

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.

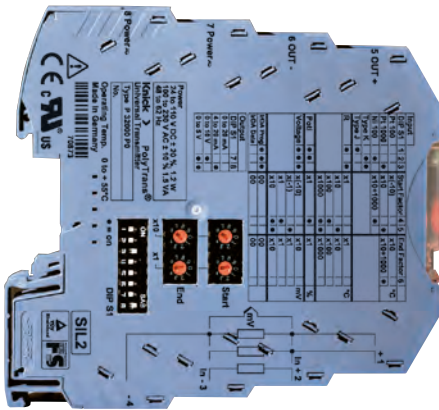
The Problem

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, being able to easily make adjustments on site is desirable. 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. 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 ± 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.



PolyTrans P 32000

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).

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.



KTA



EAC

Facts and Features

- **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 adjustment
- **Automatic detection**
of the sensor connection (2-, 3-, or 4-wire)
- **Simulation of any output values**
for correct installation/ commissioning
- **Protective separation**
according to EN 61140 – protection of the maintenance staff and downstream 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**
with innovative switching concept
- **Reduced inventory**
one transmitter covers all conceivable tasks
- **Minimum space requirement**
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 via DIN rail bus connectors
- **5-year warranty**



Product Line

| | | Order No. | |
|-----------------------------------|--|---------------------|---|
| PolyTrans P 32000 | Adjustable | 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 | 24 V DC via screw terminals or DIN rail bus connector | | 0 |
| Accessories | | Order No. | |
| Paraly SW 111 | Communication software | SW 111 | |
| ZU 0628 DIN rail bus connector | Power supply bridging for two isolators, 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 | |

PolyTrans P 32000

Specifications

Resistance/resistance thermometers

| Input data | Sensor type | Standard | Range |
|---|--|-----------|------------------|
| Input ¹⁾ | 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 ⁴⁾ | | |
| 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) | | |

Thermocouples

| Input data | Sensor type | Standard | 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 | | |
| 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 _{comp} = 0 ... 80 °C | | |

Specifications *(continued)*

Shunt voltages, input data

| | |
|--------------------------------------|--|
| Input | -1000 ... 1000 mV unipolar/bipolar |
| Input resistance | > 10 Mohms |
| Input error limits | ± (200 µV + 0.05 % meas.val.) for spans > 50 mV |
| Line monitoring | Open circuits |
| Temperature coefficient at 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 |

Strain gauge input data

| | |
|--------------------------------------|--|
| Input | ± 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 | ± (2 µV/V + 0.1 % meas.val.) for spans ≥ 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 | ± (0.2 % full scale + 0.05 % 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) |

PolyTrans P 32000

Specifications (continued)

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 V 0 ... 10 V voltage output: 0 ... 10.5 V |
| 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" table. |

Response

| | |
|----------------|---|
| Characteristic | Rising / falling linearly; configurable characteristic curves using interpolation points (via IrDA port) |
| Measuring rate | approx. 3 / s ² |

Display

| | |
|------------|---|
| Green LED | Power supply |
| Yellow LED | Signaling the connection type IrDA communication |
| Red LED | Maintenance request/device failure |

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.

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, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent devices. |
| Protection against electric shock | Protective separation 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, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent devices. |

Standards and approvals

| | |
|-------------------|---|
| Functional safety | SIL 2 according to IEC 61508, SIL 3 with redundant configuration |
| KTA approval | KTA3507 (special versions) |
| EMC | Product family standard: EN 61326 Emitted interference: Class B Immunity to interference ³⁾ : Industrial environment 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 |
| RoHS conformity | According to directive 2011/65/EU |

Interfaces

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

PolyTrans P 32000

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, weather-protected operation 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 |
| Tightening torque | 0.6 Nm |
| Ingress protection | Terminals IP 20, housing IP 40 |
| Mounting | For 35 mm DIN rail acc. to EN 6715 |
| Connection | Conductor cross sections Single wire 0.2 ... 2.5 mm ² Stranded wire: 0.2 ... 2.5 mm ² 24-14 AWG |
| Weight | Approx. 60 g |

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

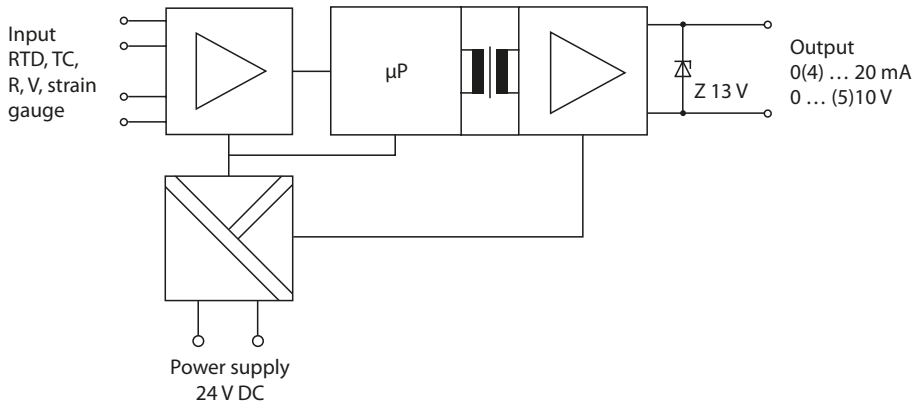
²⁾ Additional thermocouple types on request

³⁾ Slight deviations are possible while there is interference

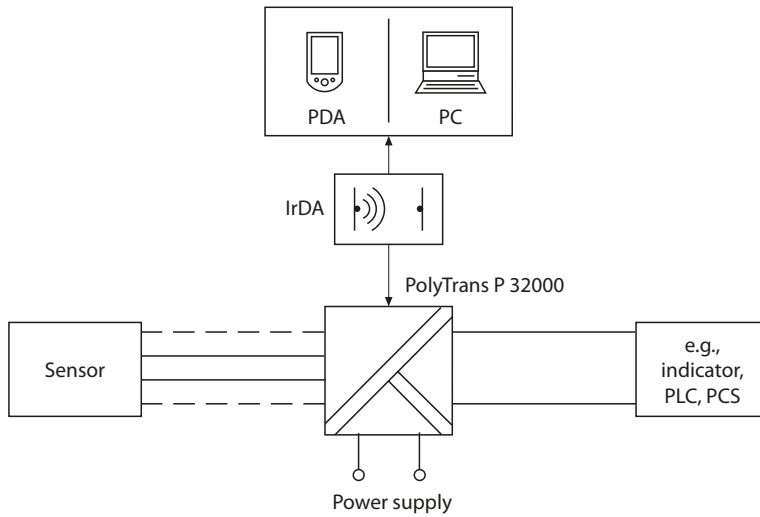
⁴⁾ 3- or 4-wire connection only

^{*}) For thermocouples with external reference junction compensation or for resistance measurements in the range of 5 kohms ... 100 kohms: Measuring rate 2/s.

Block Diagram



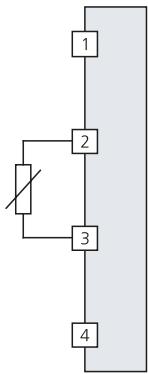
Typical Applications



PolyTrans P 32000

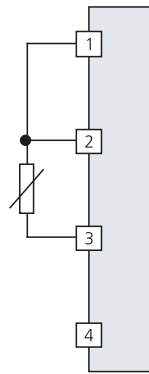
Connection of Resistance Thermometers

RTD
2-wire configuration



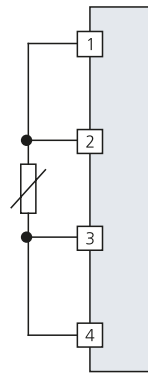
a)

RTD
3-wire configuration



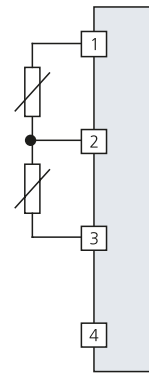
a)

RTD
4-wire configuration



a)

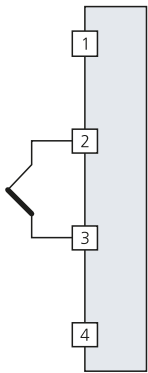
RTD
differential measurement



b)

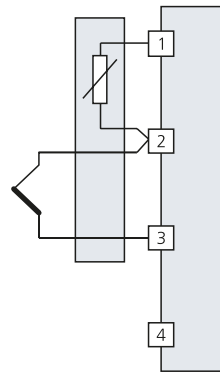
Connection of Thermocouples

Thermocouple with
internal reference
junction compensation



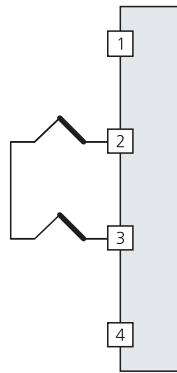
a)

Thermocouple with
external reference
junction compensation



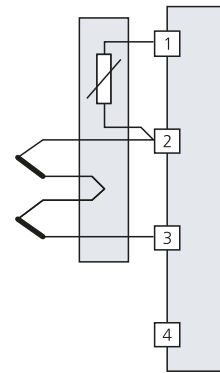
b)

Thermocouples for
differential measurement



b)

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



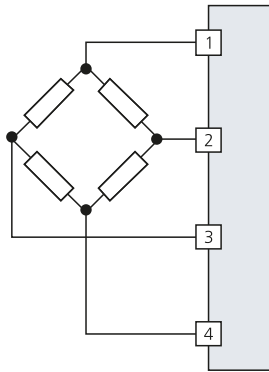
b)

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

Typical Applications *(continued)*

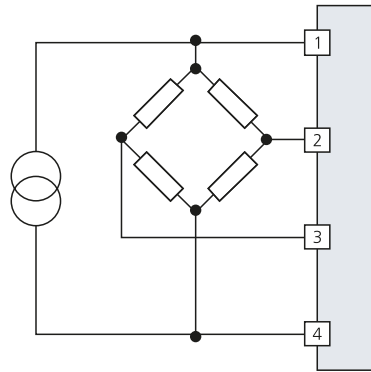
Connection of Strain Gauges

4-wire connection



a)

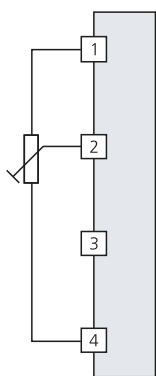
6-wire connection
(with external supply 1 ... 3 V)



b)

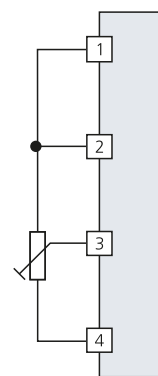
Connection of Potentiometers

3-wire connection



a)

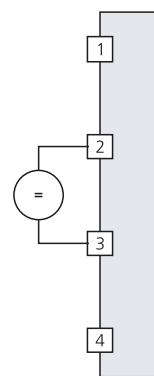
4-wire connection



b)

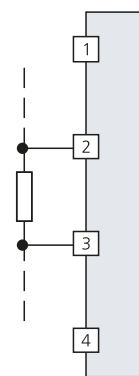
Voltage Input

Voltage measurement



a)

Current measurement
via shunt resistor

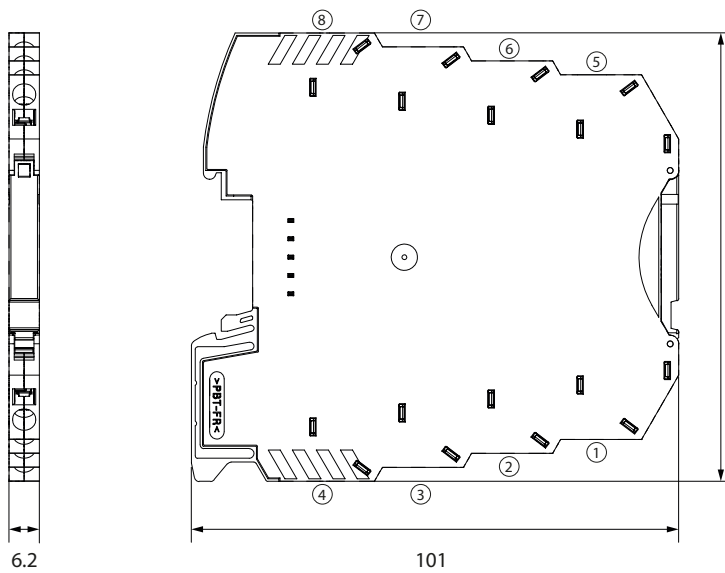


a)

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

PolyTrans P 32000

Dimension Drawing and Terminal Assignments



Terminal assignments

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

Conductor cross-sections:
 single wire 0.2 ... 2.5 mm²
 stranded wire 0.2 ... 2.5 mm²
 24-14 AWG

All dimensions in mm

Error Signaling

| No. | Error | Signal configuration ⁴⁾ | | 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 | Underrange | Not self-locking | Not self-locking | 3.6 | 0 | 0 | 0 |
| 2 | Ovrange | 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 ⁵⁾ | Self-locking | Not self-locking | 21 | 21 | 5.25 | 10.5 |
| 6 | Output load 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 | 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 |

⁴⁾ 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).

⁵⁾ With potentiometer or strain gauge only

⁶⁾ With SIL models P 32000 P0/1x only

PolyTrans P 32000

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

