

SensoTrans R A 20230

The transmitter for potentiometers for position determination, path measurement or setpoint specification in a 6 mm housing.

The Task

In many fields of industry the positions of actuators or setpoint devices, for example, must be measured accurately. In many cases they are used as a reference input for controllers or monitoring systems, safety shutdown systems, or for similar critical tasks. As a rule, high demands are placed on function, accuracy, flexibility, and electrical safety.

Rotary motion can be measured with potentiometers configured as angle sensors, translational motion with linear potentiometers as path sensors. These and other sensors provide a raw signal which is prepared, scaled and converted into a standard signal for further processing using a resistance transmitter.

The Problem

Commercial position sensors have individual characteristics, which requires tedious and time-consuming adjustment of the respective resistance transmitter using potentiometers.

Furthermore, resistance transmitters up to now had a very wide modular housing and therefore occupied a large amount of space in the enclosure. For world-wide applications, several versions with different supply voltages were often used.

The Solution

The universal SensoTrans R A 20230 resistance transmitters provide connection possibilities for all standard potentiometers for angle, path or position detection up to 50 kohms. They can be flexibly adapted to the respective measuring task using DIP and rotary encoder switches or via a "teach-in function". 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 SensoTrans R A 20230 offer maximum performance in the smallest of spaces.

Adjusting the start and end value to the individual position sensor is particularly convenient using the "teach-in function" – just at the push of a button on the front of the device. Sensors with known characteristics can be very easily calibrated using four rotary encoder switches and eight DIP switches.

Special measuring tasks can be solved with SensoTrans 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.

The Housing

The modular housing – 6 mm slim – takes up very little enclosure space and allows for high component densities. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.

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SensoTrans R A 20230



Facts and Features

- **Universal usability**
with potentiometers, resistive sensors, remote resistance transducers and similar sensors
- **Intuitive configuration**
of basic parameters – easy, without tools, using 4 rotary and 8 DIP switches
- **Calibrated range selection**
without complicated trimming
- **Convenient adjustment**
Start and end points are directly adjusted “at the push of a button” using the teach-in function
- **Protective separation**
according to EN 61140 – protection of the maintenance staff and downstream devices against excessively high voltages up to 300 V AC/DC
- **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 power supply via DIN rail bus connectors
- **5-year warranty**



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Specifications (continued)

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	$< 50 \text{ ppm/K}$ of adjusted end value (average TC within 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
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: $\pm (10 \mu\text{A} + 0.05 \% \text{ meas. val.})$ Voltage output: $\pm (5 \text{ mV} + 0.05 \% \text{ meas. val.})$
Residual ripple	$< 10 \text{ mV}_{\text{rms}}$
Temperature coefficient at the output	$< 50 \text{ ppm/K}$ of adjusted end value (average TC within allowable operating temp range, reference temp 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 and red LED for out-of-range conditions, incorrect parameter setting, sensor short circuit and line break, output load error, other device errors. See also "Error Signaling" table.

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
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.
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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, 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

EMC	Product family standard: EN 61326 Emitted interference: Class B Immunity to interference ¹⁾ : Industrial environment
cURus	File no. 220033 Standards: UL 508 and CAN/CSA 22.2 No. 14-95
RoHS conformity	According to directive 2011/65/EU

Further data

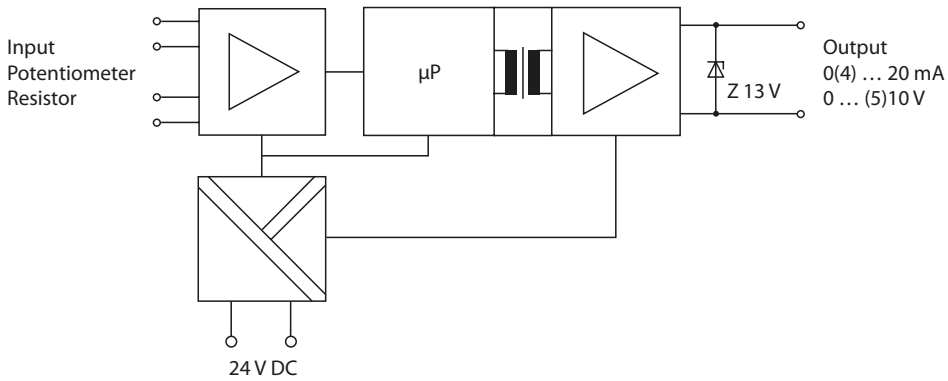
Ambient temperature	Operation: 0 ... +55 °C mounted without gaps 0 ... +65 °C with gaps ≥ 6 mm Storage: -25 ... +85 °C
Ambient conditions	Stationary, weather-protected operation Relative humidity: 5 ... 95 %, no condensation Barometric pressure: 70 ... 106 kPa Water or wind-driven precipitation (rain, 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 mm ² Stranded wire: 0.2 ... 2.5 mm ² 24-14 AWG
Weight	Approx. 60 g

*) For resistance measurements of 5 ... 100 kohms: approx. 2/s

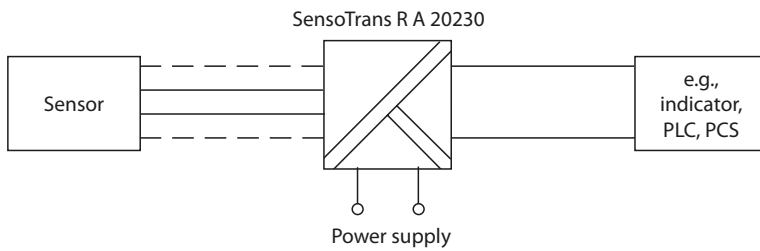
1) Slight deviations are possible while there is interference

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Block Diagram

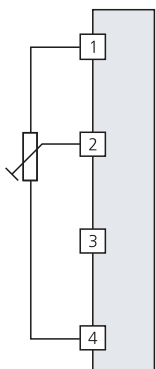


Typical Applications

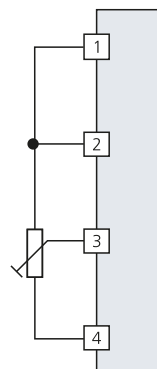


Connection of Potentiometers

3-wire connection

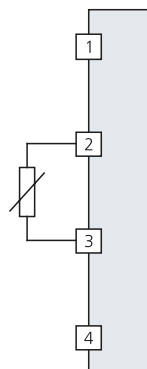


4-wire connection

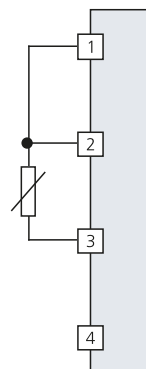


Connection of Resistors

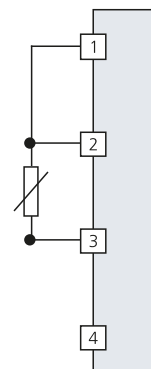
2-wire connection



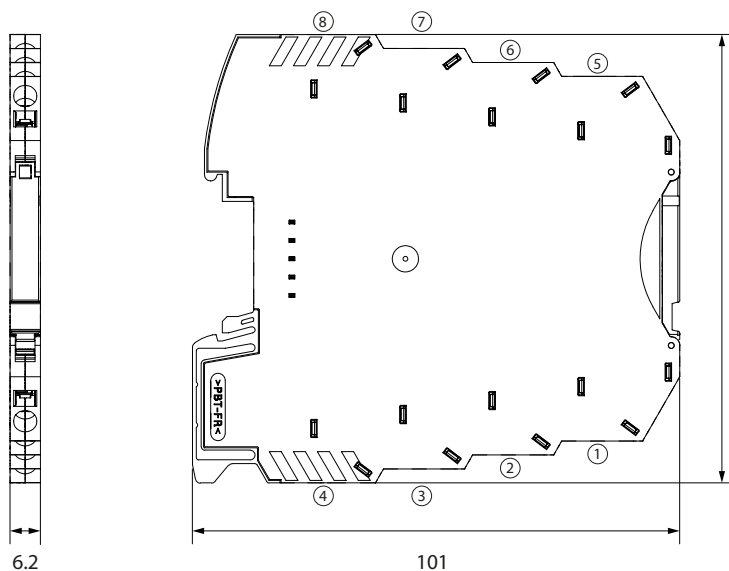
3-wire connection



4-wire connection



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

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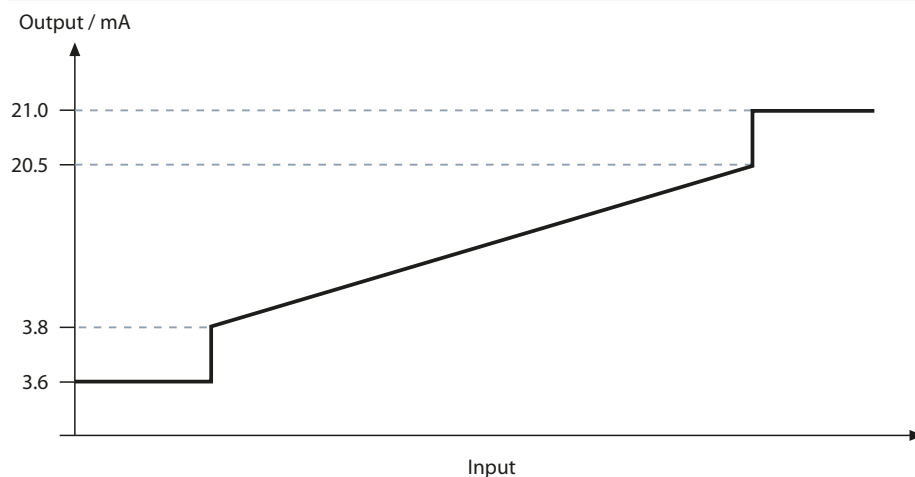
Error Signaling

No.	Error	Signal configuration ¹⁾	Output			
			4 ... 20 [mA]	0 ... 20 [mA]	0 ... 5 [V]	0 ... 10 [V]
0	None	Not self-locking	–	–	–	–
1	Underrange	Not self-locking	3.6	0	0	0
2	Overrange	Not self-locking	21	21	5.25	10.5
3	Sensor short circuit	Not self-locking	21	21	5.25	10.5
4	Sensor open	Not self-locking	21	21	5.25	10.5
5	Resistance error ²⁾	Not self-locking	21	21	5.25	10.5
6	Output load error	Not self-locking	3.6	0	0	0
7	Identification of connection	Not self-locking	21	21	5.25	10.5
8	Switch misadjusted	Not self-locking	21	21	5.25	10.5
9	Adjustment error	Not self-locking	21	21	5.25	10.5
10	Device error	Self-locking	3.6	0	0	0

¹⁾ 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).

²⁾ With potentiometers only

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



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