

# Modular Housings

**Knick** ➤

**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.

## PolyTrans® P 32000

## 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.

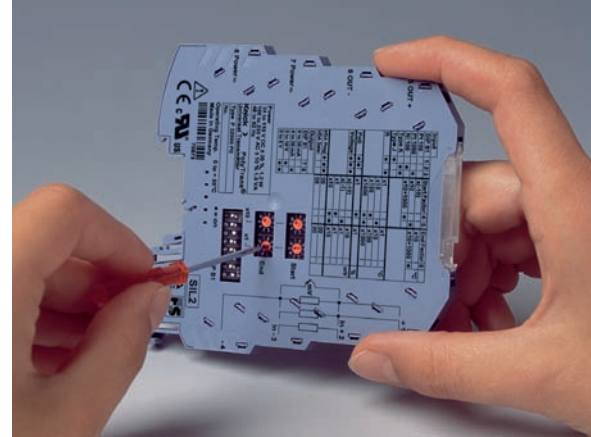
To detect mechanical quantities such as force or strain, strain gages can be connected in full-bridge configuration. The possibility for connecting resistive sen-

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  $\pm 1000$  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



# Universal Transmitters

Isolation Amplifiers  
Transmitters

Indicators

Process Analytics

Portable Meters

Laboratory Meters

Sensors

Fittings

**Knick** ➤

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.

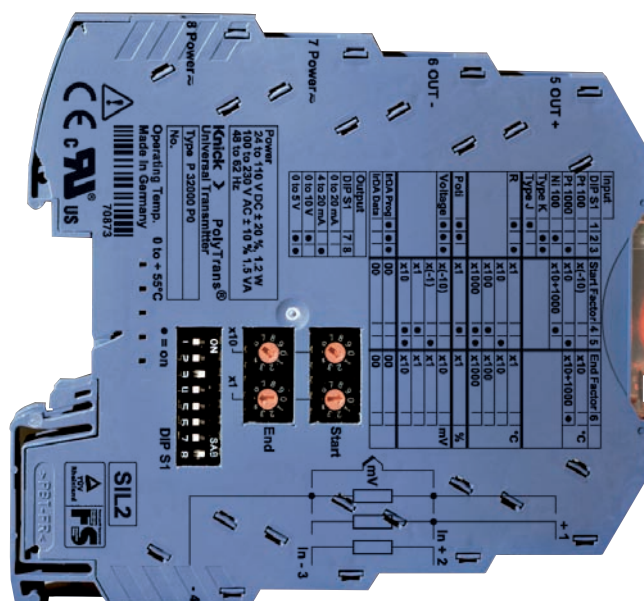
IrDA® is a registered trademark of the Infrared Data Association.

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

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



**6 mm CLASS**



# Modular Housings

## PolyTrans® P 32000

### ■ The Facts

#### Universal usability

from simple to challenging measurement demands with all known temperature sensors, strain gage 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 recognition

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

**Simulation** of any desired output values for correct installation/commissioning

#### World-wide usability

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

**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

#### Reduced stockkeeping

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 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 / <input type="checkbox"/> <input type="checkbox"/> |
| Functional Safety (EN 61508)   | Without<br>SIL 2 (up to SIL 3 in the case of redundant configuration)  | 0<br>1   |
| Power supply                   | Broad-range power supply<br>24 ... 110 V DC, 110 ... 230 V AC via screw terminals only,<br>24 V DC via screw terminals or DIN rail bus connector | 1<br>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  |

### ■ Specifications

#### Resistance/Resistance Thermometers

| Input data                                 | Sensor type  | Standard  | Measurement range  |
|--|--|---|--|
| Input <sup>1)</sup>                        | Pt 100<br>Pt 1000<br>Other platinum resistors<br>Ni 100<br>Other nickel resistors  | DIN 60751<br>DIN 60751<br>DIN 60751<br>DIN 43760<br>DIN 43760 | –200 ... +850 °C<br>–200 ... +850 °C<br>–200 ... +850 °C<br>–60 ... +180 °C<br>–60 ... +180 °C |
| Connection                                 | 2-, 3-, or 4-wire (automatic recognition), signaling via yellow LED  |   |  |
| Resistance ranges<br>incl. line resistance | Temperature measurement: 0 ... 5 kohms<br>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<br>Resistances > 5 kohms: ±(1 mohm +0.05 % meas. val.) for spans > 50 ohms |   |  |
| Temperature coefficient<br>at input        | < 50 ppm/K of adjusted end value<br>(average TC in permitted operating temp range, reference temp 23 °C)   |   |  |

#### Thermocouples

| Input data           | Sensor type  | Standard   | Measurement range   |
|----------------------|--|--|---|
| Input <sup>2)</sup>  | Type B<br>Type E<br>Type J<br>Type K<br>Type L<br>Type N<br>Type R<br>Type S<br>Type T<br>Type U<br>W3Re/W25Re<br>W5Re/W26Re | DIN 60584-1<br>DIN 60584-1<br>DIN 60584-1<br>DIN 60584-1<br>DIN 43710<br>DIN 60584-1<br>DIN 60584-1<br>DIN 60584-1<br>DIN 60584-1<br>DIN 43710<br>ASTM E988-96<br>ASTM E988-96 | +250 ... +1820 °C<br>–200 ... +1000 °C<br>–210 ... +1200 °C<br>–200 ... +1372 °C<br>–200 ... +900 °C<br>–200 ... +1300 °C<br>–50 ... +1767 °C<br>–50 ... +1767 °C<br>–200 ... +400 °C<br>–200 ... +600 °C<br>0 ... +2315 °C<br>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

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## PolyTrans® P 32000

### Specifications (continued)

#### Thermocouples (continued)

##### Input data

|   |  |   |
|---|--|---|
| Temperature coefficient at input                  | < 50 ppm/K of adjusted end value<br>(average TC in permitted operating temp range, reference temp 23 °C) |   |
| Reference junction compensation                   | Internal (Pt 100)<br>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 $T_{comp} = 0 \dots 80 \text{ °C}$ |

#### Shunt voltages

##### Input data

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

#### Strain gage input data

|                                  |  |  |
|----------------------------------|--|--|
| Input                            | $\pm 7.5 \text{ mV/V}$   |  |
| 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               | $\pm (2 \text{ } \mu\text{V/V} + 0.1 \text{ \% meas. val.})$ for spans $\geq 0.5 \text{ mV/V}$             |  |
| Temperature coefficient at input | < 50 ppm/K of adjusted sensitivity<br>(average TC in permitted operating temp range, reference temp 23 °C) |  |
| Overload                         | 5 V across all inputs  |  |

## 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               | $\pm (0.2 \% \text{ full scale} + 0.05 \% \text{ meas. val.})$ for spans $> 5 \%$  |
| Temperature coefficient at input | $< 50 \text{ ppm/K}$ of adjusted end value<br>(average TC in permitted operating temp range, reference temp $23^\circ\text{C}$ ) |

#### Output data

|                                      |  |
|--------------------------------------|--|
| Outputs                              | 0 ... 20 mA, Calibrated selection<br>4 ... 20 mA, (factory setting 4 ... 20 mA)<br>0 ... 5 V,<br>0 ... 10 V  |
| Control range                        | 0 ... $\approx 102.5 \%$ span with 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output<br>$-1.25 \dots \approx 102.5 \%$ span with 4 ... 20 mA output  |
| Resolution                           | 16 bits  |
| Simulation mode adjustable via IrDA® | 0 ... 20 mA current output: 0 ... 21 mA<br>4 ... 20 mA current output: 3 ... 21 mA<br>0 ... 5 V voltage output: 0 ... 5.25 V<br>0 ... 10 V voltage output: 0 ... 10.5 V  |
| Load                                 | Current output: $\leq 10 \text{ V}$ ( $\leq 500 \text{ ohms}$ at 20 mA)<br>Voltage output: $\leq 1 \text{ mA}$ ( $\geq 10 \text{ kohms}$ at 10 V)  |
| Output error limits                  | Current output: $\pm (10 \mu\text{A} + 0.05 \% \text{ meas. val.})$<br>Voltage output: $\pm (5 \text{ mV} + 0.05 \% \text{ meas. val.})$   |
| Residual ripple                      | $< 10 \text{ mV}_{\text{rms}}$   |
| Temperature coefficient at output    | $< 50 \text{ ppm/K}$ full scale<br>(average TC in permitted operating temp range, reference temp $23^\circ\text{C}$ )  |
| Error signaling                      | 0 ... 20 mA output: $I = 0 \text{ mA}$ or $\geq 21 \text{ mA}$<br>4 ... 20 mA output: $I \leq 3.6 \text{ mA}$ or $\geq 21 \text{ mA}$<br>0 ... 5 V or 0 ... 10 V output: $V = 0 \text{ V}$ or $V \geq 5.25 \text{ V}$ or $V \geq 10.5 \text{ V}$<br>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. |

# Modular Housings

## PolyTrans® P 32000

### Specifications (continued)

#### Transmission behavior

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

#### Display

|            |  |
|------------|--|
| Green LED  | Power supply   |
| Yellow LED | Signaling the connection type<br>IrDA® communication |
| Red LED    | Maintenance request or device failure                |

#### Power supply

|              | 24 V DC power supply unit   | Broad-range power supply unit   |
|--------------|---|---|
| Power supply | 24 V DC (–20 %, +25 %), approx. 1.2 W<br>The power supply can be routed from<br>one device to another via DIN rail<br>bus connectors. | 24 V ... 110 V DC (±20 %), approx. 1.2 W<br>110 V ... 230 V AC (±10 %),<br>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<br>(basic insulation) | Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2<br>according to EN 61010-1.<br>For applications with high working voltages, you should ensure there is sufficient spacing<br>or isolation from neighboring devices and protection against electric shocks.  |
| Protection against<br>electric shock  | Safe Isolation according to EN 61140 by reinforced insulation in accordance with<br>EN 61010-1.<br>Working voltage up to 300 V AC/DC across all circuits with overvoltage category II and<br>pollution degree 2.<br>For applications with high working voltages, you should ensure there is sufficient spacing<br>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)<br>Class 1, Div 2 / Zone 2 (UL 1604) |

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

## Specifications (continued)

### Standards and approvals (continued)

|     |   |
|-----|---|
| EMC | Product family standard: EN 61326<br>Emitted interference: Class B<br>Immunity to interference <sup>3)</sup> : Industry<br>EMC-requirements for devices with safety-related functions<br>IEC 61326-3: draft |
|-----|---|

|       |   |
|-------|---|
| cURus | File No. 220033<br>Standards: UL 508 and CAN/CSA 22.2 no. 14-95 |
|-------|---|

### Interfaces

|       |   |
|-------|---|
| IrDA® | Specification 1.1, slave device for bidirectional communication<br>Paraly® SW 111 communication software<br>Free download at <a href="http://www.knick.de">www.knick.de</a> |
|-------|---|

### Other data

|                     |   |
|---------------------|---|
| Ambient temperature | Operation: 0 ... +55 °C in row, without spacing<br>0 ... +65 °C with spacing $\geq$ 6 mm<br>Storage: -25 to +85 °C  |
| Ambient conditions  | Stationary application, weather-protected<br>relative air humidity: 5 ... 95 %, no condensation<br>barometric pressure: 70 ... 106 KPa<br>water or wind-driven rain, snow, or hail excluded |
| Design              | Modular housing with screw terminals, width 6.2 mm,<br>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  |

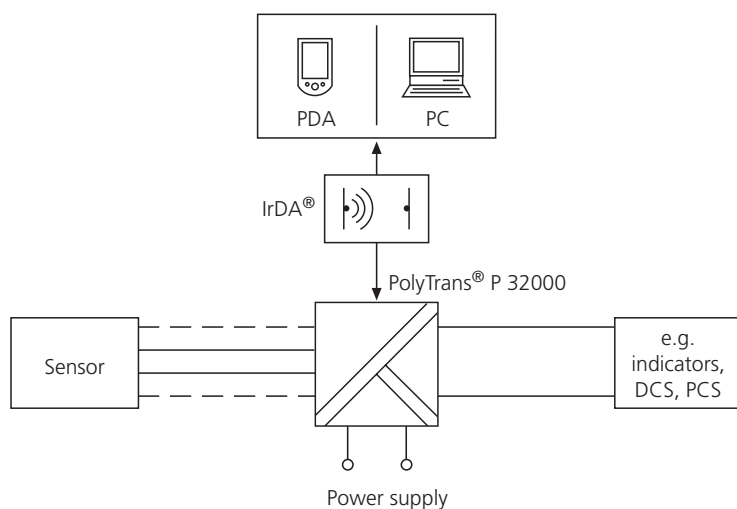
3) Slight deviations are possible while there is interference



# Modular Housings

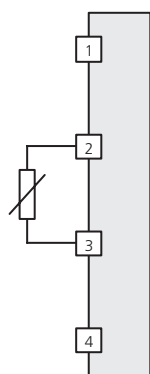
## PolyTrans® P 32000

### ■ Application Examples



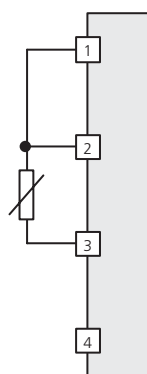
### Connection of Resistance Thermometers

RTD  
2-wire connection



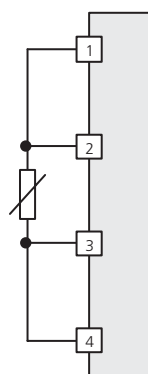
a)

RTD  
3-wire connection



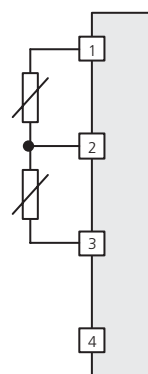
a)

RTD  
4-wire connection



a)

RTD  
differential measurement



b)

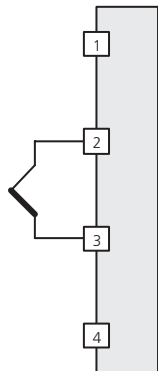
a) Selectable via DIP switches or IrDA® port

b) Special configuration selectable via IrDA®

### Application Examples (continued)

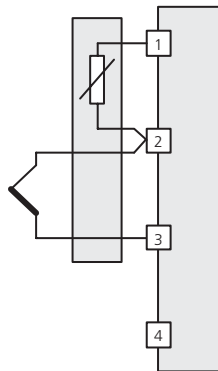
#### Connection of Thermocouples

Thermocouple with internal reference junction compensation



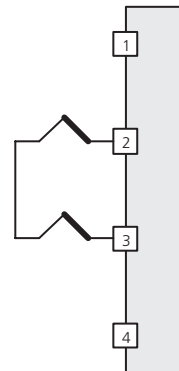
a)

Thermocouple with external reference junction compensation



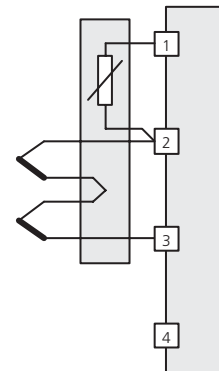
b)

Thermocouples for differential measurement



b)

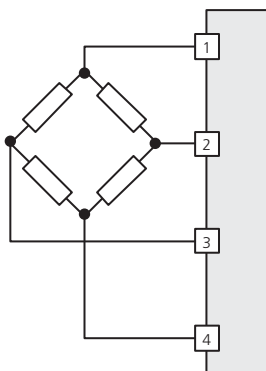
Thermocouples in summing configuration (averaging), external reference junction compensation



b)

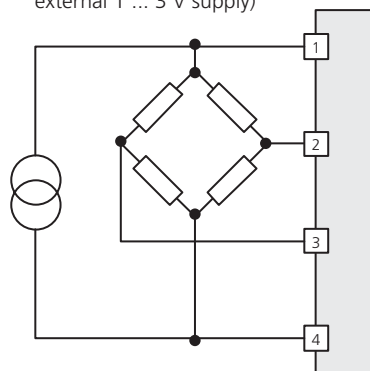
#### Connection of Strain Gages

4-wire connection



a)

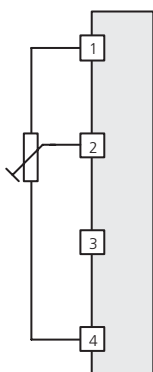
6-wire connection (with external 1 ... 3 V supply)



b)

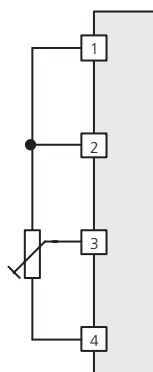
#### Connection of Potentiometers

3-wire connection



a)

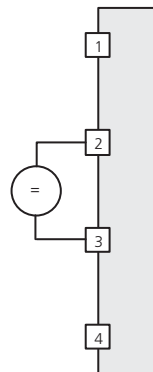
4-wire connection



b)

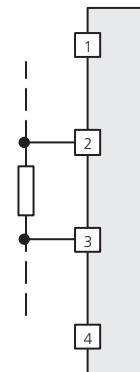
#### Voltage Input

Voltage measurement



a)

Current measurement with shunt resistor



a)

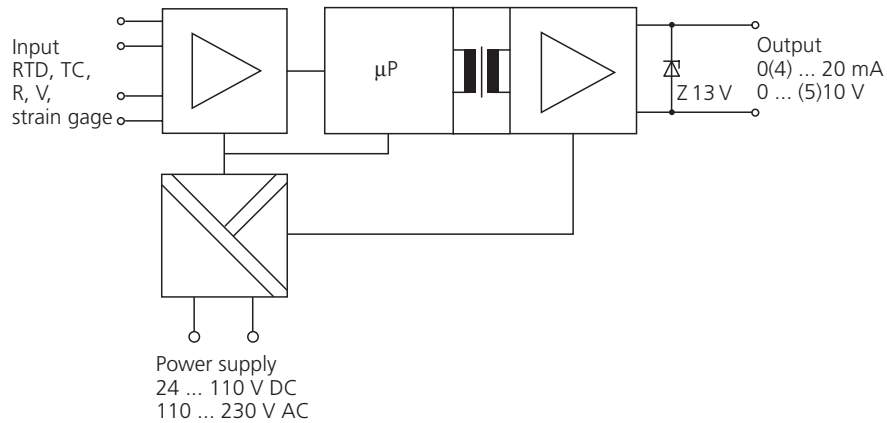
a) Selectable via DIP switches or IrDA® port

b) Special configuration selectable via IrDA®

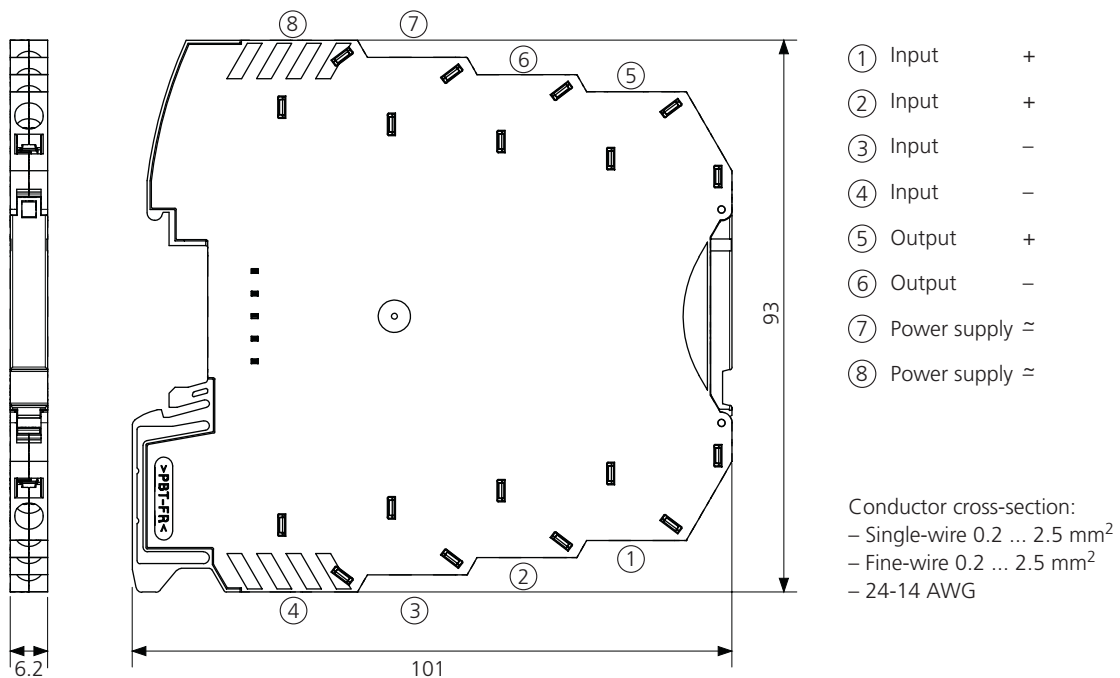
# Modular Housings

## PolyTrans® P 32000

### ■ Block Diagram



### ■ Dimension Drawings and Terminal Assignments



All dimensions in mm!

### ■ Error Signaling

| No. | Error   | Message configuration <sup>4)</sup> |                  | 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 <sup>5)</sup>                                | Self-locking                        | Not self-locking | 21            | 21            | 5.25        | 10.5         |
| 6   | Load output 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   | 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

