	SITRANS T universal transmitters for temperature, resis-		
	tance, DC voltage and DC current	2/2	Overview
	De current	2/3 2/11 2/19	Four-wire system - for mounting rail assembly - as 19-inch plug-in module - for ES 902 packaging system
		2/27 2/35	Two-wire system - for mounting rail assembly Mounting examples
	SITRANS T3K PA transmitters for temperature	2/37	PROFIBUS-PA connection / Mounting in sensor head
	SITRANS TK/TK-H transmitters for temperature	2/42	Two-wire system / Mounting in sensor head
99990	SITRANS TF transmitters for temperature	2/45	Two-wire system / Housing for field mounting
the the	Temperature sensors	2/49	Resistance thermometers and thermocouples
SITRANS T3K PA 7NG 3213 - 0NN00	SITRANS I isolating power supply HART (FSK)	2/50	
Uh : DC 9V - 24V Ta : -40 85*C F. Nr. : N1-KN-9999 Made in France	SITRANS I transmitter power supply / input isolator	2/52	
inde in France	SITRANS I output isolator HART (FSK)	2/55	
	Software	see Sec. 6	SIMATIC PDM for parameterizing HART or PROFIBUS-PA devices
AV 24V Ta: 40 CE		2/36	TransWin for parameterizing
Made in France		2/44	SITRANS T SIPROM TK for parameterizing
A A			SITRANS TK
SITRANS 0-76181 Katerake SITRANS T3K PA 7NG 3213 - 0NN00			
Nr. hir KN-9999			Siemens FI 01 · 2000 2/1

Overview

	Connection	Parameterization software	Туре	Connection to	Transmitter without Ex. protection	Transmitter with Ex. protection			
					Туре	Туре	Insta	allation	
							Transmitter	Sensor	
Land Contract of C	Four-wire system	TransWin	Mounting rail assem- bly Page 2/3	Resistance thermometer, resistance- based sensor, thermocouples, DC voltages and DC currents		7NG3041-3	Safe area	Zone 1, Zone 0	
			Plug-in module (19-inch) Page 2/11		7NG3040-1	7NG3041-1	Safe area	Zone 1, Zone 0	
			ES 902 packaging system Page 2/19		7NG3040-0	-	-	-	
	Two-wire system	TransWin	Mounting rail assem- bly Page 2/27	Resistance ther- mometer, resistance- based sensor, thermocouples, DC voltages and DC currents		7NG3022	Zone 1	Zone 1, Zone 0	
C C C C		SIPROM TK for SITRANS TK SIMATIC PDM for SITRANS TK-H	Mounting in sensor head Page 2/42	Resistance ther- mometer, resistance- based sensor, thermocouples and DC voltages up to 1.1 V	7NG3120-2	7NG3121-1 7NG3122-1 7NG3121-2 7NG3122-2		Zone 2 Zone 1, Zone 0 Zone 2 Zone 1, Zone 0	
			Housing for field mount- ing Page 2/45		7NG313 -0	7NG313 -1 7NG313 -2		Zone 1, Zone 0 Zone 2	
 A A A A A A A A A A A A A A A A A A A	PROFIBUS- PA system	SIMATIC PDM	Mounting in sensor head Page 2/37	Resistance ther- mometer, resistance- based sensor, thermocouples and DC voltages up to 1 V	7NG3213-0	7NG3213-1	Zone 1	Zone 1, Zone 0	

Fig. 2/1 SITRANS T transmitter for rail mounting

Application

"Intelligent" transmitter with universal input circuit for connecting to the following sensors:

- Resistance thermometers
- Thermocouples
- Resistance-based sensors/potentiometers
- DC voltage sources
- DC current sources

One transmitter is suitable for the connection of all sensors. The input signal is converted into a standard signal.

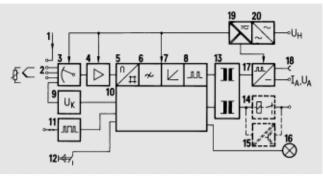
Features

- Four-wire transmitter
- Housing can be mounted on 35 mm rail or 32 mm G rail
- Plug-in screw terminals for electrical connections
- Low self-heating via electronics with extremely low power consumption
- All circuits electrically isolated
- Explosion proof to EEx ia IIC (7NG3041)
- Measuring ranges and operating parameters freely selectable
- Temperature-linear characteristic can be selected for all temperature sensors
- User-specific characteristics
- Automatic correction of zero point
- Output signal 0/4 to 20 mA or 0 to 10 V (switched by changing internal jumpers)
- Output signal clearly indicates mode of operation
- normal operation
- overrange - sensor fault
- Power pack 230/115 V AC/24 V AC/DC (switched by changing internal jumpers)
- Large tolerance range of power supply
- Optional sensor fault/limit monitor (pluggable)

Mode of operation (Fig. 2/2)

Transmitter operation can be broken down into the following function blocks and individual functions:

- Input
- Input terminals (2)
- Multiplexer (3)
- Amplifier (4)
- Constant current source (1) for resistance measurements
- Calibration circuit (9) for drift compensation



Four-wire system / Mounting rail assembly

7NG3040 and 7NG3041

Fig. 2/2 Block diagram (see mode of operation for 1 to 20)

- Microcontroller (10)
- Analog/digital converter (5)
- Adjustable low-pass filter (6) for smoothing of result
- Linearization function (7) for non-linear characteristics
- Output with pulse width modulation (8) proportional to measured signal
- Output
- Signals electrically isolated (13)
- Output module (17) containing pulse width/analog converter
- Test sockets (18) for monitoring output signal
- Optional sensor fault/limit monitor with relay (14) or electronic output (15)
- Controls and displays
- Serial interface (11) for setting and interrogating parameters
 Calibration push-button (12) for calibration of resistance measurements in two-wire circuits and trimming of start of scale/ full scale values
- Green LED (16) showing operational status (constant) or sensor fault or system malfunction (flashes)
- Power supply
- Universal power pack 24 V AC/DC (19), power pack 230/ 115 V AC (20)

Parameterization

The following parameters can be set and interrogated via the serial interface:

- Type of sensor, e.g. Pt100 resistance thermometer or NiCr/Ni thermocouple, type K
- Measuring range
- Internal or external temperature compensation for thermocouples
- 2, 3 or 4-wire circuit for resistance thermometer and resistance-based sensor
- Reaction to sensor fault (short-circuit or line breakage), e.g. output signal forced to start of scale or full scale value
- Transmitter characteristic, e.g. voltage or temperature-linear
- Rising or falling characteristic
- Response time of transmitter
- Output signal, e.g. 0 to 20 mA or 4 to 20 mA
- Limits with hysteresis
- The parameters are stored in a non-volatile memory (EEPROM).

The following are required during parameterization:

- Transmitter
- Off-line or on-line parameterization adapter
- Personal computer (PC)
- TransWin 7NG3080-8CA software package
- Printer for printing of rating plate and report

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7NG3040 and 7NG3041 Four-wire system / Mounting rail assembly

Technical data		Thermocouple	
Input		 Measured variable 	Temperature
Resistance thermometer		Measuring range	Parameterizable
Measured variable	Temperature	Measuring span	4 to 140 mV
 Measuring range 	Parameterizable	 Sensor type 	Type B: Pt30%Rh/Pt6%Rh (DIN IEC 584)
Measuring span	9 to 3150 Ω (9 Ω corresponds to approx. 25 °C for Pt100)		Type E: NiCr/CuNi (DIN IEC 584) Type J: Fe/CuNi (DIN IEC 584)
Sensor type	Pt100 (DIN IEC 751) Pt100 (JIS C1604/ α =0.00392 Ω /K) Ni100 (DIN 43 760) Cu100 Multiples or parts of specified		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 58 Type S: Pt10%Rh/Pt (DIN IEC 58 Type T: Cu/CuNi (DIN IEC 584)
	basic values (e.g. Pt500, Cu25) parameterizable		Type U: Cu-CuNi (DIN 43 710) Ni-NiMo (GE)
Characteristic	Temperature or resistance-linear		Additional thermocouples can be parameterized by the customer.
 Type of connection 		Characteristic	Temperature-linear or voltage-line
- Normal connection	One resistance-based sensor in two, three or four-wire circuit	Type of connection	ear
Two-wire circuit	Parameterized line resistance or	- Normal connection	One thermocouple, internal or ex
Three-wire circuit	line calibration using calibration pushbutton No line calibration necessary pro-	- Averaging connection	ternal temperature compensation Several thermocouples connecte in series to produce average tem perature, internal or external tem-
Four-wire circuit	vided that $R_{L2} = R_{L4}$ No calibration necessary		perature compensation
- Averaging connection	Several resistance thermometers connected in series or parallel to produce average temp. or to adapt to other basic values.	- Differential connection	Two identical thermocouples to produce temperature difference, temperature compensation not necessary; operating temperatur parameterizable
- Differential connection	e.g. Pt1000 n=10, Cu25 n=0.25 Two identical resistance-based sensors to produce temperature difference in two-wire circuit; oper- ating temperature can be parame-	Temperature compensation - Internal	Internal or external Cold junction terminal option 7NG3090-8AV required (plug-in screw terminal with integrated Pt100)
Measured current	terized 0.05 to 0.34 mA (depends on mea- suring range)	- External	Temperature of external tempera ture compensation parameteriz- able
 Line resistance R_L 	$\leq 100 \Omega$	mV sensors	
 Short-circuit monitoring 	The value below which a sensor	Measured variable	DC voltage
Resistance-based sensor, potenti-	fault is to be signalled is parame- terizable	Measuring range	Parameterizable in following ranges: -59 to +81 mV, -20 to +120 mV
ometer		•• • • • •	-39 to +100 mV, 0 to +140 mV
Measured variable	Ohmic impedance	Measuring span (maximum)	4 to 140 mV
Measuring range	Parameterizable 9 to 3150 Ω	Start of scale	-59 to +136 mV
Measuring spanStart of scale	0 to 3141 Ω	Full scale	140 mV
Full scale	3150 Ω	Characteristic	Voltage-linear or according to a prameterizable linearization function
Characteristic	Resistance-linear or according to a	 Overload capacity of inputs 	±3.5 V
• Characteristic	parameterizable linearization func-	Input resistance	≥1 MΩ
 Type of connection 		<u>V, µA, mA, A sensors</u> (without sensor breakage monitor-	
- Normal connection	One resistance-based sensor in two, three or four-wire circuit	 Malact control broatage memory Measured variable 	DC voltage / DC ourrept
Two-wire circuit	Parameterized line resistance or line calibration using calibration	Measuring range	DC voltage / DC current Parameterizable The voltage drop on the input
Three-wire circuit	pushbutton No line calibration necessary pro- vided that $R_{1,2} = R_{1,4}$		impedance R15 or shunt resis- tance R11 should correspond to
Four-wire circuit	No calibration necessary		the measuring ranges of the mV sensor.
- Differential connection	Two identical resistance-based sensors to produce temperature difference in two-wire circuit	Characteristic	Voltage or current-linear or accoing to a parameterizable linearization function
Measured current	0.05 to 0.34 mA (depends on mea- suring range)	• Voltage measurement > 140 mV	Internal voltage divider with serie resistance R12 and input imped-
 Line resistance R_L 	$\leq 100 \Omega$		ance R15
 Short-circuit monitoring 	The value below which a sensor fault is to be signalled is parame- terizable	Current measurement	Internal shunt resistance R11

7NG3040 and 7NG3041 Four-wire system / Mounting rail assembly

Technical data (continued)

Input (continued)

Input (continued)							
Order No. Measuring span 7NG304	Start of s	cale	Full scale	R12 MΩ	R15 k Ω	R11 Ω	
- 1 0 0.04 to 1.54 V	-0.5 to +	1.5 V	1.54 V	0.1	10	-	
- 20 0.4 to 14.14 V	-5 to +13	.74 V	14.14 V	1	10	-	
- 30 4 to 140.14 V	-50 to +1	36.14 V	140.14 V	1	1	-	
40 4 to 140 μA	-50 to +1	•	140 µA	-	-	1000	
- 50 0.04 to 1.4 mA	-0.5 to +		1.40 mA	-	-	100	
- 60 0.40 to 14 mA	-5.0 to +		14.0 mA	-	-	10	
- 70 4 to 140 mA	-50 to +1		140 mA	-	-	1	
- 80 0.04 to 1.00 A	-0.5 to +0	J.96 A	1.00 A	-	-	0.1	
Common data Characteristic 		tic is ge up to 14 degree point is mial.	ameteriza nerated b I first, sec polynomi defined fo	iy joini ond o nals. 1 or eve	ng tog r third The sta ry poly	gether arting yno-	
 Sensor fault monitoring 		breakag tion can	ing all terr ges and sl i be disab	hort-c led)	ircuits	(func-	
Response/drop threshold			≥1.5 kΩ lo	•			
Output following sensor fa Temperature unit	auit	most ree parame monitori	cale, to sta cent value terizable s ing F, °R para	e, safety	value	, no	
		(°R (Rar	nkine) = a	bsolu	te °F)		
Output							
Output signal		0/4 to 20 mA, can be recon. to 0 to 10 V					
 Nominal range 0 to 20 m/ Resolution Overrange Output range following s fault Impedance No-load voltage 	Ω 0 to 100% 5888 steps (0 to 100%) -0.25 to +21.0 mA (=-1.25 to +105.0%) -0.50 to +21.5 mA (=-2.5 to +107.5%), parameterizable ≤ 650 Ω ≤ 25 V						
Nominal range 4 to 20 m/ Resolution Overrange		 0 to 100% 4700 steps (0 to 100%) 8 to +20.8 mA (=-1.25 to +105.0%) 					
 Output range following s fault Impedance No-load voltage 	sensor	-0.5 to +21.5 mA (=-28.1 to +109.7%), parameterizable ≤ 650 Ω ≤ 25 V					
Nominal range 0 to 10 V Resolution Overrange		 ○ to 100% 5888 steps (0 to 100%) -0.125 to +10.5 V (=-1.25 to +105.0%) 					
 Output range following s fault Load resistance Short-circuit current 	-0.25 to +10.75 V (=-2.50 to +107.5%), parameterizable $\ge 1 k\Omega$ $\le 40 \text{ mA}$						
• Residual ripple U _{PP} /I _{PP}	\leq 1%; measured across a 1 MHz band						
 Response time Sample cycle 	100 ms						
 Electrical damping Adjustable time constant 	0 to 100 s parameterizable (software filter with 1 st order delay)						
Sensor fault/limit signalling		Relay or	utput or e	lectro	nic ou	tput	
Relay output Switching capacity Switching voltage Switching current		Relay output or electronic output Break circuit with 1 CO contact \leq 90 W, \leq 150 VA \leq 75 V AC/DC \leq 2 A AC/DC					

 Electronic output Operating output Residual volt, when /_L = 10 mA Operating current Short-circuit current 	Active during normal operation $U_{\rm H}$ = 18 to 75 V $U_0 \le 4.5$ V $I_{\rm L} \le 15$ mA $I_{\rm K} \le 70$ mA				
Sensor fault	Signalling of sensor or line break age and sensor short-circuit				
Limit monitoring	Freely parameter - lower and upp - window (coml and upper lim Limit and sensor	per limit pination o iits);	f lower		
	can be combined Parameterizable		ltoring		
Hysteresis	Falameterizable				
Accuracy Measurement error	Sum of input erro put error threshol temperature com (if known)	ds and in	ternal		
Input error thresholds					
Sensor	Range	Input en toleranc with compen	e ¹) without ²)		
Resistance thermometer Pt100	-200 to 150 °C -200 to 620 °C -200 to 850 °C	±0.08 K ±0.18 K ±0.33 K	±0.15 K ±0.35 K ±0.70 K		
- Pt500	-200 to 110 °C -200 to 400 °C -200 to 850 °C	±0.07 K ±0.43 K ±0.75 K			
- Pt1000	-200 to 200 °C -200 to 600 °C	±0.25 K ±0.75 K	±0.56 K ±1.10 K		
- Ni100 - Cu100	-60 to 90 °C -60 to 250 °C -50 to 140 °C	±0.04 K ±0.07 K ±0.06 K	±0.10 K ±0.14 K ±0.12 K		
	-50 to 180 °C	±0.10 K	±0.20 K		
Resistance-based sensor	$\begin{array}{ccc} 0 \text{ to } & 160 \ \Omega \\ 0 \text{ to } & 320 \ \Omega \\ 0 \text{ to } & 710 \ \Omega \\ 0 \text{ to } 3160 \ \Omega \end{array}$	$^{\pm 0.03}_{\pm 0.06} \Omega$ $^{\pm 0.13}_{\pm 2.17} \Omega$	±0.33 Ω		
Thermocouples					
- Type B: Pt30%Rh/Pt6%Rh	400 to 1000 °C 1000 to 1820 °C	±2.50 K ±1.00 K	±2.95 K ±1.32 K		
- Type E: NiCr/CuNi	-200 to 0 °C 0 to 500 °C 500 to 1000 °C	±0.40 K ±0.18 K ±0.15 K	-		
- Type J: Fe/CuNi	-210 to 0 °C 0 to 1200 °C	±0.50 K ±0.20 K	±0.63 K ±0.24 K		
- Type K: NiCr/Ni	-180 to 0 °C 0 to 1370 °C	±0.50 K ±0.30 K	±0.64 K ±0.35 K		
- Type L: Fe-CuNi	-200 to 0 °C 0 to 900 °C	±0.40 K ±0.20 K	±0.42 K ±0.25 K		
- Type N: NiCrSi-NiSi	-180 to 0 °C 0 to 500 °C	±0.90 K ±0.40 K	±0.96 K ±0.46 K		
- Type R: Pt13%Rh/Pt	500 to 1300 °C -50 to 0 °C 0 to 500 °C 500 to 1000 °C	±0.30 K ±2.50 K ±1.80 K ±1.00 K	±0.33 K ±3.24 K ±2.27 K ±1.11 K		
- Type S: Pt10%Rh/Pt	1000 to 1760 °C -50 to 0 °C 0 to 500 °C 500 to 1760 °C	±0.80 K ±2.50 K ±1.80 K	±0.91 K ±3.03 K ±2.22 K ±1.21 K		
- Type T: Cu/CuNi	-200 to 0 °C 0 to 400 °C	±1.10 K ±0.60 K ±0.25 K	±0.76 K ±0.31 K		
- Type U: Cu-CuNi	-200 to 0 °C 0 to 600 °C	±0.25 K ±0.50 K ±0.25 K	±0.63 K ±0.30 K		
Ni-NiMo	0 to 700 °C 700 to 1310 °C	±0.25 K ±0.23 K ±0.19 K	±0.30 K ±0.32 K ±0.23 K		
Voltage source	-60 to +140 mV	$\pm 10 \ \mu V$	±12 μV		
Error threshold of output signal	±0.05 % of meas	uring spa	In		
Internal temperature comp. error	≤0.5 K				

Includes temperature sensor linearization error.
 Following change in measuring range or type of sensor.

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Four-wire system / Mounting rail assembly

Technical data (continued)

		 Univer
Accuracy (continued)		
Influencing effects	Referred to nominal current $I_{\rm AN}$ =20 mA nominal voltage $U_{\rm AN}$ =10 V	
 of ambient temperature during resistance measurement on start of scale on span 	$\leq (0.05 + 0.015 \cdot (R_{Anf}/\Delta R))\%/10K$ $\leq 0.16\%/10K$	• Tolera - 230
 during voltage measurement on start of scale on span 	$\leq (0.05 + 0.05 \cdot (U_{Anf}/\Delta U))\%/10K$ $\leq 0.2\%/10K$	- 24 V
Additional influence - with internal cold junction com- pensation	\leq 0.1 K/10 K (temperature mea-	- Mair - Mair • Power
- with internal voltage divider	surement using thermocouples) $\leq 0.05 $ %/10 K (voltage measure- ment > 140 mV)	Electrica
- with internal shunt	\leq 0.025 %/10 K (current measurement)	• Test vo
 of load with current output of load with voltage output	\leq for a change from 50 to 650 Ω \leq with a change of load current from 0 to 10 mA	- Inpu ply a - Outp
• of power supply	\leq 0.05% within supply tolerance range	mon - Outp mon
of line resistance	\leq 0.02%/10 Ω	Permit
long term effect on span and start of scale	\leq 0.03%/month	- Inpu agai pow
Rated operating conditions		fault,
Installation condions: Site of installation (explosion-proof		- Outp mon
- Transmitter	Outside potentially explosive area	all in
- Sensor	Within potentially explosive area, zone 0 or zone 1	Explosio measuri
Ambient conditions		 "Intrins
Permitted ambient temperature		tion - Conf
 Operating temperature Functional temperature Storage temperature 	-10 to +65 °C -25 to +70 °C -40 to +85 °C	Externa
 Climatic category Relative humidity 	HSF, DIN 40 040 5 to 95%, no condensation	lines Insulatio
Electromagnetic compatibility Interference immunity Emitted interference	According to EN 50 082-1 According to EN 50 081-2	 Protect all the
• Degree of protection to EN 60 529	-	 Protect
Design		agains
Weight	Approx. 0.3 kg	Protectiv
Enclosure material	PBT, glass-fibre reinforced	Vibratio
Electrical connection / process con- nection	Plug-in screw terminal, max. 2.5 mm ²	
Displays and controls		
Calibration pushbutton function	Line compensation for resistance measurement in two-wire circuit, calibration of start of scale and full scale. Function can be disabled during parameterization.	
Parameterization	using TransWin program (page 2/36) and serial interface	
Serial interface	Developmentorining or distance and	
- Function - Interface	Parameterizing and interrogating of operating data Via online or offline V.24/V.28 (RS 232) parameterizing adapter	
Test sockets (front)	Monitoring output signal with a measuring instrument; permitted internal resistance of meas. instrument for current output \leq 15 Ω	
	10.121 ± 10.12	

Power supply

• Universal power pack	230 V AC and 24 V AC/DC or 115 V AC and 24 AC/DC V; can be changed via internal plug- in jumper from 230 V/115 V AC to 24 V AC/DC; can be changed from 230 V AC to 115 V AC by exchanging a capaci- tor
 Tolerance ranges 230 V/115 V AC 24 V AC/DC Mains frequency 230 V AC Mains frequency 115 V AC Power consumption at 24 V DC 	±15% 18 to 75 V DC (uninterruptible from 20.4 V upwards; 20 ms) 20.4 to 55.2 V AC 47 to 63 Hz 57 to 63 Hz Approx. 1.4 W
Electrical isolation	
	All circuits (input/output/power supply/sensor fault and limit moni- tor) are electrically isolated
 Test voltages Input against output, power supply and sensor fault/limit monitor Output and sensor fault/limit monitor against power supply Output against sensor fault/limit monitor Permitted impulse voltages Input, output and power supply against one another, input and power supply against sensor fault/limit monitor Output against sensor fault/limit monitor, series mode voltage to all inputs and outputs Certificates and approvals Explosion protection for the input measuring circuit "Intrinsically safe" type of protection 	
tion - Conformity certificate	PBT No. Ex-91.C.2091 X ASEV 92.1 C10162 X
External standards and guide- lines	
Insulation	
Protection of input circuit against all the other circuits	Functional extra-low voltage with safe isolation to VDE 0100 part 410
Protection of all the other circuits against input circuit	250 V AC, overvoltage class III to VDE 0100 part 410
Protective measures	DIN 57 411 /VDE 0411 part 1
Vibration resistance	DIN 57 411 /VDE 0411 part 1 (rail-mounted)

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Four-wire system / Mounting rail assembly

Ordering information

The order number structure shown below is used to specify a fully functioning transmitter.

The stock items can be easily adapted to the measuring task by the user himself. Usually the adaptation is carried out using the TransWin software for parameterization and possibly by changing plug-in jumpers and installation of accessory devices. Thus the stock items of the SITRANS T transmitter have the shortest delivery time and are the low-price versions of the SITRANS T transmitter.

The parameterization of operating data (sensor type, measuring range, characteristic etc.) takes place as follows:

Parameters preset in factory.

A list of the parameters as set in the factory is shown on pages 2/8 and 2/9. The presets can be modified by the customer to match the requirements precisely.

Parameterization defined in the order.

Add "-Z" and the order code "Y01" to the order number. The parameterization required can be selected from the list shown on pages 2/8 and 2/9. Only specify codes A \blacksquare to J \blacksquare for parameters that deviate from the factory settings. The factory setting will be used for any parameters that are not specified.

The selected parameters are printed on the transmitter's rating plate.

Ordering examples

Customer requirement	Ordering data	Standard parameter
Example 1: Four-wire transmitter - rail mounted - Ex-proof - power supply 230 V AC - output signal 0/4 to 20 mA - without sensor fault/limit monitor - input for temperature sensor	7NG3041-3JN00 (stock item)	
Sensor PT100, three-wire circuit Measuring range 0 to 150 °C Characteristic rising, temperature-lin- ear Output 4 to 20 mA Response to sensor breakage to full scale		X X X X X
Example 2: Four-wire transmitter - rail mounted - not Ex-proof - power supply 230 V AC - output signal 0 to 10 V - without sensor fault/limit monitor - input for temperature sensor rating plate in English	7NG3040-3UN00-Z Y01 + S76	
Sensor NiCr/Ni, type K Cold junction internal Measuring range 0 to 900°C Characteristic rising, temperature-lin- ear Accessories: cold junction terminal	AA2 EB8 7NG3090-8AV	x x
Example 3: Four-wire transmitter - rail mounted - not Ex-proof - power supply 230 V AC - output signal 0/4 to 20 mA - without sensor fault/limit monitor - input for DC voltage 0 to 1 V Sensor voltage signal Measuring range 0 to 1 V Characteristic falling, sensor propor- tional Filter period 15 s	7NG3040-3JN10-Z Y01 AE0 FA1 GS0	x
Output 0 to 20 mA (no sensor breakage monitoring)	HB3 GS0: T99 = 15 s	

Ordering data

SITRANS T universal transmitter for rail mounting in four-wire circuit for temperature, resistance, DC voltage and DC current	7NG304 - 0
Explosion protectionNot Ex-proofEx-proof, for inputs EEx ia IIC	0 1
Power supply (adjusted/selectable to)	
 AC 47 to 63 Hz 230 V AC / 24 V AC/DC AC 47 to 63 Hz 24 V AC/DC / 230 V AC AC 57 to 63 Hz 115 V AC / 24 V AC/DC AC 57 to 63 Hz 24 V AC/DC / 115 V AC 	4 5
Output signal (adjusted/selectable to)	
 0/4 to 20 mA / 0 to 10 V 0 to 10 V / 0/4 to 20 mA 	U U
Sensor fault/limit monitor	
 Not present (can be retrofitted) Relay with NO contact Relay with CO contact Electronic output 	N A B C
Input for temperature sensor, resis- tance-based sensor and mV sensor Input with additional circuitry ¹)	0
• for DC voltage, measuring span 0.04 to 1.5 V 0.4 to 14 V 4 to 140 V	1 2 3
• for DC current, measuring span 4 to 140 μA 0.04 to 1.4 mA 0.4 to 14 mA 4 to 140 mA 0.04 to 1 A	 4 5 6 7 8
Suffixes Add "-Z" and the order code to the order number and specify any plain text (see pages 2/8 and 2/9).	Order code
Parameterization specified in order Language of rating plate (together with	Y01
Y01 order code only) • Italian • English • French • Spanish	S72 S76 S77 S78
Accessories (if required)	Order No.
Sensor fault/limit monitor With relay output With electronic output Cold junction terminal	7NG3090-8AB 7NG3090-8AC 7NG3090-8AV
Off-line parameterization adapter	7NG3090-8AK
On-line parameterization adapter for parameterization during operation	7NG3090-8EK
TransWin program (see page 2/36) Conversion kit for SITRANS T One resistor each of 0.1 Ω , 1.0 Ω , 10.0 Ω , 100 Ω , 1 k Ω , 10 k Ω , 100 k Ω , 1 M Ω and one capacitor for 115 V AC power pack	7NG3080-8CA 7NG3090-8AW
Operating instructions for STRANS T (7NG304 -3/4/5/6, in 5 languages, included in scope of supply)	C73000-B7164-C155

Stock items

 Without sensor breakage monitoring. In Ex-proof instruments, observe maximum permitted currents and voltages as specified in conformance certificate.

7NG3040 and 7NG3041

Four-wire system / Mounting rail assembly

Parameter list (coded text A = to J =)

Parameters set in factory

Sensor Thermocouples

L: Fe-CuNi (DIN)

J: Fe/CuNi (IEC)

S: Pt10%Rh/Pt

R: Pt13%Rh/Pt

E: NiCr/CuNi

N: NiCrSi/NiSi

T: Cu/CuNi (IEC)

U: Cu/CuNi (DIN)

Pt100 (DIN IEC)

Pt100 (JIS)

Ni-Ni18%Mo (GE)

B· Pt30%Rh/Pt6%Rh

K · NiCr/Ni

Type

Note

Sensor fault/limit monitor: Specify desired parameterization acc. to Technical Data in plain text if

required. Code: A = + B = to J = Measuring ranges Connection Normal BA1 -30 to +60 °C EA0 $-200 \text{ to } + 900 \,^{\circ}\text{C}$ $\Lambda t > 75 \,^{\circ}\text{C}$ **AA**0 Cold junction compensation n^{3}) = 1 +20 °C EA1 40 °C EA2 60 °C EA3 -20 to 0 to 0 to -210 to +1200 °C, $\Delta t \ge 75$ °C BA2 internal ⁶) CA: **AA1** Averaq.4) n = 2 80 °C EA4 100 °C EA5 120 °C EA6 150 °C EA7 0 to -270 to +1372 °C, $\Delta t \ge 100$ °C **AA**2 BA3 external n = 3 0 to 0 to BA4 -50 to +1769 °C. $\Delta U \ge 4 \text{ mV}$ AA3 n = 4 0°C CB0 0 to 150 °C EA8 200 °C EA8 250 °C EA9 300 °C EB0 350 °C EB1 400 °C EB2 450 °C EB3 0 to 20 °C CB2 0 to 1820 °C. $\Delta U \ge 4 \text{ mV}$ **AA4** n = 5 BA5 -50 to +1769 °C, $\Delta U \ge 4 \text{ mV}$ ۵۵5 BA6 CB5 n = 6 50 °C -270 to +1000 °C, $\Delta t \ge 65$ °C AA6 n = 7 BA7 60 °C CB6 0 to 500 °C EB4 600 °C EB5 700 °C EB6 0 to -270 to +1300 °C, $\Delta U \ge 4 \text{ mV}$ AA7 n = 8 BA8 70 °C CB7 700 °C EB0 800 °C EB7 900 °C EB8 1000 °C EB9 1200 °C EC0 1400 °C EC1 -270 to + 400 °C, $\Delta U \ge 4 \text{ mV}$ AA8 n = 9 BA9 Others ¹²) CS0 -200 to + 600 °C, $\Delta U \ge 4 \text{ mV}$ AA9 = 10 BB0 n 1400 °C EC1 1600 °C EC2 1800 °C EC3 100 °C EC4 150 °C EC5 200 °C EC6 300 °C EC7 0 to 0 to 50 to 0 to +1310 °C, $\Delta t \ge 100$ °C **AB0** Differential ¹²) BS0 Resistance thermometer ¹) Connection 50 to 100 to $(R_{\max} + R_{L} < 1140 (3150) \Omega^{2}))$ Normal $n^{3}) = 1$ BA1 Connection Line resistance 7) 100 to 300 °C EC7 400 °C EC8 300 °C EC9 400 °C ED0 500 °C ED1 600 °C ED2 100 to 200 to 200 to -200 to +850 °C, ∆t ≥ 25 °C ACO Averag.5) n Two-wire CA2 0Ω DA0 +630 °C, $\Delta t \geq 25$ °C AC1 CA3 10 **Ω** DA1 -200 to n = 2 BA2 Three-wire 200 to 300 to to

Ni100 (DIN)	-60 to +180 °C, Δt 2	≥ 20 °C /	AC2	n = 10 F	BB0	Four-wire	CA4	20 Ω	DA2		1000 °C 1200 °C	
Cu100	-200 to +200 °C, Δt 2	≥ 25 °C /	AC3	Others ¹²)	BS1			100 Ω	DB1		1200 °C 1600 °C	
				Differential ¹²)	BS2			Others ¹²)	DS0	Other rang	les ¹²)	ES0
	sensor, potentiometer		AD0	Connection						Measuring	, ranges	3
$(R_{\rm max} + R_{\rm L} < 1140)$	(3150) Ω -)			Normal n ³) = 1	BA1	Connection		Line resistance ⁷)	0 to	100 Ω	EE1
				Differential ¹²)	BS3	Two-wire	CA2	0 Ω	DA0	0 to 2	200 Ω	EE2
						Three-wire	CA3	10 Ω	DA1	0 to	500 Ω	EE5
						Four-wire	CA4	20 Ω	DA2	0 to 10	000Ω	EF1
								100 Ω	DB1			
								Others ¹²)	DS0	Other rang	es ¹²)	ES1
mV sensor (V, μA, ι	mA, A sensor ¹⁰))	1	AE0	Measuring range for Order	r No.	7NG 304 🗖 - 🗖 🗖	0					
				0 1 ¹¹) mV V	2 ¹¹) V	 3 ¹¹) 4 ¹¹) V mA		5 ¹¹) 6 ¹¹) mA mA	7 ¹¹) mA	8 ¹¹) A		
				-20 to +20 -0.2 to +0.2 - -10 to +10 -0.1 to +0.1 - 0 to 10 0 to 0.1 0 to 20 0 to 0.2 0 to 50 0 to 0.5 0 to 100 0 to 1.0	2 to	2 0 to 20 0 to 5 0 to 50 0 to 10 0 to 100 0 to 1	+20 -0.2 +10 -0.1 10 (20 (50 (2 to +0.2 -2 to +2 -	20 to+	20 0 to 50 0 to 00 0 to	0.2 0.1 0.1 0.2 0.5	EG0 EG1 EG2 EG3 EG4 EG5 EG6 EG7
				Other ranges ¹²)								ES2

¹) For other basis values see Connection Averaging

(e.g. Pt500: $n = 5 \cong$ BA5). With 4-wire connection no sensor fault monitoring.

- 3 n = number of sensors to be connected.
- 4 The sum of the thermovoltages must not exceed 140 mV.

5 The sum of the resistances must not exceed 3150 Ω .

6 The cold junction terminal 7NG3090-8AV must be ordered separately. ¹²)

⁷) For 2-wire connection the indicated loop resistance must be obeyed or determined by calibration; for 3 and 4-wire connection the expectable maximum value per wire has to be stated.

10 Observe maximum permitted currents and voltages in explosion proof instrument (see conformance certificate).

- 11) Without sensor fault monitoring.
- See page 2/10 for operational data and special parameters.

7NG3040 and 7NG3041

Four-wire system / Mounting rail assembly

Parameter list (coded text A = to J =) (continued)

Parameters set in factory

Note

Sensor fault/limit monitor: Specify desired parameterization acc. to Technical Data in plain text if

required.

Code: A = + B = to J = Sensor 4 Thermocouples Characteri-Filter period ⁸ Basic functions Output signal stic Type Mains Filter 9) 0 s 0.1 s GA0 GA1 4 to 20 mA temperature-linear, L: Fe-CuNi (DIN) -200 to + 900 °C, Δt ≥ 75 °C AA0 FAO following sensor fault rising 50 Hz 0.1 s 0.2 s 0.5 s 1 s GA2 GA3 to full scale to start of scale retain most recent val. J: Fe/CuNi (IEC) -210 to +1200 °C, $\Delta t \ge 75$ °C AA1 HAC Calibr. pushb. HA1 temperature-linear. FΔ1 GA4 GA5 GA6 GA7 JE0 disabled HA₂ K: NiCr/Ni -270 to +1372 °C, Δt ≥ 100 °C AA2 falling 2 s 5 s 10 s enabled JF1 no monitoring safety value 12) HA3 HSO S: Pt10%Rh/Pt -50 to +1769 °C, ΔU≥ 4 mV AA3 FA2 60 Hz sensor proportional, 20 s 50 s 100 s GA8 GA9 0 to 20 mA rising Calibr. pushb. B: Pt30%Rh/Pt6%Rh 0 to 1820 °C, $\Delta U \ge$ 4 mV AA4 following sensor fault disabled JG0 GB0 GS0 HB0 sensor proportional, FA3 to full scale enabled JG1 Other alues ¹² to start of scale retain most recent val. R: Pt13%Rh/Pt -50 to +1769 °C, ΔU≥ 4 mV AA5 falling HB1 HB2 HB3 E: NiCr/CuNi no monitoring safety value ¹²) -270 to +1000 °C, $\Delta t \geq$ 65 °C AAe HS1 N: NiCrSi/NiSi -270 to +1300 °C, ΔU≥ 0 to 10 V 4 mV AA7 following sensor fault -270 to + 400 °C, $\Delta U \ge$ T: Cu/CuNi (IEC) 4 mV AA8 to full scale to start of scale retain most recent val. HA0 HA1 HA2 HA3 U: Cu/CuNi (DIN) -200 to + 600 °C, ΔU≥ 4 mV AA9 no monitoring safety value ¹²) Ni-Ni18%Mo(GE) 0 to +1310 °C, $\Delta t \ge 100$ °C ABO HS2 Resistance thermometer 1) $(R_{\rm max} + R_{\rm L} < 1140 (3150)^{'} \Omega^{2}))$ Pt100 (DIN IEC) -200 to +850 °C, Δt ≥ 25 °C AC0 Pt100 (JIS) -200 to +630 °C. Δt ≥ 25 °C AC1 Ni100 (DIN) -60 to +180 °C. Δt ≥ 20 °C AC2 Cu100 -200 to +200 °C Δt > 25 °C AC3 Resistance-based sensor, potentiometer AD0 Characteristic $(R_{\rm max} + R_{\rm L} < 1140 \ (3150) \ \Omega^2))$ FA0 sensor proportional, risina sensor proportional, falling FA1 programmed FS0 rising or falling ¹²) mV sensor (V, μ A, mA, A sensor ¹⁰)) AE0

For other basis values see Connection Averaging (e.g. Pt500: $n = 5 \cong BA5$). With 4-wire connection no sensor fault monitoring.

8 Software filter for smoothing result.

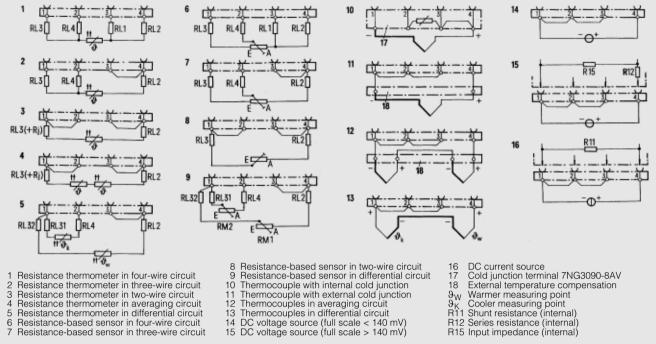
Filter to suppress mains interference on the input.

10 Observe maximum permitted currents and voltages in explosion proof instrument (see conformance certificate).

¹²) See page 2/10 for operational data and special parameters.

7NG3040 and 7NG3041

Four-wire system / Mounting rail assembly



- Resistance thermometer in averaging circuit Resistance thermometer in differential circuit

Resistance-based sensor in four-wire circuit Resistance-based sensor in three-wire circuit 6 7

. .

- Thermocouples in averaging circuit Thermocouples in differential circuit

DC voltage source (full scale < 140 mV) DC voltage source (full scale > 140 mV)

Fig. 2/3 Connection diagram for input signal (terminal X1)

Special par	ameters	
Code	Text	Options
BS0	TA=	Working point Ta for differential temperature mea- surement using thermocouples
BS1	N=	Factor n for multiplication with the basic values of the resistance thermometers or thermocouples Example: 3 x Pt500 parallel : BS1 : N = 1.667
BS2	TA=	Working point Ta for differential temperature mea- surement using resistance thermometers
	N=	Number n of resistance thermometers in each branch
	TMAX=	Max. temperature Tmax (total of temperatures in both branches)
BS3	RMAX=	Max. sum of the resistances of both branches T_{max}
CS0	TV=	Temperature Tv of external cold junction
DS0	RL=	Line resistance RL (resistance thermometer or potentiometer with 2-wire connection: loop resi- stance; with 3-wire and 4-wire connection: expectable maximum value per line)
ES0	MA=	Start of scale Ma for resistance thermometer/ thermocouples
	ME=	Full scale Me for resistance thermometer/thermo- couples
	D=	Unit (×C, ×K, ×F, ×R: ×R = Rankine = abs. Fah- renheit)
ES1	MA=	Start of scale Ma for resistance-based sensor/ potentiometer
	ME=	Full scale Me for resistance-based sensor/poten- tiometer
ES2	MA=	Start of scale Ma for mV, V, μV , mA and A sensor
	ME=	Full scale Me for mV, V, µA, mA and A sensor
	D=	Unit (mV→MV, V, μA→UA, mA→MA,A)
FS0	E1= A1=	Pair of values En, An for user-specific characteri- stic (Up to 50 pairs can be specified)
	EN= AN=	En: input (mV or Ω) An: output value (any unit)
	F=	Approximation function F: $L = linear;$ Q = quadratic; C = cubic
	K=	Direction of action of characteristic S = rising; $F = falling$
GS0	Т99=	Response time T99 of software filter (0 to 100 s)

Text Code Options HS0 S=... Safety output value s following sensor fault (output 4 to 20 mA) HS1 S=... Safety output value s following sensor fault (output 0 to 20 mA) Safety output value s following sensor fault (output signal 0 to 10 V) HS2 S=... 5 + $|_{A}$ (U_{A}) U Relay output Electronic output IA, UA Output Signal U_H Power supply

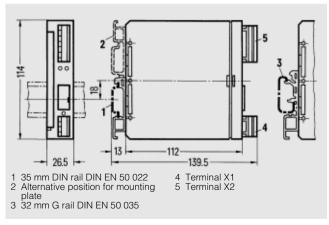


Fig. 2/4 Connection diagram for power supply and outputs (terminal X2)

Fig. 2/5 Dimensions for control room mounting, rail mounting

Fig. 2/6 SITRANS T transmitter as plug-in module (19-inch)

Application

"Intelligent" transmitter with universal input circuit for connecting to the following sensors:

- Resistance thermometers
- Thermocouples
- Resistance-based sensors/potentiometers
- DC voltage sources
- DC current sources

One transmitter is suitable for the connection of all sensors. The input signal is converted into a standard signal.

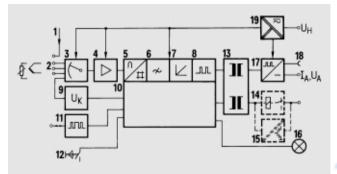
Features

- Four-wire transmitter
- Plug-in module (19-inch) 4 modules wide
- Low self-heating via electronics with extremely low power consumption
- All circuits electrically isolated
- Explosion proof to EEx ia IIC (7NG3041)
- Fully encapsulated housing facilitates the mounting of explosion-proof modules beside non-explosion-proof modules
- Measuring ranges and operating parameters freely selectable Temperature-linear characteristic can be selected for all temperature sensors
- User-specific characteristics
- Automatic correction of zero point
- Output signal 0/4 to 20 mA or 0 to 10 V (switched by changing internal jumpers)
- Output signal clearly indicates mode of operation
- normal operation
- overrange
- sensor fault
- Power pack 24 V AC/DC
- Large tolerance range of power supply
- Optionally with up to 3 sensor fault/limit monitors (pluggable)

Mode of operation (Fig. 2/7)

Transmitter operation can be broken down into the following function blocks and individual functions

- Input
- Input terminals (2)
- Multiplexer (3)
- Amplifier (4)
- Constant current source (1) for resistance measurements
- Calibration circuit (9) for drift compensation



Four-wire system / Plug-in module (19-inch)

7NG3040-1 and 7NG3041-1

Fig. 2/7 Block diagram (see mode of operation for 1 to 19)

- Microcontroller (10)
- Analog/digital converter (5)
- Adjustable low-pass filter (6) for smoothing of result Linearization function (7) for non-linear characteristics
- Output with pulse width modulation (8) proportional to measured signal
- Output
 - Signals electrically isolated (13)
 - Output module (17) containing pulse width/analog converter Test sockets (18) for monitoring output signal

 - Optional sensor fault/limit monitor with relay (14) or electronic output (15) (max. 3)
- Controls and displays
- Serial interface (11) for setting and interrogating parameters Calibration push-button (12) for calibration of resistance mea-_ surements in two-wire circuits and trimming of start of scale/
- full scale values Green LED (16) showing operational status (constant) or sen-
- sor fault or system malfunction (flashes)
- Power supply
 - Universal power pack 24 V AC/DC (19)

Parameterization

The following parameters can be set and interrogated via the serial interface:

- Type of sensor, e.g. Pt100 resistance thermometer or NiCr/Ni thermocouple, type K
- Measuring range
- Internal or external temperature compensation for thermocouples
- 2, 3 or 4-wire circuit for resistance thermometer and resistance-based sensor
- Reaction to sensor fault (short-circuit or line breakage), e.g. output signal forced to start of scale or full scale value
- Transmitter characteristic, e.g. voltage or temperature-linear
- Rising or falling characteristic
- Response time of transmitter
- Output signal, e.g. 0 to 20 mA or 4 to 20 mA
- Limits with hysteresis

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

The following are required during parameterization:

- Transmitter
- Off-line or on-line parameterization adapter
- Personal computer (PC)
- TransWin 7NG3080-8CA software package
- Printer for printing of rating plate and report

7NG3040-1 and 7NG3041-1 Four-wire system / Plug-in module (19-inch) Technical data

Technical data		Thermocouple	
Input		 Measured variable 	Temperature
Resistance thermometer		 Measuring range 	Parameterizable
Measured variable	Temperature	Measuring span	4 to 140 mV
 Measuring range 	Parameterizable	Sensor type	Type B: Pt30%Rh/Pt6%Rh (DIN IEC 584)
Measuring span	9 to 3150 Ω (9 Ω corresponds to approx. 25 °C for Pt100)		Type E: NiCr/CuNi (DIN IEC 584) Type J: Fe/CuNi (DIN IEC 584)
Sensor type	Pt100 (DIN IEC 751) Pt100 (JIS C1604/ α =0.00392 Ω /K) Ni100 (DIN 43 760) Cu100 Multiples or parts of specified basic values (e.g. Pt500, Cu25) parameterizable		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)
Characteristic	Temperature or resistance-linear		Ni-NiMo (GE) Additional thermocouples can be parameterized by the customer.
 Type of connection 		Characteristic	Temperature-linear or voltage-lin-
- Normal connection	One resistance-based sensor in two, three or four-wire circuit	Type of connection	ear
Two-wire circuit	Parameterized line resistance or line calibration using calibration pushbutton	- Normal connection	One thermocouple, internal or external temperature compensa- tion
Three-wire circuit Four-wire circuit	No line calibration necessary provided that $R_{L2} = R_{L4}$	- Averaging connection	Several thermocouples connected in series to produce average tem- perature, internal or external tem-
- Averaging connection	No calibration necessary Several resistance thermometers connected in series or parallel to produce average temp. or to adapt to other basic values. e.g. Pt1000 n=10, Cu25 n=0.25	- Differential connection	perature compensation Two identical thermocouples to produce temperature difference, temperature compensation not necessary; operating temperature parameterizable
- Differential connection	Two identical resistance-based sensors to produce temperature difference in two-wire circuit; oper- ating temperature can be parame- terized	 Temperature compensation internal 	Internal or external Cold junction terminal option 7NG3090-8AV required (plug-in screw terminal with integrated Pt100)
Measured current	0.05 to 0.34 mA (depends on mea- suring range)	- external	Temperature of external tempera- ture compensation
Line resistance R _L	$\leq 100 \Omega$		parameterizable
Short-circuit monitoring Resistance-based sensor, potenti-	The value below which a sensor fault is to be signalled is parameterizable	<u>mV sensors</u> • Measured variable • Measuring range	DC voltage Parameterizable in following ranges:
ometer			-59 to +81 mV, -20 to +120 mV
Measured variable	Ohmic impedance	• Macouring open (maximal)	-39 to +100 mV, 0 to +140 mV 4 to 140 mV
Measuring range	Parameterizable	 Measuring span (maximal) Start of scale 	-59 to +136 mV
Measuring span	9 to 3150 Ω	Full scale	140 mV
Start of scale	0 to 3141 Ω	Characteristic	Voltage-linear or according to a
Full scaleCharacteristic	$3150 \ \Omega$ Resistance-linear or according to a parameterizable linearisation func-		parameterizable linearization func-
	tion	Overload capacity of inputs	±3.5 V ≥1 MΩ
Type of connection		Input resistance	
- Normal connection Two-wire circuit	One resistance-based sensor in two, three or four-wire circuit Parameterized line resistance or line calibration using calibration	<u>V, μA, mA, A sensors</u> (without sensor breakage monitor- ing) • Measured variable	DC voltage / DC current
Three-wire circuit	pushbutton No line calibration necessary pro- vided that $R_{L2} = R_{L4}$	Measuring range	Parameterizable The voltage drop on the input
Four-wire circuit	No calibration necessary		impedance R15 or shunt resis- tance R11 should correspond to
- Differential connection	Two identical resistance-based sensors to produce temperature difference in two-wire circuit		the measuring ranges of the mV sensor.
Measured current	0.05 to 0.34 mA (depends on mea- suring range)	Characteristic	Voltage or current-linear or accord ing to a parameterizable lineariza- tion function
• Line resistance R_L	$\leq 100 \Omega$	 Voltage measurement > 140 mV 	Internal voltage divider with series
 Short-circuit monitoring 	The value below which a sensor fault is to be signalled is parameterizable	Current measurement	resistance R12 and input imped- ance R15
		 Current measurement 	Internal shunt resistance R11

7NG3040-1 and 7NG3041-1 Four-wire system / Plug-in module (19-inch)

Technical data (continued)

Input (continued)

Input (continued)	Input (continued)							
Order No. Measuring span 7NG304	Start of s	cale	Full scale	R12 MΩ	R15 kΩ	R11 Ω		
- 1 0 0.04 to 1.54 V	-0.5 to +	1.5 V	1.54 V	0.1	10	-		
- 20 0.4 to 14.14 V	-5 to +13		14.14 V	1	10	-		
- 30 4 to 140.14 V	-50 to +1	36.14 V	140.14 V	1	1	-		
40 4 to 140 μA	-50 to +1	36 µA	140 µA	-	-	1000		
- 5 0 0.04 to 1.4 mA	-0.5 to +	1.36 mA	1.40 mA	-	-	100		
- 60 0.40 to 14 mA	-5.0 to +	13.6 mA	14.0 mA	-	-	10		
- 270 4 to 140 mA	-50 to +1	36 mA	140 mA	-	-	1		
- 80 0.04 to 1.00 A	-0.5 to +0).96 A	1.00 A	-	-	0.1		
Common data • Characteristic • Sensor fault monitoring		The parameterizable characteris- tic is generated by joining together up to 14 first, second or third degree polynominals. The starting point is defined for every polyno- mial. Monitoring all terminations for breakages and short-circuits (func-						
			be disab	,				
Response/drop threshold			≥1.5 kΩ la	•				
Output following sensor fa Temperature unit	To full scale, to start of scale, retain most recent value, parameterizable safety value, no monitoring °C, K, °F, °R parameterizable							
		(°R (Rar	nkine) = a	bsolu	te °F)			
Output								
<u>Output signal</u>		0/4 to 20 mA, can be recon. to 0 to 10 V						
 Nominal range 0 to 20 m/ - Resolution Overrange Output range following a fault Impedance No-load voltage Nominal range 4 to 20 m/ - Resolution Overrange 	-0.25 to +105.09 -0.50 to +107.59 ≤ 650 G ≤ 25 V \cong 0 to 10 4700 sta 3.8 to +	eps (0 to +21.0 m/ %) +21.5 m/ %), param 2 00% eps (0 to 20.8 mA (A (=-1 A (=-2 neteriz 100%)	.25 to .5 to able				
 Output range following fault Impedance No-load voltage Nominal range 0 to 10 V Resolution 	+105.0%) -0.5 to +21.5 mA (=-28.1 to +109.7%), parameterizable ≤ 650 Ω ≤ 25 V ≅ 0 to 100% 5888 steps (0 to 100%)							
 Overrange Output range following a fault Load resistance Short-circuit current Residual ripple U_{PP}/I_{PP} 	-0.125 to +10.5 V (=-1.25 to +105.0%) -0.25 to +10.75 V (=-2.50 to +107.5%), parameterizable ≥ 1 kΩ ≤ 40 mA ≤ 1%, measured across a 1 MHz band							
Response time Sample cycle		100 ms						
Electrical damping Adjustable time constar	0 to 100 s parameterizable (software filter with 1 st order delay)							
Sensor fault/limit signalling • Relay output - Switching capacity - Switching voltage - Switching current	Break c		1 CO					

 Electronic output Operating output Residual volt, when / L = 10 mA Operating current Short-circuit current Sensor fault monitoring Limit monitoring 	iActive during normal operation $U_{\rm H} = 18$ to 75 V $U_0 \leq 4.5$ V $I_L \leq 15$ mA $I_K \leq 70$ mA Signalling of sensor or line break- age and sensor short-circuit Freely parameterizable are: - lower and upper limit - window (combination of lower and upper limits); Limit and sensor fault monitoring can be combined				
Hysteresis	Parameterizable				
Accuracy Measurement error	Sum of input erro put error threshol temperature com (if known)	ds and internal			
Input error thresholds	_	-			
Sensor	Range	Range Input er- ror tolerance ¹) with without ²) compensation			
Resistance thermometer	000 +- 150 00				
- Pt100 - Pt500	-200 to 150 °C -200 to 620 °C -200 to 850 °C -200 to 110 °C	±0.08 K ±0.15 K ±0.18 K ±0.35 K ±0.33 K ±0.70 K ±0.07 K ±0.16 K			
- Pt1000	-200 to 400 °C -200 to 850 °C -200 to 200 °C	±0.43 K ±0.88 K ±0.75 K ±1.54 K ±0.25 K ±0.56 K			
- Ni100	-200 to 600 °C -60 to 90 °C	±0.75 K ±1.10 K ±0.04 K ±0.10 K			
- Cu100	-60 to 250 °C -50 to 140 °C -50 to 180 °C	±0.07 K ±0.14 K ±0.06 K ±0.12 K ±0.10 K ±0.20 K			
Resistance-based sensor	$\begin{array}{ccc} 0 \ to & 160 \ \Omega \\ 0 \ to & 320 \ \Omega \\ 0 \ to & 710 \ \Omega \\ 0 \ to & 3160 \ \Omega \end{array}$	$\begin{array}{c} \pm 0.03 \ \Omega \\ \pm 0.06 \ \Omega \\ \pm 0.13 \ \Omega \\ \pm 2.17 \ \Omega \\ \pm 3.58 \ \Omega \end{array}$			
 Thermocouples Type B: Pt30%Rh/Pt6%Rh 	400 to 1000 °C	±2.50 K ±2.95 K			
- Type E: NiCr/CuNi	1000 to 1820 °C -200 to 0 °C 0 to 500 °C	±1.00 K ±1.32 K ±0.40 K ±0.48 K ±0.18 K ±0.20 K			
- Type J: Fe/CuNi	500 to 1000 °C -210 to 0 °C 0 to 1200 °C	±0.15 K ±0.16 K ±0.50 K ±0.63 K ±0.20 K ±0.24 K			
- Type K: NiCr/Ni	-180 to 0 °C 0 to 1370 °C	±0.50 K ±0.64 K ±0.30 K ±0.35 K			
- Type L: Fe-CuNi	-200 to 0 °C	±0.40 K ±0.42 K			
- Type N: NiCrSi-NiSi	-180 to 0 °C 0 to 500 °C	±0.90 K ±0.40 K ±0.96 K ±0.46 K			
- Type R: Pt13%Rh/Pt	500 to 1300 °C -50 to 0 °C 0 to 500 °C 500 to 1000 °C 1000 to 1760 °C	±0.30 K ±0.33 K ±2.50 K ±3.24 K ±1.80 K ±2.27 K ±1.00 K ±1.11 K ±0.80 K ±0.91 K			
- Type S: Pt10%Rh/Pt	-50 to 0 °C 0 to 500 °C 500 to 1760 °C	±2.50 K ±1.80 K ±2.22 K			
- Type T: Cu/CuNi	-200 to 0 °C	±1.10 K ±1.21 K ±0.60 K ±0.76 K			
- Type U: Cu-CuNi	0 to 400 °C -200 to 0 °C	±0.25 K ±0.31 K ±0.50 K ±0.63 K			
Ni-NiMo	0 to 600 °C 0 to 700 °C 700 to 1310 °C	±0.25 K ±0.30 K ±0.23 K ±0.32 K ±0.19 K ±0.23 K			
Voltage source	-60 to +140 mV	±10 μV ±12 μV			
Error threshold of output signal	±0.05 % of meas	uring span			
Internal temperature comp. error	≤0.5 K				

Includes temperature sensor linearization error.
 Following change in measuring range or type of sensor.

7NG3040-1 and 7NG3041-1

Four-wire system / Plug-in module (19-inch)

Technical data (continued)

Accuracy (continued)	
Influencing effects	Referred to nominal current I_{AN} =20 mA nominal voltage U_{AN} =10 V
 of ambient temperature during resistance measurement on start of scale on span 	≤ $(0.05 + 0.015 \cdot (R_{Anf}/\Delta R))%/10K$ ≤ 0.16%/10K
 during voltage measurement on start of scale on measuring span 	$\leq (0.05 + 0.05 \cdot (U_{Anf}/\Delta U))\%/10K$ $\leq 0.2\%/10K$
Additional influence - with internal cold junction com- pensation	≤ 0.1 K/10 K (temperature mea-
- with internal voltage divider	surement using thermocouples) $\leq 0.05 $ %/10 K (Voltage measure- ment > 140 mV)
- with internal shunt	\leq 0.025 %/10 K (Current measurement)
 of load with current output 	\leq 0.1% for a change from 50 to 650 Ω
 of load with voltage output 	\leq 0.1% with a change of load current from 0 to 10 mA
• of power supply	\leq 0.05% within supply tolerance range
• of line resistance	\leq 0.02%/10 Ω
long term effect on span and start of scale	≤ 0.03%/month
Rated operating conditions	
Installation conditions	
 Site of installation (explosion-proof instruments) 	
- Transmitter - Sensor	Outside potentially explosive area Within potentially explosive area, zone 0 or zone 1
Ambient conditions • Permitted ambient temperature - Operating temperature - Functional temperature - Storage temperature	-10 to +65 °C -25 to +70 °C -40 to +85 °C
Climatic category Relative humidity	HSF, DIN 40 040 5 to 95%, no condensation
• Electromagnetic compatibility - Interference immunity - Emitted interference	According to EN 50 082-1 According to EN 50 081-2
Degree of protection to EN 60 529	IP 20
Design	
Weight	Approx. 0.3 kg
Enclosure material	PBT, glass-fibre reinforced
Electrical connection / process con- nection	Plug connector, type F DIN 41 612 32 way, rows b and z
Displays and controls	
Calibration pushbutton function	Line compensation for resistance measurement in two-wire circuit, calibration of start of scale and full scale. Function can be disabled during parameterization.
Parameterization	using TransWin program (page 2/36) and serial interface
Serial interface Function Interface	Parameterizing and interrogating of operating data Via online or offline V.24/V.28 (RS 232) parameterizing adapter
Test sockets (front)	Monitoring output signal with a measuring instrument; permitted internal resistance of meas. instrument for current output \leq 15 Ω

Power supply

Universal power pack	24 V AC/DC
Tolerance ranges Power supply	18 to 60 V DC (uninterruptible from 20.4 V upwards; 20 ms) 20.4 to 41.4 V AC
- Mains frequency	47 to 63 Hz
 Power consumption At 24 V AC At 24 V DC 	Approx 1.8 W/2.2 VA Approx 1.4 W
Electrical isolation	All circuits (input/output/power supply/sensor fault and limit moni- tor) are electrically isolated
 Test voltages Input against output, power supply and sensor fault/limit monitor 	
 Power supply against output and sensor fault/limit monitor Output against sensor fault/limit monitor 	
 Power supply against output and sensor fault/limit monitor Output against sensor fault/limit monitor, series mode voltage to 	$\hat{u} = \pm 1.5$ kV, 1 µs/50 µs, $R_{\rm i} = 500 \ \Omega$
all inputs and outputs	$\hat{u} = \pm 500 \text{ V}, 1 \mu\text{s}/50 \mu\text{s}, R_{\text{j}} = 500 \Omega$
Certificates and approvals Explosion protection for the input measuring circuit	
 "Intrinsically safe" type of protection Conformity certificate 	EEx ia IIC PBT Nr. Ex-91.C.2091 X ASEV 92.1 C10162 X
External standards and guide- lines	
Insulation	
Protection of input circuit against all the other circuits	Functional extra-low voltage with safe isolation to VDE 0100 part 410
Protection of all the other circuits against input circuit	250 V AC, overvoltage class II to VDE 0100 part 410
Protective measures	DIN 57 411 /VDE 0411 part 1

7NG3040-1 and 7NG3041-1 Four-wire system / Plug-in module (19-inch)

Order No.

7NG304 1

0

1

J U

EFGHKLMPQ

0

0

Ordering information

The order number structure shown below is used to specify a fully functioning transmitter.

The stock items can be easily adapted to the measuring task by the user himself. Usually the adaptation is carried out using the TransWin software for parameterization and possibly by changing plug-in jumpers and installation of accessory devices. Thus the stock items of the SITRANS T transmitter have the shortest delivery time and are the low-price versions of the SITRANS T transmitter.

The parameterization of operating data (sensor type, measuring range, characteristic etc.) takes place as follows:

Parameters preset in factory.

A list of the parameters as set in the factory is shown on pages 2/16 and 2/17. The presets can be modified by the customer to match the requirements precisely.

Parameterization defined in the order.

Add "-Z" and the order code "Y01" to the order number. The parameterization required can be selected from the list shown on pages 2/16 and 2/17. Only specify codes A \blacksquare to J \blacksquare for parameters that deviate from the factory settings. The factory setting will be used for any parameters that are not specified.

The selected parameters are printed on the transmitter's rating plate.

Ordering examples

Customer requirement	Ordering data	Standard parameter
Example 1: Four-wire transmitter - plug-in module 19-inch - Ex-proof - output signal 0/4 to 20 mA - without sensor fault/limit monitor - input for temperature sensor	7NG3041-1JD00 (stock item)	
Sensor PT100, three-wire circuit Measuring range 0 to 150 °C Characteristic rising, temperature-lin- ear Output 4 to 20 mA Response to sensor breakage to full scale		X X X X
Example 2: Four-wire transmitter - plug-in module 19-inch - not Ex-proof - output signal 0 to 10 V - without sensor fault/limit monitor - input for temperature sensor Rating plate in English Sensor NiCr/Ni, type K Cold junction internal Measuring range 0 to 900°C Characteristic rising, temperature-lin- ear Accessories: cold junction terminal cold junction connection module	7NG3040-1UD00-Z Y01 + S76 AA2 EB8 7NG3090-8AV 7NG3090-8AA	x x
Example 3: Four-wire transmitter - plug-in module 19-inch - not Ex-proof - output signal 0/4 to 20 mA - without sensor fault/limit monitor - input for DC voltage 0 to 1 V Sensor voltage signal Measuring range 0 to 1 V Characteristic falling, sensor propor- tional. Filter period 15 s Output 0 to 20 mA	7NG3040-1JD10-Z Y01 AE0 FA1 GS0 HB3 GS0: T99 = 15 s	x

Ordering data

SITRANS T universal transmitter

Plug-in module (19-inch), in four-wire circuit, for temperature, resistance, DC voltage and DC current

Explosion protection

Not Ex-proof
Ex-proof, for inputs EEx ia IIC

Output signal (adjusted/selectable to)

- 0/4 to 20 mA / 0 to 10 V
- 0 to 10 V / 0/4 to 20 mA

Sensor fault/limit monitor

- Not present (can be retrofitted)
- 1 relay with CO contact
- 1 electronic output
- 2 relays with CO contact

Y01 order code only)

- 2 electronic outputs 3 relays with CO contact
- 3 electronic outputs
- 1 relay, 1 electronic outputs
- 1 relay, 2 electronic outputs
- 2 relays, 1 electronic output

Input for temperature sensor, resistance-based sensor and mV sensor

Input with additional circuitry¹) • for DC voltage, measuring span 0.04 to 1.5 V 0.4 to 14 V

4 to 140 V	3
• for DC current, measuring span 4 to 140 μA 0.04 to 1.4 mA 0.4 to 140 mA 4 to 140 mA 0.04 to 1 A	4 5 6 7 8
Suffixes	Order code
Add "-Z" and the order code to the order number and specify any plain text (see pages 2/16 and 2/17).	
Parameterization specified in order	Y01
Language of rating plate (together with	

 Italian English French Spanish 	S72 S76 S77 S78
Accessories (if required)	Order No.
Sensor fault/limit monitor	
With relay output	7NG3090-8AB
With electronic output	7NG3090-8AC
Cold junction terminal	7NG3090-8AV
Cold junction connection module for 2 cold junction terminals with 1 end holder	7NG3090-8AA
End holder	W73078-Z10
Coding strip with 2 coding nipples	W73070-Z53
Off-line parameterization adapter	7NG3090-8AK
On-line parameterization adapter for parameterization during operation	7NG3090-8EK
TransWin program (see page 2/36)	7NG3080-8CA

Conversion kit for SITRANS T One resistor each of 0.1 0, 1.0 0, 10.0 0

One resistor each of 0.1 Ω , 1.0 Ω , 10.0 Ω , 100 Ω , 1 k Ω , 10 k Ω , 100 k Ω , 1 M Ω and one capacitor for 115 V AC power pack **Conversion kit for SITRANS T** ((7NG304 -1, in 5 languages, included

((7NG304 -1, in 5 languages, included in scope of supply)

Stock items

 Without sensor breakage monitoring. In Ex-proof instruments, observe maximum permitted currents and voltages as specified in conformance certificate.

C73000-B7164-C157

7NG3040-1 and 7NG3041-1

Four-wire system / Plug-in module (19-inch)

Parameter list (coded text A = to J =)

Parameters set in factory

Note

Sensor fault/limit monitor:

Specify desired parameterization acc. to Technical Data in plain text if required.

⁵ Code: A - + B - to	J 🗖 🗖			. +			+		+		-	·	+	-
Sensor		_	r			-		↑			<u> </u>			<u> </u>
Thermocouples Type			Connection	۱								Measuri ranges	ng	
L: Fe-CuNi (DIN)	-200 to + 900 °C, $\Delta t \ge 75$ °C	AA0	Normal	n ³) =	1	BA1	Cold junction of	compensati	on			-30 to -20 to	+60 °(+20 °(C EA0 C EA1
J: Fe/CuNi (IEC)	-210 to +1200 °C, $\Delta t \geq$ 75 °C	AA1	Averag. ⁴)	n =	2	BA2	internal ⁶)	CA3				0 to 0 to	40 °0 60 °0	C EA2 C EA3
K: NiCr/Ni	-270 to +1372 °C, $\Delta t \ge 100$ °C	AA2		n =	3	BA3	external					0 to 0 to	100 °(C EA4 C EA5
S: Pt10%Rh/Pt	-50 to +1769 °C, $\Delta U \ge 4 \text{ mV}$	AA3		n =	4	BA4	0 °C	СВО				0 to 0 to	150 °(C EA6 C EA7
B: Pt30%Rh/Pt6%Rh	0 to 1820 °C, $\Delta U \ge 4 \text{ mV}$	AA4		n =	5	BA5	20 °C	CB2				0 to 0 to 0 to	250 °(C EA8 C EA9 C EB0
R: Pt13%Rh/Pt	-50 to +1769 °C, $\Delta U \ge 4 \text{ mV}$	AA5		n =	6	BA6	50 °C	CB5				0 to 0 to	350 °(C EB1 C EB2
E: NiCr/CuNi	-270 to +1000 °C, $\Delta t \geq 65$ °C	AA6		n =	7	BA7	60 °C	СВ6				0 to 0 to	450 °(C EB3 C EB4
N: NiCrSi/NiSi	-270 to +1300 °C, $\Delta U \ge 4 \text{ mV}$	AA7		n =	8	BA8	70 °C	СВ7				0 to 0 to	700 °C	C EB5 C EB6
T: Cu/CuNi (IEC)	-270 to + 400 °C, $\Delta U \ge 4 \text{ mV}$	AA8		n =	9	BA9	Others ¹²)	CS0				0 to 0 to	900 °(C EB7 C EB8
U: Cu/CuNi (DIN)	-200 to + 600 °C, $\Delta U \ge 4 \text{ mV}$	AA9		n =	10	BB0						0 to 0 to 0 to	1200 °(C EC0
Ni-Ni18%Mo (GE)	0 to +1310 °C, $\Delta t \ge 100$ °C	AB0	Differential ¹	12)		BS0						0 to 0 to	1600 °(C EC2
Resistance thermometer			Connection	ı								50 to 50 to	100 °(C EC4 C EC5
$(R_{\max} + R_{L} < 1140)$	50) 52 -))		Normal	n ³) =	1	BA1	Connection		Line resis	stance	7)	100 to 100 to	200 °(300 °(C EC6 C EC7
Pt100 (DIN IEC)	-200 to $+850 ^{\circ}\text{C}, \Delta t \geq 25 ^{\circ}\text{C}$	AC0	Averag. 5)	n			Two-wire	CA2	0 Ω		DA0	100 to 200 to	300 °(C EC8 C EC9
Pt100 (JIS)	-200 to $+630$ °C, $\Delta t \ge 25$ °C	AC1		n = to		BA2	Three-wire	CA3	10 Ω		DA1	200 to 200 to	500 °(C ED0 C ED1 C ED2
Ni100 (DIN)	-60 to $+180 ^{\circ}\text{C}, \Delta t \geq 20 ^{\circ}\text{C}$	AC2		n =		BB0	Four-wire	CA4	20 Ω		DA2	300 to 500 to 600 to	1000 °(
Cu100	-200 to $+200 ^{\circ}\text{C}, \Delta t \geq 25 ^{\circ}\text{C}$	AC3		Others	5 ¹²)	BS1			100 Ω		DB1	800 to		
			Differential	¹²)		BS2			Others 12	?)	DS0	Other rar	nges ¹²)	ES0
Resistance-based sens		AD0	Connection	ı			_					Measuri	ng range	S
$(R_{\max} + R_{L} < 1140)(31)$	50) 52)		Normal	n ³) =	1	BA1	Connection		Line resis	stance	7)	0 to	100 Ω	EE1
			Differential	¹²)		BS3	Two-wire	CA2	0 Ω		DA0	0 to	200 Ω	EE2
							Three-wire	CA3	10 Ω		DA1	0 to	500 Ω	EE5
							Four-wire	CA4	20 Ω		DA2	0 to	1000 Ω	EF1
									100 Ω		DB1			
									Others 12	²)	DS0	Other rar	nges ¹²)	ES1
mV sensor (V, µA, mA, ,	A sensor)	AE0	Measuring	range	for Orde	er No	7NG 304 🗖 -	0						
			0 mV		1 ¹¹) V	2 ¹¹)	3 ¹¹)	4 ¹¹) mA		6 ¹¹) mA	7 ¹¹) mA	8 ¹¹)	
				20 -0.2 10 -0.1 10 0 20 0 50 0 00 0	to +0.2 to +0.1 to 0.1 to 0.2 to 0.5	-2 to	+1 -10 to +10 -1 1 0 to 10 2 0 to 20 5 0 to 50 10 0 to 100	0 to +50 -0. 0 to +20 -0. 0 to +10 -0. 0 to 10 0 to 20 0 to 50	5 to +0.5 -5 2 to +0.2 -2 1 to +0.1 -1 0 to 0.1 (0 to 0.2 (0 to 0.5 (0 to 1.0 (5 to +5 2 to +2	-50 to + -20 to +	+50 -0.5 to +20 -0.2 to +10 -0.1 to 10 0 to 20 0 to 50 0 to 100 0 to	+0.2	EG0 EG1 EG2 EG3 EG4 EG5 EG5 EG7 ES2
				903)										

¹) For other basis values see Connection Averaging (e.g. Pt500: $n = 5 \cong BA5$).

2) 3) 4) With 4-wire connection no sensor fault monitoring.

n = number of sensors to be connected.

- The sum of the thermovoltages must not exceed 140 mV.

⁷) For 2-wire connection the indicated loop resistance must be obeyed or determined by calibration; for 3 and 4-wire connection the expectable maximum value per wire has to be stated.

10) Observe maximum permitted currents and voltages in explosion proof instrument (see conformance certificate).

¹¹ Without sensor fault monitoring.
 ⁶) The cold junction terminal 7NG3090-8AV must be ordered separately.
 ¹¹ Without sensor fault monitoring.
 ¹² See page 2/18 for operational data and special parameters.

7NG3040-1 and 7NG3041-1

Four-wire system / Plug-in module (19-inch)

Parameter list (coded text A = to J =) (continued)

Parameters set in factory

Note Sensor fault/limit monitor: Specify desired parameterization acc. to Technical Data in plain text if required.

Sensor		T			1		1		1	
Thermocouples Type			Character- istic		Filter period ⁸)		Output signal		Basic functions	
L: Fe-CuNi (DIN)	-200 to + 900 °C, $\Delta t \geq 75$	5°C AA0	temperature-linear, rising	FA0	0 s 0.1 s	GA0 GA1	4 to 20 mA following sensor fault		Mains filter ⁹) 50 Hz	
J: Fe/CuNi (IEC)	-210 to +1200 °C, $\Delta t \geq 75$	5°C AA1	temperature-linear,	FA1	0.2 s 0.5 s	GA2 GA3	- to full scale - to start of scale	HA0 HA1	Calibr. pushb.	
K: NiCr/Ni	-270 to +1372 °C, $\Delta t \ge 100$	°C AA2	falling	FAI	1 s 2 s 5 s	GA4 GA5	 retain most recent val. 	HA2 HA3	 disabled enabled 	JF0 JF1
S: Pt10%Rh/Pt	-50 to +1769 °C, $\Delta U \ge -4$	mV AA3	sensor pro- portional, rising	FA2	2 10 s GA7	 no monitoring safety value ¹²) 0 to 20 mA 	HS0	60 Hz		
B: Pt30%Rh/Pt6%Rh	0 to 1820 °C, $\Delta U \ge 4$	mV AA4	sensor pro-	FA3	20 s 50 s 100 s	GA9 GB0	following sensor fault - to full scale	HB0	Calibr. pushb. - disabled	JG0
R: Pt13%Rh/Pt	-50 to +1769 °C, $\Delta U \ge 4$	mV AA5		173	Other values	GSO	 to start of scale 	HB1	- enabled	JG1
E: NiCr/CuNi	-270 to +1000 °C, $\Delta t \geq 65$	5°C AA6			12)		 retain most recent val. no monitoring safety value ¹²) 	HB3 HS1		
N: NiCrSi/NiSi	-270 to +1300 °C, $\Delta U \ge -4$	mV AA7					0 to 10 V following sensor fault			
T: Cu/CuNi (IEC)	-270 to + 400 °C, $\Delta U \ge -4$	mV AA8					 to full scale to start of scale 	HAO HA1		
U: Cu/CuNi (DIN)	-200 to + 600 °C, $\Delta U \ge -4$	mV AA9					- retain most recent val.			
Ni-Ni18%Mo(GE)	0 to +1310 °C, $\Delta t \ge 100$	°C AB0					 no monitoring safety value ¹²) 	HS2		
Resistance thermomete (R _{max} + R _L < 1140 (31	er ¹) 50) Ω ²))									
Pt100 (DIN IEC)	-200 to +850 °C, $\Delta t \ge 25$	5°C <mark>AC0</mark>								
Pt100 (JIS)	-200 to +630 °C, $\Delta t \ge 25$	5°C AC1								
Ni100 (DIN)	-60 to +180 °C, $\Delta t \ge 20$	°C AC2								
Cu100	-200 to +200 °C, $\Delta t \ge 25$	5°C AC3								
Resistance-based sens R _{max} + R _L < 1140 (31		AD0	Characteristic							
max + nL < 1140 (31	30) \$2))		sensor pro- portional, rising	FA0						
			sensor pro- portional, falling	FA1						
			programmed rising or falling ¹²)	FS0						
mV sensor (V, μA, mA, J	A sensor)	AE0								

For other basis values see Connection Averaging (e.g. Pt500: $n = 5 \cong BA5$).

1) 2) 8) With 4-wire connection no sensor fault monitoring.

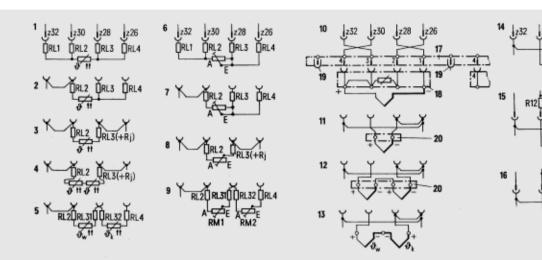
Software filter for smoothing result.

9

⁹) Filter to suppress mains interference on the input.
 ¹⁰) Observe maximum permitted currents and voltages in explosion proof instrument (see conformance certificate).
 ¹²) See page 2/18 for operational data and special parameters.

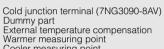
7NG3040-1 and 7NG3041-1

Four-wire system / Plug-in module (19-inch)



1	Resistance thermometer in four-wire
2	Resistance thermometer in three-wire circuit
3	Resistance thermometer in two-wire circuit
4	Resistance thermometer in averaging circuit
5	Resistance thermometer in differential circuit
6	Resistance-based sensor in four-wire circuit
7	Resistance-based sensor in three-wire circuit
8	Resistance-based sensor in two-wire circuit
9	Resistance-based sensor in differential circuit

- Thermocouple with internal temperature comp. Thermocouple with external temperature comp. 10 11
 - Thermocouples in averaging circuit Thermocouples in differential circuit
- DC voltage source (full scale < 140 mV) DC voltage source (full scale > 140 mV) DC current source Cold junction connection module (7NG3090-8AA)
- 12 13 14 15 16 17



z30

O

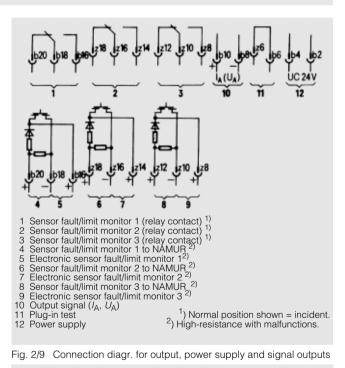
z28

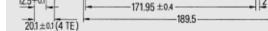
z26

- 18 19 20
- ອ_W ອ_K R11
- Cooler measuring point Shunt resistance (internal) Series resistance (internal) Input impedance (internal) R12 R15

Fig. 2/8 Connection diagram for input signal

Special p	arameters	
Code	Text	Options
BS0	TA=	Working point T _a for differential temperature mea- surement using thermocouples
BS1	N=	Factor n for multiplication with the basic values of the resistance thermometers or thermocouples Example: 3 x Pt500 parallel : BS1 : N = 1.667
BS2	TA=	Working point T_a for differential temperature measurement using resistance thermometers
	N= TMAX=	Number n of resistance thermom. in each branch Max. temperature T _{max} (total of temperatures in both branches)
BS3	RMAX=	Max. sum of the resist. of both branches R _{max}
CS0	TV=	Temperature Tv of external cold junction
DS0	RL=	Line resistance <i>R</i> _L (resistance thermometer or potentiometer with 2-wire connection: loop resistance; with 3-wire and 4-wire connection: expectable maximum value per line)
ES0	MA=	Start of scale Ma for resistance thermometer/ thermocouples
	ME=	Full scale Me for resistance-based sensor/poten- tiometer
	D=	Unit (°C, °K, °F, °R: °R = Rankine = abs. Fahrenh.)
ES1	MA=	Start of scale Ma for resistance-based sensor/ potentiometer
	ME=	Full scale Me for resistance-based sensor/poten- tiometer
ES2	MA=	Start of scale Ma for mV, V, µV, mA and A sensor
	ME=	Full scale Me for resistance-based sensor/poten- tiometer
	D=	Unit (mV -> MV, V, µA -> UA, mA -> MA, A)
FS0	E1= A1= EN= AN=	Pair of values E_n , A_n for user-specific character. (Up to 50 pairs can be specified) E_n ; input (mV or Ω) A_n : output value (any unit)
	F=	Approximation function F: L = linear; Q = qua- dratic; C = cubic
	K=	Direction of action of characteristic S = rising; F = falling
GS0	T99=	Response time T_{99} of software filter (0 to 100 s)
HS0	S=	Safety output value S following sensor fault (output 4 to 20 mA)
HS1	S=	Safety output value S following sensor fault (output 4 to 20 mA)
HS2	S=	Safety output value S following sensor fault (Output signal 0 to 10 V)





5.5

2

Fig. 2/10 Dimensions for plug-in module (19-inch)

 128.4 ± 0.3

12.5+0.1

+02 122.5 :

2/18



Fig. 2/11 SITRANS T transmitter as printed circuit board for the ES 902 packaging system

Application

"Intelligent" transmitter with universal input circuit for connecting to the following sensors:

- Resistance thermometers
- Thermocouples
- Resistance-based sensors/potentiometers
- DC voltage sources
- DC current sources

One transmitter is suitable for the connection of all sensors. The input signal is converted into a standard signal.

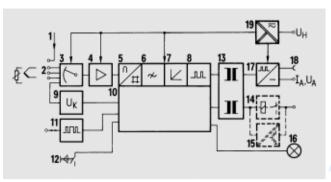
Features

- Four-wire transmitter
- Printed circuit board for ES 902 packaging system, 2 standard slots
- Compatible with the 7NG1204 and 7NG1205 transmitters (previous devices)
- Low self-heating via electronics with extremely low power consumption
- All circuits electrically isolated
- Measuring ranges and operating parameters freely selectable
- Temperature-linear characteristic can be selected for all temperature sensors
- User-specific characteristics
- Automatic correction of zero point
- Output signal 0/4 to 20 mA or 0 to 10 V (switched by changing internal jumpers)
- Output signal clearly indicates mode of operation
- normal operation
- overrange
- sensor fault
- Power pack 24 V AC/DC
- Large tolerance range of power supply
- Optional sensor fault/limit monitor (pluggable)

Mode of operation (Fig. 2/12)

Transmitter operation can be broken down into the following function blocks and individual functions:

- Input
- Input terminals (2)
- Multiplexer (3)
- Amplifier (4)
- Constant current source (1) for resistance measurements
- Calibration circuit (9) for drift compensation



Four-wire system / ES 902 packaging system

7NG3040-0

Fig. 2/12 Block diagram (see mode of operation for 1 to 19)

- Microcontroller (10)
 - Analog/digital converter (5)
 - Adjustable low-pass filter (6) for smoothing of result
 - Linearization function (7) for non-linear characteristics
- Output with pulse width modulation (8) proportional to measured signal
- Output
 - Signals electrically isolated (13)
 - Output module (17) containing pulse width/analog converter
 - Test sockets (18) for monitoring output signal
 - Optional sensor fault/limit monitor with relay (14) or electronic output (15)
 - Controls and displays
 - Serial interface (11) for setting and interrogating parameters
 Calibration push-button (12) for calibration of resistance mea-
 - surements in two-wire circuits and trimming of start of scale/ full scale values
 - Green LED (16) showing operational status (constant) or sensor fault or system malfunction (flashes)
 - Power supply
 - Universal power pack 24 V AC/DC (19)

Parameterization

The following parameters can be set and interrogated via the serial interface:

- Type of sensor, e.g. Pt100 resistance thermometer or NiCr/Ni thermocouple, type K
- Measuring range
- Internal or external temperature compensation for thermocouples
- 2, 3 or 4-wire circuit for resistance thermometer and resistance-based sensor
- Reaction to sensor fault (short-circuit or line breakage), e.g. output signal forced to start of scale or full scale value
- Transmitter characteristic, e.g. voltage or temperature-linear
- Rising or falling characteristic
- Response time of transmitter
- Output signal, e.g. 0 to 20 mA or 4 to 20 mA
- Limits with hysteresis
- The parameters are stored in a non-volatile memory (EEPROM).

The following are required during parameterization:

- Transmitter
- Off-line or on-line parameterization adapter
- Personal Computer (PC)
- TransWin 7NG3080-8CA software package
- Printer for printing of rating plate and report

7NG3040-0

Four-wire system / ES 902 packaging system

Technical data		Thermocouple	
Input		 Measured variable 	Temperature
Resistance thermometer		 Measuring range 	Parameterizable
Measured variable	Temperature	 Measuring span 	4 to 140 mV
Measuring range	Parameterizable	 Sensor type 	Type B: Pt30%Rh/Pt6%Rh
Measuring span	9 to 3150 Ω (9 Ω corresponds to approx. 25 °C for Pt100)		(DIN IEC 584) Type E: NiCr/CuNi (DIN IEC 584) Type J: Fe/CuNi (DIN IEC 584)
Sensor type	Pt100 (DIN IEC 751) Pt100 (JIS C1604/ α =0.00392 Ω/K) Ni100 (DIN 43 760) Cu100		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)
	Multiples or parts of specified basic values (e.g. Pt500, Cu25) parameterizable		Type S: Pt10%Rh/Pt (DIN IEC 584) Type T: Cu/CuNi (DIN IEC 584) Type U: Cu-CuNi (DIN 43 710)
Characteristic	Temperature or resistance-linear		Ni-NiMo (GE) Additional thermocouples can be
 Type of connection 			parameterized by the customer.
- Normal connection	One resistance-based sensor in	 Characteristic 	Temperature-linear or voltage-lin-
- Normal connection	two, three or four-wire circuit	- Turne of composition	ear
Two-wire circuit	Parameterized line resistance or line calibration using calibration	 Type of connection Normal connection 	One thermocouple, internal or external temperature compensa-
Three-wire circuit	pushbutton No line calibration necessary pro- vided that $R_{L2} = R_{L4}$	- Averaging connection	tion Several thermocouples connected
Four-wire circuit	No calibration necessary		in series to produce average tem-
- Averaging connection	Several resistance thermometers connected in series or parallel to produce average temp. or to adapt to other basic values. e.g. Pt1000 n=10, Cu25 n=0.25	- Differential connection	perature, internal or external tem- perature compensation Two identical thermocouples to produce temperature difference, temperature compensation not necessary; operating temperature
- Differential connection	Two identical resistance-based sensors to produce temperature difference in two-wire circuit; oper- ating temperature can be parame-	 Temperature compensation Internal 	parameterizable Internal or external Cold junction terminal option 7NG3090-8AV required (plug-in
	terized		screw terminal with integrated
Measured current	0.05 to 0.34 mA (depends on mea- suring range)	- External	Pt100) Temperature of external tempera-
 Line resistance R_L 	$\leq 100 \Omega$		ture compensation parameteriz- able
Resistance-based sensor, potentiometer		mV sensors	
Measured variable	Ohmic impedance	 Measured variable 	DC voltage
Measuring range	Parameterizable	 Measuring range 	Parameterizable in following
Measuring span	9 to 3150 Ω		ranges:
Start of scale	0 to 3141 Ω		-59 to +81 mV, -20 to +120 mV -39 to +100 mV, 0 to +140 mV
Full scale	3150 Ω	 Measuring span (maximal) 	4 to 140 mV
Characteristic		Start of scale	-59 to +136 mV
• Characteristic	Resistance-linear or according to a parameterizable linearization func-		
	tion	• Full scale	140 mV
 Type of connection 		Characteristic	Voltage-linear or according to a parameteriz. linearization function
- Normal connection	One resistance-based sensor in	 Overload capacity of inputs 	±3.5 V
- · · ·	two, three or four-wire circuit	Input resistance	$\geq 1 M\Omega$
Two-wire circuit	Parameterized line resistance or line calibration using calibration pushbutton	V, μA, mA, A sensors	- 1 10152
Three-wire circuit	No line calibration necessary pro- vided that $R_{1,2} = R_{1,4}$	(without sensor breakage monitor.) • Measured variable	DC voltage / DC current
Four-wire circuit	No calibration necessary	 Measuring range 	Parameterizable
Differential connection Measured current	Two identical resistance-based sensors to produce temperature difference in two-wire circuit		The voltage drop on the input impedance R15 or shunt resis- tance R11 should correspond to the measuring ranges of the mV
- measured current	0.05 to 0.34 mA (depends on mea- suring range)		sensor.
• Line resistance R_L	$\leq 100 \Omega$	Characteristic	Voltage or current-linear or accord ing to a parameterizable lineariza- tion function
		• Voltage measurement > 140 mV	Internal voltage divider with series resistance R12 and input imped- ance R15
		Current measurement	Internal shunt resistance R11

7NG3040-0 Four-wire system / ES 902 packaging system

Technical data (continued)

Input (continued)

Input (continued)								
Order No. Measuring span 7NG304	Start of s	cale	Full scale	R12 MΩ	R15 k Ω	R11 Ω		
- 1 5 0.04 to 1.54 V	-0.5 to +	1.5 V	1.54 V	0.1	10	-		
- 25 0.4 to 14.14 V	-5 to +13	.74 V	14.14 V	1	10	-		
- 3 5 4 to 140.14 V	-50 to +1	36.14 V	140.14 V	1	1	-		
- = = 45 4 to 140 μA	-50 to +1	36 µA	140 µA	-	-	1000		
- 5 5 0.04 to 1.4 mA	-0.5 to +	1.36 mA	1.40 mA	-	-	100		
- E 65 0.40 to 14 mA	-5.0 to +	13.6 mA	14.0 mA	-	-	10		
- 2 75 4 to 140 mA	-50 to +1	36 mA	140 mA	-	-	1		
- 85 0.04 to 1.00 A	-0.5 to +0	0.96 A	1.00 A	-	-	0.1		
Common data								
Characteristic Sensor fault monitoring	The parameterizable characteris- tic is generated by joining together up to 14 first, second or third degree polynominals. The starting point is defined for every polyno- mial. Monitoring all terminations for breakages and short-circuits (func- tion can be disabled)							
 Response/drop threshold 		$\leq 3 \text{ k}\Omega/2$	≥1.5 kΩ la	oop re	sistan	се		
Output following sensor fa	ault	most ree parame monitori	$\leq 3 \text{ k}\Omega \geq 1.5 \text{ k}\Omega$ loop resistance To full scale, to start of scale, retain most recent value, parameterizable safety value, no monitoring					
Temperature unit	°C, K, °F, °R parameterizable (°R (Rankine) = absolute °F)							
Output								
Output signal		0/4 to 20 10 V	0 mA, car	n be re	econ. t	o 0 to		
 Nominal range 0 to 20 m/ Resolution Overrange 	Ą	 ○ to 100% 5888 steps (0 to 100%) -0.25 to +21.0 mA (=-1.25 to +105.0%) 						
 Output range following a fault Impedance No-load voltage 	Impedance			-0.50 to +21.5 mA (=-2.5 to +107.5%), parameterizable $\leq 650 \Omega$ $\leq 25 V$				
Nominal range 4 to 20 m/ Resolution Overrange	Ą	 0 to 100% 4700 steps (0 to 100%) 3.8 to +20.8 mA (=-1.25 to +105.0%) 						
 Output range following fault Impedance No-load voltage 	sensor	-0.5 to +21.5 mA (=-28.1 to +109.7%), parameterizable ≤ 650 Ω ≤ 25 V						
Nominal range 0 to 10 V Resolution Overrange		 ≙ 0 to 100% 5888 steps (0 to 100%) -0.125 to +10.5 V (=-1.25 to +105.0%) 						
 Output range following fault Load resistance 	sensor	+107.59 ≥ 1 kΩ	+10.75 V %), param					
- Short-circuit current		\leq 40 mA \leq 1%, measured across a 1 MHz						
 Residual ripple U_{PP}/I_{PP} 		\leq 1%, r band	neasured	acros	sal	IVIHZ		
 Response time Sample cycle 		bana						
Electrical damping		100 ms						
- Adjustable time constar	nt 7 ₉₉	0 to 100 s, parameterizable (software filter with 1 st order delay)						
Sensor fault/limit signalling		Relay or	utput or e	lectro	nic ou	tput		
 Relay output 		Break circuit with 1 CO contact						
 Switching capacity Switching voltage Switching current 		≤ 90 W, ≤ 150 VA ≤ UC 75 V ≤ UC 2 A						

 Electronic output Operating output Residual volt, when <i>I</i>_L=10 mA Operating current Short-circuit current Sensor fault monitoring 	Active during normal operation $U_{\rm H}$ = 18 to 75 V $U_0 \le 4.5$ V $I_L \le 15$ mA $I_{\rm K} \le 70$ mA Signalling of sensor or line break- age and sensor short-circuit					
Limit monitoring	lower and upper - window (comb and upper lim - window (comb and upper lim	pination o its); pination o its);	f lower			
• Hysteresis	Limit and sensor can be combined Parameterizable		itoring			
Accuracy	T dramotonzabio					
Measurement error	Sum of input erro put error threshol temperature com (if known)	ds and in	ternal			
Input error thresholds		-				
Sensor	Range	Input error tolerance with compensi	¹) without ²)			
Resistance thermometer Pt100	-200 to 150 °C -200 to 620 °C	±0.08 K ±0.18 K	±0.15 K ±0.35 K			
- Pt500	-200 to 850 °C -200 to 110 °C -200 to 400 °C -200 to 850 °C	±0.33 K ±0.07 K ±0.43 K ±0.75 K	±0.70 K ±0.16 K ±0.88 K ±1.54 K			
- Pt1000	-200 to 200 °C -200 to 600 °C	±0.25 K ±0.75 K	±0.56 K ±1.10 K			
- Ni100	-60 to 90 °C -60 to 250 °C	±0.04 K ±0.07 K	±0.10 K ±0.14 K			
- Cu100	-50 to 140 °C -50 to 180 °C	±0.12 K ±0.20 K				
Resistance-based sensor	$\begin{array}{ccc} 0 \ to & 160 \ \Omega \\ 0 \ to & 320 \ \Omega \\ 0 \ to & 710 \ \Omega \\ 0 \ to & 3160 \ \Omega \end{array}$	$\begin{array}{c} \pm 0.03 \ \Omega \\ \pm 0.06 \ \Omega \\ \pm 0.13 \ \Omega \\ \pm 2.17 \ \Omega \end{array}$				
Thermocouples Type B: Pt30%Rh/Pt6%Rh	400 to 1000 °C	±2.50 K	±2.95 K			
- Type E: NiCr/CuNi	1000 to 1820 °C -200 to 0 °C 0 to 500 °C 500 to 1000 °C	±1.00 K ±0.40 K ±0.18 K ±0.15 K	±1.32 K ±0.48 K ±0.20 K ±0.16 K			
- Type J: Fe/CuNi	-210 to 0 °C 0 to 1200 °C	±0.50 K ±0.20 K	±0.63 K ±0.24 K			
- Type K: NiCr/Ni	-180 to 0 °C 0 to 1370 °C	±0.50 K ±0.30 K	±0.64 K ±0.35 K			
- Type L: Fe-CuNi	-200 to 0 °C 0 to 900 °C	±0.40 K ±0.20 K	±0.42 K ±0.25 K			
- Type N: NiCrSi-NiSi	-180 to 0 °C 0 to 500 °C 500 to 1300 °C	±0.90 K ±0.40 K ±0.30 K	±0.96 K ±0.46 K ±0.33 K			
- Type R: Pt13%Rh/Pt	-50 to 1000 °C 0 to 500 °C 500 to 1000 °C	±2.50 K ±1.80 K ±1.00 K	±3.24 K ±2.27 K ±1.11 K			
- Type S: Pt10%Rh/Pt	1000 to 1760 °C -50 to 0 °C 0 to 500 °C 500 to 1760 °C	±0.80 K ±2.50 K ±1.80 K ±1.10 K	±0.91 K ±3.03 K ±2.22 K ±1.21 K			
- Type T: Cu/CuNi	-200 to 0 °C 0 to 400 °C	±0.60 K ±0.25 K	±0.76 K ±0.31 K			
- Type U: Cu-CuNi	-200 to 0 °C 0 to 600 °C	±0.25 K ±0.50 K ±0.25 K	±0.63 K ±0.30 K			
Ni-NiMo	0 to 700 °C 700 to 1310 °C	±0.23 K ±0.19 K	±0.32 K ±0.23 K			
Voltage source	-60 to +140 mV	$\pm 10 \ \mu V$	±12 μV			
Error threshold of output signal	±0.05 % of meas	uring spa	n			
Internal temperature comp. error	≤0.5 K					

¹) Includes temperature sensor linearization error.
 ²) Following change in measuring range or type of sensor.

7NG3040-0

Four-wire system / ES 902 packaging system

Т

Technical data (continued)	
Accuracy (continued)	
Influencing effects	Referred to nominal current $I_{\rm AN}$ =20 mA nominal voltage $U_{\rm AN}$ =10 V
 of ambient temperature during resistance measurement on start of scale on span during voltage measurement 	$\leq (0.05 + 0.015 \cdot (R_{Anf}/\Delta R))\%/10K$ $\leq 0.16\%/10K$
on start of scale on span	$\leq (0.05 + 0.05 \cdot (U_{Anf}/\Delta U))\%/10K$ $\leq 0.2\%/10K$
Additional influence - with internal cold junction com- pensation - with internal voltage divider	≤ 0.1 K/10 K (temperature mea- surement using thermocouples) ≤ 0.05 %/10 K (voltage measure- ment > 140 mV)
- with internal shunt	≤ 0.025 %/10 K (current measure- ment)
of load with current output	$\leq 0.1\%$ for a change from 50 to 650 Ω
of load with voltage output	\leq 0.1% with a change of load cur- rent from 0 to 10 mA
 of power supply of power supply	\leq 0.05% within supply tolerance range \leq 0.02%/10 Ω
 long term effect on span and start of scale 	
Rated operating conditions	
Ambient conditions	
 Permitted ambient temperature Operating temperature Functional temperature Storage temperature 	-10 to +65 °C -25 to +70 °C -40 to +85 °C
 Climatic category Relative humidity 	HSF, DIN 40 040 5 to 95%, no condensation
 Electromagnetic compatibility Interference immunity Emitted interference 	According to EN 50 082-1 According to EN 50 081-2
Degree of protection to EN 60 529	IP 00
Design	
Weight	Approx. 0.3 kg
Enclosure material	PBT, glass-fibre reinforced
Electrical connection / process con- nection	Plug connector, type F DIN 41 612 32 way, rows b and z
Displays and controls	
Calibration pushbutton function	Line compensation for resistance measurement in two-wire circuit, calibration of start of scale and full scale. Function can be disabled during parameterization.
Parameterization	Using TransWin program (page 2/36) and serial interface
Serial interface Function	Parameterizing and interrogating of
- Interface	operating data Via online or offline V.24/V.28 (RS 232) parameterizing adapter
Test sockets (front)	Monitoring output signal with a measuring instrument; permitted internal resistance of meas. instrument for current output \leq 15 Ω

De er supply

 Universal power pack 	24 V AC/DC ;
Tolerance ranges Power supply	18 to 60 V DC (uninterruptible from 20.4 V upwards; 20 ms) 20.4 to 41.4 V AC
- Mains frequency	47 to 63 Hz
Power consumption 24 V AC 24 V DC	Approx. 1.8 W/2.2 VA Approx. 1.4 W
Electrical isolation	All circuits (input/output/power supply/sensor fault and limit moni- tor) are electrically isolated
 Test voltages Input against output, power supply and sensor fault/limit monitor Power supply against output and sensor fault/limit monitor Output against sensor fault/limit 	$U_{\rm rms}$ = 4 kV, 50 Hz, 1 min
monitor	$U_{\rm rms}$ = 500 V, 50 Hz, 1 min
 Power supply against output and sensor fault/limit monitor Output against sensor fault/limit 	$\hat{u} = \pm 1.5$ kV, 1 µs/50 µs, $R_{\rm i} = 500 \ \Omega$
monitor, series mode voltage to all inputs and outputs	\hat{u} = ±500 V, 1 µs/50 µs, $R_{\rm i}$ = 500 Ω
External standards and guide- lines	
Insulation	
Protection of input circuit against all the other circuits	Functional extra-low voltage with safe isolation to VDE 0100 part 410
Protection of all the other circuits against input circuit	250 V AC, overvoltage class III to VDE 0100 part 410
Protective measures	DIN 57 411 / VDE 0411 part 1

7NG3040-0 Four-wire system / ES 902 packaging system

Order No.

7NG3040 - 0

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Ordering information

The order number structure shown below is used to specify a fully functioning transmitter.

The stock items can be easily adapted to the measuring task by the user himself. Usually the adaptation is carried out using the TransWin software for parameterization and possibly by changing plug-in jumpers and installation of accessory devices. Thus the stock items of the SITRANS T transmitter have the shortest delivery time and are the low-price versions of the SITRANS T transmitter.

The parameterization of operating data (sensor type, measuring range, characteristic etc.) takes place as follows:

- Parameters preset in factory. A list of the parameters as set in the factory is shown on pages 2/24 and 2/25. The presets can be modified by the customer to match the requirements precisely.
- Parameterization defined in the order.

Add "-Z" and the order code "Y01" to the order number. The parameterization required can be selected from the list shown on pages 2/24 and 2/25. Only specify codes A = to J = for parameters that deviate from the factory settings. The factory setting will be used for any parameters that are not specified.

The selected parameters are printed on the transmitter's rating plate.

Ordering examples

Customer requirement	Ordering data	Standard parameter
Example 1: Four-wire transmitter - ES 902 printed circuit board - output signal 0/4 to 20 mA - without sensor fault/limit monitor - input for temperature sensor - input in three-wire system	7NG3040-0JN02 (stock item)	
Sensor PT100, three-wire circuit Measuring range 0 to 150 °C Characteristic rising, temperature-lin- ear Output 4 to 20 mA Response to sensor breakage to full scale		x x x x
Example 2: Four-wire transmitter - ES 902 printed circuit board - output signal 0 to 10 V - without sensor fault/limit monitor - input for temperature sensor - internal cold junction rating plate in English	7NG3040-0UN04-Z Y01 + S76	
Sensor NiCr/Ni, type K Cold junction internal Measuring range 0 to 900°C Characteristic rising, temperature-lin- ear	AA2 EB8	x x
Accessories: cold junction terminal, cold junction connection module	7NG3090-8AV 7NG3090-8AA	
Example 3: Four-wire transmitter - ES 902 printed circuit board - output signal 0/4 to 20 mA - without sensor fault/limit monitor - input for DC voltage 0 to 1 V Sensor voltage signal Measuring range 0 to 1 V Characteristic falling, sensor propor- tional Filter period 15 s	7NG3040-0JN15-Z Y01 AE0 FA1 GS0	x
Output 0 to 20 mA (no monitoring)	HB3 GS0: T99 = 15 s	

Stock items

Ordering data

SITRANS T universal transmitter

for ES 902 packaging system in four-wire circuit for temperature, resistance, DC voltage and DC current

Output signal (adjusted/ selectable to)

• 0/4 to 20 mA / 0 to 10 V • 0 to 10 V / 0/4 to 20 mA

Sensor fault/limit monitor

- Not present (can be retrofitted)Relay with CO contact
- Electronic output

Input for temperature sensor, resistance-based sensor and mV sensor

- Input for resistance thermometer and resistance-based sensor
- 4-wire system
- 3-wire system and differential circuit - 2-wire system and averaging circuit
- Input for thermocouple

Internal cold junction 1) External cold junction or mV sensor for voltages up to 140 mV

Input for higher voltages; for currents,

input with additional circuitry	
•for DC voltage ²), measuring span 0.04 to 1.5 V 0.4 to 14.0 V 4 to 140 V	 1 5 2 5 3 5
•for DC current ²), measuring span 4 to 140 μA 0.04 to 1.4 mA 0.4 to 14 mA 4 to 140 mA 0.04 to 1 A	45 55 65 75 85
Suffixes	Order code
Add "-Z" and the order code to the order number and specify any plain text (see pages 2/24 and 2/25).	
Parameterization specified in order	Y01
Language of rating plate (together with Y01 order code only) Italian	S72
• English	S76
FrenchSpanish	S77 S78
Accessories (if required)	Order No.
Sensor fault/limit monitor • With relay output	7NG3090-8AB

• With electronic output 7NG3090-8AC 7NG3090-8AV Cold junction terminal Cold junction connection module 2 cold junction terminals with 1 end holder 7NG3090-8AA W73078-Z10 Coding strip with 2 coding nipples W73070-Z53 7NG3090-8AK Off-line parameterization adapter 7NG3090-8EK

On-line parameterization adapter for parameterization during operation

End holder

TransWin program (see page 2/36)

Conversion kit for SITRANS TT

One resistor each of 0.1 Ω, 1.0 Ω, 10.0 Ω, 100 Ω , 1 k Ω , 10 k Ω , 100 k Ω , 1 M Ω and one capacitor for 115 V AC power pack

Operating instructions for SITRANS T (7NG3040-0, German/English, included in scope of supply)

¹) The cold junction terminal and cold junction connection module are to be ordered separately

²) Without sensor breakage monitoring.

7NG3080-8CA

7NG3090-8AW

C73000-B7174-C158

7NG3040-0

Four-wire system / ES 902 packaging system

Parameter list (coded text A = to J =)

Parameters set in factory

Order No. with order code: 7NG3040 - 0 - Z Y01

Note Sensor fault/limit monitor: Specify desired parameterization acc. to Technical Data in plain text if required.

Code: A + B to J		+		+	+ *		+	-
Sensor Thermocouples	╀	Connection	Ŧ	↑	1	Measuri	na	Ŧ
Туре		Connection			_	ranges	- -	
L: Fe-CuNi (DIN) -200 to + 900 °C, $\Delta t \ge 75$ °C	AA0		BA1	Cold junction compensa	tion	-30 to -20 to	+20 °C	C EA0 C EA1
J: Fe/CuNi (IEC) -210 to +1200 °C, $\Delta t \ge 75$ °C	AA1	Averag. 4) n = 2	BA2	internal ⁶) CA3	3	0 to 0 to	o 60 °C	C EA2 C EA3
K: NiCr/Ni -270 to +1372 °C, $\Delta t \ge 100$ °C	AA2	n = 3	BA3	external		0 to 0 to	0 100 ℃	C EA4
S: Pt10%Rh/Pt -50 to +1769 °C, $\Delta U \ge 4 \text{ mV}$	AA3	n = 4	BA4	0 °C CB 0	D	0 to 0 to) 150 ℃	C EA6 C EA7 C EA8
B: Pt30%Rh/Pt6%Rh 0 to 1820 °C, $\Delta U \ge 4 \text{ mV}$	AA4	n = 5	BA5	20 °C CB2	2	0 to 0 to 0 to	250 °C	C EA9
R: Pt13%Rh/Pt -50 to +1769 °C, $\Delta U \ge 4 \text{ mV}$	AA5	n = 6	BA6	50 °C CB	5	0 to 0 to	350 °C	C EB1
E: NiCr/CuNi -270 to +1000 °C, $\Delta t \ge 65$ °C	AA6	n = 7	BA7	60 °C CB6	6	0 to 0 to	0 450 ℃	C EB3 C EB4
N: NiCrSi/NiSi -270 to +1300 °C, $\Delta U \ge 4 \text{ mV}$	AA7	n = 8	BA8	70 °C CB7	7	0 to 0 to	0° 000 ℃	C EB5 C EB6
T: Cu/CuNi (IEC) -270 to + 400 °C, $\Delta U \ge 4 \text{ mV}$	AA8	n = 9	BA9	Others ¹²) CSC	2	0 to 0 to	900 °C	C EB7 C EB8
U: Cu/CuNi (DIN) -200 to + 600 °C, $\Delta U \ge 4 \text{ mV}$	AA9	n = 10	BB0			0 to 0 to	1200 °C	C ECO
Ni-Ni18%Mo (GE) 0 to +1310 °C, $\Delta t \ge 100$ °C	AB0	Differential ¹²)	BS0			0 to 0 to	1600 °C	C EC2
Resistance thermometer ¹)		Connection			·	0 to 50 to 50 to	100 °C	C EC3
$(R_{\max} + R_{L} < 1140 (3150) \Omega^{2}))$		Normal n ³) = 1	BA1	Connection	Line resistance 7)	100 to 100 to	200 °C	C EC6
Pt100 (DIN IEC) -200 to +850 °C, $\Delta t \ge 25$ °C	AC0	Averag. ⁵) n		Two-wire CA2	2 0 Ω DAO	100 to	0 400 °C	C EC8 C EC9
Pt100 (JIS) -200 to +630 °C, $\Delta t \ge 25$ °C	AC1	n = 2	BA2	Three-wire CA3	3 10 Ω DA1	200 10	0 500 ℃	C ED0 C ED1
Ni100 (DIN) -60 to +180 °C, $\Delta t \ge 20$ °C	AC2	to n = 10	BB0	Four-wire CA4	4 20 Ω DA2		0 1000 ℃	
Cu100 -200 to +200 °C, $\Delta t \ge 25$ °C	AC3	Others ¹²)	BS1		100 Ω DB1	600 to 800 to		
		Differential ¹²)	BS2		Others ¹²) DS0	Other rai	nges ¹²)	ES0
Resistance-based sensor, potentiometer	AD0	Connection				Measur.	ranges	
$(R_{\rm max} + R_{\rm L} < 1140 (3150) \Omega^2)$		Normal n ³) = 1	BA1	Connection	Line resistance ⁷)	0 to	100 Ω	EE1
		Differential ¹²)	BS3	Two-wire CA2	2 0 Ω DAO	0 to	200 Ω	EE2
				Three-wire CA3	3 10 Ω DA1	0 to	500 Ω	EE5
				Four-wire CA4	4 20 Ω DA2	0 to	1000 Ω	EF1
					100 Ω DB1			
					Others ¹²) DS0	Other rai	nges ¹²)	ES1
mV sensor (V, µA, mA, A sensor ¹⁰))	AE0	Measuring range for Orde	er No.	7NG 304 0 - 0 5		1		
		l Į.	1	↑		l_		
		0 1 ¹¹) mV V	2 ¹¹) V	3 ¹¹) 4 ¹¹) V mA	5 ¹¹) 6 ¹¹) 7 ¹¹) mA mA mA	8 ¹¹ A)	
		-20 to+20 -0.2 to+0.2 -10 to+10 -0.1 to+0.1 0 to 10 0 to 0.1	-2 to -1 to 0 to	1 0 to 10 0 to 10 2 0 to 20 0 to 20 5 0 to 50 0 to 50 10 0 to 100 0 to 100	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	+20 -0.2 to +10 -0.1 to 10 0 to 20 0 to 50 0 to 100 0 to	o +0.2	EG0 EG1 EG2 EG3 EG4 EG5 EG6 EG7
		Other ranges ¹²)	1 10		1 to 5 4 to	20		EG7

For other basis values see Connection Averaging (e.g. Pt500: n = 5 ≅ BA5).
 With 4-wire connection no sensor fault monitoring.
 n = number of sensors to be connected.

⁷) For 2-wire connection the indicated loop resistance must be obeyed or determined by calibration; for 3 and 4-wire connection the expectable maximum value per wire has to be stated.
¹⁰) Observe maximum permitted currents and voltages in explosion proof

(e.g. Pt500: n = 0 - 2...,
With 4-wire connection no sensor fault monitoring.
n = number of sensors to be connected.
The sum of the thermovoltages must not exceed 140 mV.
The sum of the resistances must not exceed 3150 Ω.
The cold junction terminal 7NG3090-8AV must be ordered separately.
See page 2/26 for operational data and special parameters.

7NG3040-0

Four-wire system / ES 902 packaging system

Parameter list (coded text A = to J =) (continued)

Parameters set in factory

Order No. with order code: 7NG3040 - 0 - Z Y01

Note Sensor fault/limit monitor: Specify desired parameterization acc. to Technical Data in plain text if required.

Code: A 📕 + B 📕 to	o J 🗖 🗖		++	-	+	_	+		++	
Sensor		^	T	-	1	<u> </u>	I	_	1	<u> </u>
Thermocouples Type		_	Character.		Filter period ⁸)		Output signal		Basic functions	
L: Fe-CuNi (DIN)	-200 to + 900 °C, $\Delta t \geq$	75°C AAO	temperature-linear, rising	FA0	0 s 0.1 s	GA0 GA1	4 to 20 mA following sensor fault		Mains filter ⁹) 50 Hz	
J: Fe/CuNi (IEC)	-210 to +1200 °C, $\Delta t \geq$	75 °C AA1	temperature-linear,	EA 4	0.2 s 0.5 s	GA2 GA3	- to full scale - to start of scale	HAO HA1	Calibr. pushb.	\bot
K: NiCr/Ni	-270 to +1372 °C, $\Delta t \ge 1$	00 °C AA2		FA1	1 s 2 s 5 s	GA4 GA5	 retain most recent val. 		 disabled enabled 	JF0 JF1
S: Pt10%Rh/Pt	-50 to +1769 °C, $\Delta U \ge$	4 mV AA3	sensor pro- portional, rising	FA2	10 s GA7	 no monitoring safety value ¹²) 0 to 20 mA 	HSO	60 Hz		
B: Pt30%Rh/Pt6%Rh	0 to 1820 °C, $\Delta U \ge$	4 mV AA4	sensor pro-	FA3	20 s 50 s 100 s	GA8 GA9 GB0	following sensor fault - to full scale	нво	Calibr. pushb. - disabled	JG0
R: Pt13%Rh/Pt	-50 to +1769 °C, $\Delta U \ge$	4 mV AA5		FAJ	Other	GS0	 to full scale to start of scale retain most recent val. 	HB1	- enabled	JG1
E: NiCr/CuNi	-270 to +1000 °C, $\Delta t \geq$	65 °C AA6	i		values ¹²)		 no monitoring safety value ¹²) 	HB3 HS1		
N: NiCrSi/NiSi	-270 to +1300 °C, $\Delta U \ge$	4 mV AA7	,				0 to 10 V			
T: Cu/CuNi (IEC)	-270 to + 400 °C, $\Delta U \ge$	4 mV AA8	-				following sensor fault - to full scale	HAO		
U: Cu/CuNi (DIN)	-200 to + 600 °C, $\Delta U \ge$	4 mV AA9)				 to start of scale retain most recent val. 			
Ni-Ni18%Mo(GE)	0 to +1310 °C, $\Delta t \ge 1$	00 °C AB0)				 no monitoring safety value ¹²) 	HA3 HS2		
Resistance thermomete ($R_{max} + R_{L} < 1140$ (31										
Pt100 (DIN IEC)	-200 to $+850$ °C, $\Delta t \ge$	25 °C ACO								
Pt100 (JIS)	-200 to $+630$ °C, $\Delta t \ge$	25 °C AC1								
Ni100 (DIN)	-60 to $+180$ °C, $\Delta t \ge$	20 °C AC2								
Cu100	-200 to $$ +200 °C, $\Delta t \geq$	25 °C AC3								
Resistance-based sens		AD0	Characteristic		-					
$(R_{\rm max} + R_{\rm L} < 1140)$ (31)		ADU	Characteristic sensor pro-	FA0						
			portional, rising	FAU						
			sensor pro- portional, falling	FA1						
			programmed rising or falling ¹²)	FS0						
mV sensor (V, μA, mA,	A sensor ¹⁰))	AE0	-							

For other basis values see Connection Averaging (e.g. Pt500: n = 5 ≏ BA5).
 With 4-wire connection no sensor fault monitoring.
 Software filter for smoothing result.
 Filter to suppress mains interference on the input.

¹⁰) Observe maximum permitted currents and voltages in

explosion proof instrument (see conformance certificate). ¹²) See page 2/26 for operational data and special parameters.

7NG3040-0

Four-wire system / ES 902 packaging system

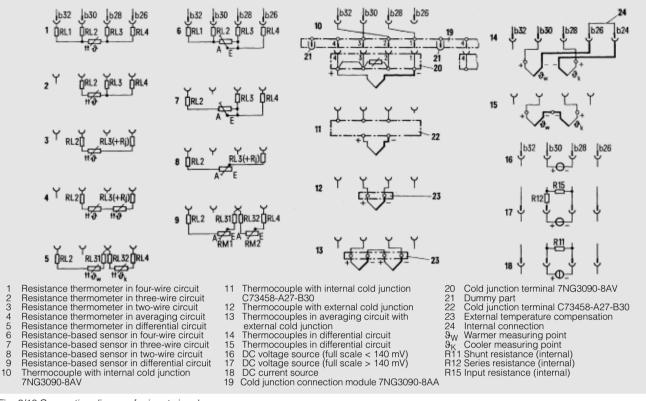


Fig. 2/13 Connection diagram for input signal

Special	parameters	
Code	Text	Options
BS0	TA=	Working point T_{a} for differential temperature measurement using thermocouples
BS1	N=	Factor n for multiplication with the basic values of the resistance thermometers or thermocouples Example: 3 x Pt500 parallel: BS1: N=1.667
BS2	TA=	Working point T_a for differential temperature measurement using resistance thermometers
	N=	Number n of resistance thermometers in each branch
	TMAX=	Max. temperature T _{max} (total of temperatures in both branches)
BS3	RMAX=	Max. sum of the resistances of both branches R_{\max}
CS0	TV=	Temperature T_v of external cold junction
DS0	RL=	Line resistance $R_{\rm L}$ (resistance thermometer or potentiometer with 2-wire connection: loop resis- tance; with 3-wire and 4-wire connection: expect- able maximum value per line
ES0	MA=	Start of scale Ma for resistance thermometer/ thermocouples
	ME=	Full scale Me for resistance thermometer/thermo- couples
	D=	Unit (°C, K, °F, °R (°R (Rankine) = abs. °Fahrenh.)
ES1	MA=	Start of scale Ma for resistance-based sensor/ potentiometer
	ME=	Full scale Me for resistance-based sensor/ potentiometer
ES2	MA=	Start of scale Ma for mV, V, $\mu A,$ mA and A sensor
	ME=	Full scale Me for mV, V, μ A, mA and A sensor
	D=	Unit (mV→MV, V, μA→UA, mA→MA,A)
FS0	E1= A1= EN= AN=	Pair of values E_n , A_n for user-specific characteristic (Up to 50 pairs can be specified.) E_n : input (mV or Ω) A_n : output (any unit)
	F=	Approximation function F: L = linear; Q = quadratic; C = cubic
	K=	Direction of action of characteristic $S = rising;$ F = falling

Code	Text	Options				
GS0	T99=	Response time T ₉₉ of software filter (0 to 100 s)				
HS0	S=	= Safety output value S following sensor fault (output 4 to 20 mA)				
HS1	S=	Safety output value S following sensor fault (output 0 to 20 mA)				
HS2	S=	Safety output value S following sensor fault (output signal 0 to 10 V)				
	2 b4 b6 UC 24V Plue con Output si C Power su	gnal – +				



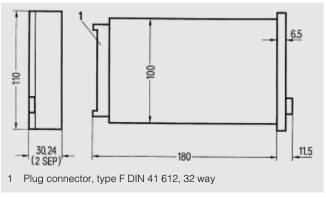


Fig. 2/15 Dimensions of ES 902 printed circuit board

7NG3020 and 7NG3022

Two-wire system / Mounting rail assembly



Fig. 2/16 SITRANS T transmitter for rail mounting

Application

"Intelligent" transmitter with universal input circuit for connecting to the following sensors:

- Resistance thermometers
- Thermocouples
- Resistance-based sensors/potentiometers
- DC voltage sources
- DC current sources

One transmitter is suitable for the connection of all sensors. The input signal is converted into a standard signal 4 to 20 mA.

Features

- Two-wire transmitter
- Housing can be mounted on 35 mm rail or 32 mm G rail
- Plug-in screw terminals for electrical connections
- All circuits electrically isolated
- Explosion proof to EEx ib [ia] IIC P5/P6 (7NG3022)
- Measuring ranges and operating parameters freely selectable
- Temperature-linear characteristic can be selected for all temperature sensors
- User-specific characteristics
- Automatic correction of zero point
- Output signal clearly indicates mode of operation
- normal operation
- overrange
- sensor fault
- Optional sensor fault/limit monitor (pluggable)

Mode of operation (Fig. 2/17)

Transmitter operation can be broken down into the following function blocks and individual functions:

- Input
- Input terminals (2)
- Multiplexer (3)
- Amplifier (4)
- Constant current source (1) for resistance measurements
- Calibration circuit (9) for drift compensation
- Microcontroller (10)
- Analog/digital converter (5)
- Adjustable low-pass filter (6) for smoothing of result
- Linearization function (7) for non-linear characteristics
- Output with pulse width modulation (8) proportional to measured signal

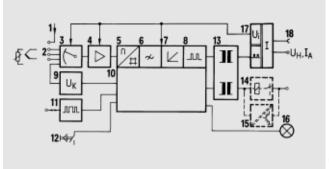


Fig. 2/17 Block diagram (see mode of operation for 1 to 18)

- Output
- Signals electrically isolated (13)
- Output module (17) containing pulse width/analog converter
- Test sockets (18) for monitoring output signal Optional sensor fault/limit monitor with relay (14) or NAMUR output (15)
- Controls and displays
- Serial interface (11) for setting and interrogating parameters
 Calibration push-button (12) for calibration of resistance measurements in two-wire circuits and trimming of start of scale/ full scale values
- Green LED (16) showing operational status (constant) or sensor fault or system malfunction (flashes)

Parameterization

The following parameters can be set and interrogated via the serial interface:

- Type of sensor, e.g. Pt100 resistance thermometer or NiCr/Ni thermocouple, type K
- Measuring range
- Internal or external temperature compensation for thermocouples
- 2, 3 or 4-wire circuit for resistance thermometer and resistance-based sensor
- Reaction to sensor fault (short-circuit or line breakage), e.g. output signal forced to start of scale or full scale value
- Transmitter characteristic, e.g. voltage or temperature-linear
- Rising or falling characteristic
- Response time of transmitter
- Limits with hysteresis

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

The following are required during parameterization:

- Transmitter
- Off-line or on-line parameterization adapter
- Personal computer (PC)
- TransWin 7NG3080-8CA software package
- Printer for printing of rating plate and report

7NG3020 and 7NG3022

Two-wire system / Mounting rail assembly

Technical data		Thermocouple	
Input		 Measured variable 	Temperature
Resistance thermometer		 Measuring range 	Parameterizable
Measured variable	Temperature	 Measuring span 	4 to 140 mV
Measured range	Parameterizable	 Sensor type 	Type B: Pt30%Rh/Pt6%Rh
Measured span	9 to 3150 Ω (9 Ω corresponds to approx. 25 °C for Pt100)		(DIN IEC 584) Type E: NiCr/CuNi (DIN IEC 584) Type J: Fe/CuNi (DIN IEC 584)
Sensor type	Pt100 (DIN IEC 751) Pt100 (JIS C1604/ α =0.00392 Ω/K) Ni100 (DIN 43 760) Cu100		Type S. Pie/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)
	Multiples or parts of specified basic values (e.g. Pt500, Cu25) parameterizable		Type T: Cu/CuNi (DIN IEC 584) Type U: Cu-CuNi (DIN 43 710) Ni-NiMo (GE)
Characteristic	Temperature-linear or resistance- linear		Additional thermocouples can be parameterized by the customer.
 Type of connection 		Characteristic	Temperature-linear or voltage-
- Normal conneciton	One resistance-based sensor in		linear
Two-wire circuit	two, three or four-wire circuit Parameterized line resistance or line calibration using calibration pushbutton	 Type of connection Normal connection 	One thermocouple, internal or external temperature compensa-
Three-wire circuit Four-wire circuit	No line calibration necessary pro- vided that $R_{L2} = R_{L4}$ No calibration necessary	- Averaging connection	tion Several thermocouples connected in series to produce average tem-
- Averaging connection	Several resistance thermometers connected in series or parallel to produce average temp. or to adapt to other basic values z.B. Pt1000 n=10, Cu25 n=0.25	- Differential connection	perature, internal or external tem- perature compensation Two identical thermocouples to produce temperature difference, temperature compensation not
- Differential connection	Two identical resistance-based sensors to produce temperature difference in two-wire circuit; oper- ating temperature can be parame- terized	 Temperature compensation Internal 	necessary; operating temperature parameterizable internal or external Cold junction terminal option 7NG3090-8AV required (clug in earow terminal with into
Measured current	0.05 to 0.34 mA (depends on mea- suring range)	- External	(plug-in screw terminal with inte- grated Pt100) Temperature of external tempera-
 Line resistance R_L 	$\leq 100 \Omega$		ture compensation parameteriz- able
Resistance-based sensor, potenti-		mV sensors	
ometer			DC voltage
Measured variable	Ohmic impedance	Measured variable	DC voltage
 Measuring range 	Parameterizable	 Measuring range 	Parameterizable in following ranges:
 Measuring span 	9 to 3150 Ω		-59 to +81 mV, -20 to +120 mV
Start of scale	0 to 3141 Ω		-39 to +100 mV, 0 to +140 mV
• Full scale	3150 Ω	 Measuring span (maximal) 	4 to 140 mV
Characteristic	Resistance-linear or according to a	 Start of scale 	-59 to +136 mV
	parameterizable linearization func- tion	 Full scale 	140 mV
 Type of connection 		Characteristic	Voltage-linear or according to a
- Normal conneciton	One resistance-based sensor in		parameterizable linearization function
Two-wire circuit	two, three or four-wire circuit Parameterized line resistance or	 Overload capacity of inputs Input resistance 	±3.5 V ≥1 MΩ
Three-wire circuit	line calibration using calibration pushbutton No line calibration necessary pro-	V, μA, mA, A sensors (without sensor breakage monitor-	< 1 IVIS2
	vided that $R_{L2} = R_{L4}$	ing)	
Four-wire circuit - Differential connection	No calibration necessary Two identical resistance-based	 Measured variable 	DC voltage / DC current
- Differential connection	sensors to produce temperature difference in two-wire circuit	Measuring range	Parameterizable, the voltage drop on the input impedance R15 or shunt resistance R11 should corre
Measured current	0.05 to 0.34 mA (depends on mea- suring range)		spond to the measuring ranges of the mV sensor.
• Line resistance R _L	≤ 100 Ω	Characteristic	Voltage or current-linear or accord ing to a parameterizable lineariza- tion function
		 Voltage measurement > 140 mV 	Internal voltage divider with series resistance R12 and input imped- ance R15

Two-wire system / Mounting rail assembly

Technical data (continued)

Innut (continued)

Input (continued)							
Order No. Measuring span 7NG302	Start of s	cale	Full scale	R12 MΩ	R15 kΩ	R11 Ω	
- 1 0 004 toto 1.54 V	-0.5 to +1	1.5 V	1.54 V	0.1	10	-	
- 20 0.4 to 14.14 V	-5 to +13	.74 V	14.14 V	1	10	-	
- 3 0 4 to 140.14 V	-50 to +1	36.14 V	140.14 V	1	1	-	
- 4 4 to 140 μA	-50 to +1	36 µA	140 µA	-	-	1000	
- 5 0 0.04 to 1.4 mA	-0.5 to +1	1.36 mA	1.40 mA	-	-	100	
- 60 0.40 to 14 mA	-5.0 to +1	13.6 mA	14.0 mA	-	-	10	
- 270 4 to 140 mA	-50 to +1	36 mA	140 mA	-	-	1	
- 80 0.04 to 1.00 A	-0.5 to +0).96 A	1.00 A	-	-	0.1	
Common data						<u> </u>	
Characteristic Sensor fault monitoring		The parameterizable characteris- tic is generated by joining together up to 14 first, second or third degree polynominals. The starting point is defined for every polyno- mial. Monitoring all terminations for breakages and short-circuits					
• Deeperer (drep three held		`	n can be o				
Response/drop threshold Output following concern for	ault.		≥1.5 kΩ lo colo, to otr	•			
Output following sensor fa	aun	most reo parame monitori	0	e, safety	value		
Temperature unit		°C, K, °F (°R (Rar	⁼ , °R para nkine) = a	meter bsolut	izable :e °F)		
Output							
<u>Output signal</u>		Standar	d DC curi	rent			
Nominal range 4 to 20 mA Resolution Overrange Output range following s fault	 ○ to 100% 5888 steps (0 to 100%) 3.8 to +20.8 mA (=-1.25 to +105.0%) 3.6 to +21.2 mA (=-2.5 to +107.5%), parameterizable 						
• Internal residual ripple I _{PP}	0	≤ 1%, n band	neasured	acros	sa1	MHz	
 Ripple cause by pulsating voltage 	g supply	\leq 70 μ A/V (47 to 125 Hz)					
 Response time Sample cycle 		100 ms					
 Electrical damping Adjustable time constant 	nt 7 ₉₉	0 to 100 s parameterizable (soft- ware filter with 1 st order delay)					
Sensor fault/limit signalling		Relay output or NAMUR output					
 Relay output Switching capacity Switching voltage Switching current NAMUR output to DIN 19 for connection to switchin 	Break circuit with 1 CO contact (not to be used with 7NG3022) \leq 90 W, \leq 150 VA \leq UC 75 V \leq UC 2 A Active during normal operation						
amplifier with - Open-circuit voltage - Short-circuit voltage - Operating points Disabl Active	≤ 12 V ≤ 16 mA ≤ 1.2 mA ≤ 2.1 mA						
Sensor fault monitoring		Signallir breakag	ng of sens ge and sei	or or	line hort-c	ircuit	
Limit monitoring	Freely parameterizable are: - lower and upper limit - window (combination of lower and upper limits)						
		Limit and sensor fault monitoring can be combined					
 Hysteresis 	Freely parameterizable						

Accuracy		
Measurement error	Sum of input error put error threshol temperature com (if known)	ds and internal
Input error thresholds		
Sensor	Range	Input error tolerance ¹) with Iwithout ²) compensation
Resistance thermometer	000 1 450 00	0.00 // 0.45 //
- Pt100 - Pt500	-200 to 150 °C -200 to 620 °C -200 to 850 °C -200 to 110 °C	±0.08 K ±0.15 K ±0.18 K ±0.35 K ±0.33 K ±0.70 K ±0.07 K ±0.16 K
- Pt1000	-200 to 400 °C -200 to 850 °C -200 to 200 °C	±0.43 K ±0.88 K ±0.75 K ±1.54 K ±0.25 K ±0.56 K
- Ni100	-200 to 600 °C -60 to 90 °C -60 to 250 °C	±0.75 K ±1.10 K ±0.04 K ±0.10 K ±0.07 K ±0.14 K
- Cu100	-50 to 140 °C -50 to 180 °C	±0.06 K ±0.10 K ±0.20 K
Resistance-based sensor	$\begin{array}{cccc} 0 \ to & 160 \ \Omega \\ 0 \ to & 320 \ \Omega \\ 0 \ to & 710 \ \Omega \\ 0 \ to & 3160 \ \Omega \end{array}$	$\begin{array}{c} \pm 0.03 \ \Omega \\ \pm 0.06 \ \Omega \\ \pm 0.12 \ \Omega \\ \pm 0.13 \ \Omega \\ \pm 2.17 \ \Omega \\ \pm 3.58 \ \Omega \end{array}$
Thermocouples		
- Type B: Pt30%Rh/Pt6%Rh	400 to 1000 °C 1000 to 1820 °C	±2.50 K ±1.00 K ±1.32 K
- Type E: NiCr/CuNi	-200 to 0 °C 0 to 500 °C 500 to 1000 °C	±0.40 K ±0.48 K ±0.18 K ±0.20 K ±0.15 K ±0.16 K
- Type J: Fe/CuNi	-210 to 0 °C 0 to 1200 °C	±0.50 K ±0.63 K ±0.20 K ±0.24 K
- Type K: NiCr/Ni	-180 to 0 °C 0 to 1370 °C	±0.50 K ±0.64 K
- Type L: Fe-CuNi	-200 to 0 °C 0 to 900 °C	±0.30 K ±0.35 K ±0.40 K ±0.42 K ±0.20 K ±0.25 K
- Type N: NiCrSi-NiSi	-180 to 0 °C 0 to 500 °C 500 to 1300 °C	±0.90 K ±0.40 K ±0.30 K ±0.33 K
- Type R: Pt13%Rh/Pt	-50 to 0 °C 0 to 500 °C 500 to 1000 °C 1000 to 1760 °C	±2.50 K ±3.24 K ±1.80 K ±2.27 K ±1.00 K ±1.11 K ±0.80 K ±0.91 K
- Type S: Pt10%Rh/Pt	-50 to 0 °C 0 to 500 °C 500 to 1760 °C	±2.50 K ±3.03 K ±1.80 K ±2.22 K ±1.10 K ±1.21 K
- Type T: Cu/CuNi	-200 to 0 °C 0 to 400 °C	±0.60 K ±0.76 K ±0.25 K ±0.31 K
- Type U: Cu-CuNi	-200 to 0 °C	±0.50 K ±0.63 K
Ni-NiMo	0 to 600 °C 0 to 700 °C 700 to 1310 °C	±0.25 K ±0.30 K ±0.23 K ±0.32 K ±0.19 K ±0.23 K
Voltage source	-60 to +140 mV	±10 μV ±12 μV
Error threshold of output signal	±0.05 % of meas	uring span
Internal temperature comp. error	≤0.5 K	

¹) Includes temperature sensor linearization error.
 ²) Following change in measuring range or type of sensor.

7NG3020 and 7NG3022

Two-wire system / Mounting rail assembly

Technical data (continued)

Technical data (continued)	
Accuracy (continued)	
Influencing effects	Referred to nominal current I _{AN} =20 mA
 of ambient temperature during resistance measurement on start of scale during voltage measurement on start of scale on full scale 	$\leq (0.05 + 0.015 \cdot (R_{Anf}/\Delta R))\%/10 \text{ K}$ $\leq (0.05 + 0.05 \cdot (U_{Anf}/\Delta U))\%/10 \text{ K}$ $\leq 0.2\%/10 \text{ K}$
Additional influence - with internal temperature com- pensation - with internal voltage divider	≤ 0.1 K/10 K (temperature mea- surement using thermocouples) ≤ 0.05 %/10 K (voltage measure-
- with internal shunt	ment > 140 mV) $\leq 0.02 $ %/10 K (current measure- ment)
 of power supply 	\leq 0.1% for voltage fluctuations between 12 and 40 V
 of line resistance 	\leq 0.02%/10 Ω
long term effect on span and start of scale	≤ 0.03%/month
Rated operating conditions	
Installation conditions	
 Site of installation (explosion-proof instruments) Transmitter Sensor 	Within potentially explosive area, zone 1 Within potentially explosive area,
	zone 0 or zone 1
 Ambient conditions Permitted ambient temperature Operating temperature Installed in zone 1, T6 Installed in zone 1, T5 Installed outside potentially explosive area Functional temperature for instal- lation outside potentially explo- sive area 	-25 to +70 °C
 Storage temperature Climatic category 	-40 to +85 °C HSF, DIN 40 040
- Relativ humidity	5 to 95%, no condensation
 Electromagnetic compatibility Interference immunity Emitted interference 	According to EN 50 082-1 According to EN 50 081-2
Degree of protection to EN 60 529	IP 20
Design	
Weight	Approx. 0.3 kg
Enclosure material	PBT, glass-fibre reinforced
Electrical connection / process con- nection	Plug-in screw terminal, max. 2.5 mm ²
Displays and controls	
Calibration pushbutton function Parameterization	Line compensation for resistance measurement in two-wire circuit, calibration of start of scale and full scale. Function can be disabled during parameterization. using TransWin program (page 2/36) and serial interface
 Serial interface Function Interface Test sockets (front) 	Parameterizing and interrogating of operating data Via online or offline V.24/V.28 (RS 232) parameterizing adapter
Test sockets (front)	Monitoring output signal with a measuring instrument; permitted internal resistance of meas. instrument for current output $\leq 15 \Omega$

Power supply

 Not Ex-proof version 	12 to 45 V DC
 Ex-proof version 	12 to 30 V DC (intrinsically safe)
 Permissible residual ripple of pow- er supply 	Peaks must lie within the above limits (47 to 125 Hz)
Electrical isolation	Input, output and sensor fault/limit monitor are electrically isolated
 Test voltages All inputs and outputs against one-another Permitted impulse voltages All inputs and outputs against one-another, series mode voltage to all inputs and outputs 	$U_{ m eff}$ = 500 V, 50 Hz, 1 min \hat{u} = ±500 V, 1 µs/50 µs, $R_{ m i}$ = 500 Ω
Certificates and approvals	
Explosion protection for the input measuring circuit	
 "Intrinsically safe" type of protec- tion 	EEx ib [ia] IIC T5/T6
- Conformity certificate	PBT No. Ex-91.C.2078 X ASEV 92.1 C10162 X
External standards and guide- lines	
Protective measures	DIN 57 411 / VDE 0411 part 1
Vibration resistance	DIN 57 411 / VDE 0411 part 1 (rail-mounted)

7NG3020 and 7NG3022 Two-wire system / Mounting rail assembly

Ordering information

The order number structure shown below is used to specify a fully functioning transmitter.

The stock items can be easily adapted to the measuring task by the user himself. Usually the adaptation is carried out using the TransWin software for parameterization and possibly by installation of accessory devices. Thus the stock items of the SITRANS T transmitter have the shortest delivery time and are the lowprice versions of the SITRANS T transmitter.

The parameterization of operating data (sensor type, measuring range, characteristic etc.) takes place as follows:

Parameters preset in factory.

A list of the parameters as set in the factory is shown on pages 2/32 and 2/33. The presets can be modified by the customer to match the requirements precisely.

Parameterization defined in the order. Add "–Z" and the order code "Y01" to the order number.

The parameterization required can be selected from the list shown on pages 2/32 and 2/33. Only specify codes A \blacksquare to $J \blacksquare$ for parameters that deviate from the factory settings. The factory setting will be used for any parameters that are not specified.

The selected parameters are printed on the transmitter's rating plate.

Ordering examples

-	
Ordering data	Standard parameter
7NG3022-3JN00 (stock item)	
	X X X
	X X
7NG3022-3JN00-Z Y01 + S78	
AA2	
EB8	x x
7NG3090-8AV	
7NG3020-3JN20-Z Y01	
AEO	х
FA1 GS0	
HA3 GS0: T99 = 15 s	
	7NG3022-3JN00 (stock item) 7NG3022-3JN00-Z Y01 + S78 AA2 EB8 7NG3090-8AV 7NG3090-8AV 7NG3020-3JN20-Z Y01 AE0 FA1 GS0 HA3

Drdering data	Order No.
SITRANS T universal transmitter	7NG302 - 3J 0
for rail mounting in two-wire circuit for temperature, resistance, DC voltage and DC current	
Explosion protection	
 Not Ex-proof Ex-proof, for inputs EEx ib [ia] IIC T5/T6 	02
Sensor fault/limit monitor	
 Not present (can be retrofitted) Relay with CO contact (only 7NG3020) NAMUR output 	N B C
Input for temperature sensor, resis- tance-based sensor and mV sensor	0 0
Input with additional circuitry ¹)	
• for DC voltage, measuring span 0.04 to 1.5 V 0.4 to 14 V 4 to 140 V	1 2 3
 for DC current, measuring span 4 to 140 μA 0.04 to 1.4 mA 0.4 to 14 mA 4 to 140 mA 0.04 to 1 A 	 4 5 6 7 8
Suffixes	Order code
Add "-Z" and the order code to the order number and specify any plain text (see pages 2/32 and 2/33).	
Parameterization specified in order	Y01
Language of rating plate (together with Y01 order code only)	
• Italian • English • French • Spanish	S72 S76 S77 S78
Accessories (if required)	Order No.
Sensor fault/limit monitor	
	ZNO2000 0AD
With relay output (only 7NG3020) With electronic output (NAMUR)	7NG3090-8AB 7NG3090-8AC
 With relay output (only 7NG3020) With electronic output (NAMUR) Cold junction terminal 	7NG3090-8AC 7NG3090-8AV
 With relay output (only 7NG3020) With electronic output (NAMUR) Cold junction terminal Off-line parameterization adapter 	7NG3090-8AC 7NG3090-8AV 7NG3090-8AK
With relay output (only 7NG3020) With electronic output (NAMUR) Cold junction terminal Off-line parameterization adapter On-line parameterization adapter for parameterization during operation	7NG3090-8AC 7NG3090-8AV 7NG3090-8AK 7NG3090-8EK
With relay output (only 7NG3020) With electronic output (NAMUR) Cold junction terminal Off-line parameterization adapter On-line parameterization adapter for parameterization during operation TransWin program (see page 2/36)	7NG3090-8AC 7NG3090-8AV 7NG3090-8AK 7NG3090-8EK 7NG3080-8CA
With relay output (only 7NG3020) With electronic output (NAMUR) Cold junction terminal Off-line parameterization adapter On-line parameterization adapter for parameterization during operation	7NG3090-8AC 7NG3090-8AV 7NG3090-8AK 7NG3090-8EK
• With relay output (only 7NG3020) • With electronic output (NAMUR) Cold junction terminal Off-line parameterization adapter On-line parameterization adapter for parameterization during operation TransWin program (see page 2/36) Conversion kit for SITRANS T One resistor each of 0.1 Ω , 1.0 Ω , 10.0 Ω , 100 Ω , 1 k Ω 10 k Ω , 100 k Ω , 1 M Ω and	7NG3090-8AC 7NG3090-8AV 7NG3090-8AK 7NG3090-8EK 7NG3080-8CA

 Without sensor breakage monitoring. In Ex-proof instruments, observe maximum permitted currents and voltages as specified in

conformance certificate.

7NG3020 and 7NG3022

Two-wire system / Mounting rail assembly

Parameter list (coded text A = to J =)

Parameters set in factory

Order No. with order code: 7NG302 - 3J - 0-Z Y01

Note Sensor fault/limit monitor: Specify desired parameterization acc. to Technical Data in plain text if required.

Code: A + B to J		+		+	+ I	+	
Sensor	-	1	1	↑	↑	T	
Thermocouples Type		Connection			_	Measur. ranges	
L: Fe-CuNi (DIN) -200 to + 900 °C, $\Delta t \ge 75$ °C	AA0	Normal n ³) = 1	BA1	Cold junction compensat	ion	-30 to +60 °C -20 to +20 °C	
J: Fe/CuNi (IEC) -210 to +1200 °C, $\Delta t \ge 75$ °C	AA1	Averag. 4) n = 2	BA2	internal ⁶) CA3		0 to 40 °C 0 to 60 °C	EA3
K: NiCr/Ni -270 to +1372 °C, $Δt$ ≥ 100 °C	AA2	n = 3	BA3	external		0 to 80 °C 0 to 100 °C	EA5
S: Pt10%Rh/Pt -50 to +1769 °C, $\Delta U \ge 4 \text{ mV}$	AA3	n = 4	BA4	0 °C CBO		0 to 120 °C 0 to 150 °C 0 to 200 °C	EA7
B: Pt30%Rh/Pt6%Rh 0 to 1820 °C, $\Delta U \ge 4 \text{ mV}$	AA4	n = 5	BA5	20 °C CB2	1	0 to 250 °C 0 to 300 °C	EA9
R: Pt13%Rh/Pt -50 to +1769 °C, $\Delta U \ge 4 \text{ mV}$	AA5	n = 6	BA6	50 °C CB5		0 to 350 °C 0 to 400 °C	EB1
E: NiCr/CuNi -270 to +1000 °C, $\Delta t \ge 65$ °C	AA6	n = 7	BA7	60 °C CB6	ì	0 to 450 °C 0 to 500 °C	EB4
N: NiCrSi/NiSi -270 to +1300 °C, $\Delta U \ge 4 \text{ mV}$	AA7	n = 8	BA8	70 °C CB7		0 to 600 °C 0 to 700 °C	EB6
T: Cu/CuNi (IEC) -270 to + 400 °C, $\Delta U \ge 4 \text{ mV}$	AA8	n = 9	BA9	Others ¹²) CS0	1	0 to 800 °C 0 to 900 °C	EB8
U: Cu/CuNi (DIN) -200 to + 600 °C, $\Delta U \ge 4 \text{ mV}$	AA9	n = 10	BB0			0 to 1000 °C 0 to 1200 °C 0 to 1400 °C	EC0
Ni-Ni18%Mo (GE) 0 to +1310 °C, $\Delta t \ge 100$ °C	AB0	Differential ¹²)	BS0			0 to 1600 °C 0 to 1800 °C	EC2
Resistance thermometer ¹)		Connection				50 to 100 °C 50 to 150 °C	EC4
$(R_{\max} + R_{L} < 1140 (3150) \Omega^{2}))$		Normal n ³) = 1	BA1	Connection	Line resistance ⁷)	100 to 200 °C 100 to 300 °C	EC6 EC7
Pt100 (DIN IEC) -200 to +850 °C, $\Delta t \ge 25$ °C	AC0	Averag. ⁵) n		Two-wire CA2	0 Ω DA0	200 10 300 0	EC9
Pt100 (JIS) -200 to +630 °C, $Δt ≥ 25 °C$	AC1	n = 2 to	BA2	Three-wire CA3	10 Ω DA1	20010 300 0	ED1
Ni100 (DIN) -60 to +180 °C, $\Delta t \ge 20 °C$	AC2	n = 10	BB0	Four-wire CA4	20 Ω DA2	300 to 600 °C 500 to 1000 °C 600 to 1200 °C	ED3
Cu100 -200 to +200 °C, $\Delta t \ge 25$ °C	AC3	Others ¹²)	BS1		100 Ω DB1		
		Differential ¹²)	BS2		Others ¹²) DS0	Other ranges ¹²)	ES0
Resistance-based sensor, potentiometer $(P_{1}, P_{2}, P_{3}, P_{4}, P_$	AD0	Connection				Measuring ranges	<i>i</i>
$(R_{\text{max}} + R_{\text{L}} < 1140 \ (3150) \ \Omega^2)$		Normal n ³) = 1	BA1	Connection	Line resistance ⁷)	0 to 100 Ω	EE1
		Differential ¹²)	BS3	Two-wire CA2	0 Ω DA0	0 to 200Ω	EE2
				Three-wire CA3	10 Ω DA1	0 to 500Ω	EE5
				Four-wire CA4	20 Ω DA2	0 to 1000 Ω	EF1
					100 Ω DB1		
					Others ¹²) DS0	Other ranges ¹²)	ES1
mV sensor (V, μ A, mA, A sensor ¹⁰))	AE0	Measuring range for Orde	er No.	7NG 302 - 3J 0			
		0 1 ¹¹)	2 ¹¹)	3 ¹¹) 4 ¹¹)	5^{11} 6^{11} 7^{11}	8 ¹¹)	
		mV V′	V	V´ mÁ	mÁ mÁ mÁ	A	
		-20 to +20 -0.2 to +0.2	-2 to	+5 -50 to +50 -50 to +50 -0. +2 -20 to +20 -20 to +20 -0.	.2 to +0.2 -2 to +2 -20 to -	+20 -0.2 to +0.2	EG0 EG1
		0 to 10 0 to 0.1	0 to		0 to 0.1 0 to 1 2 to		EG2 EG3
		0 to 20 0 to 0.2 0 to 50 0 to 0.5 0 to 100 0 to 1.0	0 to	5 0 to 50 0 to 50	0 to 0.2 0 to 2 0 to 0 to 0.5 0 to 5 0 to 0 to 1.0 0 to 10 0 to	50 0 to 0.5	EG4 EG5 EG6
			1 to		1 to 5 4 to		EG7
		Other ranges ¹²)					ES2

For other basis values see Connection Averaging (e.g. Pt500: n = 5 ≙ BA5).
 With 4-wire connection no sensor fault monitoring.
 n = number of sensors to be connected.

⁷) For 2-wire connection the indicated loop resistance must be obeyed or determined by calibration; for 3 and 4-wire connection the expectable maximum value per wire has to be stated.
 ¹⁰) Observe maximum permitted currents and voltages in explosion proof

(e.g. Pt500: n = 0 - 2...,
With 4-wire connection no sensor fault monitoring.
n = number of sensors to be connected.
The sum of the thermovoltages must not exceed 140 mV.
The sum of the resistances must not exceed 3150 Ω.
The cold junction terminal 7NG3090-8AV must be ordered separately.
See page 2/34 for operational data and special parameters.

7NG3020 and 7NG3022

Two-wire system / Mounting rail assembly

Parameter list (code A = to J =) (continued)

Parameters set in factory

Order No. with order code: 7NG302 - 3J - 0-Z Y01

Note Sensor fault/limit monitor: Specify desired parameterization acc. to Technical Data in plain text if required.

L: Fe-CuNi (DIN) $-200 \text{ to} + 900 ^{\circ}\text{C}$, $\Delta t \ge 75 ^{\circ}\text{C}$ AA0 J: Fe/CuNi (IEC) $-210 \text{ to} + 1200 ^{\circ}\text{C}$, $\Delta t \ge 75 ^{\circ}\text{C}$ AA1 K: NiCr/Ni $-270 \text{ to} + 1372 ^{\circ}\text{C}$, $\Delta t \ge 100 ^{\circ}\text{C}$ AA2 S: Pt10%Rh/Pt $-50 \text{ to} + 1769 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA3 B: Pt30%Rh/Pt6%Rh 0 to 1820 ^{\circ}\text{C}, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-270 \text{ to} + 1372 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} + 1369 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$, $\Delta U \ge 4 \text{ mV}$ AA4 $-50 \text{ to} - 1820 ^{\circ}\text{C}$	AC IAO IA1 IA2 IA2 IA2 IA2 IA3 IA3 IA3 IA3 IA3 IA3 IA3 IA3		в) В)		<u> </u>		^		Sensor
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	AC IAO IA1 IA2 IA2 IA2 IA2 IA3 IA3 IA3 IA3 IA3 IA3 IA3 IA3		⁸)						
$\begin{array}{c} \text{In Signature integral}{ling} \\ \hline \text{High preduction integral}{$	AAO AA1 AA2 - disabled JF0		′	Filter per.		Character.			
$\frac{1}{2} = Fe/CuNi (EC) - 210 to + 1200 °C, \Delta t \ge 75 °C ~ AA $	IAO IA1 Calibr. pushb IA2 - disabled JFO				FA0		AA0	200 to + 900 °C, $\Delta t \ge 75$ °C	L: Fe-CuNi (DIN)
$\begin{array}{c} \text{K: NiCr/Ni} & -270 \text{ to } +1372 \text{ °C, } \text{ At } \geq 100 \text{ °C } \text{ AA2} \\ tailing membrain product of membrain of the product of membrain of the product of membrain of the product of the pro$	IA2 - disabled JF0	- to full scale HAO	GA2	0.2 s	FA 4	0	AA1	210 to +1200 °C, $\Delta t \ge 75$ °C	J: Fe/CuNi (IEC)
$\begin{array}{c} \text{Cultoration t} & \text{Color + 1705 C, } \Delta \text{Cl} & \text{Cultor + 1705 C, } \Delta \text{Cl} & \text{Cl} & \text{Cultor + 1705 C, } \Delta \text{Cl} & \text{Cl} & \text{Cultor + 1705 C, } \Delta \text{Cl} & C$	IAS - ellabled JFI	 retain most recent val. HA2 	GA5	1 s 2 s	FA1		AA2	270 to +1372 °C, $\Delta t \ge 100$ °C	K: NiCr/Ni
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	ISO 60 Hz	- safety value ¹²) HS0	GA7	10 s	FA2		AA3	-50 to +1769 °C, $\Delta U \ge -4 \text{ mV}$	S: Pt10%Rh/Pt
R: Pt13%Rh/Pt-50 to +1769 °C, ΔU ≥ 4 mVAAS AAS portional, fallingSonder- zeit 15Sonder- zeit 15E: NiCr/CuNi-270 to +1000 °C, Δt ≥ 65 °CAA6 AA7 T. Cu/CuNi (IEC)-270 to +1300 °C, ΔU ≥ 4 mVAA7 AA9 PW: NiCrSi/NISi-270 to + 400 °C, ΔU ≥ 4 mVAA7 AA9 PNi-Ni18%Mo(GE)0 to +1310 °C, Δt ≥ 100 °CAB0 Resistance thermometer 1) ($R_{max} + R_{L} < 1140 (3150) \Omega^{2}$))Pt100 (DIN IEC)-200 to +630 °C, Δt ≥ 25 °CAC0 PPt100 (DIN)-60 to +180 °C, Δt ≥ 25 °CAC1 PNi100 (DIN)-60 to +180 °C, Δt ≥ 25 °CAC2 PResistance-based sensor, potentiometer ($R_{max} + R_{L} < 1140 (3150) \Omega^{2}$))AD0 Sensor pro- portional, fallingFeinstance-based sensor, potentiometer ($R_{max} + R_{L} < 1140 (3150) \Omega^{2}$))AD0 Sensor pro- portional, fislingFeinstance-based sensor, potentiometer ($R_{max} + R_{L} < 1140 (3150) \Omega^{2}$))AD0 Sensor pro- portional, fislingFall programmedFS0	Calibr. pushb. - disabled JG0		GA9	50 s	EA 2		AA4	0 to 1820 °C, $\Delta U \ge 4 \text{ mV}$	B: Pt30%Rh/Pt6%Rh
E: NiCr/CuNi -270 to $+1000$ °C, $\Delta t \ge 65$ °C AA6 N: NiCrSi/NISi -270 to $+1300$ °C, $\Delta U \ge 4$ mV AA7 T: Cu/CuNi (IEC) -270 to $+400$ °C, $\Delta U \ge 4$ mV AA9 U: Cu/CuNi (DIN) -200 to $+600$ °C, $\Delta U \ge 4$ mV AA9 Ni-Ni18%Mo(GE) 0 to $+1310$ °C, $\Delta t \ge 100$ °C AB0 Resistance thermometer ¹) ($R_{max} + R_{L} < 1140$ (3150) Ω^{2})) Pt100 (DIN IEC) -200 to $+850$ °C, $\Delta t \ge 25$ °C AC1 Ni100 (DIN) -60 to $+180$ °C, $\Delta t \ge 25$ °C AC2 Cu100 -200 to $+200$ °C, $\Delta t \ge 25$ °C AC2 Resistance-based sensor, potentiometer ($R_{max} + R_{L} < 1140$ (3150) Ω^{2})) Pt101 (JIS) Ω^{2})) Resistance-based sensor, potentiometer ($R_{max} + R_{L} < 1140$ (3150) Ω^{2})) Resistance-based sensor, potentiometer ($R_{max} + R_{L} < 1140$ (3150) Ω^{2})) Resistance-based sensor, potentiometer ($R_{max} + R_{L} < 1140$ (3150) Ω^{2})) Resistance-based sensor, potentiometer ($R_{max} + R_{L} < 1140$ (3150) Ω^{2})) ($R_{max} + R_{L} < 1140$ (3150) Ω^{2}))	- enabled JG1			Sonder-	FAJ		AA5	-50 to +1769 °C, $\Delta U \ge -4 \text{ mV}$	R: Pt13%Rh/Pt
$\frac{\text{T: } Cu/CuNi (\text{IEC}) -270 \text{ to } + 400 ^{\circ}\text{C}, \Delta U \ge 4 \text{ mV } \text{AA8}}{\text{U: } Cu/CuNi (DIN) -200 \text{ to } + 600 ^{\circ}\text{C}, \Delta U \ge 4 \text{ mV } \text{AA9}}$ $\frac{\text{N:-Ni18\%Mo(GE)} 0 \text{ to } +1310 ^{\circ}\text{C}, \Delta t \ge 100 ^{\circ}\text{C} \text{AB0}}{\text{Resistance thermometer }^{1}}$ $\frac{(R_{max} + R_{L} < 1140 (3150) \Omega^{2}))}{(3150) \Omega^{2}(100 + 630 ^{\circ}\text{C}, \Delta t \ge 25 ^{\circ}\text{C} \text{AC0})}$ $\frac{\text{Pt100 (DIN IEC)} -200 \text{ to } +850 ^{\circ}\text{C}, \Delta t \ge 25 ^{\circ}\text{C} \text{AC1}}{\text{Ni100 (DIN)} -60 \text{ to } +180 ^{\circ}\text{C}, \Delta t \ge 25 ^{\circ}\text{C} \text{AC2}}$ $\frac{\text{Resistance-based sensor, potentiometer}}{(R_{max} + R_{L} < 1140 (3150) \Omega^{2}))}$ $\frac{\text{AD0}}{\text{Resistance-based sensor, potentiometer}}$ $\frac{\text{AD0}}{\text{Resistance-based sensor, potentiometer}}$ $\frac{\text{AD0}}{\text{rotional, falling}}$				2011)			AA6	270 to +1000 °C, $\Delta t \geq 65$ °C	E: NiCr/CuNi
$\frac{\text{U: } \text{Cu/CuNi (DIN)} -200 \text{ to } + 600 ^{\circ}\text{C}, \ \Delta \text{U} \ge 4 \text{ mV} \textbf{AA9}}{\text{Ni-Ni18\%Mo(GE)} 0 \text{ to } + 1310 ^{\circ}\text{C}, \ \Delta t \ge 100 ^{\circ}\text{C} \textbf{AB0}}$ Resistance thermometer ¹) $(R_{\text{max}} + R_{\text{L}} < 1140 (3150) \Omega^{2}))$ Pt100 (DIN IEC) -200 to +850 ^{\circ}\text{C}, \ \Delta t \ge 25 ^{\circ}\text{C} \textbf{AC0} Pt100 (JIS) -200 to +630 ^{\circ}\text{C}, \ \Delta t \ge 25 ^{\circ}\text{C} \textbf{AC1} Ni100 (DIN) -60 to +180 ^{\circ}\text{C}, \ \Delta t \ge 25 ^{\circ}\text{C} \textbf{AC2} Cu100 -200 to +200 ^{\circ}\text{C}, \ \Delta t \ge 25 ^{\circ}\text{C} \textbf{AC2} Resistance-based sensor, potentiometer $(R_{\text{max}} + R_{\text{L}} < 1140 (3150) \Omega^{2}))$ AD0 Characteristic sensor pro- portional, rising sensor pro- portional, falling programmed FS0							AA7	270 to +1300 °C, $\Delta U \ge 4 \text{ mV}$	N: NiCrSi/NiSi
$\frac{\text{Ni-Ni18\%Mo(GE)} 0 \text{ to } + 1310 ^{\circ}\text{C}, \Delta t \geq 100 ^{\circ}\text{C} \textbf{AB0}}{\text{Resistance thermometer} ^{1})}$ $\frac{(R_{\text{max}} + R_{\text{L}} < 1140 (3150) \Omega^{2}))}{\text{Pt100} (\text{DIN} \text{IEC}) - 200 \text{ to } + 850 ^{\circ}\text{C}, \Delta t \geq 25 ^{\circ}\text{C} \textbf{AC0}}{\text{Pt100} (\text{DIN} \text{IEC}) - 200 \text{ to } + 630 ^{\circ}\text{C}, \Delta t \geq 25 ^{\circ}\text{C} \textbf{AC1}}$ $\frac{\text{Ni-Ni18\%Mo(GE)} 0 \text{ to } + 180 ^{\circ}\text{C}, \Delta t \geq 25 ^{\circ}\text{C} \textbf{AC1}}{\text{Ni100} (\text{DIN}) - 60 \text{ to } + 180 ^{\circ}\text{C}, \Delta t \geq 20 ^{\circ}\text{C} \textbf{AC2}}$ $\frac{\text{Cu100} - 200 \text{ to } + 200 ^{\circ}\text{C}, \Delta t \geq 25 ^{\circ}\text{C} \textbf{AC3}}{\text{Sensor pro-portional, rising}}}$ $\frac{\text{AD0}}{\text{portional, rising}} \frac{\text{FA0}}{\text{portional, falling}}$							AA8	270 to + 400 °C, $\Delta U \ge 4 \text{ mV}$	T: Cu/CuNi (IEC)
Resistance thermometer ¹) $(R_{max} + R_{L} < 1140 (3150) \Omega^{2}))$ Pt100 (DIN IEC) -200 to +850 °C, $\Delta t \ge 25 °C$ AC0 Pt100 (JIS) -200 to +630 °C, $\Delta t \ge 25 °C$ AC1 Ni100 (DIN) -60 to +180 °C, $\Delta t \ge 20 °C$ AC2 Cu100 -200 to +200 °C, $\Delta t \ge 25 °C$ AC3 Resistance-based sensor, potentiometer $(R_{max} + R_{L} < 1140 (3150) \Omega^{2}))$ AD0 Characteristic sensor pro- portional, rising FA0 sensor pro- portional, falling FA1 programmed FS0							AA9	200 to + 600 °C, $\Delta U \ge 4 \text{ mV}$	U: Cu/CuNi (DIN)
$(R_{max} + R_{L} < 1140 (3150) \Omega^{2}))$ Pt100 (DIN IEC) -200 to +850 °C, $\Delta t \ge 25 °C$ AC0 Pt100 (JIS) -200 to +630 °C, $\Delta t \ge 25 °C$ AC1 Ni100 (DIN) -60 to +180 °C, $\Delta t \ge 20 °C$ AC2 Cu100 -200 to +200 °C, $\Delta t \ge 25 °C$ AC3 Resistance-based sensor, potentiometer ($R_{max} + R_{L} < 1140 (3150) \Omega^{2}$)) AD0 Characteristic sensor pro- portional, rising FA0 sensor pro- portional, falling programmed FS0							AB0	0 to +1310 °C, $\Delta t \ge 100$ °C	Ni-Ni18%Mo(GE)
$\frac{Pt100 (JIS) -200 \text{ to } +630 ^{\circ}\text{C}, \ \Delta t \ge 25 ^{\circ}\text{C} \text{ AC1}}{Ni100 (DIN) -60 \text{ to } +180 ^{\circ}\text{C}, \ \Delta t \ge 20 ^{\circ}\text{C} \text{ AC2}}$ $\frac{Pt100 (JIS) -60 \text{ to } +180 ^{\circ}\text{C}, \ \Delta t \ge 20 ^{\circ}\text{C} \text{ AC2}}{20 ^{\circ}\text{C} \text{ AC2}}$ Resistance-based sensor, potentiometer ($R_{\text{max}} + R_{\text{L}} < 1140 (3150) \Omega^2$)) $\frac{Pt100 (JIS) -200 \text{ to } +200 ^{\circ}\text{C}, \ \Delta t \ge 25 ^{\circ}\text{C} \text{ AC2}}{50 ^{\circ} \text{ AC2}}$ Resistance-based sensor, potentiometer ($R_{\text{max}} + R_{\text{L}} < 1140 (3150) \Omega^2$)) $\frac{Pt100 (JIS) -200 \text{ to } +200 ^{\circ}\text{C}, \ \Delta t \ge 25 ^{\circ}\text{C} \text{ AC2}}{50 ^{\circ} \text{ AC2}}$ $\frac{Pt100 (JIS) -200 \text{ to } +200 ^{\circ}\text{C}, \ \Delta t \ge 25 ^{\circ}\text{C} \text{ AC2}}{50 ^{\circ} \text{ AC2}}$ $\frac{Pt100 (JIS) -200 \text{ to } +200 ^{\circ}\text{C}, \ \Delta t \ge 25 ^{\circ}\text{C} \text{ AC2}}{50 ^{\circ} \text{ AC2}}$								¹)) Ω ²))	Resistance thermomete ($R_{max} + R_{L} < 1140$ (31)
$\frac{\text{Ni100}(\text{DIN}) -60 \text{ to } +180 \text{ °C, } \Delta t \geq 20 \text{ °C } \text{AC2}}{20 \text{ Cu100} -200 \text{ to } +200 \text{ °C, } \Delta t \geq 25 \text{ °C } \text{AC3}}$ Resistance-based sensor, potentiometer $(R_{\text{max}} + R_{\text{L}} < 1140 (3150) \Omega^{2}))$ AD0 Characteristic sensor pro- portional, rising FA0 programmed FS0							AC0	200 to +850 °C, $\Delta t \ge 25$ °C	Pt100 (DIN IEC)
$\frac{Cu_{100} -200 \text{ to } +200 \text{ °C, } \Delta t \ge 25 \text{ °C } \textbf{AC3}}{\text{Resistance-based sensor, potentiometer}} \qquad \textbf{AD0} \qquad \frac{\text{Characteristic}}{\text{sensor pro-portional, rising}} \qquad \textbf{FA0} \\ \frac{\text{sensor pro-portional, rising}}{\text{portional, falling}} \qquad \textbf{FA1} \\ \frac{\text{programmed}}{\text{FS0}} \qquad \textbf{FS0} $							AC1	200 to +630 °C, $\Delta t \ge 25$ °C	Pt100 (JIS)
Resistance-based sensor, potentiometer (R _{max} + R _L < 1140 (3150) Ω ²)) AD0 Sensor pro- portional, rising Sensor pro- portional, falling programmed FS0							AC2	-60 to $+180$ °C, $\Delta t \ge 20$ °C	Ni100 (DIN)
(R _{max} + R _L < 1140 (3150) Ω ²)) sensor pro- portional, rising FA0 sensor pro- portional, falling FA1 programmed FS0							AC3	200 to +200 °C, $\Delta t \ge 25$ °C	Cu100
(R _{max} + R _L < 1140 (3150) Ω ²)) sensor pro- portional, rising sensor pro- portional, falling programmed FS0									
sensor pro- portional, rising sensor pro- portional, falling programmed FS0						Characteristic	AD0		
portional, falling programmed FS0					FA0			() (2))	(H _{max} + H _L < 1140 (31)
				-	FA1				
					FS0	programmed rising or falling ¹²)			
mV sensor (V, μA, mA, A sensor ¹⁰)) ΑΕ0							AE0	sensor ¹⁰))	mV sensor (V, μA, mA,

¹) For other basis values see Connection Averaging (e.g. Pt500: $n = 5 \cong BA5$). ²) With 4-wire connection no sensor fault monitoring. ⁸) Software filter for smoothing result. ⁹) Filter to suppress mains interference on the input.

2) 8)

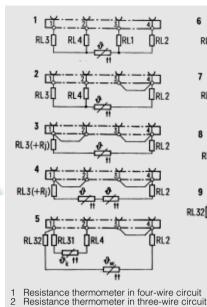
9

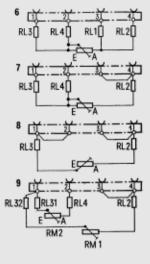
¹⁰) Observe maximum permitted currents and voltages

in explosion proof instrument (see conformance certificate).
 ¹²) See page 2/34 for operational data and special parameters.

7NG3020 and 7NG3022

Two-wire system / Mounting rail assembly





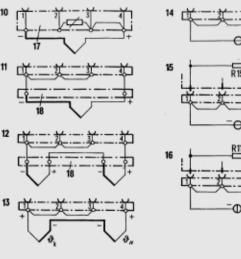
10

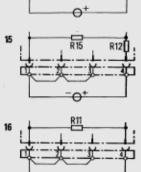
11

Thermocouple with internal temperature compensation

Thermocouple with external temperature

12 Thermocouple with external temperature compensation
12 Thermocouples in averaging circuit
13 Thermocouples in differential circuit
14 DC voltage source (full scale < 140 mV)
15 DC voltage source (full scale > 140 mV)
16 DC current source





- Cold junction terminal 7NG3090-8AV External temperature compensation Warmer measuring point Cooler measuring point Shunt resistance (internal) Series resistance (internal) 17 18

 - 9_W 9_K R11 R12
 - R15 Input resistance (internal)

Resistance thermometer in averaging circuit Resistance thermometer in averaging circuit Resistance thermometer in differential circuit Resistance-based sensor in four-wire system 3 4

- 5 6 7
- Resistance-based sensor in three-wire system Resistance-based sensor in two-wire system Resistance-based sensor in differential circuit
- 89

Fig. 2/18 Connection diagram for input signal (terminal X1)

Special parameters Text Code Options

Code	Text	Options
BS0	TA=	Working point T_{a} for differential temperature measurement using thermocouples $^{1})$
BS1	N=	Factor n for multiplication with the basic values of the resistance thermometers or thermocouples Example: 3 x Pt500 parallel: BS1: N=1.667
BS2	TA=	Working point T_a for differential temperature measurement using resistance thermometers ¹)
	N=	Number n of resistance thermometers in each branch
	TMAX=	Max. temperature T _{max} (total of temperatures in both branches)
BS3	RMAX=	Max. sum of the resistances of both branches R_{max}
CS0	TV=	Temperature Tv of external cold junction
DS0	RL=	Line resistance RL (resistance thermometer or potentiometer with 2-wire connection: loop resi- stance; with 3-wire and 4-wire connection: expectable maximum value per line)
ES0	MA=	Start of scale Ma for resistance thermometer/ thermocouples
	ME=	Full scale Me for resistance thermometer/thermo- couples
	D=	Unit (°C, K, °F, °R (°R (Rankine) = abs. °Fahrenh.)
ES1	MA=	Start of scale Ma for resistance-based sensor/ potentiometer
	ME=	Full scale Me for resistance-based sensor/poten- tiometer
ES2	MA=	Start of scale Ma for mV, V, μ V, mA and A sensor
	ME=	Full scale Me for mV, V, µA, mA and A sensor
	D=	Unit (mV→MV, V, µA→UA, mA→MA,A)
FS0	E1=	Pair of values E _n , A _n for user-specific charac-
	A1= EN=	teristic (Up to 50 pairs can be specified.) E_n : input (mV or Ω)
	AN=	A _n : output value (any unit)
	F=	Approximation function F: L = linear; Q=quadratic; C=cubic
	K=	Direction of action of characteristic S = rising; $F = falling$
GS0	T99=	Response time T ₉₉ of software filter (0 to 100 s)
HS0	S=	Safety output value S following sensor fault (output 4 to 20 mA)

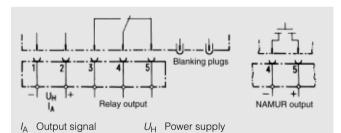


Fig. 2/19 Connection diagram for power supply and outputs (terminal X2)

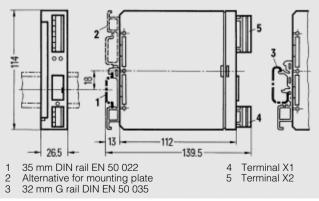


Fig. 2/20 Dimensions for control room mounting, rail mounting

 The difference temperature measurement is based on the forming of the difference of resistances or thermovoltages. Therefore, for nonlinear sensor characteristics, the result can only be approximative, except for difference = 0.

The transmitter forms the temperature difference from that difference and the slope of the straight line between Ta and Ta+(Ma-Me).

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Mounting examples

Rail mounted



Fig. 2/21 Rail-mounted transmitter in enclosure (supplied by customer) for field mounting

Plug-in module (19-inch)

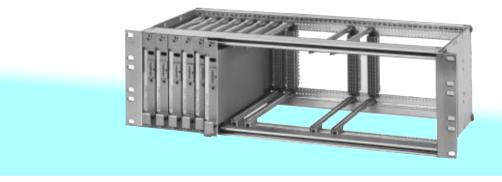


Fig. 2/22 Plug-in transmitters in 19-inch mounting rack

ES 902 C packaging system

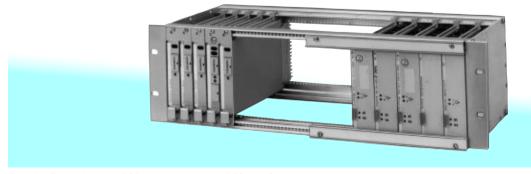


Fig. 2/23 Transmitters as PCB in mounting rack of ES 902 C packaging system

TransWin software for parameterizing the SITRANS T universal transmitter

Brief description

Application

The TransWin program is used to parameterize the SITRANS T universal transmitter. The program is menu-driven and self-explanatory.

- Enters transmitter parameters into the computer
- Loads operational parameters into the transmitter's non-volatile memory (EEPROM) from the computer
- Saves transmitter parameters in the computer
- Performs fine calibration of start of scale and full scale values
- Enters user-specific characteristics for transmitter
- Files parameters on diskette
- Documents transmitter parameters
- Generates the transmitter's rating plate in English, French, German, Italian or Spanish

An On-Line Help facility is provided. The help texts are provided in 5 languages (English, French, German, Italian and Spanish).

Parameterization

The following parameters can be set:

- Type of sensor, e.g. Pt100 resistance thermometer or NiCr/Ni thermocouple
- Measuring range
- Internal or external temperature compensation for thermocouples
- 2, 3 or 4-wire circuit for resistance thermometer and resistance-based sensor
- Reaction to sensor fault or line breakage, e.g. output signal forced to start of scale or full scale value
- Type of connection, e.g. averaging or differential circuit
- Transmitter characteristic, e.g. voltage or temperature-linear or user-specific
- Rising or falling characteristic
- Response time of transmitter
- Output signal, e.g. 0 to 20 mA or 4 to 20 mA
- Limits with hysteresis

The parameters are stored in the transmitter in a non-volatile memory (EEPROM).

The following are required during parameterization:

- Transmitter
- Off-line or on-line parameterization adapter
- Personal computer (PC) or SIMATIC programming unit (PG)
- TransWin 7NG3080-8CA software package
- Printer for printing of rating plate and report

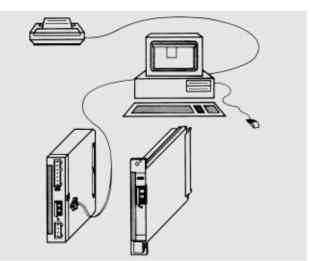


Fig. 2/24 Parameterizing the SITRANS T universal transmitter

Personal computer / programming unit configuration

- XT/AT compatible
- MS-DOS 3.0 operating system or higher (not Windows NT)
- 512 kbyte main memory
- V.24/V.28 serial interface (RS-232)
- 3½-inch (720 kbyte) floppy-disk drive
- Printer interface
- Mouse (optional)

Ordering dataOrder No.TransWin software, Version 3.02 for
PC/PG (MS-DOS), 3½-inch diskette7NG3080-8CAOff-line parameterization adapter
to parameterize during operation7NG3090-8AKOn-line parameterization adapter
to parameterize during operation7NG3090-8EK

Stock items.

7NG3213 with PROFIBUS-PA connection / Mounting in sensor head

- Quality data for the measured values: status and limit values
- Fixed bus current limiting in the event of an error
- Electrical isolation (test voltage 500 V AC)
- Intrinsically safe version for use in potentially explosive areas

Mode of operation (Fig. 2/26)

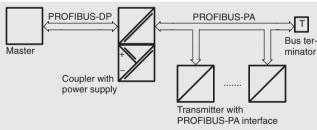
The signal supplied by a resistance-based sensor (two, three or four-wire circuit) or thermocouple is amplified in the input stage. The voltage proportional to the input variable is then converted into digital signals in an analog/digital converter (1). These are converted according to the sensor characteristic in the microprocessor (2). Furthermore, the microprocessor interprets the bus commands, initiates device-internal actions and provides electrically-isolated (3) measured values, status and device data on the bus.

Integrated device protection functions:

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

Parameterization

SITRANS T transmitters with a PROFIBUS-PA interface (Fig. 2/26) are parameterized, starting from a master, using signals that are transmitted via PROFIBUS-DP. These signals are converted by a SIMATIC DP/PA coupler with power supply (5, 6) into a signal for PROFIBUS-PA. A bus terminator is required for cable lengths > 2 m. SIMATIC PDM is preferably used as parameterization software.



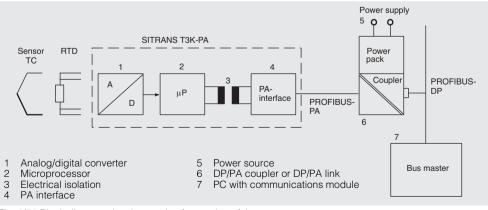


Fig. 2/26 Block diagram showing mode of operation of the SITRANS T3K PA

Fig. 2/25 SITRANS T3K PA transmitter for temperature

Application

The SITRANS T3K PA transmitter can be used in all branches. Its compact size enables it to be installed in the sensor head type B (DIN 43 729) with raised cover or larger. The following sensors/ signal sources can be connected via its universal input module:

- Resistance thermometers
- Thermocouples
- Resistance-based sensors/potentiometers
- DC voltage sources

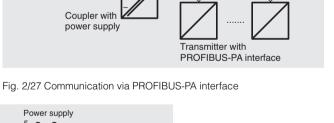
The useful data - measured values with status as a quality specification and other parameters - are provided on PROFIBUS-PA

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

Transmitters with the "Intrinsically safe" type of protection can be mounted within potentially explosive atmospheres (zone 1) and used for feeding sensors in zone 0. The conformity declarations comply with the European standard (CENELEC).

Features

- Transmitter with bus connection according to DIN 61 158-2 and EN 50 170, part 4
- Data transmission and transmitter supply via common bus link
- Assembly in connection head type B with raised cover (DIN 43 729) or larger
- Can communicate via PROFIBUS-PA (profile B, version 3.0); sensor, measuring range and much more can therefore be programmed



7NG3213 with PROFIBUS-PA connection / Mounting in sensor head

Technical data

Technical data		Iwo-wire circuit	
Input		Three-wire circuit	
Selectable filters to suppress the line frequency	Selectable for 50/60 Hz (also 10 Hz for special applications)		
Resistance thermometers			
 Measured variable 	Temperature	Four-wire circuit	I
Measuring range limits	Depending on type of connected sensor (defined sensor range)	- Generation of average values	
Sensor type			i
 acc. to DIN IEC 751, DIN 43 760 JIS C 1604-97, BS 1904 acc. to JIS C 1604-81 acc. to DIN 43 760 	Pt10, Pt50, Pt100, Pt200, Pt1000 Pt10, Pt50, Pt100 Ni50, Ni100, Ni120, Ni1000	- Generation of difference	i [t
Characteristic	Temperature-linear		(
Type of connection	Standard (logic channel 1), gener- ation of average value or difference (of 2 channels)	- Series or parallel circuit	1
- Standard	1 resistance thermometer in two, three or four-wire circuit		
Two-wire circuit	Line resistance parameterizable $\leq 100 \Omega$ (range dependent)	Sensor current	
Three-wire circuit	No adjustment necessary. The line	Thermocouples	_
	resistances must be equal between the respective sensor	Measured variable	-
	connection and the associated connection on the transmitter.	Measuring range limits	1
Four-wire circuit	No adjustment necessary.		\$
- Generation of average values	Average value of two resistance	 Sensor type 	
	thermometers in two-wire circuit, parameterizable default value		-
	behaviour (e.g. the value of the other channel is output if a channel is defective)		-
- Generation of difference	Difference between two resistance- based sensors in two-wire circuit, difference is parameterizable (e.g. channel 2 - channel 1).		-
- Series or parallel circuit	Series or parallel connection of several resistance-based sensors in two-wire circuit, e.g. to adapt other sensor types, is implemented as an additional function. This	• Characteristic	-
	results in a scaling factor.	 Type of connection 	
Sensor current	≤ 0.55 mA		0
 Resistance-based sensors Measured variable 	Obmia impodance	Chandard	•
Input range (9 resistance measur-	Ohmic impedance 0 to 24 Ω	- Standard	
ing ranges can be selected)	$\begin{array}{c} 0 \text{ to } 24 \Omega \\ 0 \text{ to } 47 \Omega \\ 0 \text{ to } 94 \Omega \end{array}$	- Generation of average value	/
	0 to 188 Ω 0 to 375 Ω 0 to 750 Ω) (i
	0 to 1500 Ω 0 to 3000 Ω 0 to 6000 Ω	- Generation of difference	j
Sensor type	Linear: 1 resistance-based sensor in two, three or four-wire circuit		
Characteristic	Resistance-linear		\$
Type of connection	Standard (logic channel 1), gener- ation of average value or difference (of 2 channels)		(
- Standard	1 resistance thermometer in two, three or four-wire circuit		

Two-wire circuit Line resistance parameterizable \leq 100 Ω (range dependent) No adjustment necessary. The line resistances must be equal between the respective sensor connection and the associated connection on the transmitter. No adjustment necessary. Average value of two resistancebased sensors in two-wire circuit, parameterizable default value behaviour (e.g. the value of the other channel is output if a channel is defective) Difference between two resistance thermometers in two-wire circuit, difference is parameterizable (e.g. channel 2 - channel 1). Series or parallel connection of several resistance thermometers in two-wire circuit, e.g. to adapt other sensor types, is implemented as an additional function. This results in a scaling factor. ≤ 0.55 mA Temperature Depending on type of connected sensor (defined sensor range) Thermocouples Type B: Pt30Rh-Pt6Rh (DIN IEC 584) Type C:W5-Re (ASTM 988) Type D:W3-Re (ASTM 988) Type E: NiCr-CuNi (DIN IEC 584) Type J: Fe-CuNi (DIN IEC 584) Type K: NiCr-Ni (DIN IEC 584) Type L: Fe-CuNi (DIN 43 710) Type N: NiCrSi-NiSi (BS 4937 Part 2) Type R: Pt13Rh-Pt (DIN IEC 584) Type S: Pt10Rh-Pt (DIN IEC 584) Type T: Cu-CuNi (DIN 43 710) Type U:Cu-CuNi (DIN 43 710) Temperature-linear Standard with 1 thermocouple with cold junction compensation (logic channel 1) or generation of difference or average value 1 thermocouple with or without cold junction compensation. Average value of the temperatures of two thermocouples. The default value behaviour is parameterizable (e.g. the value of the other channel is output if a channel is defective). The internal sensor is used for cold junction compensation. Difference between the temperatures of two thermocouples. The difference is parameterizable (e.g. channel 2 - channel 1). The internal sensor is used for cold junction compensation.

SITRANS T3K PA Transmitters for temperature 7NG3213 with PROFIBUS-PA connection /

Mounting in sensor head

Accuracy

Technical data (continued)	
Input (continued)	
Cold junction compensation	 Type specification No compensation (2 channels) Internal acquisition with integra- ed or external sensor: a manufac turer-specific PA parameter must be set for the "external sensor" case (default value: internal sensor) Externally specified cold junction temperature can be set as a fixed value
mV sensors	
 Measured variable 	DC voltage
Input range (7 voltage ranges can be selected)	-3 to 32 mV -7 to 65 mV
	-15 to 131 mV -31 to 262 mV -63 to 525 mV -120 to 1000 mV
Sensor type	Linear
Characteristic	Voltage-linear
Type of connection	
 Standard Overload consoity of the input 	mV sensor (logic channel 1) max. 3.5 mV
Overload capacity of the inputInput resistance	max. 3.5 mV $\ge 1 M\Omega$
Sensor current	2 ΠΝΙ22 180 μΑ
Output	Digital bus signal
Bus voltage	9 to 32 V (without Ex protection)
	9 to 24 V for intrinsically safe oper- ation (see Ex certificate) Active internal inductance Li < 10 nH (acc. to FISCO model) Active internal capacitance Ci < 5 nF (acc. to FISCO model)
Communication	Layers 1 and 2 according to PROFIBUS-PA, transmission tech- nique according to IEC 1158-2; slave function; layer 7 (protocol layer) according to PROFIBUS-DP, EN 50170 standard with the extended PROFIBUS functions (all data acyclic, measured value and status also cyclic)
- C2 connections	Four connections to master class 2 are supported; automatic connec- tion setup 60 s after break in com- munication; response time to master message typ. 10 ms
- Device profile	PROFIBUS-PA profile B, version 3.0, more than 200 parameters
- Device address	126 when delivered
 Temperature units 	°C, K, °F, °R parameterizable (°R (Rankine) = absolute °F)
Measuring accuracy	
Reference conditions	
- Power supply	15 V ± 1 %
- Ambient temperature	23 °C
- Warming-up time	1 h
 Influencing effects 	
- Error in the internal cold junction	
- Temperature drift	± 0.05 %/10 °C FSR, 0.1 % between -10 and 60 °C
 Influence of the power supply on the span 	< 0.005 %/V FSR
- Long-term drift	< 0.1 %/year

Resistance thermometers					
Input	Measuring	g range °C	Max. parameterizable line resist. in Ω	∙Accuracy °C	
IEC 751, DIN 43 760 JIS C 1604-97, MS 1904 - Pt10 DIN-IEC - Pt50 DIN-IEC - Pt200 DIN-IEC - Pt200 DIN-IEC - Pt500 DIN-IEC - Pt1000 DIN-IEC	-200 to +8 -200 to +8 -200 to +8 -200 to +8 -200 to +8 -200 to +8	350 350 350 350	2.35 9.4 18.75 37.5 37.5 300	1.5 0.3 0.15 0.3 0.5 0.5	
JIS C 1604-81 - Pt10 - Pt50 - Pt100	-200 to +6 -200 to +6 -200 to +6	649	2.35 9.4 18.75	1.5 0.3 0.15	
DIN 43 760 - Ni50 - Ni100 - Ni120 - Ni1000	-60 to +25 -60 to +25 -60 to +25 -60 to +25	50 50	9.4 18.75 18.75 150	0.15 0.15 0.15 0.15 0.15	
Resistance-based sensors					
Input	Measuring	g range Ω	Max. parameterizable line resist. in Ω	Accuracy Ω	
- Resistance	0 to 24 0 to 47 0 to 94 0 to 188 0 to 375 0 to 750 0 to 1500 0 to 3000	7 4 3 5 0 0 0	1.2 2.35 4.7 9.4 18.75 37.5 75 150	0.04 0.03 0.03 0.04 0.05 0.1 0.7 0.4	
Thermocouples	0 to 6000)	300	1.2	
	Moosuring	g range °C	Accuracy	°C ¹)	
Input - Type B - Type C - Type D	+100 to +	+1820 +2300 +2300	3 2 1		
- Týpe E - Type J - Type K - Type L - Type N - Type R - Type S - Type T - Type U	-200 to + -210 to + -200 to + -200 to + -200 to + -50 to +	+1000 + 800 +1372 +900 +1300 +1300 +1760 +1760 +400 +600	1 1 2 1 2 2 1 2		
- Type E - Type J - Type K - Type L - Type N - Type R - Type S - Type T	-200 to + -210 to + -200 to + -200 to + -200 to + -50 to + -50 to + -200 to	+1000 + 800 +1372 +900 +1300 +1760 +1760 +400	1 1 2 1 2 2 1		
- Type E - Type J - Type K - Type L - Type N - Type R - Type S - Type T - Type U	-200 to + -210 to + -200 to + -200 to + -200 to + -50 to + -200 to - 200 to - 200 to - 200 to - 200 to - 200 to - -200 to - -2	+1000 + 800 +1372 +900 +1300 +1760 +1760 +1760 +600 +16 +400 +65 +131 +262 +525	1 1 2 1 2 2 1 2 4 Accuracy (10 10 10 10 10 25 50 100	<u>a√</u>	
- Type E - Type J - Type K - Type L - Type N - Type R - Type S - Type T - Type U mV sensors Input	-200 to + -210 to + -200 to + -200 to + -50 to + -50 to + -200 to - 200 to - 200 to - 200 to - 200 to - 1 to - 3 to - 7 to - 3 t	+1000 + 800 +1372 +900 +1300 +1760 +1760 +1760 +600 +16 +400 +65 +131 +262 +525	1 1 2 1 1 2 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 1 1 2 1 1 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1	1V	
Type E Type J Type K Type L Type N Type R Type R Type T Type U mV sensors Input Millivoltgeber Rated operating condition	-200 to + -210 to + -200 to + -200 to + -200 to + -50 to + -50 to + -200 to - 200 to - 200 to - 200 to - -200 to - -200 to - -200 to - -200 to - -200 to + -200 to + -200 to + -31 to - -63 to - -120 to + -55 to + -55 to + -200 to - -200 to + -200 to - -200 to + -200 to - -200 to - -31 to - -63 to - -120 to - -120 to - -31 to - -3	+1000 + 800 +1372 +900 +1300 +1760 +1760 +1760 +600 +16 +32 +65 +131 +262 +525 1000 -40 to +88 -40 to +84 -40 to +66 operation -40 to +9	1 1 2 1 1 0 10 10 10 10 10 10 10 1	sically safe	
 Type E Type J Type K Type N Type R Type R Type T Type U mV sensors Input Millivoltgeber Rated operating conditions Permitted ambient temp Ambient comperature Storage temperature 	-200 to + -210 to + -200 to + -200 to + -50 to + -50 to + -200 to -200 to -200 to -200 to -200 to -200 to -200 to -1 to -3 to -3 to -1 to -3 to -3 to -15 to -3 to -15 to -3 to -15 to -3 to -15 to -1	$\begin{array}{r} +1000 \\ +800 \\ +1372 \\ +900 \\ +1300 \\ +1760 \\ +1760 \\ +1760 \\ +600 \\ \hline \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	1 1 2 1 1 0 10 10 10 10 10 10 10 1	sically safe	

Specified accuracy value refers to the largest error of the total mea-suring range.

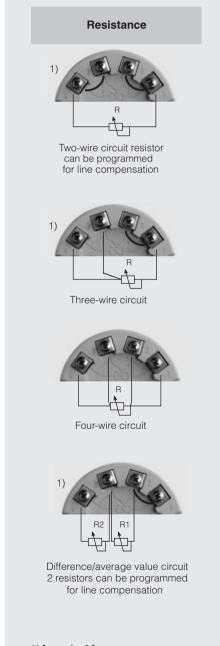
7NG3213 with PROFIBUS-PA connection / Mounting in sensor head

Technical data (continued)

Design	
Weight	250 g
Dimensions	See page 2/41
Enclosure material	Plastic PA6 (polyam., moulded GF 20)
Electrical connection	Plug-in screw terminal, max. 2.5 mm ²
Power supply	
Supply voltage	Bus infeed 9 to 32 V (9 to 24 for Ex version)

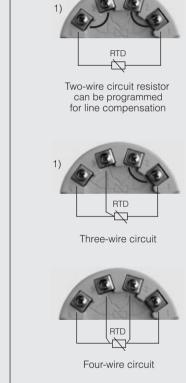
- Current consumption of device 11 mA
- Max. excess current in the event of $I_{max} \le 3 \text{ mA}$ a fault

Electrical isolation	Input and output are electrically isolated
Test voltage	500 V AC, 50 Hz, 1 min
Certificates and approvals	
CENELEC	
 "Intrinsically safe" type of protec- tion Conformity certificate 	II (1) 2G EEx ia IIB/IIC T4/T5/T6 II (1) 2G EEx ib IIB/IIC T4/T5/T6 ZELM 99 ATEX 0001



1) Important ! Fit short-circuit bridges on site.

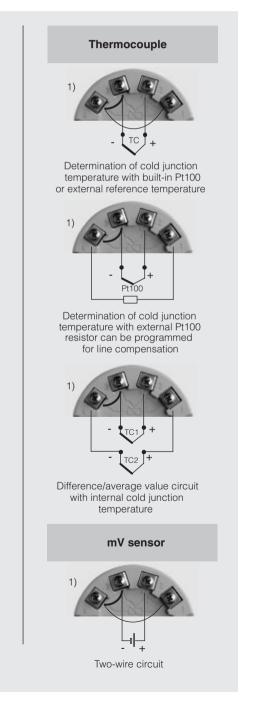
Fig. 2/28 Sensor terminal assignments



Resistance thermometer



Difference/average value circuit 2 resistors can be programmed for line compensation



SITRANS T3K PA Transmitters for temperature 7NG3213 with PROFIBUS-PA connection / Mounting in sensor head

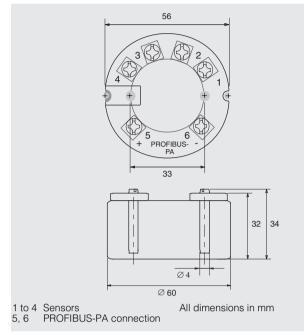


Fig. 2/29 Dimension drawing and connections

Ordering data	Order No.
SITRANS T3K PA temperature transmitter With PROFIBUS-PA for installation in ter- minal housing; with electrical isolation Operating instructions must be ordered separately	
 Without explosion protection With explosion protection EEx ia und EEx ib 	7NG3213-0NN00 7NG3213-1NN00
Accessories	
Operating instructions SITRANS T3K PA (English/German)	C79000-B7174-C55
SIMATIC PDM software See section 6	
For additional PA components, see Catalog ST PI	

Stock item.

7NG3120, 7NG3121, 7NG3122 (EEx ia) Two-wire system / Mounting in sensor head



Fig. 2/30 SITRANS TK/TK-H transmitter for temperature

Application

The SITRANS TK/TK-H transmitter converts the signals from resistance thermometers, resistance-based sensors, thermocouples or voltage sensors into a load-independent direct current corresponding to the sensor characteristic. As a result of its compact design, the transmitter fits in the sensor head type B (DIN 43 729).

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

Parameterization is carried out using a PC for the programmable SITRANS TK.

Transmitters of the "Non incendive" type of protection can be installed within potentially explosive atmospheres (zone 2).

Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres (zone 1).

Mode of operation (Fig. 2/31)

The measured signal supplied by a resistance-based sensor (2, 3 or 4-wire connection) or by a thermocouple is amplified in the input stage. The voltage, which is proportional to the input variable, is then converted into digital signals by an analog/digital converter (1). These signals are forwarded electrically isolated (2) to the microprocessor (3). They are converted there in accordance with the sensor characteristic and further parameters (damping, ambient temperature etc.).

The signal prepared in this way is converted in a digital/analog converter (4) into a load-independent direct current of 4 to 20 mA. The power supply (5) is located in the output signal circuit.

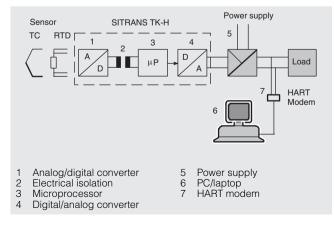


Fig. 2/31 Block diagram: operating principle of the SITRANS TK-H

The SITRANS TK-H transmitter is parameterized and operated using a PC (6) connected to the two-wire line via the interface module for SIPROM software (HART® modem) (7). A hand-held communicator can also be used for this purpose. The signals needed for communication in conformity with the HART® protocol V 5.7 are superimposed on the output current in accordance with the frequency shift keying (FSK) method.

Technical data

Input

Resistance thermometer

Measured variable		Temperature		
Sensor type		Pt25 to Pt1000 (DIN IEC 751) Pt25 to Pt1000 (JIS C1604) Ni25 to Ni1000 (DIN IEC 751) Cu25 to Cu1000		
 Characteristic 	Characteristic		ure-linear	
 Type of connection 		2, 3 or 4-\	wire circuit	
Resistance-based sensor				
 Measured variable 		Ohmic im	pedance	
 Measuring limit 		2200 Ω		
Characteristic		Resistance ble (TK)	e-linear or p	rogramma-
 Type of connection 		2, 3 or 4-\	wire circuit	
Thermocouples				
 Measured variable 		Temperat	ure	
Input type		(DIN IEC Type L, U Type N (E	(DIN 43 710)
 Characteristic 		Temperat	ure-linear	
Cold junction compensat	ion	Internal, external with Pt100 or external with a fixed value		
mV sensor				
Measured variable		DC voltage		
Measuring limit		1100 mV		
Characteristic		Voltage-linear or programmable (TK)		
 Overload capacity of the 	input	-0.5 to +3	5 V DC	
 Input resistance 		$\geq 1 \ M\Omega$		
Output				
Output signal		4 to 20 mA, two-wire		
Communication for SITRAN	IS TK-H	According to HART V 5.7		5.7
Accuracy				
Digital measuring errors				
Resistance thermometers				
Input	Measurin	ng range °C	Min. measur- ing span °C	Dig. accu- racy °C
- Pt25 to Pt500 -200 to + - Pt501 to Pt1000 IEC -200 to + - Ni25 to Ni1000 -50 to + - Cu25 to Cu1000 -50 to +		350 250	10 10 10 10	0.1 0.1 0.1 0.1
Resistance-based sensors				
Input	Measurin	ig range Ω	Min. measuring span Ω	Dig. accu- racy Ω
ResistanceResistance	0 to 390 0 to 2200		5 25	0.05 0.25
mV sensors				

<u>mV sensors</u>			
Input	Measuring range	Min. measur-	Dig. accu-
	mV	ing span mV	racy μV
 mV sensor mV sensor 	-10 to +70	2	40
	-100 to +1100	20	400

7NG3120, 7NG3121, 7NG3122 (EEx ia) Two-wire system / Mounting in sensor head

Technical data (continued)

Accuracy (continued)

Thermocouples

Input	Measurin	g range °C	Min. measur- ing span °C	Dig. accu- racy °C
- Type B - Type D - Type D - Type E - Type K - Type K - Type L - Type N - Type R - Type R - Type T - Type T - Type U	-250 to -210 to -230 to -200 to -200 to 0 to 0 to -220 to	+900	50 100 50 50 50 50 50 50 50 50 50 50 50 50 5	2 2 2 1 1 1 1 1 2 2 1 1
• Error in the analog output			f measuring	span
Error in the internal cold ju	unction	< 0.5 K		00.04/00
Temperature drift		±0.01 %/	°C, typ. ±0.00	J3 %/°C
 Influence of the power supply on the span and zero point 		<0.005 % of measuring span/V		
Long-term drift		<0.03 % in first month		
Rated operating condition	าร			
Ambient conditions				
 Ambient temperature 		-40 to +85	5 °C	
 Relative humidity 		< 98 %, with condensation		
Electromagnetic compatil Interference immunity Emitted interference	bility		g to EN 50 08 g to EN 50 08	
Design				
Weight		50 g		
Dimensions		See page	2/44	
Material		Moulded	plastic	

	Power supply	
	for SITRANS TK	6.5 to 35 V DC (28 V for EEx ia)
	for SITRANS TK-H	12 to 35 V DC (28 V for EEx ia)
	Electrical isolation	between input and output
cu-	 Test voltage 	U _{eff} =3.75 kV, 50 Hz, 1 min
	 Insulation 	500 V _{ac}
	Certificates and approvals	
	Explosion protection (CENELEC)	
	 "Intrinsic. safe" type of protection Conformity certificate 	EEx ia IIC T4
	for TK for TK-H	DEMKO-Nr.: 98D.124351X DEMKO-Nr.: 98D.123803X
	Explosion protection (German Tech- nical Inspectorate)	
	 EX tested for zone 2n Conformity statement 	II 3 G Ex nA II T 4 TÜV 98 ATEX 1292 X
	Hardware and software require- ments for the parameteriz. software	
)	SIPROM TK for SITRANS TK	
V	Personal computer	CPU of type 486 upwards, compat- ible with industrial standard
		31⁄2" diskette drive
		Hard disk with 5 MB vacant space
		Min. 4 MB RAM
		VGA graphics adapter (or compatible) with at least 16 colours
		One vacant serial port
		Mouse or compatible pointer unit (recommended) Printer (recommended)

PC operating system:

• SIMATIC PDM für SITRANS TK-H

See section 6

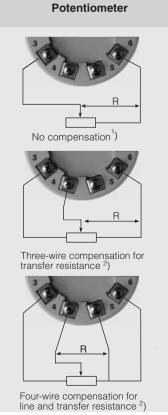
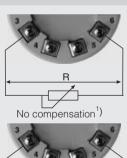


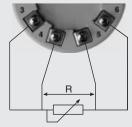
Fig. 2/32 Sensor pin assignments

Resistance

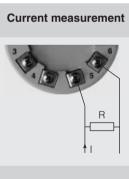




Three-wire line compensation

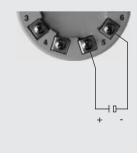


Four-wire line compensation



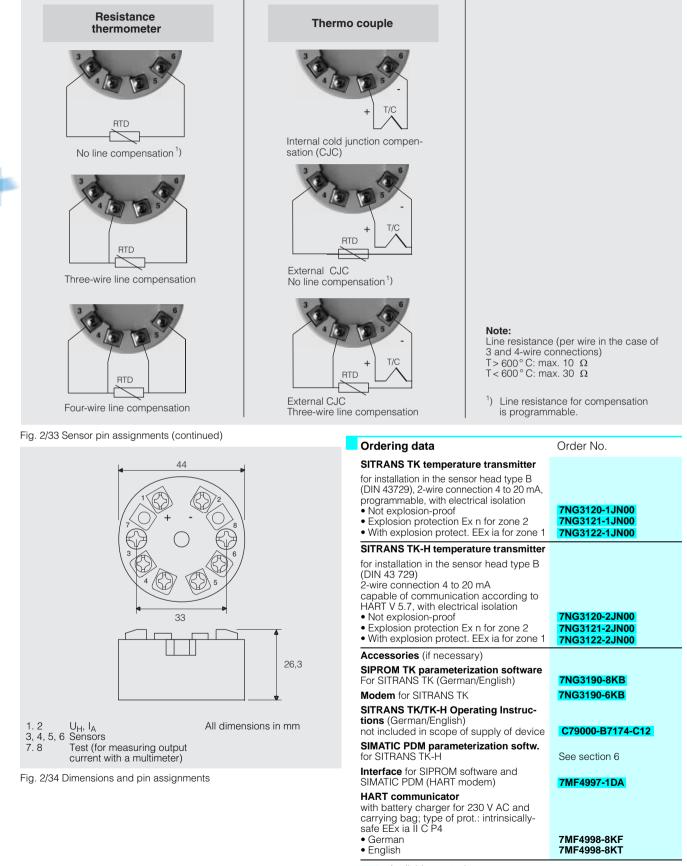
MS-DOS V 5.0 upwards, MS-Windows V 3.1 upwards (not Wind. NT)

Voltage measurement



- Line resistance for compensation is programmable.
 Resistance between start of
- Resistance between start of resistance and sliding contact.

7NG3120, 7NG3121, 7NG3122 (EEx ia) Two-wire system / Mounting in sensor head



Available ex stock For power supplies see page 2/50.

7NG3130, 7NG3131, 7NG3132 Two-wire system / Housing for field mounting



Fig. 2/35 SITRANS TF transmitter for temperature

Application

The SITRANS TF transmitter converts the signals from resistance thermometers, resistance-based sensors, thermocouples or voltage sensors into a load-independent direct current corresponding to the sensor characteristic.

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

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

Transmitters of the "Non incendive" type of protection can be installed within potentially explosive atmospheres (zone 2).

Transmitters of the "intrinsically safe" type of protection can be installed within potentially explosive atmospheres (zone 1).

Mode of operation (Fig. 2/36)

The measured signal supplied by a resistance-based sensor (2, 3 or 4-wire connection) or by a thermocouple is amplified in the input stage. The voltage, which is proportional to the input variable, is then converted into digital signals by an analog/digital converter (1). These signals are forwarded electrically isolated (2) to the microprocessor (3). They are converted there in accordance with the sensor characteristic and further parameters (damping, ambient temperature etc.).

The signal prepared in this way is converted in a digital/analog converter (4) into a load-independent direct current of 4 to 20 mA. The power supply (5) is located in the output signal circuit.

The SITRANS TK-H transmitter is parameterized using a PC (6) connected to the two-wire line via the interface module (HART® modem) (7). A hand-held communicator can also be used for this purpose. The signals needed for communication in conformity with the HART® protocol V 5.7 are superimposed on the output current in accordance with the frequency shift keying (FSK) method.

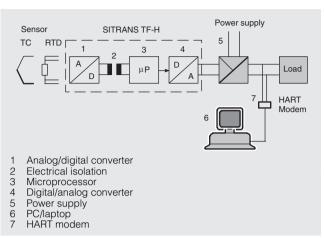


Fig. 2/36 Block diagram: Operation of the SITRANS TF with an integrated SITRANS TK-H

Technical data				
Input				
Resistance thermometer				
 Measured variable 		Temperat	ure	
Sensor type		Pt25 to Pt	1000 (DIN IE 1000 (JIS C 1000 (DIN IE Cu1000	1604)
 Characteristic 		Temperat	ure-linear	
 Type of connection 		2, 3 or 4-v	vire circuit	
Resistance-based sensor				
 Measured variable 		Temperat	ure	
 Measuring limit 		2200 Ω		
Characteristic		Resistanc ble (TK)	e-linear or p	rogramma-
 Type of connection 		2, 3 or 4-v	vire circuit	
Thermocouples				
 Measured variable 		Temperat	ure	
Input type		Type B, E, J, K, R, S, T (DIN IEC 584-1) Type L, U (DIN 43 710) Type N (BS 4937) Type C, D (ASTM 988)		
Characteristic		Temperat		
Cold junction compensation			external with with a fixed va	
mV sensor				
 Measured variable 		Temperature		
 Measuring limit 		1100 mV		
 Characteristic 		Voltage-linear or programmable		
 Overload capacity of the 	input	-0.5 to +35 V DC		
 Input resistance 		$\geq 1 M\Omega$		
Output				
<u>Output signal</u>		4 to 20 mA, two-wire		
Communication for SITRAN	Communication for SITRANS TK-H		According to HART V 5.7	
Accuracy Digital measuring errors	•			
Resistance-based sensors				
Input	Measurin	ig range Ω	Min. measuring span Ω	Dig. accuracy Ω
- Resistance - Resistance	0 to 390 0 to 2200		5 25	0.05 0.25

7NG3130, 7NG3131, 7NG3132 Two-wire system / Housing for field mounting

Technical data (continued)

Accuracy (continued)

Resistance thermometers

Input	Measuring range °C	Min. measu- ring span °C	Dig. accu- racy °C
 Pt25 to Pt500 Pt501 to Pt 1000 IEC Ni25 to Ni1000 Cu25 to Cu1000 	-200 to +850 -200 to +350 -50 to +250 -50 to +200	10 10 10 10	0.1 0.1 0.1 0.1
Thermocouples			

Thermocouples

Input	Measuring range °C	Min. measu- ring span °C	
- Type B - Type C - Type D - Type E - Type J - Type K - Type L - Type N - Type R - Type R - Type T - Type T - Type U	+500 to +1820 0 to +2300 -250 to +2300 -210 to +1200 -230 to +1370 -200 to +900 -200 to +900 -200 to +1300 0 to +1750 0 to +1750 -220 to +400 -200 to +600	50 100 50 50 50 50 50 50 50 100 40 50	2 2 2 2 1 1 1 1 1 2 2 1 1 1

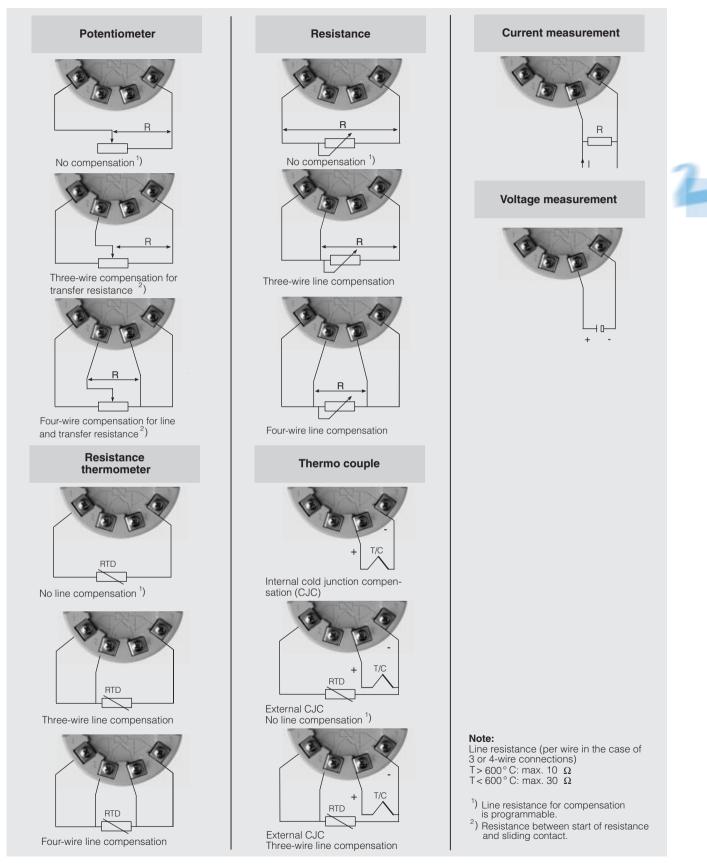
mV sensors

Input	Measuring range mV		Min. measu- ring span mV	Dig. accu- racy μV
 mV sensor mV sensor 	-10 to +70 -100 to +1100		2 20	40 400
Error in the analog output		< 0.1 % of measuring span		
• Error in the internal cold junction		< 0.5 K		
 Temperature drift 		± 0.01 %/°C, typ. ± 0.003 %/°C		
• Influence of the power supply on the span and zero point		< 0.005 % of measuring span/V		
 Long-term drift 		< 0.03 % in first month		
Rated operating condition Ambient conditions	ıs			
 Ambient temperature 		-40 to +85 °C		
 Condensation 		Permissible		
 Electromagnetic compatibility Interference immunity 		According EN 50 082-2 and NAMUR NE21		
- Emitted interference		According EN 50 081-2		
Degree of protection to EN 60 529		IP 65		
Design				
Weight		Approx. 1.5 kg (without options)		
Dimensions		See page 2/48		
Housing material		Low-copper cast aluminium GD- AlSi 12, polyester-based coating, stainless steel rating plate		
Electrical connection, sens nection	or con-		minals, cable or 1/2-14 NP	
Mounting bracket (optional)		vanised and stainless ste	
Power supply				
for SITRANS TK		6.5 to 35 V DC (28 V for EEx ia)		
for SITRANS TK-H		12 to 35 \	/ DC (28 V fo	r EEx ia)
Electrical isolation		between i	input and out	iput
 Test voltage 		$U_{\rm eff} = 3.7$	5 kV, 50 Hz,	1 min
Insulation		500 V _{ac}		

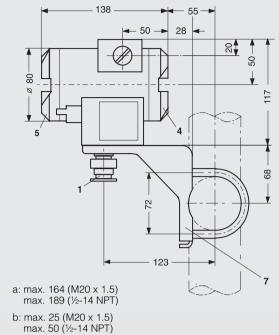
Certificates and approvals	
Explosion protection (CENELEC)	
 "Intrinsically safe" type of protection Conformity certificate 	II 2 (1) G EEx ia IIC T4 ZELM 99 ATEX 0007
Explosion protection (German Technical Inspectorate)	
 Ex tested for zone 2n Conformity statement 	II 3 G Ex nA II T 4 TÜV 98 ATEX 1292 X
Hardware and software require- ments for the parameterization soft- ware	
SIPROM TK for SITRANS TK	
Personal computer with:	CPU of type 486 upwards, compat- ible with industrial standard
	3.5" diskette drive
	Hard disk with 5 MB vacant space
	Min. 4 MB RAM
	VGA graphics adapter (or compatible) with at least 16 colours
	One vacant serial port
	Mouse or compatible pointing device and printer (recommended)
PC operating system:	MS-DOS V 5.0 upwards, MS- Windows V 3.1 upwards (not Windows NT)
SIMATIC PDM for SITRANS TK-H See section 6	
Communication	
 Load for HART connection 	230 to 1100 O

 Load for HART connection 	230 to 1100 Ω
• Cable	Two-core shielded: \leq 3 km Multi-core shielded: \leq 1.5 km
Protocol	HART protocol V 5.x
SIMATIC PDM for SITRANS TK-H	See section 6

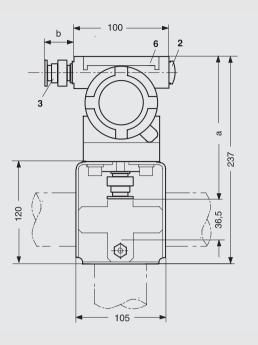
7NG3130, 7NG3131, 7NG3132 Two-wire system / Housing for field mounting



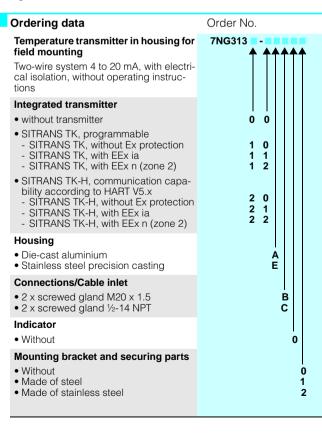
7NG3130, 7NG3131, 7NG3132 Two-wire system / Housing for field mounting



- 1 Sensor connection (screwed gland M20 x 1.5 or 1/2-14 NPT)
- 2 Blanking plug
- 3 Electrical connection (screwed gland M20 x 1.5 or 1/2-14 NPT)
- 4 Terminal side, output signal
- 5 Terminal side, sensor



6 Protective cover (without function) 7 Mounting bracket (option) with cla Mounting bracket (option) with clamp for securing to a vertical or horizontal pipe



Suffixes	Order Code
Add "-Z" and the order code to the order number and specify any plain text	
 Inscription on measuring-point label Measuring range (max. 27 characters) Measuring-point number/identification (max. 16 characters) 	Y22 Y23
• Measuring-point text (max. 27 charac.)	Y24
Accessories (if necessary)	Order No.
SIPROM TK parameterization software For SITRANS TK (German/English)	7NG3190-8KB
Modem for SITRANS TK	7NG3190-6KB
SITRANS TK/TK-H Operating Instructions German/English (not included in scope of supply of device)	C79000-B7174-C12
SIMATIC PDM parameterization softw. for SITRANS TK-H	See section 6
Interface for SIPROM software and SIMATIC PDM (HART modem)	7MF4997-1DA
HART communicator with battery charger for 230 V AC and carrying bag; type of prot.: intrinsically- safe EEx ia II C P4 • German	7MF4998-8KF
• English	7MF4998-8KT
Mounting bracket and securing parts • Steel for 7NG313 • Steel for 7NG313 • Stainl. steel for 7NG313 • Stainl. steel for 7NG313	7MF4997-1AC 7MF4997-1AB <mark>7MF4997-1AJ</mark> 7MF4997-1AH

Available ex stock.

For power supplies, see page 2/50.

Fig. 2/38 SITRANS TF, dimensions in mm

Temperature sensors Resistance thermometers and thermocouples

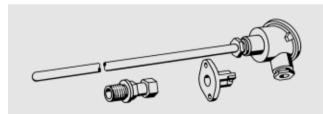


Fig. 2/39 Resistance thermometers and thermocouples

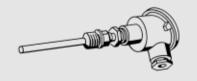
Examples of possible design variants

Application

Resistance thermometers and thermocouples are used in all areas of industrial temperature measurement. The wide range of materials, protective valves and process connections available make them easily adaptable to every measuring task.



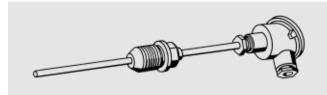
Smoke resistance thermometer / straight thermocouple



Low-pressure screw-in resistance thermometer / thermocouple (without neck tube)



Low-pressure screw-in resistance thermometer / thermocouple (with neck tube)

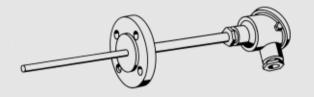


High-pressure screw-in resistance thermometer / thermocouple

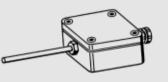




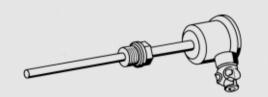
High-pressure weld-connection resistance thermometer / thermocouple



Flange resistance thermometer



Resistance thermometer for humid conditions



Explosion-proof resistance thermometer / thermocouple for measuring the temperature of liquids and gases, also in potentially explosive areas (EEx d)



Shielded thermocouple with exposed connecting leads



Shielded thermocouple with compensating cable

Note:

These are only examples of possible design variants. Siemens supplies a complete range of temperature sensors. For further information, please contact your local Siemens office.