

# Universal Transmitters

## PolyTrans P 32000

Universal transmitter for temperature, strain gauges 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. As a rule, high 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 temperature ranges, different supply voltages, and required output signals call for very flexible 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. In addition, this high level of performance should not result in increased susceptibility – high reliability and availability are essential.

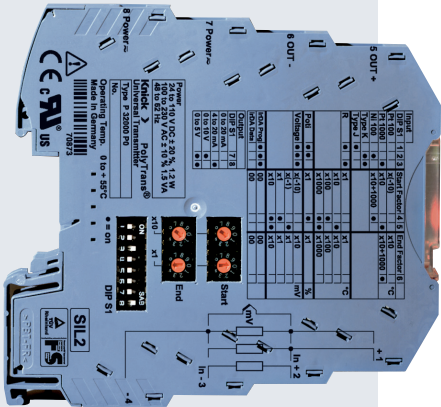
### The Solution

The PolyTrans P 32000 universal transmitters provide connection possibilities for all standard thermocouples, resistance thermometers, strain gauge full bridges, resistors and potentiometers/resistive sensors. They can be flexibly adapted to the respective measuring task using DIP and rotary encoder switches or via an IrDA interface.

The broad-range power supply covers all common supply voltages from 110 to 230 V and ensures maximum safety even with unstable power grids. 3-port isolation with protective separation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measuring signals. The PolyTrans P 32000 offer maximum performance in the smallest of spaces. Resistance thermometers can be operated in 2-, 3- or 4-wire configuration. The connection configuration 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 gauges can be connected in full-bridge configuration. The possibility of connecting variable resistors and potentiometers creates a wide range of application possibilities, e.g. in the field of displacement or position detection. Input voltage signals up to  $\pm 1000$  mV are converted into standard 0/4 to 20 mA or 0 to 10 V signals. This enables low-cost implementation of current measurements using shunt resistors, for example.

Knick offers the PolyTrans P 32000 transmitter with SIL approval for applications with high demands on functional safety. The requirements of EN 61508 were implemented through specially developed hardware and software. The implemented 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).





### The 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, and the use of extensive diagnostic functions. Configuration, documentation and, if necessary, maintenance of entire plant components can thus 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 for high component densities. 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.



### The Facts

- **Universal usability**  
from simple to challenging measurement demands with all known temperature sensors, strain gauge sensors, potentiometers 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 detection**  
of the sensor connection (2-, 3- or 4-wire)
- **Simulation**  
of any desired output values for correct installation/commissioning
- **Worldwide usability**  
Broad-range power supply 110 ... 230 V AC ( $\pm 10\%$ )
- **Protective separation**  
according to EN 61140 – protection of the maintenance staff and subsequent devices against excessively 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
- **Reduced inventory**  
One transmitter covers all conceivable tasks
- **Minimum space consumption**  
in the enclosure – only 6 mm wide modular housing – more transmitters per meter of mounting rail
- **Low-cost installation**  
Quick mounting, convenient connection of the power supply through DIN rail bus connectors (in the case of 24 V DC supply)
- **5-year warranty**

**Warranty**  
**5 years!**

Warranty  
Defects occurring within 5 years from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender).

# Universal Transmitters

## PolyTrans P 32000

### Product Line

#### PolyTrans P 32000, adjustable

Order No.	P 32000 P0 /	<input type="checkbox"/>	<input type="checkbox"/>
Functional safety (EN 61508)	Without SIL 2 (up to SIL 3 in the case of redundant configuration)	0	1
Power supply	Broad-range power supply 110 ... 230 V AC only via screw terminals 24 V DC via screw terminals or DIN rail bus connector	2	0

#### Accessories

	Order No.	
Paraly SW 111	Communication software	SW 111
ZU 0628 DIN-rail bus connector	Power supply bridging for two isolators, resp., A 20XXX P0 or P 32XXX P0	ZU 0628
IsoPower A 20900	Power supply unit 24 V DC, 1 A	A 20900 H4
ZU 0678 DIN rail bus connector	Tapping of supply voltage (A 20900), routing to ZU 0628 DIN rail bus connector	ZU 0678
ZU 0677 power terminal block	For connecting the 24 V DC supply voltage to the ZU 0628 DIN rail bus connector	ZU 0677

### Specifications

#### Resistance/Resistance Thermometers

Input data	Sensor type	Standard	Range
Input <sup>1)</sup>	Pt100	DIN 60751	-200 ... +850 °C
	Pt1000	DIN 60751	-200 ... +850 °C
	other platinum resistors	DIN 60751	-200 ... +850 °C
	Ni100	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	For temperature measurement: 0 ... 5 kohms For resistance measurement: 0 ... 5 kohms or 5 ... 100 kohms <sup>4)</sup>		
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 ohm +0.2 % meas. val.) for spans >50 ohms		
Temperature coefficient at the input	< 50 ppm/K of adjusted end value (average TC within allowable operating temp range, reference temp 23 °C)		

**Specifications (continued)**

**Thermocouples**

**Input data**

Input data	Sensor type	Standard	Range
Input <sup>2)</sup>	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 the input

< 50 ppm/K of adjusted end value  
(average TC within allowable operating temp range, reference temp 23 °C)

Reference junction compensation

Internal  
selectable via IrDA: external (Pt100), fixed value or uncompensated

Internal reference junction compensation error

< 1.5 K

External reference junction compensation error

< 80 mohms + 0.1 % meas. val. via Pt100 for T<sub>comp</sub> = 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 the input

< 50 ppm/K of adjusted end value  
(average TC within allowable operating temp range, reference temp 23 °C)

Overload capacity

5 V across all inputs

# Universal Transmitters

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### Specifications (continued)

#### Strain gauge input data

Input	$\pm 7.5$ mV/V
Bridge resistance	200 ohms ... 10 kohms
Zero compensation	Within the 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	$\pm (2 \mu\text{V/V} + 0.1 \% \text{ meas.val.})$ for spans $\geq 0.5$ mV/V
Temperature coefficient at the input	$< 50$ ppm/K of adjusted sensitivity (average TC in allowable operating temp range, reference temp 23 °C)
Overload capacity	5 V across all inputs

#### Potentiometer

##### 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	$\pm (0.2 \% \text{ full scale} + 0.05 \% \text{ meas.val.})$ for spans $> 5 \%$
Temperature coefficient at the input	$< 50$ ppm/K of adjusted sensitivity (average TC in allowable operating temp range, reference temp 23 °C)

##### Output data

Outputs	0 ... 20 mA, calibrated switching 4 ... 20 mA, (default setting 4 ... 20 mA) 0 ... 5 V, 0 ... 10 V
Control range	0 ... approx. 102.5 % of span at 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output -1.25 ... approx. 102.5 % of span at 4 ... 20 mA output
Resolution	16 bit
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 mA 0 ... 10 V voltage output: 0 ... 10.5 V

**Specifications (continued)**

**Output data (continued)**

Load	Current output: $\leq 10\text{ V}$ ( $\leq 500\text{ ohms}$ at 20 mA) Voltage output: $\leq 1\text{ mA}$ ( $\geq 10\text{ kohms}$ at 10 V)
Output error limits	Current output: $\pm (10\text{ }\mu\text{A} + 0.05\% \text{ meas. val.})$ Voltage output: $\pm (5\text{ mV} + 0.2\% \text{ meas. val.})$
Residual ripple	$< 10\text{ mV}_{\text{rms}}$
Temperature coefficient at the output	$< 50\text{ ppm/K}$ full scale (average TC in allowable operating temperature range, reference temperature 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, incorrect parameter setting, sensor short circuit and line break, output load error, accidental changing of the switch settings during operation (only for SIL devices), other device errors. See also "Error Signaling".

**Transmission behavior**

Characteristic	Rising / falling linearly; configurable characteristic curves using interpolation points (via IrDA port)
Measuring 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**

24 V DC power supply	Broad-range 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.	110 V ... 230 V AC ( $\pm 10\%$ ), 48 .. 62 Hz, approx. 1.5 VA

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### Specifications (continued)

#### 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, ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

Protection against electric shock

Protective separation according to EN 61140 by reinforced insulation according to 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, ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

#### Standards and approvals

Functional safety

SIL 2 according to IEC 61508, SIL 3 with redundant configuration

KTA approval

KTA3507 (special version)

EMC

Product family standard: EN 61326

Emitted interference: Class B

Immunity to interference<sup>1)</sup>: 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](http://www.knick.de)

**Specifications (continued)**

**Further data**

Ambient temperature

Operation: 0 ... +55 °C mounted without gaps  
0 ... +65 °C with gaps  $\geq$  6 mm  
Storage: -25 ... +85 °C

Ambient conditions

Stationary operation, weatherproof  
Relative humidity: 5 ... 95 %, no condensation  
Barometric pressure: 70 ... 106 kPa  
Water or wind-driven precipitation (rain, snow, hail, etc.) excluded

Design

Modular housing with screw terminals, 6.2 mm wide  
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 (EN 50022)

Weight

Approx. 60 g

<sup>1)</sup> Other sensor types with resistance values up to 5 kohms on request

<sup>2)</sup> Additional thermocouple types on request

<sup>3)</sup> Slight deviations are possible while there is interference

<sup>4)</sup> 3- or 4-wire connection only

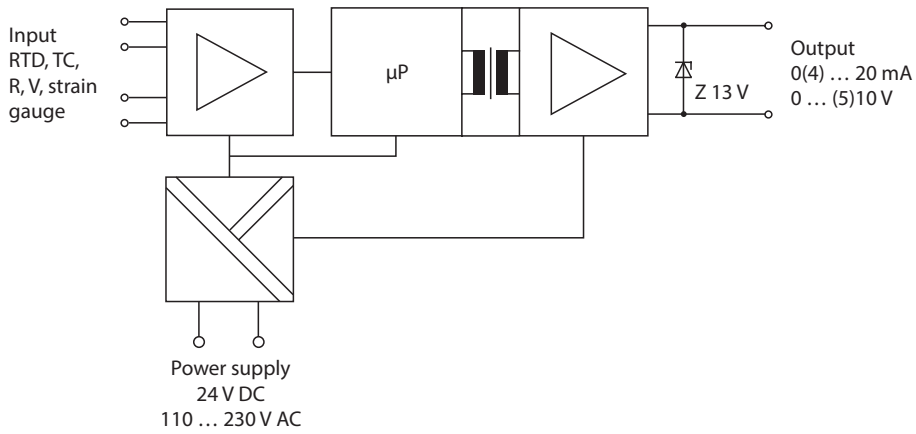
<sup>\*)</sup> For thermocouples with external reference junction compensation or for resistance measurements in the range of 5 kohms ... 100 kohms: measuring rate 2/s.



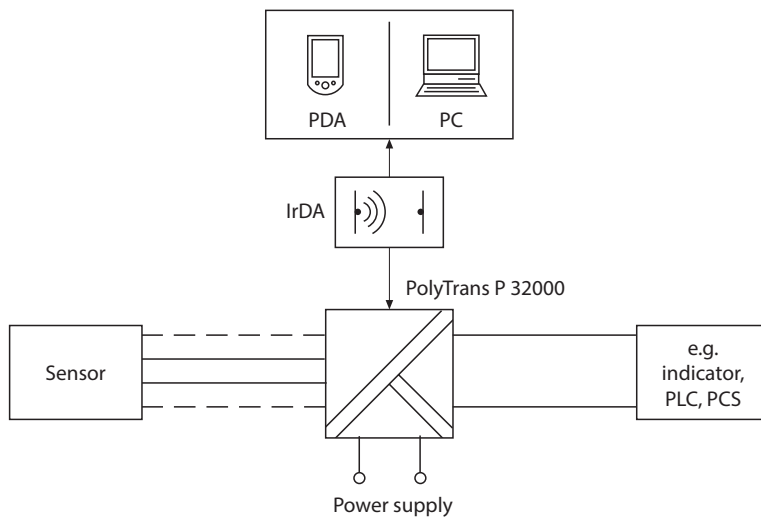
# Universal Transmitters

## PolyTrans P 32000

### Block Diagram

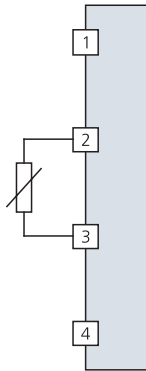


### Typical Applications



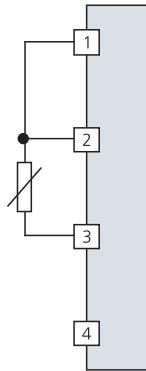
**Connection of Resistance Thermometers**

RTD  
2-wire configuration



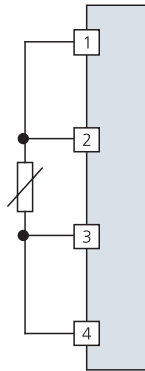
a)

RTD  
3-wire configuration



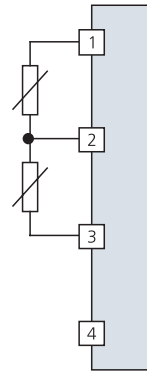
a)

RTD  
4-wire configuration



a)

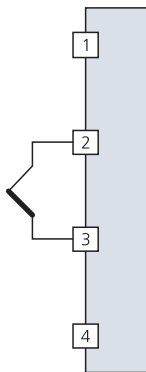
RTD  
differential measurement



b)

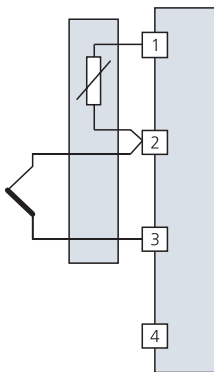
**Connection of Thermocouples**

Thermocouple with  
internal reference  
junction compensation



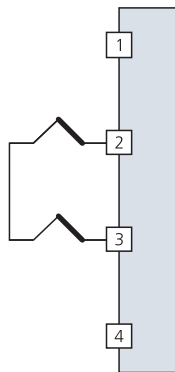
a)

Thermocouple with  
external reference  
junction compensation



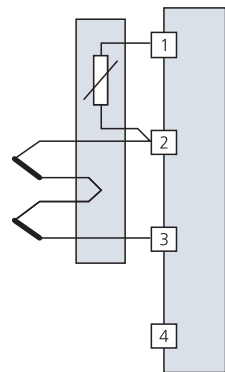
b)

Thermocouples for  
differential measurement



b)

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



b)

- a) Selectable via DIP switches and IrDA port
- b) Special configuration selectable via IrDA port

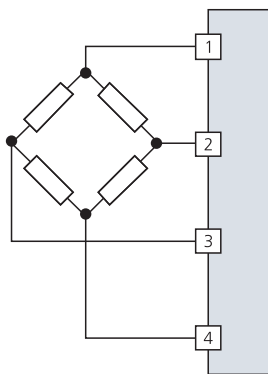
# Universal Transmitters

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### Typical Applications (continued)

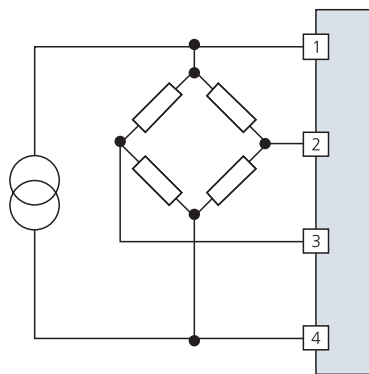
#### Connection of Strain Gauges

4-wire connection



a)

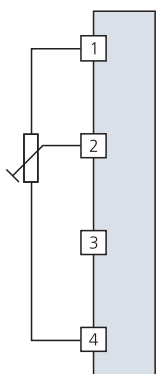
6-wire connection  
(with external supply 1 ... 3 V)



b)

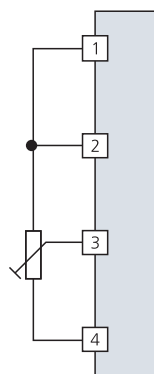
#### Connection of Potentiometers

3-wire connection



a)

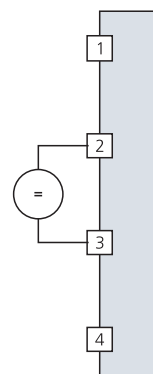
4-wire connection



b)

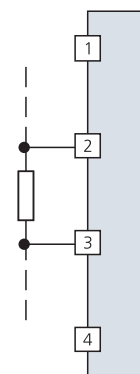
#### Voltage Input

Voltage measurement



a)

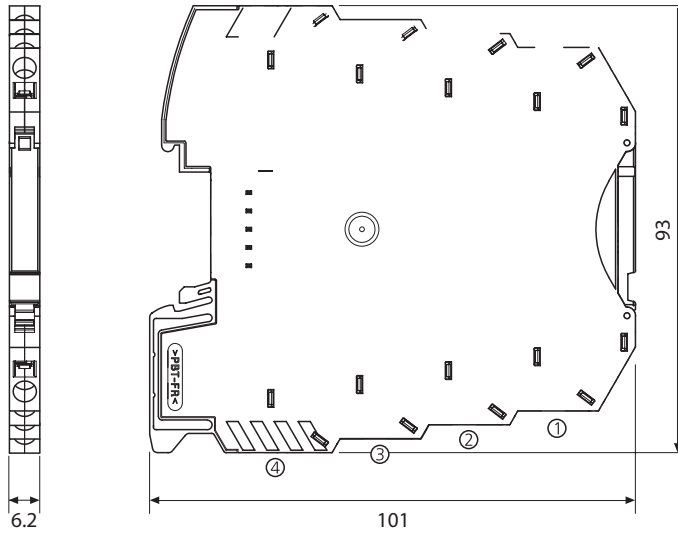
Current measurement  
via shunt resistor



a)

- a) Selectable via DIP switches and IrDA port
- b) Special configuration selectable via IrDA port

## Dimension Drawing and Terminal Assignments



### Terminal assignments

- 1 Input +
- 2 Input +
- 3 Input -
- 4 Input -
- 5 Output +
- 6 Output -
- 7 Power supply AC/DC
- 8 Power supply AC/DC

Conductor cross-sections:  
single wire 0.2 ... 2.5 mm<sup>2</sup>  
stranded wire 0.2 ... 2.5 mm<sup>2</sup>  
24-14 AWG

All dimensions in mm

# Universal Transmitters

## PolyTrans P 32000

### Error Signaling

No.	Error	Signal configuration <sup>4)</sup>		Output			
		With SIL function	Without SIL function	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	Resistance error <sup>5)</sup>	Self-locking	Not self-locking	21	21	5.25	10.5
6	Output load error <sup>6)</sup>	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	Adjustment error	Self-locking	Not self-locking	21	21	5.25	10.5
10	Device error (subordinated error number differentiated via IrDA port)	Self-locking	Self-locking	3.6	0	0	0

<sup>4)</sup> With the "self-locking" configuration, the error signal is maintained after termination of the error cause. The error message can be reset through a restart (power supply on/off or via IrDA port).

<sup>5)</sup> With potentiometer or strain gauge only

<sup>6)</sup> With SIL models P 32000 P0/1x only

### Response of the output current (4 ... 20 mA) to out-of-range conditions

