Modular Housings

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PolyTrans® P 32000

Universal transmitter for temperature, strain gages, and potentiometers – in a 6-mm housing with infrared interface, SIL approval, and broad-range power supply.

The Task

Temperature, strain or force, and position are parameters which must be measured in virtually all areas of industry. They are often used as reference input for control or 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. These sensors provide a raw signal which is prepared, linearized if required, and standardized for further processing using a transmitter.

The Problem

There is a very wide range of standardized and commercial sensors for the detection of temperature, strain or force, and position. The large number of sensors, connection variants, individual measurement 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.
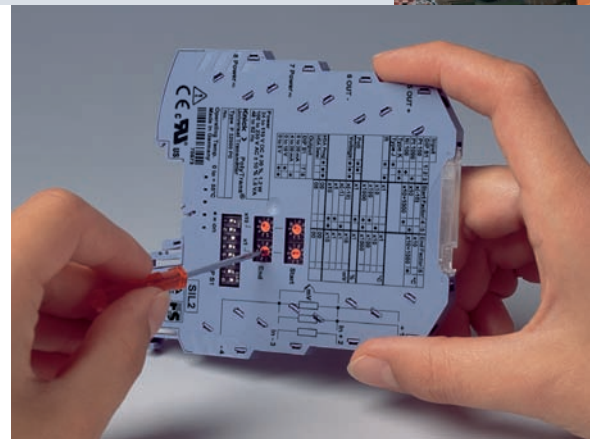
The Solution

The PolyTrans® P 32000 universal transmitters provide connection possibilities for all standard thermocouples, resistance thermometers, strain gage full bridges, resistors, and potentiometers/resistive sensors. 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 PolyTrans® P 32000 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.

To detect mechanical quantities such as force or strain, strain gages can be connected in full-bridge configuration. The possibility for connecting resistive sen-

sors and potentiometers creates a wide range of application possibilities, for example, in the field of path or position measurement.

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.

Knick offers the PolyTrans® P 32000 transmitters with SIL approval for applications with high demands on functional safety. The requirements of EN 61508 were implemented by a specially developed hardware
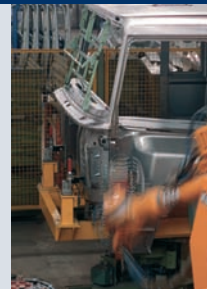
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and software. The fail-safe concept makes use of structural measures at the device level (redundancy of system components) and diagnostic methods for selective fault detection. The product is SIL 2 approved (EN 61508) by an authorized body (TÜV Rheinland).

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).

SIL 2
IEC 61508

SIL 2
IEC 61508/
IEC 61511 *
* gemäß 11.4

6mm CLASS

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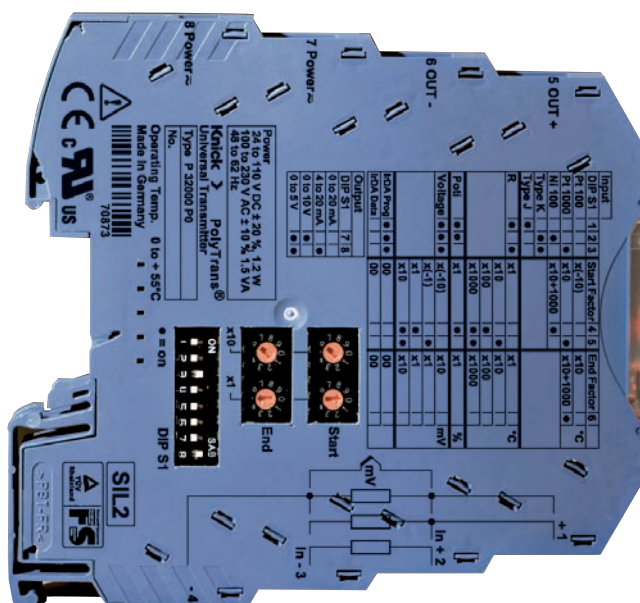
PolyTrans® P 32000

■ The Facts

Universal usability
from simple to challenging
measurement demands with all
known temperature sensors,
strain gage sensors, potentio-
meters, and similar 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

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

Simulation of any desired out-
put values for correct installation/
commissioning

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

Safe Isolation according to
EN 61140 – protection of main-
tenance 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 redun-
dant configuration) with TÜV

certificate – systematically devel-
oped according to EN 61508

High accuracy
due to innovative circuit design

Reduced stockkeeping
One transmitter covers all
conceivable tasks

Minimum space consumption
in the enclosure: only 6 mm wide
modular housing – more trans-
mitters 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

Universal transmitter, adjustable

PolyTrans® P 32000	Order No.	P 32000 P0 / ☐ ☐
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 via screw terminals only,	1
	24 V DC via screw terminals or DIN rail bus connector	0

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

Universal Transmitters

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■ Specifications

Resistance/Resistance Thermometers

Input data	Sensor type	Standard	Measurement range
Input [1]	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 ranges incl. line resistance	Temperature measurement: 0 ... 5 kohms Resistance measurement: 0 ... 5 kohms or 5 ... 100 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 [2]	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

1) Other sensor types with resistance values up to 5 kohms on request
2) Other thermocouple types on request

PolyTrans® P 32000

Specifications *(continued)*

Thermocouples *(continued)*
Input data

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

Strain gage input data

Input	±7.5 mV/V
Bridge resistance	200 ohms ... 10 kohms
Zero adjustment	Within input range
Supply current (int. supply)	0 ... 5 mA
Supply voltage (ext. supply)	1 ... 3 V
Line monitoring	Short circuit or open circuit
Input error limits	± (2 µV/V +0.1 % meas. val.) for spans ≥ 0.5 mV/V
Temperature coefficient at input	< 50 ppm/K of adjusted sensitivity (average TC in permitted operating temp range, reference temp 23 °C)
Overload	5 V across all inputs

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Specifications *(continued)*

Potentiometers
Input data

Input	200 ohms ... 50 kohms
Connection	3- or 4-wire
Supply current	0 ... 5 mA
Line monitoring	Short circuit or open circuit
Input error limits	±(0.2 % full scale + 0.05 % meas. val.) for spans > 5 %
Temperature coefficient at input	< 50 ppm/K of adjusted end value (average TC in permitted operating temp range, reference temp 23 °C)

Output data

Outputs	0 ... 20 mA, Calibrated selection 4 ... 20 mA, (factory setting 4 ... 20 mA) 0 ... 5 V, 0 ... 10 V
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
Simulation mode adjustable via IrDA®	0 ... 20 mA current output: 0 ... 21 mA 4 ... 20 mA current output: 3 ... 21 mA 0 ... 5 V voltage output: 0 ... 5.25 V 0 ... 10 V voltage output: 0 ... 10.5 V
Load	Current output: ≤ 10 V (≤ 500 ohms at 20 mA) Voltage output: ≤ 1 mA (≥ 10 kohms at 10 V)
Output error limits	Current output: ±(10 µA + 0.05 % meas. val.) Voltage output: ±(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, 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 149.

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PolyTrans® P 32000

Specifications *(continued)*

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	Signaling the connection type IrDA® communication
Red LED	Maintenance request or device failure

Power supply

Power supply	24 V DC power supply unit	Broad-range power supply unit
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.	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)

*) For thermocouples with exernal reference junction compensation or for resistance measurements in the range 5 kohms ... 100 kohms: measuring rate 2/s.

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Isolation Amplifiers Transmitters | Indicators | Process Analytics | Portable Meters | Laboratory Meters | Sensors | Fittings

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Specifications *(continued)*

Standards and approvals *(continued)*

EMC	Product family standard: EN 61326
	Emitted interference: Class B
	Immunity to interference[3]: 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

Other data

Ambient temperature	Operation: 0 ... +55 °C in row, without spacing
	0 ... +65 °C with spacing ≥ 6 mm
	Storage: −25 to +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

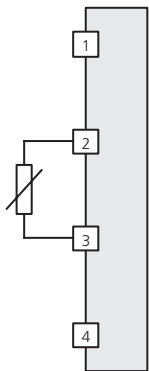3) Slight deviations are possible while there is interference

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PolyTrans® P 32000

■ **Application Examples**

PDA | PC

IrDA®

PolyTrans® P 32000

Sensor

e.g. indicators, DCS, PCS

Power supply
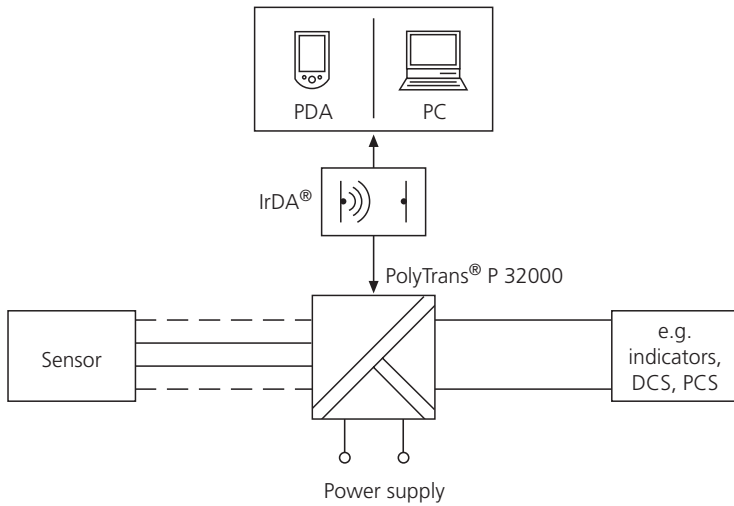
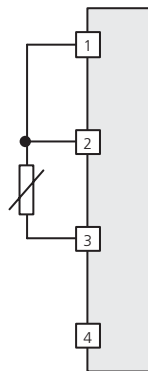**Connection of Resistance Thermometers**

RTD
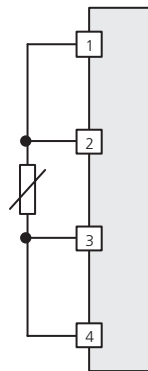2-wire connection

RTD
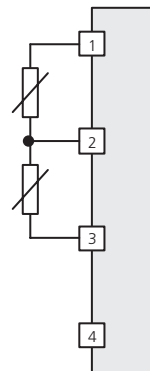3-wire connection

RTD
4-wire connection

RTD
differential measurement

a)   a)   a)   b)
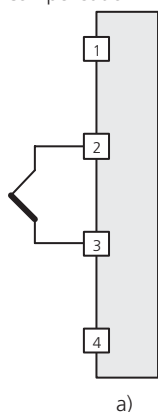
a) Selectable via DIP switches or IrDA® port
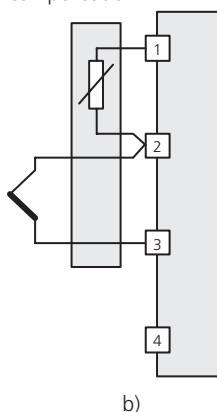b) Special configuration selectable via IrDA®

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Application Examples *(continued)*

Connection of Thermocouples
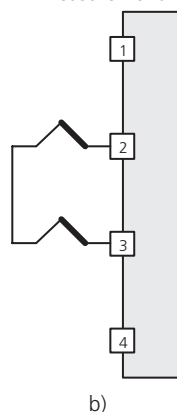
Thermocouple with internal reference junction compensation
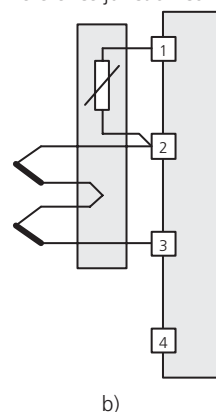
Thermocouple with external reference junction compensation
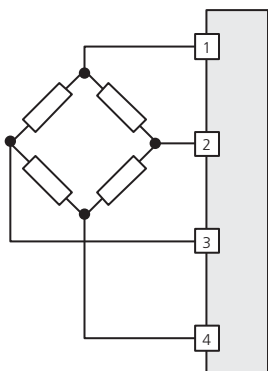
Thermocouples for differential measurement

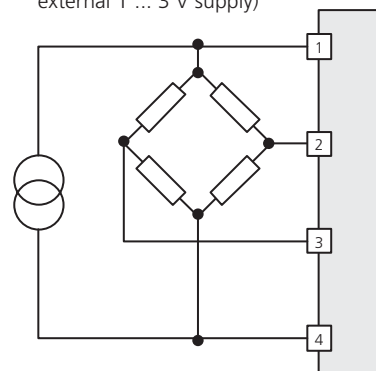Thermocouples in summing configuration (averaging), external reference junction compensation

a)

b)

b)

b)

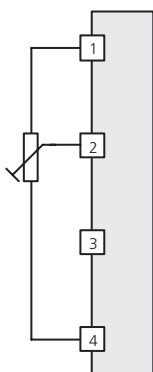### Connection of Strain Gages

4-wire connection

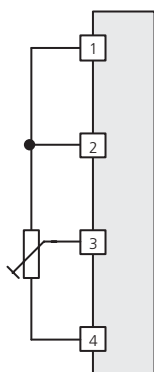6-wire connection (with external 1 ... 3 V supply)

a)

b)

Connection of Potentiometers
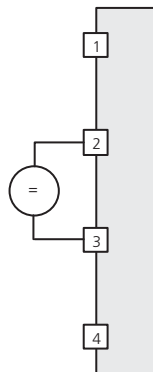
3-wire connection
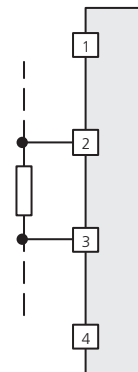
4-wire connection

Voltage Input

Voltage measurement

Current measurement with shunt resistor

a)

b)

a)

a)

a) Selectable via DIP switches or IrDA® port

b) Special configuration selectable via IrDA®

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■ Block Diagram

Input
RTD, TC,
R, V,
strain gage

μP

Z 13 V

Output
0(4) ... 20 mA
0 ... (5)10 V

Power supply
24 ... 110 V DC
110 ... 230 V AC
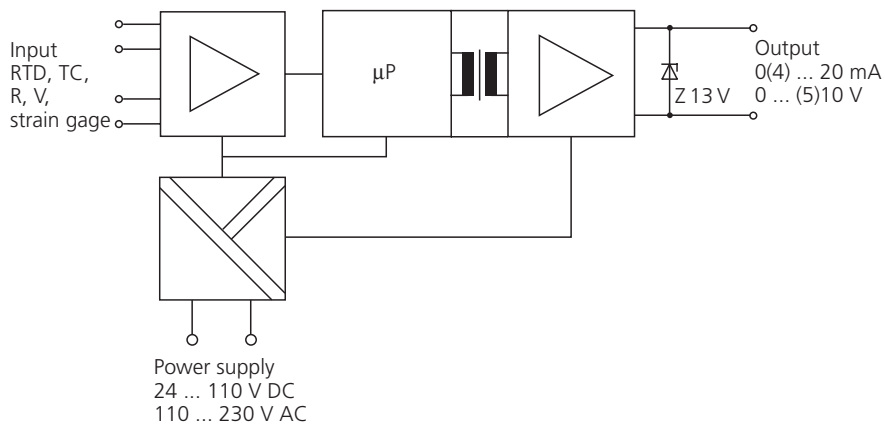
■ Dimension Drawings and Terminal Assignments

① Input   +

② Input   +

③ Input   –

④ Input   –

⑤ Output   +

⑥ Output   –

⑦ Power supply ≃

⑧ Power supply ≃

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

93

6.2

101

>PBT-FR<

All dimensions in mm!

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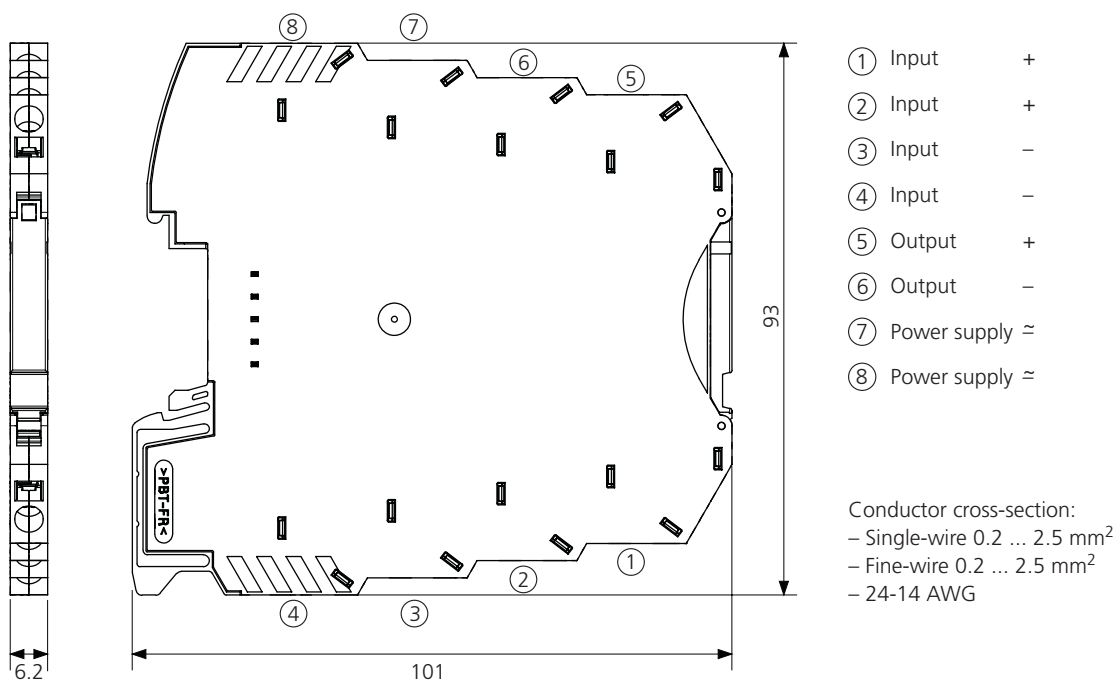
■ Error Signaling

No.	Error	Message configuration [4]		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	Basic resistance invalid [5]	Self-locking	Not self-locking	21	21	5.25	10.5
6	Load output error [6]	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

4) 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).
5) With potentiometer or strain gage only
6) With SIL models P 32000 P0/1x only

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

Output / mA

21.0
20.5

3.8
3.6

Input