

# Measuring instruments for temperature

## Transmitters for temperature

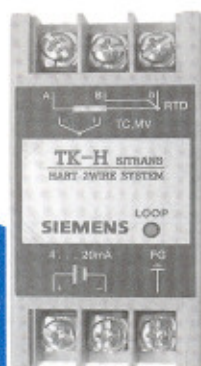


Fig. 2/22 SITRANS TK/TK-H-R transmitter for temperature

### Application

The SITRANS TK/TK-H-R transmitter converts the signals from resistance thermometers, resistance-based sensors, T/C 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.x) 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 incensive" 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

The measured signal supplied by a resistance-based sensor (2, 3-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.

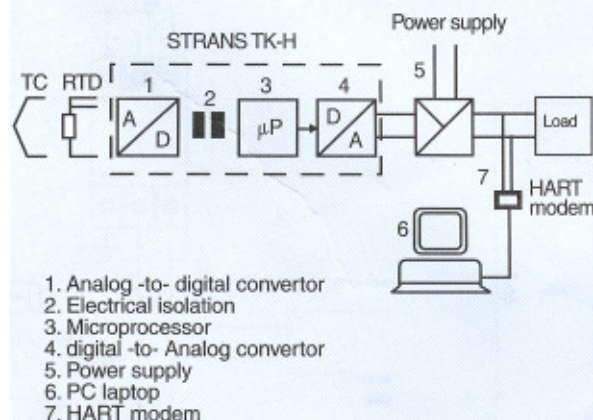


Fig. Block diagram: operating principle of the SITRANS TK-H-R

### SITRANS TK/TK-H-R

#### Two-wire system/Rail Mounting

The SITRANS TK-H-R 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

#### 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	Temperature-linear
• Type of connection	2, 3 or 4-wire circuit

#### Resistance-based sensor

• Measured variable	Ohmic impedance
• Measuring limit	2200 Ω
• Characteristic	Resistance-linear or programmable (TK)
• Type of connection	2, 3 -wire circuit

#### Thermocouples

• Measured variable	Temperature
• 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	Temperature-linear
• Cold junction compensation	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	-0.5 to +35 V DC
• Input resistance	W 1 MΩ

#### Output

Output signal	4 to 20 mA, two-wire
Communication	According to HART V 5.x

#### Accuracy

- Digital measuring errors

#### Resistance thermometers

Input	Measuring range °C (°F)	Min. span °C (°F)	Dig. accuracy °C (°F)
- Pt25 to Pt500	-200 to +850 (-328 to +1562)	10 (18)	0.1 (0.18)
- Pt501 to Pt1000 IEC	-200 to +350 (-328 to +662)	10 (18)	0.1 (0.18)
- Ni25 to Ni1000	-50 to +250 (-58 to +482)	10 (18)	0.1 (0.18)
- Cu25 to Cu1000	-50 to +200 (-58 to +392)	10 (18)	0.1 (0.18)

#### Resistance-based sensors

Input	Measuring range Ω	Min. span Ω	Dig. accuracy Ω
- Resistance	0 to 390	5	0.05
- Resistance	0 to 2200	25	0.25

#### mV sensors

Input	Measuring range mV	Min. span mV	Dig. accuracy mV
- mV sensor	-10 to +70	2	40
- mV sensor	-100 to +1100	20	400



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#### Two-wire system/Rail Mounting

#### Technical data (continued)

##### Accuracy (Continued)

##### Thermocouples

Input	Measuring range °C (°F)	Min. span °C (°F)	Dig. accuracy °C (°F)
- Type B	+500 to +1820 (+930 to +3308)	50 (90)	2 (3.6)
- Type C	0 to +2300 (+32 to +4172)	100 (180)	2 (3.6)
- Type D	0 to +2300 (+32 to +4172)	100 (180)	2 (3.6)
- Type E	-250 to +900 (-418 to +1652)	50 (90)	1 (1.8)
- Type J	-210 to +1200 (-346 to +2192)	50 (90)	1 (1.8)
- Type K	-230 to +1370 (-382 to +2498)	50 (90)	1 (1.8)
- Type L	-200 to +900 (-328 to +1652)	50 (90)	1 (1.8)
- Type N	-200 to +1300 (-328 to +2372)	50 (90)	1 (1.8)
- Type R	0 to +1750 (+32 to +3182)	100 (180)	2 (3.6)
- Type S	0 to +1750 (+32 to +3182)	100 (180)	2 (3.6)
- Type T	-220 to +400 (-364 to +752)	40 (72)	1 (1.8)
- Type U	-200 to +600 (-328 to +1112)	50 (90)	1 (1.8)

- Error in the analog output
- Error in the internal cold
- Temperature drift

< 0.1% of span  
 < 0.5 K (0.9 °F)  
 ±0.01%/°C (0.0016%/°F),  
 typ. ±0.003%/°C (0.0056%/°F)

- Influence of the power
- the span and zero point
- Long-term drift

<0.005% of span/V  
 <0.03% in first month

##### Rated operating conditions

##### Ambient conditions

- Ambient temperature
- Relative humidity
- Electromagnetic compatibility

< 0.1% of span  
 < 0.5 K (0.9 °F)  
 ±0.01%/°C (0.0016%/°F),  
 typ. ±0.003%/°C (0.0056%/°F)

##### Interference immunity

##### Emitted interference

<0.005% of span/V  
 <0.03% in first month

##### Power supply

- For SITRANS TK
- For SITRANS TK-H-R

6.5 to 35 V DC (30 V for EEx ia)  
 12 to 35 V DC (30 V for EEx ia)

##### Electrical isolation

- Test voltage
- Insulation

between input and output  
 Urms = 3.75 kV, 50 Hz, 1 min  
 500 Vac

##### Certificates and approvals

##### Explosion protection (CENELEC)

- "Intrinsic. Safe" protection
- EC-Type Examination
- Certificate for TK

II 1G EEx ia IIC T4  
 DEMKO 99 ATEX 126892X  
 DEMKO 99 ATEX 126893X

##### Explosion protection (German

##### Technical Inspectorate)

- Ex tested for zone 2n
- Conformity statement

II 3 G Ex nA II T 4  
 T

##### Hardware and software requirements

##### for the parameteriz. software

##### SIPROM TK for SITRANS TK

##### Personal computer

CPU of type 486 upwards, compatible with industrial standard  
 3½" diskette drive  
 Hard disk with 5 MB vacant space  
 Min. 4 MB RAM  
 VGA graphics adapter (or compatible) with at least 16 colors  
 One vacant serial port  
 Mouse or compatible pointer unit and printer (recommended)  
 MS-DOS V 5.0 upwards, MS-Windows V 3.1 upwards

##### PC operating system:

##### SIMATIC PDM for SITRANS TK-H

## EXTERNAL & WIRING DRAWING

### Internal Wiring Connection(Terminal)

