

Modular Housings

Knick ➤

Universal transmitters for temperature measurement with resistance thermometers and thermocouples – in a 6-mm housing with infrared interface, SIL approval, and broad-range power supply.



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 accuracy, flexibility, and functional safety as well as 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 universal ThermoTrans® P 32100 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 switches or via an IrDA® port. The broad-range power supply covers all common supply voltages from 24 to 230 V and ensures maximum safety even with unstable mains supplies. 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® P 32100 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. All commercial 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.

ThermoTrans® P 32100

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.

Knick offers the ThermoTrans® P 32100 transmitters with SIL approval for applications with high demands on functional safety. The requirements of EN 61508 were implemented by a specially developed hardware and software. The fail-safe concept makes use of structural measures at the device level (redundancy of system components) and diagnostic methods for selective fault detection. The product is SIL 2 approved (EN 61508) by an authorized body (TÜV Rheinland).



Temperature Transmitters

Isolation Amplifiers Transmitters	Indicators	Process Analytics	Portable Meters	Laboratory Meters	Sensors	Fittings
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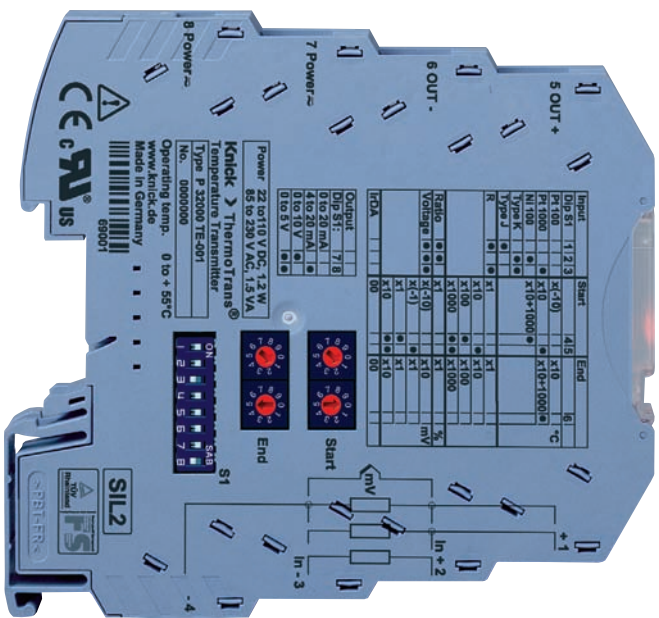
Operating Software

The user-friendly, menu-guided Paraly® SW 111 communication software runs on standard and pocket PCs and opens a number of further options – such as access to further sensor types, input of customer-specific linearization curves, readout of the connection configuration, as well as the use of extensive diagnostic functions. Configuration, documentation and, if necessary, maintenance of entire plant components can be accomplished by “infrared remote control”. Moreover, the output current or voltage can be specified independently of the input value using the simulation function – a useful feature for plant commissioning or revision.

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.

IrDA® is a registered trademark of the Infrared Data Association.



Warranty
5 years!

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

Modular Housings

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ThermoTrans® P 32100

■ The Facts

Universal usability

from simple to challenging measurement demands with all known temperature sensors

Convenient parameter setting

via IrDA® port – uncomplicated, menu-guided adjustment also “on site” including archiving of configuration data

Intuitive configuration of basic parameters – easy, without tools, using 4 rotary and 8 DIP switches

Calibrated range selection

without complicated adjustments

World-wide usability due to broad-range power supply 24 ... 110 V DC ($\pm 20\%$) and 110 ... 230 V AC ($\pm 10\%$)

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

Functional safety

up to SIL 2 (up to SIL 3 in the case of redundant configuration) with TÜV certificate – systematically developed according to EN 61508

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 (in the case of 24 V DC supply)

5-year warranty

■ Product Line

Temperature transmitter, adjustable

ThermoTrans® P 32100

Functional safety (EN 61508)

Power supply

Order No.	P 32100 P0 /	<input type="checkbox"/>	<input type="checkbox"/>
Without SIL 2 (up to SIL 3 in the case of redundant configuration)		0	
		1	
Broad-range power supply 24 ... 110 V DC, 110 ... 230 V AC via screw terminals only, 24 V DC via screw terminals or DIN rail bus connector		1	
		0	

Temperature Transmitters

Isolation Amplifiers Transmitters	Indicators	Process Analytics	Portable Meters	Laboratory Meters	Sensors	Fittings
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Product Line (continued)

Temperature transmitter,
with fixed settings

ThermoTrans® P 32100	Order No.	P 32100 P0 /	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Functional safety (EN 61508)	Without	0																	
	SIL 2 (up to SIL 3 in the case of redundant configuration)	1																	
Power supply	Broad-range power supply																		
	24 ... 110 V DC, 110 ... 230 V AC	1																	
	24 V DC via screw terminals	0																	
	or DIN rail bus connector																		
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 comp. (Pt100)			X															
	TC / K (–200 ... +1372 °C), external reference comp. (Pt100)			Y															
	U (–1000 mV ... +1000 mV)			U															
	Other			S															
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					
Further customer-specific settings (e. g. other thermocouple)	Without																		
	As specified														n	n	n	n	
Example for fixed-setting model:	SIL 2, broad-range power supply, Pt1000 / –50 °C ... +150 °C / 4 ... 20 mA																		
	Order no.	P 32100 P0 /	1	1	Q	–	0	0	5	0	+	0	1	5	0	B			

Modular Housings

ThermoTrans® P 32100

Accessories		Order No.
Paraly® SW 111	Communication software	SW 111
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
	Other platinum resistors	DIN 60751	–200 ... +850 °C
	Ni 100	DIN 43760	–60 ... +180 °C
	Other nickel resistors	DIN 43760	–60 ... +180 °C
Connection	2-, 3-, or 4-wire (automatic recognition), signaling via yellow LED		
Resistance range incl. line resistance	0 ... 5 kohms		
Max. line resistance	100 ohms		
Supply current	200 µA, 400 µA, or 0 ... 500 µA		
Line monitoring	Open circuit monitoring		
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)		

Temperature Transmitters

Isolation Amplifiers
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Indicators

Process Analytics

Portable Meters

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Specifications (continued)

Thermocouples

Input data

	Sensor type	Standard	Measurement range
Input	Type B	DIN 60584-1	+250 ... +1820 °C
	Type E	DIN 60584-1	−200 ... +1000 °C
	Type J	DIN 60584-1	−210 ... +1200 °C
	Type K	DIN 60584-1	−200 ... +1372 °C
	Type L	DIN 43710	−200 ... +900 °C
	Type N	DIN 60584-1	−200 ... +1300 °C
	Type R	DIN 60584-1	−50 ... +1767 °C
	Type S	DIN 60584-1	−50 ... +1767 °C
	Type T	DIN 60584-1	−200 ... +400 °C
	Type U	DIN 43710	−200 ... +600 °C
	W3Re/W25Re	ASTM E988-96	0 ... +2315 °C
	W5Re/W26Re	ASTM E988-96	0 ... +2315 °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) Selectable via IrDA®: 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 ... 80 °C		

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		

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Specifications (continued)

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 ... $\approx 102.5\%$ span with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output -1.25 ... $\approx 102.5\%$ span with 4 ... 20 mA output	
Resolution	16 bits	
Simulation mode adjustable via IrDA®	0 ... 20 mA current output: 4 ... 20 mA current output: 0 ... 5 V voltage output: 0 ... 10 V voltage output:	0 ... 21 mA 3 ... 21 mA 0 ... 5.25 V 0 ... 10.5 V
Load	Current output: Voltage output:	$\leq 10\text{ V}$ ($\leq 500\text{ ohms}$ at 20 mA) $\leq 1\text{ mA}$ ($\geq 10\text{ kohms}$ at 10 V)
Output error limits	Current output: Voltage output:	$\pm(10\text{ }\mu\text{A} + 0.05\% \text{ meas. val.})$ $\pm(5\text{ mV} + 0.05\% \text{ meas. val.})$
Residual ripple	$< 10\text{ mV}_{\text{rms}}$	
Temperature coefficient at output	$< 50\text{ ppm/K}$ full scale (average TC in permitted operating temp range, reference temp 23 °C)	
Error signaling	0 ... 20 mA output: $I = 0\text{ mA}$ or $\geq 21\text{ mA}$ 4 ... 20 mA output: $I \leq 3.6\text{ mA}$ or $\geq 21\text{ mA}$ 0 ... 5 V or 0 ... 10 V output: $V = 0\text{ V}$ or $V \geq 5.25\text{ V}$ or $V \geq 10.5\text{ V}$ via output signal, red LED, and IrDA® for out-of-range conditions, faulty settings, sensor short circuit or open circuit, output load error, unintentional adjustment of switches during operation (for SIL devices only), other device errors. Also see "Error Signaling" Page 161.	

Transmission behavior

Characteristic	Linear rising / falling, curves defined by sampling points (via IrDA® port)
Meas. rate	Approx. 3/s *)

Display

Green LED	Power supply
Yellow LED	Connection type signalling of IrDA® communication
Red LED	Maintenance request or device failure

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

Temperature Transmitters

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Specifications (continued)

Power supply

Power supply

24 V DC power supply unit

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.

Broad-range power supply unit

24 V ... 110 V DC (± 20 %), approx. 1.2 W
110 V ... 230 V AC (± 10 %),
48 ... 62 Hz, approx. 1.5 VA

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

Functional safety

SIL 2 to EN 61508, SIL 3 with redundant configuration

Explosion protection

ATEX Zone 2 (EN 60079-15)
Class 1, Div 2 / Zone 2 (UL 1604)

EMC

Product family standard: EN 61326
Emitted interference: Class B
Immunity to interference¹⁾: Industry
EMC-requirements for devices with safety-related functions
IEC 61326-3: draft

cURus

File No. 220033
Standards: UL 508 and CAN/CSA 22.2 no. 14-95

Interfaces

IrDA®

Specification 1.1, slave device for bidirectional communication
Paraly® SW 111 communication software
Free download at www.knick.de

¹⁾ Slight deviations are possible while there is interference

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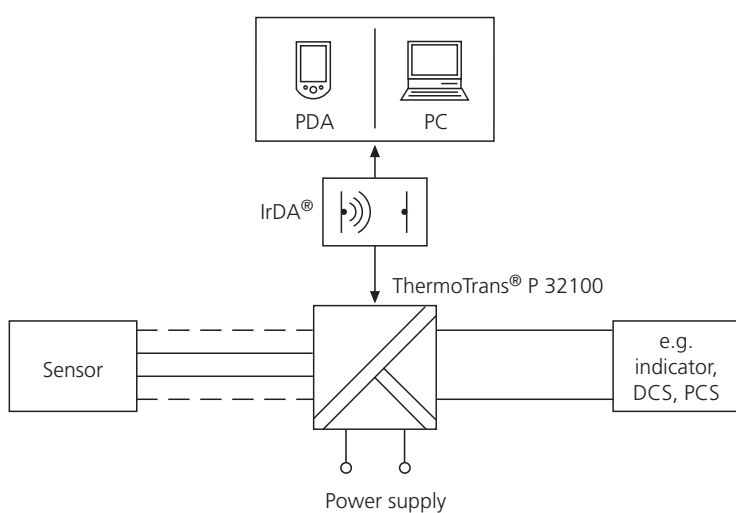
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Specifications (continued)

Other data

Ambient temperature	Operation: 0 ... +55 °C in row, without spacing 0 ... +65 °C with spacing \geq 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

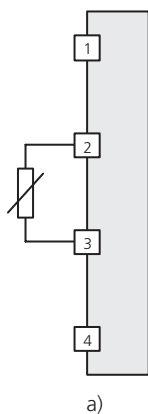
■ Application Examples



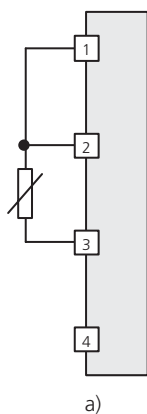
Application Examples (continued)

Connection of Resistance Thermometers

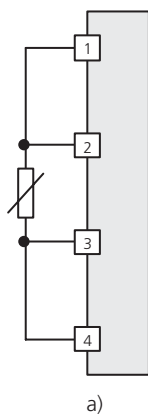
RTD / 2-wire connection



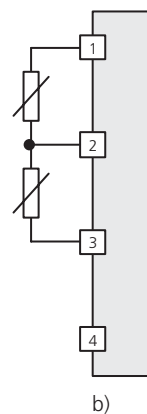
RTD / 3-wire connection



RTD / 4-wire connection

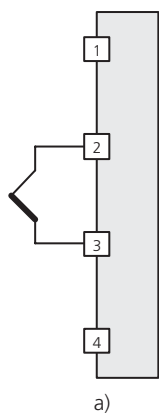


RTD / differential measurement

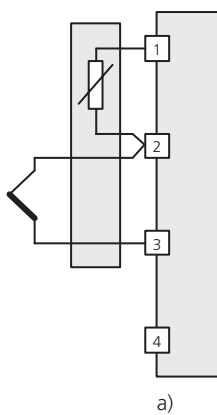


Connection of Thermocouples

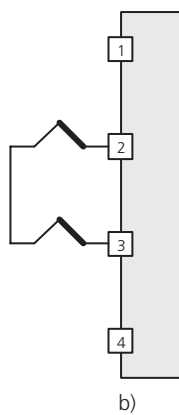
Thermocouple with internal reference junction compensation



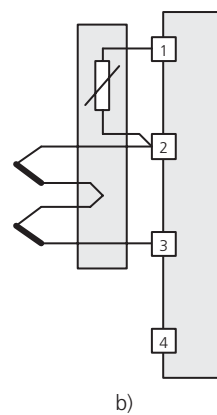
Thermocouple with external reference junction compensation



Thermocouples for differential measurement

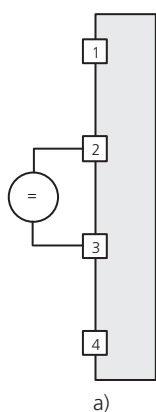


Thermocouples in summing configuration (averaging), external reference junction compensation

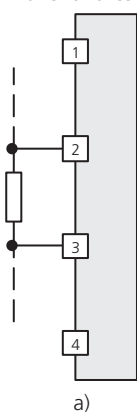


Voltage Input

Voltage measurement



Current measurement with shunt resistor



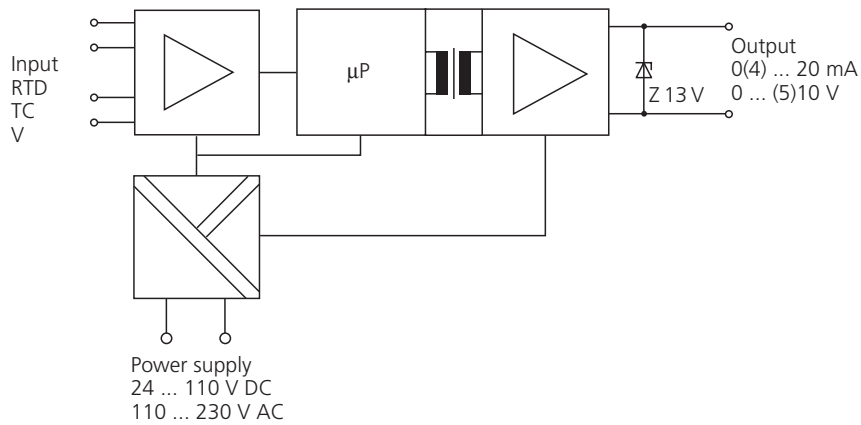
a) Selectable via DIP switches or IrDA® port

b) Special configuration selectable via IrDA®

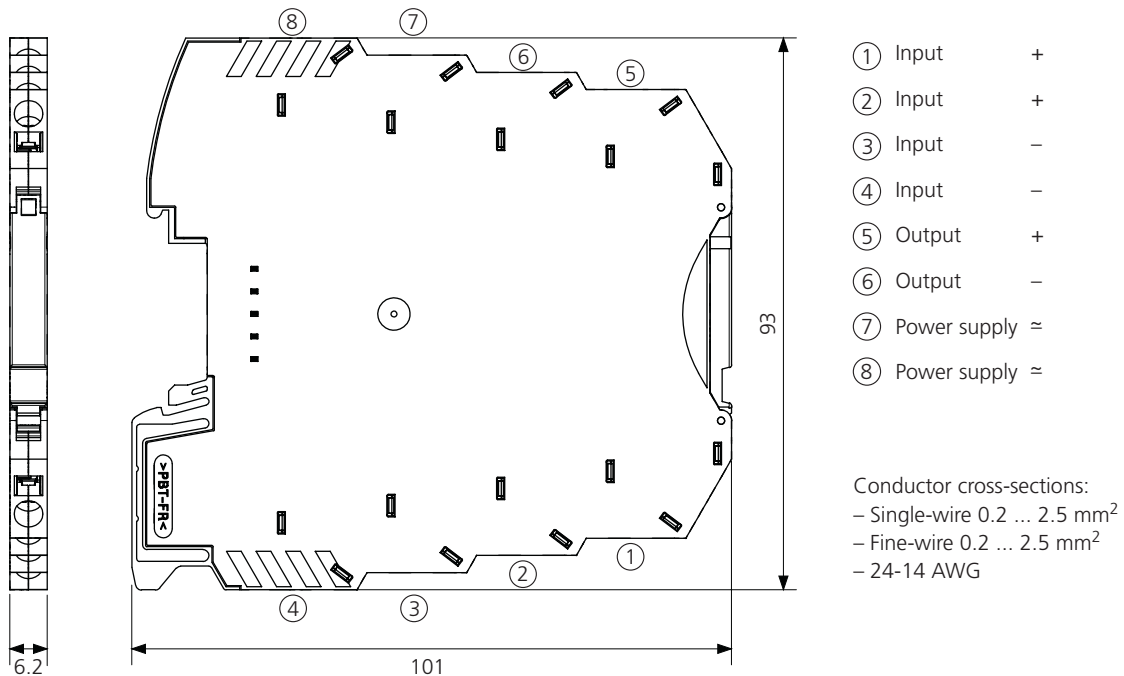
Modular Housings

ThermoTrans® P 32100

■ Block Diagram



■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

Error Signaling

No.	Error	Message configuration ²⁾		Output			
		With SIL	Without SIL	4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	Not self-locking	—	—	—	—
1	Value below range	Not self-locking	Not self-locking	3.6	0	0	0
2	Value above range	Not self-locking	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Self-locking	Not self-locking	21	21	5.25	10.5
4	Sensor open	Self-locking	Not self-locking	21	21	5.25	10.5
5	—	—	—	—	—	—	—
6	Load output error ³⁾	Not self-locking	Not self-locking	3.6	0	0	0
7	Identification of connection	Self-locking	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Self-locking	Not self-locking	21	21	5.25	10.5
9	Parameter error	Self-locking	Not self-locking	21	21	5.25	10.5
10	Device error (subordinated error number distinguished via IrDA [®] port)	Self-locking	Self-locking	3.6	0	0	0

2) 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 or via IrDA[®] port).

3) With SIL models P 32100 P0/1x only

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

