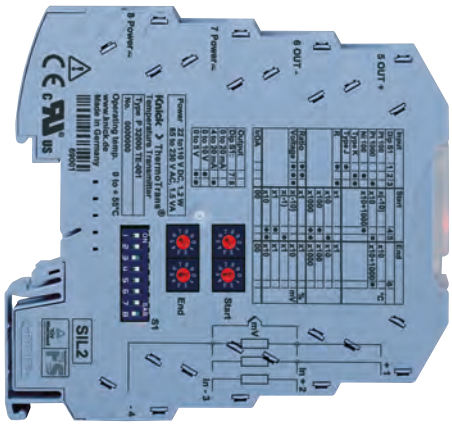


ThermoTrans P 32100

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

The Task

In virtually all areas of industry, temperatures are continuously measured and often used as a reference input for closed-loop control systems, 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. They provide a raw signal which is prepared, linearized and standardized for further processing using a temperature transmitter.

The Problem

The range of standardized and commercial temperature sensors is extremely broad. 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 come at the price of complex operation. Rather, being able to easily make adjustments on site is desirable. High performance should not result in increased susceptibility – high reliability and availability are essential.

The Solution

The universal ThermoTrans P 32100 temperature transmitters provide connection possibilities for all common thermocouples and resistance thermometers. They can be flexibly adapted to the respective measuring task using DIP and rotary 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 ThermoTrans P 32100 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.

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.

Special measuring tasks can be solved with ThermoTrans devices which Knick configures according to individual specifications. Fixed-range devices without switch are used, for example, when manipulations or mix-ups must be precluded.

Knick offers the ThermoTrans P 32100 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).

ThermoTrans P 32100

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.

Facts and Features

- **Universal usability**
  from simple to challenging measurement demands with all known temperature sensors
- **Convenient parameter setting**
  via IrDA port – uncomplicated, menu-guided adjustment also "on site" including archiving of configuration data
- **Intuitive configuration**
  of basic parameters – easy, without tools, using 4 rotary and 8 DIP switches
- **Calibrated range selection**
  without complicated adjustment
- **Automatic detection**
  of the sensor connection (2-, 3-, or 4-wire)
- **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
- **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 the power supply via DIN rail bus connectors (in the case of 24 V DC supply)
- **5-year warranty**

5 Year Warranty!

Product Line

ThermoTrans P 32100, adjustable

Order No.	P 32100 P0 /	□	□
Functional Safety (EN 61508)	Without	**0**	
	SIL 2 (up to SIL 3 in the case of redundant configuration)	**1**	
Power supply	24 V DC via screw terminals or DIN rail bus connector		**0**

ThermoTrans P 32100, fixed setting

Order No.	P 32100 P0 /	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□	□
Functional Safety (EN 61508)	Without	**0**																	
	SIL 2 (up to SIL 3 in the case of redundant configuration)	**1**																	
Power supply	24 V DC via screw terminals or DIN rail bus connector		**0**																
Input/sensor type	Pt100 (-200 … +850 °C)			**P**															
	Pt1000 (-200 … +850 °C)			**Q**															
	Ni100 (-60 … +180 °C)			**N**															
	TC / J (-210 … +1200 °C)			**J**															
	TC / K (-200 … +1372 °C)			**K**															
	TC / J (-210 … +1200 °C), ext. ref. junction compensation (Pt100)			**X**															
	TC / K (-200 … +1372 °C), ext. ref. junction compensation (Pt100)			**Y**															
	U (-1000 mV … +1000 mV)			**U**															
	Other			**S**															
Start of range	Prefix + or –				**X**														
	4-digit number (°C / mV)					**X**	**X**	**X**	**X**										
End of range	Prefix + or –									**X**									
	4-digit number (°C / mV)										**X**	**X**	**X**	**X**					
Output	0 … 20 mA														**A**				
	4 … 20 mA														**B**				
	0 … 10 V														**C**				
	0 … 5 V														**D**				
Further customer-specific settings (e.g., different thermocouple)	Without																		
	As specified															**n**	**n**	**n**	**n**
Example Fixed setting model	SIL 2, Pt1000 /-50 °C … +150 °C / 4 … 20 mA																		
	Order no. **P 32100 P0 /**	**1**	**0**	**Q**	**–**	**0**	**0**	**5**	**0**	**+**	**0**	**1**	**5**	**0**	**B**				

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, 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**

ThermoTrans P 32100

Specifications

Resistance thermometers

Input data	Sensor type	Standard	Range
Input	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	0 … 5 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 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	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

Output data

Outputs	0 … 20 mA, 4 … 20 mA, 0 … 5 V, 0 … 10 V	calibrated switching (default setting 4 … 20 mA)
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: 4 … 20 mA current output: 0 … 5 V voltage output: 0 … 10 V voltage output:	0 … 21 mA 3 … 21 mA 0 … 5.25 V 0 … 10.5 V
Load	Current output: Voltage output:	≤ 10 V (≤ 500 ohms at 20 mA) ≤ 1 mA (≥ 10 kohms at 10 V)
Output error limits	Current output: Voltage output:	±(10 µA + 0.05 % meas. val.) ±(5 mV + 0.2 % meas. val.)
Residual ripple	< 10 mV_{rms}	
Temperature coefficient at the output	< 50 ppm/K full scale (average TC in allowable operating temperature range, reference temperature 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, 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*

ThermoTrans P 32100

Specifications *(continued)*

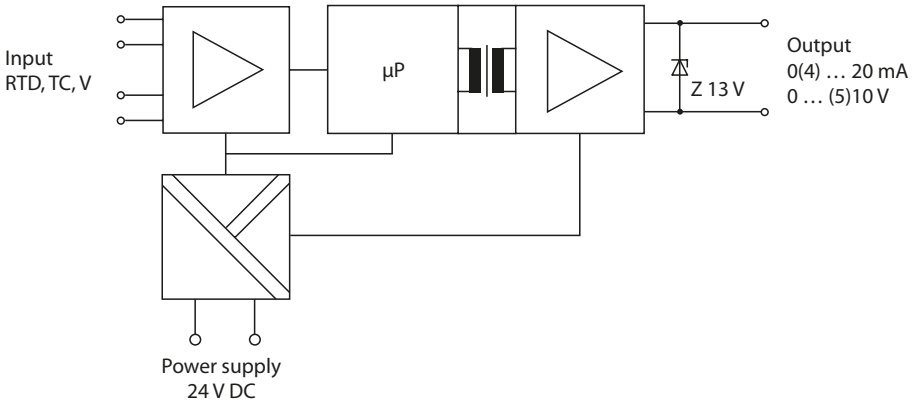
Display	
Green LED	Power supply
Yellow LED	Signaling the connection type IrDA communication
Red LED	Maintenance request/device failure
Power supply	
Power supply	24 V DC (–20 %, +25 %), approx. 1.2 W The power supply can be routed from one device to another via DIN rail bus connectors.
Isolation	
Galvanic 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
EMC	Product family standard: EN 61326 Emitted interference: Class B Immunity to interference[1)]: 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
KTA approval	KTA3507 (special versions)
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

Specifications *(continued)*

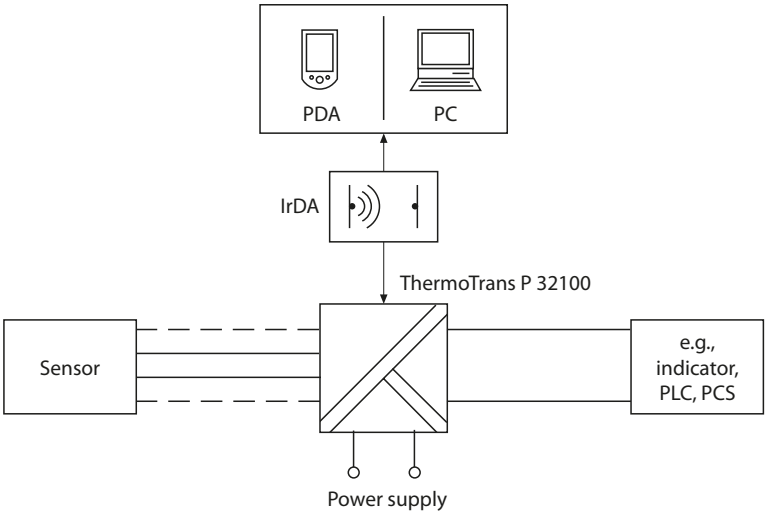
Further data	
Ambient temperature	Operation: 0 … +55 °C mounted without gaps 0 … +65 °C with gaps ≥ 6 mm Storage: –25 … +85 °C
Ambient conditions	Stationary, weather-protected operation Relative humidity: 5 … 95 %, no condensation Barometric pressure: 70 … 106 kPa Water or wind-driven precipitation (rain, 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 60715
Connection	Conductor cross sections Single wire 0.2 … 2.5 mm² Stranded wire: 0.2 … 2.5 mm² 24-14 AWG
Weight	Approx. 60 g

*) For thermocouples with external reference junction compensation: approx. 2 / s
1) Slight deviations are possible while there is interference

Block Diagram

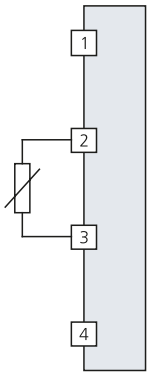


Typical Applications



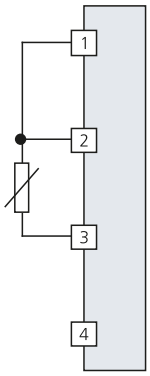
Connection of Resistance Thermometers

RTD
2-wire configuration



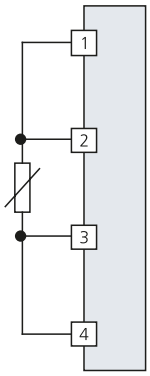
a)

RTD
3-wire configuration



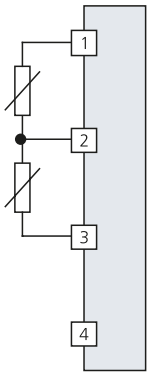
a)

RTD
4-wire configuration



a)

RTD
differential measurement



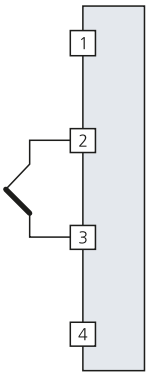
b)

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

Typical Applications *(continued)*

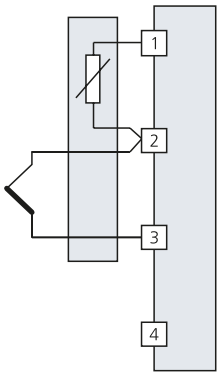
Connection of Thermocouples

Thermocouple with internal reference junction compensation



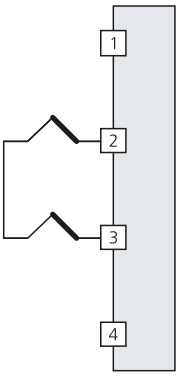
a)

Thermocouple with external reference junction compensation



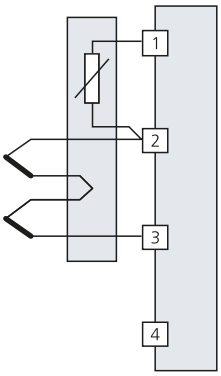
a)

Thermocouples for differential measurement



b)

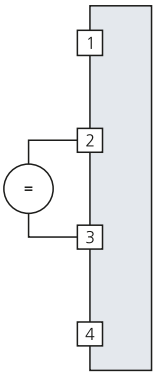
Thermocouples in summing configuration (averaging), external reference junction compensation



b)

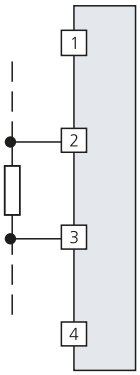
Voltage Input

Voltage measurement



a)

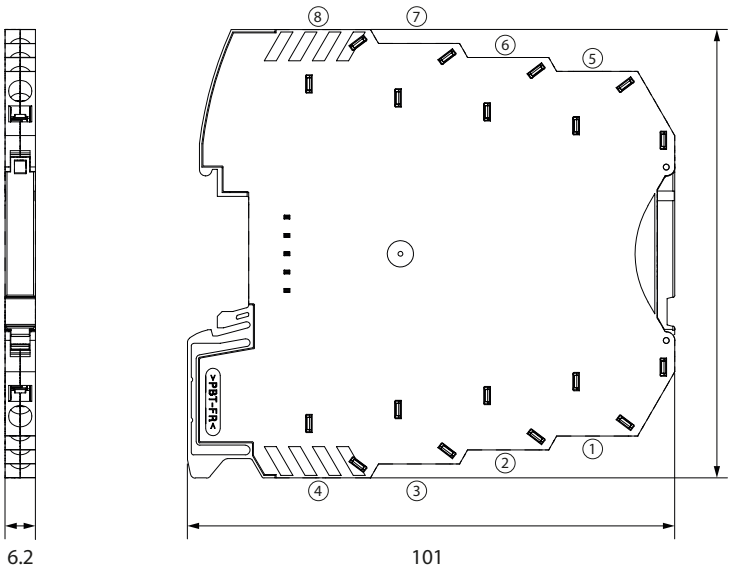
Current measurement via shunt resistor



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	+
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[2]		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	Overrange	Not self-locking	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Self-locking	Not self-locking	21	21	5.25	10.5
4	Sensor open	Self-locking	Not self-locking	21	21	5.25	10.5
5	–	–	–	–	–	–	–
6	Output load error[3]	Not self-locking	Not self-locking	3.6	0	0	0
7	Identification of connection	Self-locking	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Self-locking	Not self-locking	21	21	5.25	10.5
9	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

[2] 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).
[3] With SIL models P 32000 P0/1x only

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