Modular Housings

Knick

ThermoTrans® A 20210

Standard transmitters for temperature measurement with resistance thermometers and thermocouples in a 6-mm housing.

The Task

In virtually all areas of industry temperatures are continuously measured and often used as reference input for closed-loop control systems, monitoring systems, safety shutdown systems, or for similar critical jobs. Here, normally the highest demands are placed on function, accuracy, flexibility, and electrical safety.

Different sensors are used depending on the measuring task. They provide a raw signal which is prepared, linearized, and standardized for further processing using a temperature transmitter.

The Problem

There is a very wide range of standardized and commercial temperature sensors. The large number of sensors, connection variants, individual temperature ranges, different supply voltages, and required output signals call for very variable transmitters that can be optimally suited to the different conditions.

However, the required flexibility should not be paid for with complex operation. Rather, it is desirable that adjustments can easily be made on the site. High performance should not result in increased susceptibility – high reliability and availability are key requirements.

The Solution

The flexible ThermoTrans® A 20210 temperature transmitters provide connection possibilities for all common thermocouples and resistance thermometers. They can be flexibly adapted to the respective measuring task using DIP and rotary coding switches. 3-port isolation with Safe Isolation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measurement signals. The ThermoTrans® A 20210 offer maximum performance in the smallest of spaces.

Resistance thermometers can be operated either in 2-, 3-, or 4-wire configuration. The configuration type is automatically recognized, adjustment is not required. Thermocouples can be detected with internal or external reference junction compensation.

Input voltage signals up to +/– 1000 mV are converted to 0/4 to 20 mA or 0 to 10 V standard signals.
This enables low-cost implementation of current measurements using shunt resistors, for example.

The devices meet the requirements of type of protection "n". This means they can be installed and used in Zone 2 hazardous areas in the EC, the USA, and in Canada. Thanks to their approval to Class 1, Division 2 (UL 1604), they can also be used according to the traditional North American classification system.

Special measuring tasks can be solved with ThermoTrans® devices that Knick configures according to individual specifications. Fixed-range models without switch are used, for example, when manipulations or mix-up are to be excluded.

The Housing

The modular housing – 6 mm slim – is stingy with enclosure space and allows high component density. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.

Temperature Transmitters



Knick

The Facts

Flexible application
with common temperature sensors: Pt100, Pt1000, Ni100, thermocouples type J and K

Intuitive configuration
Easy, without tools, using 4 rotary and 8 DIP switches

Calibrated range selection
without complicated adjustments

Automatic recognition
of the sensor connection (2-, 3-, or 4-wire)

Safe Isolation according to EN 61140 – protection of maintenance staff and subsequent devices against non-permitted high voltages up to 300 V AC/DC

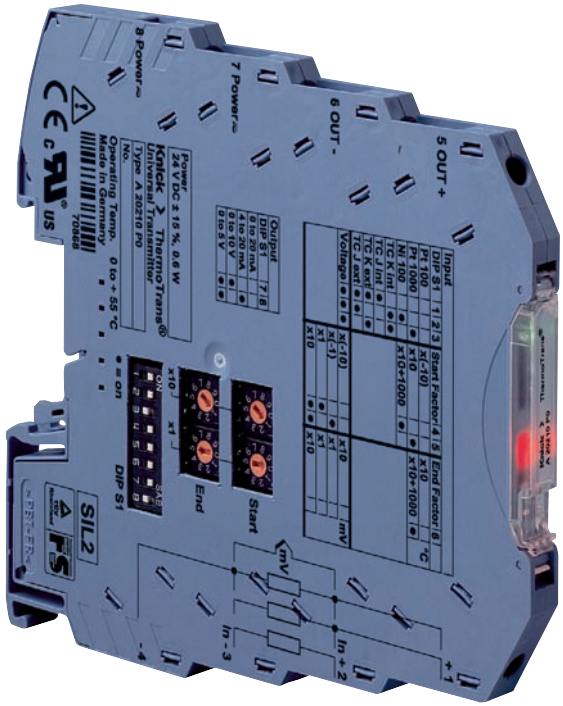
High accuracy due to innovative circuit design

Minimum space consumption
in the enclosure: only 6 mm wide modular housing – more transmitters per meter of mounting rail

Low-cost assembly
Quick mounting, convenient connection of power supply through DIN rail bus connectors

5-year warranty

6 mm CLASS



Warranty
5 years!

Defects occurring within 5 years from delivery are remedied free of charge at our works (carriage and insurance paid by sender).

ThermoTrans® A 20210

Product Line

Temperature transmitter, adjustable

ThermoTrans® A 20210	Order No.	A 20210 P0

Temperature transmitter, with fixed settings

ThermoTrans® A 20210	Order No.	A 20210 P0 /	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □
Input / Sensor type	Pt100 (–200 … +850 °C)		P
	Pt1000 (–200 … +850 °C)		Q
	Ni100 (–60 … +180 °C)		N
	TC / J (–210 … +1200 °C)		J
	TC / K (–200 … +1372 °C)		K
	TC / J (–210 … +1200 °C), external reference junction comp. (Pt100)		X
	TC / K (–200 … +1372 °C), external reference junction comp. (Pt100)		Y
	U (–1000 mV … +1000 mV)		U
Start of range	+ or – sign		X
	4-digit number (°C / mV)		X X X X
End of range	+ or – sign		X
	4-digit number (°C / mV)		X X X X
Output	0 … 20 mA		A
	4 … 20 mA		B
	0 … 10 V		C
	0 … 5 V		D
Example for fixed-setting model:	Pt1000 / –50 °C … +150 °C / 4 … 20 mA		
	Order no.	A 20210 P0 /	Q – 0 0 5 0 + 0 1 5 0 B

Accessories		Order No.
DIN rail bus connector ZU 0628	Power supply bridging for two devices, A 20XXX P0 or P 32XXX P0	ZU 0628
IsoPower® A 20900	Power supply, 24 V DC, 1 A, see Page 212	A 20900 H4
DIN rail bus connector ZU 0678	Tapping of supply voltage (A 20900), routing to ZU 0628 DIN rail bus connector	ZU 0678
Power terminal block ZU 0677	Feeding the 24 V DC supply voltage to the ZU 0628 DIN rail bus connector	ZU 0677

Specifications

Resistance thermometers

Input data	Sensor type	Standard	Measurement range
	Pt 100	DIN 60751	–200 ... +850 °C
	Pt 1000	DIN 60751	–200 ... +850 °C
	Ni 100	DIN 43760	–60 ... +180 °C
Connection	2-, 3-, or 4-wire (automatic recognition), signaling via yellow LED		
Max. resistance range incl. line resistance	5 kohms		
Max. line resistance	100 ohms		
Supply current	200 µA, 400 µA, or 0 ... 500 µA		
Line monitoring	Open circuits		
Input error limits	Resistances < 5 kohms: ± (50 mohms +0.05 % meas. val.) for spans > 15 ohms Resistances > 5 kohms: ± (1 mohm +0.05 % meas. val.) for spans > 50 ohms		
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)		

Thermocouples

Input data	Sensor type	Standard	Measurement range
Input	Type J	DIN 60584-1	–210 ...+1200 °C
	Type K	DIN 60584-1	–200 ...+1372 °C
Input resistance	> 10 Mohms		
Max. line resistance	1 kohm		
Line monitoring	Open circuits		
Input error limits	± (10 µV + 0.05 % meas. val.) for spans > 2 mV		
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)		
Reference junction compensation	Internal (Pt 100) external (Pt 100), fixed value, or uncompensated		
Error of internal reference junction compensation	< 1.5 K		
Error of external reference junction compensation	< 80 mohms +0.1 % meas. val.	via Pt 100 for T_{comp} = 0 ... 100 °C	

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Specifications *(continued)*

Shunt voltages
Input data

Input	–1000 ... 1000 mV unipolar/bipolar
Input resistance	> 10 Mohms
Input error limits	± (200 µV + 0.05 % meas. val.) for spans > 50 mV
Line monitoring	Open circuits
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)
Overload	5 V across all inputs

Output data

Outputs	0 ... 20 mA, 4 ... 20 mA, 0 ... 5 V, 0 ... 10 V	Calibrated selection (factory setting 4 ... 20 mA)
Control range	0 ... ≈102.5 % span with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output –1.25 ... ≈102.5 % span with 4 ... 20 mA output	
Resolution	16 bits	
Load	Current output: Voltage output:	≤ 10 V (≤ 500 ohms at 20 mA) ≤ 1 mA (≥ 10 kohms at 10 V)
Output error limits	Current output: Voltage output:	±(10 µA + 0.05 % meas. val.) ±(5 mV + 0.05 % meas. val.)
Residual ripple	< 10 mV_{rms}	
Temperature coefficient at output	< 50 ppm/K full scale (average TC in permitted operating temp range, reference temp 23 °C)	
Error signaling	0 ... 20 mA output: I = 0 mA or ≥ 21 mA 4 ... 20 mA output: I ≤3.6 mA or ≥ 21 mA 0 ... 5 V or 0 ... 10 V output: V = 0 V or V ≥ 5.25 V or V ≥ 10.5 V via output signal and red LED for out-of-range conditions, faulty settings, sensor short circuit or open circuit, output load error, other device errors. Also see "Error Signaling" Page 171.	

Transmission behavior

Characteristic	Linear rising / falling
Meas. rate	Approx. 3/s *)

*) For thermocouples with exernal reference junction compensation: measuring rate 2/s.

Specifications *(continued)*

Display

Green LED	Power supply
Yellow LED	Connection type
Red LED	Maintenance request or device failure

Power supply

Power supply	24 V DC (– 20 %, + 25 %), approx. 1.2 W The power supply can be routed from one device to another via DIN rail bus connectors.

Isolation

Galvanic isolation	3-port isolation between input, output and power supply
Test voltage	2.5 kV AC, 50 Hz: Power supply against input against output
Working voltage (basic insulation)	Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2 according to EN 61010-1. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.
Protection against electric shock	Safe Isolation according to EN 61140 by reinforced insulation in accordance with EN 61010-1. Working voltage up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2. For applications with high working voltages, you should ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Standards and approvals

Explosion protection	ATEX Zone 2 (EN 60079-15) Class 1, Div 2 / Zone 2 (UL 1604)	
EMC	Product family standard: Emitted interference: Immunity to interference [1]:	EN 61326 Class B Industry
cURus	File No. 220033 Standards: UL 508 and CAN/CSA 22.2 no. 14-95	

1) Slight deviations are possible while there is interference

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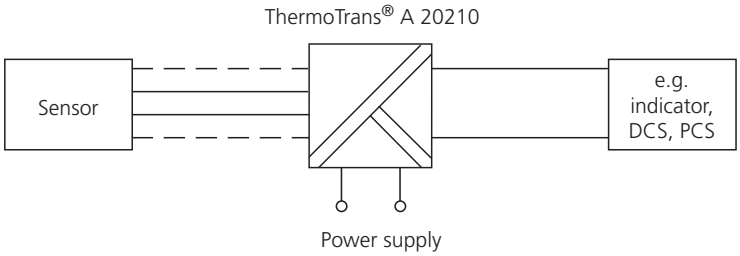
Specifications *(continued)*

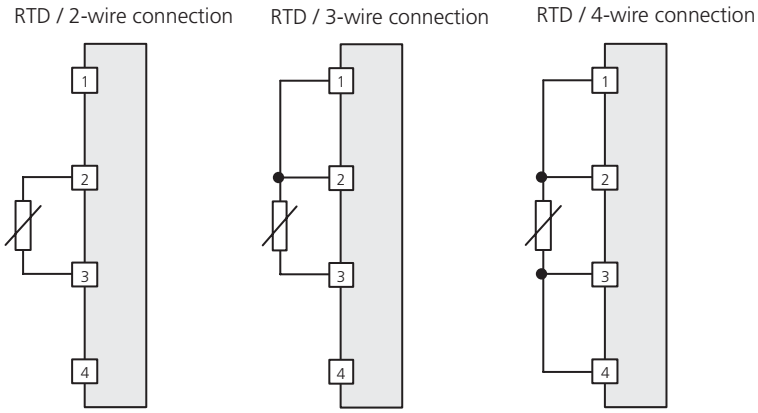
Other data

Ambient temperature	Operation:	0 ... +55 °C in row, without spacing 0 ... +65 °C with spacing ≥ 6 mm
	Storage:	–25 ... +85 °C
Ambient conditions		Stationary application, weather-protected relative air humidity: 5 ... 95 %, no condensation barometric pressure: 70 ... 106 KPa water or wind-driven rain, snow, or hail excluded
Design		Modular housing with screw terminals, width 6.2 mm, see dimension drawings for further measurements and conductor cross section
Ingress protection		Terminal IP 20, housing IP 40
Mounting		For 35 mm top hat rail to EN 50022
Weight		Approx. 60 g

Application Examples



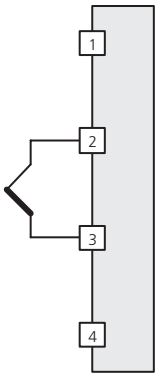
Connection of Resistance Thermometers



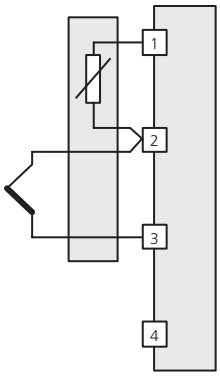
Application Examples *(continued)*

Connection of Thermocouples

Thermocouple with internal reference junction compensation

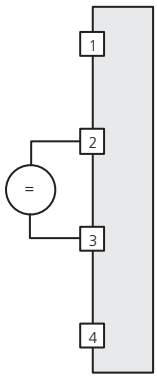


Thermocouple with external reference junction compensation

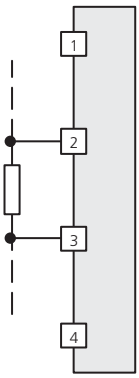


Voltage Input

Voltage measurement



Current measurement with shunt resistor



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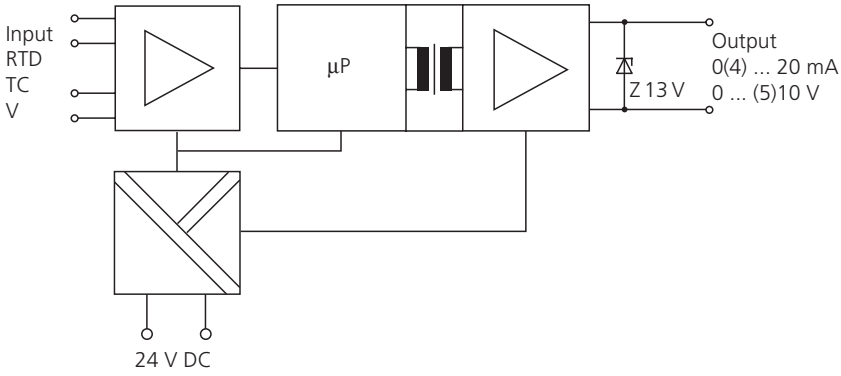
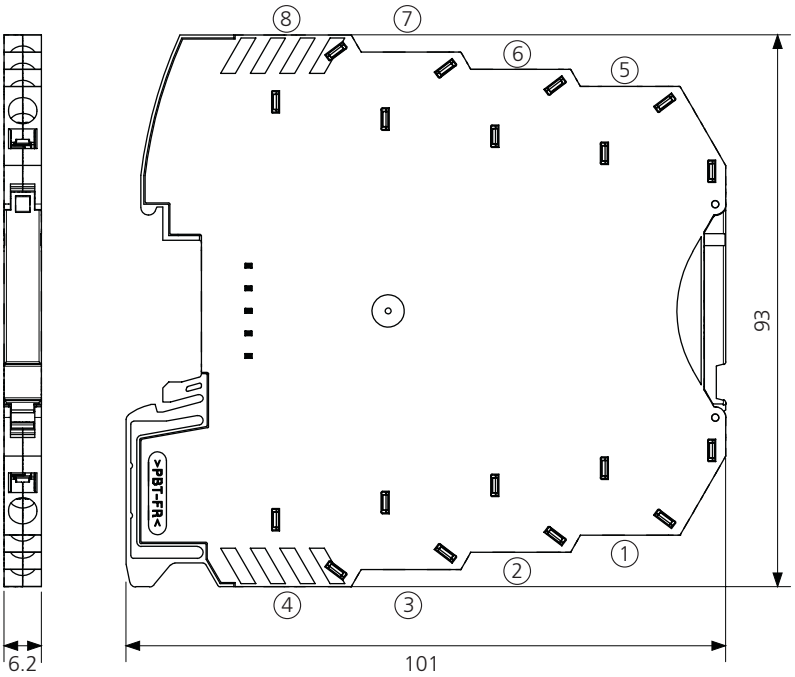
Block Diagram



Dimension Drawings and Terminal Assignments



1	Input	+
2	Input	+
3	Input	–
4	Input	–
5	Output	+
6	Output	–
7	Power supply	+
8	Power supply	–

Conductor cross-sections:
– SIngle-wire 0.2 ... 2.5 mm^2
– Fine-wire 0.2 ... 2.5 mm^2
– 24-14 AWG

All dimensions in mm!

Error Signaling

No.	Error	Message configuration[1]	Output			
			4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	–	–	–	–
1	Value below range	Not self-locking	3.6	0	0	0
2	Value above range	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Not self-locking	21	21	5.25	10.5
4	Sensor open	Not self-locking	21	21	5.25	10.5
5	–	–	–	–	–	–
6	Output load error	Not self-locking	3.6	0	0	0
7	Identification of connection	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Not self-locking	21	21	5.25	10.5
9	Parameter error	Not self-locking	21	21	5.25	10.5
10	Device error	Self-locking	3.6	0	0	0

1) With the "self-locking" configuration, the error signal is maintained after termination of the error cause. The error message can be reset by restart (power supply on/off).

Output Current (4 ... 20 mA) Response to Out-Of-Range Conditions