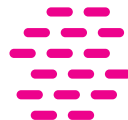




temperature



humidity



CO<sub>2</sub>



atm. pressure



VOC

Product Catalogue for Railway Vehicles



extend your senses



*The mission of SENSIT s.r.o. is to develop, manufacture and supply sensors for non-electric quantities.*

Our goal is to provide a wide range of quality products, competitive prices and high quality services, including the provision of servicing and consultancy. Our priority commitment is to ensure our offered products and services optimally meet the expectations and requirements of our customers, positively influence their satisfaction and ensure the building of long-term partnerships.

In terms of development, production and utilization of sensors throughout their entire life cycle, we also deal with the issue of minimizing negative impacts on the environment and ensuring safety in production and actual use of these sensors.

To fulfil the specified mission, we rely on the following internal values of the company:

#### QUALITY

the high quality of processes ensures the flawlessness of the offered products and services

#### COSTS

by reducing input and operating costs we achieve competitive prices

#### SPEED

by improving the efficiency of processes we increase the speed of delivery of our products and services

#### RELIABILITY

by repeatedly verifying and testing basic properties, including compliance with current legislation, we ensure the reliability of our products and services

#### FLEXIBILITY

by selecting qualified, motivated and loyal employees we create conditions enabling us to respond flexibly to customer requirements

Ing. Petr Brzezina

Executive Head of SENSIT s.r.o.



*The company SENSIT s.r.o. from Rožnov pod Radhoštěm, known in the Czech market of temperature sensors since 1991, has begun the development, manufacture and supply of special temperature sensors for railway vehicles since 2004.*

Products for this segment must have specific properties defined in the so-called railway standards (**EN 50155**, **EN 61373**, **EN 50121-3-2**, **EN 45545-2** and **NFPA 130** as amended). They include especially resistance to vibration and electrical safety. They have to meet fire standards, and electronic components have to meet the conditions for electromagnetic compatibility (EMC). All these characteristics are taken into consideration during development – this is confirmed with a test report and a certificate issued by an independent technical and properly accredited testing laboratory.

SENSIT, s.r.o., is also engaged in the manufacture of temperature sensors in various industries. The standard temperature range of the sensors is from **-200 °C to 1100 °C** and the diameter of the resistance temperature sensors is from **1.0 mm**. In recent years, company's product range has expanded with relative humidity sensors, CO<sub>2</sub> sensors, atmospheric pressure and VOC sensors, level sensors, flow sensors and inductive sensors.

As a significant competitive advantage, SENSIT s.r.o. maintains the capability of small series or piece production. High flexibility in relation to the special requirements of customers enables the company to react flexibly to their needs in terms of composition of the custom range, as well as in time performance.

The high level of quality of its products is ensured, among other ways, through the performance of regular and repeat type tests of the properties of products or through the sophisticated operation of cycling 7 to 10 cycles in temperature intervals from -10 °C to 80 °C with the objective of detecting critical manufacturing defects. A standard part of production processes is initial calibration and output inspection. The final products are thus supplied in the guaranteed quality, which is reflected in the low percentage of justified complaints.

SENSIT s.r.o. meets the requirements of standards EN ISO 9001, EN ISO 14001 and OHSAS 18001 as amended for all areas of its activities, as evidenced by valid certificates.



The Authorized Metrology Centre authorized by the Czech Office for Standards, Metrology and Testing has been a part of SENSIT s.r.o. since 2001. SENSIT s.r.o. has its own laboratory carrying out calibrations of company's own products as well as specialist products from other manufacturers.

The competitiveness of the company's products is continuously tested on the Czech market, as well as abroad, with regard to the implementation of long-term supplies to significant manufacturers of technological units and components in the following fields:



Paired temperature sensors – qualified meters



Sensors of temperature, humidity and flow in food processing applications



Temperature sensors for railway vehicles



Sensors of temperature, humidity and flow for air conditioning equipment



Temperature sensors for heating systems control



Temperature sensors in applications for renewable resources



Temperature sensors for machines and equipment



Temperature sensors for applications in rubber and plastic industries



Temperature sensors for chemical industry



Sensors of temperature, humidity and flow in white goods and medical applications



Custom production of temperature sensors



Temperature sensors for science and research



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## CUSTOM PRODUCTION OF TEMPERATURE SENSORS

92



# KTR 156/R

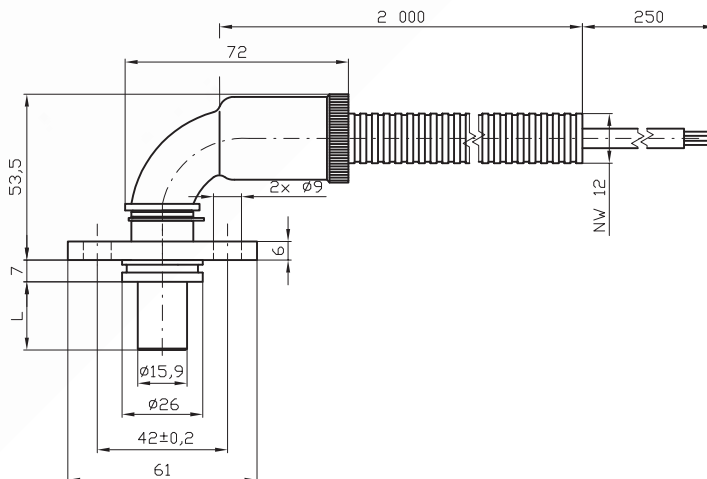
Temperature measurement of axle bearings



Z017.7a



temperature



## DESCRIPTION AND APPLICATION

The KTR 156/R resistance temperature sensor is designed to measure temperature of solid substances. In the application segment of Railway Vehicles, it is intended to measure temperature of carriage axle bearings. The sensor configuration is depended on achieving the required resistance of the entire structure, in particular against vibrations and shocks.

The temperature range is  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 68 (1 bar) according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTR 156/R
Type of sensing element	all types
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)
Ingress protection	IP 68 (1 bar) in accordance with EN 60529
Case dimension	$15.9 \pm 0.05 \text{ mm}$
Length of case L	10 to 100 mm
Case material	stainless steel DIN 1.4301
Lead-in cable	RADOX shielded $2 \times 0.5 \text{ mm}^2$ RADOX shielded $4 \times 0.5 \text{ mm}^2$
Wire resistance	$0.07 \Omega$ for 1 m of cable for 2-wire connection
Protection tube	PMAFLEX PCST-12B.50, could be different
Insulation resistance	$> 200 \text{ M}\Omega$ at $500 \text{ V}_{\text{DC}}$ , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$
Shock and vibration tests	category 3 in accordance with EN 61373
Insulation test	$4 \text{ kV}_{\text{DC}}$ for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.95 \times 10^6 \text{ hrs}$

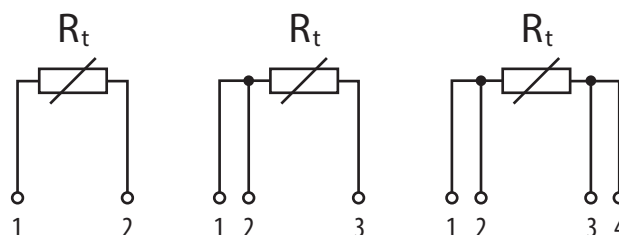
\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

■ 2wire

■ 3wire

■ 4wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, etc.)

**In case of change cable to silicone shielded 2 x 0.56 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 150 °C (the measuring range can be extended – see the modifications)

## SENSOR INSTALLATION ↓

1. Place the sensor on the surface to be measured and attached by means of two screws of suitable length.
2. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.  
**The lead-in cable shielding is not conductively connected with the external housing of the sensor or with the sensing element.**
3. Provide fixing the cable and the protective tube so as to prevent their free movement during measuring process.
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z017.7a | 09/18

replace Z017.6a



# KTR 167/R

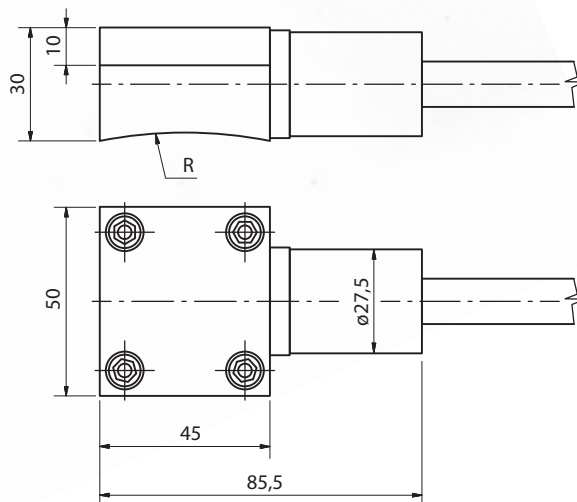
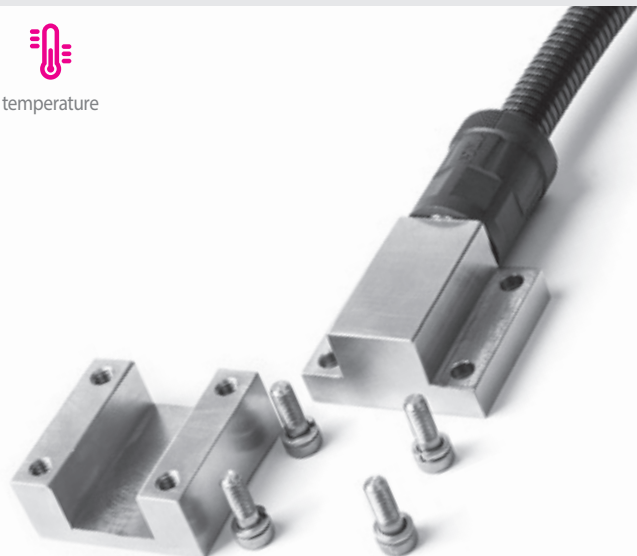
Temperature measurement of axle bearings



Z052.3a



temperature



## DESCRIPTION AND APPLICATION

The KTR 167/R resistance temperature sensor is designed to measure temperature of solid substances. In the application segment of Railway Vehicles, it is intended to measure temperature of carriage axle bearings. The sensor configuration is depended on achieving the required resistance of the entire structure, in particular against vibrations and shocks.

The temperature range is -40 °C to 120 °C and these limits must not be exceeded even for a brief period. The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 68 (1 bar) according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTR 167/R
Type of sensing element	all types
Temperature range	-40 °C to 120 °C (the measuring range can be extended – see the modifications)
Ingress protection	IP 68 (1 bar) in accordance with EN 60529
Case dimension	45 x 50 x 30 mm / R162 + 4
Case material	stainless steel DIN 1.4301
Lead-in cable	RADOX shielded 2 x 0.5 mm <sup>2</sup> RADOX shielded 4 x 0.5 mm <sup>2</sup>
Wire resistance	0.07 Ω for 1 m of cable for 2-wire connection
Connector	HARTING Han 3A-F
Protection tube	PMAFLEX PCST-12B.50, could be different
Insulation resistance	> 200 MΩ at 500 V <sub>DC</sub> , 25 °C ± 3 °C, humidity < 80%
Shock and vibration tests	category 3 in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.95 x 10 <sup>6</sup> hrs

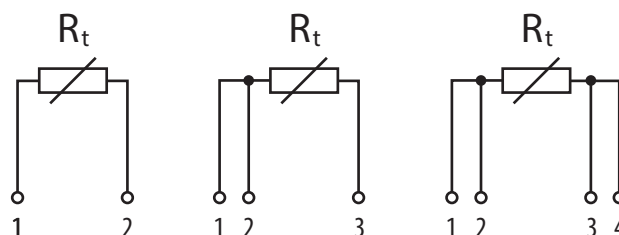
\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

■ 2wire

■ 3wire

■ 4wire





## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, etc.)

**In case of change cable to silicone shielded 2 x 0.56 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 150 °C (the measuring range can be extended – see the modifications)

## SENSOR INSTALLATION ↓

1. Before placing the sensor in the place measured, clean the contact surface with a file or use a thermally conductive paste between the measured surface and the metal sensor case.
2. Remove the four mounting screws and separate the two parts of the cases. Weld the lower part of the case with a radius to the measured point and let the metal part to cool.
3. Insert the top part of the case with a cable into the welded part and fasten with four mounting screws.
4. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.  
**The lead-in cable shielding is not conductively connected with the external housing of the sensor or with the sensing element.**
5. Provide fixing the cable and the protective tube so as to prevent their free movement during measuring process.
6. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z052.3a | 09/18

replace Z052.2a



# KTR 069/R

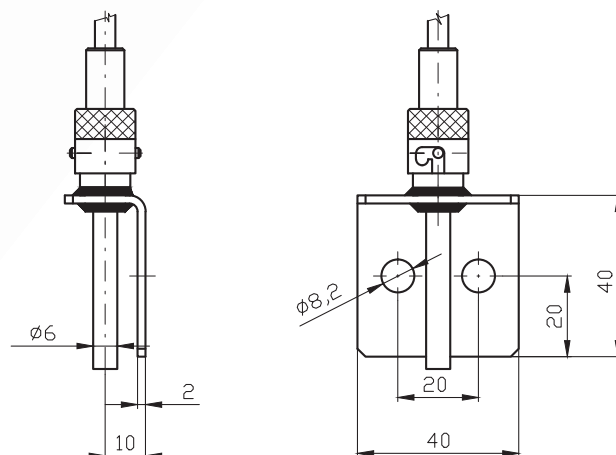
Measuring temperature of cooling air of traction electric motors



Z014.6a



temperature



## DESCRIPTION AND APPLICATION

The KTR 069/R temperature sensor is designed to measure temperature of gaseous, liquid or solid substances. In the application segment of Railway Vehicles, it has been produced to measure temperature of cooling air of traction electric engines of shunting locomotives. A special adapter with a bayonet mount prevents the sensor from loosening.

The temperature range is  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. The case of the temperature sensor and the adapter with bayonet mount is made of stainless steel. The sensor can be used for any control system compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTR 069/R
Type of sensing element	all types
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)
Ingress protection	IP 67 in accordance with EN 60529
Case dimension	$6 \pm 0.1$ mm
Length of case L	10 to 100 mm
Case material	stainless steel DIN 1.4301
Lead-in cable	RADOX shielded $2 \times 0.5$ mm <sup>2</sup> RADOX shielded $4 \times 0.5$ mm <sup>2</sup>
Wire resistance	$0.07 \Omega$ for 1 m of cable for 2-wire connection
Time response	$\tau_{0.5} < 9$ s (in flowing water at $0.4$ ms <sup>-1</sup> )
Accessories	special holder with bayonet mount
Insulation resistance	$> 200$ M $\Omega$ at $500$ V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$
Shock and vibration tests	category 2, class B in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.95 \times 10^6$ hrs

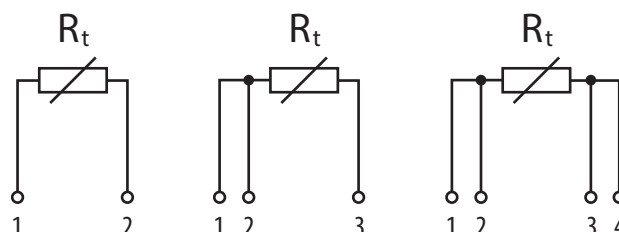
\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

■ 2wire

■ 3wire

■ 4wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, etc.)

**In case of change cable to silicone shielded 2 x 0.34 mm<sup>2</sup> or silicone shielded 4 x 0.15 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 200 °C (the measuring range can be extended – see the modifications)
- possibility of encasing two sensors

## SENSOR INSTALLATION ↓

1. Mount the holder on a solid base using two screws.
2. Insert the sensor thorough the hole on the lock side and fasten the bayonet locking head.
3. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.  
**The lead-in cable shielding is not conductively connected with the external housing of the sensor or with the sensing element.**
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z014.6a | 09/18

replace Z014.5a





## KTR 164/R

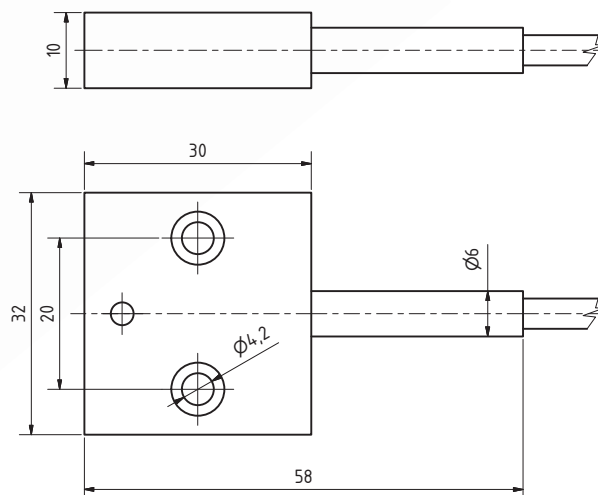
Measuring the temperature of coolants, batteries  
or other parts with planner surface



Z018.6a



temperature



### DESCRIPTION AND APPLICATION ↓

The KTR 164/R resistance temperature sensor is designed to measure temperature of solid substances. In the application segment of Railway Vehicles, the sensor is intended to be used for measurement of temperature of coolers, accumulators or other parts with a flat surface.

The temperature range is  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensors meets ingress protection IP 67 according to EN 60529.

Sensors are intended for operation in chemically non-aggressive environment.

### TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
  - Shock and Vibration tests in accordance with **EN 61373**, as amended
- The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

### SPECIFICATIONS ↓

Sensor type	KTR 164/R
Type of sensing element	all types
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)
Ingress protection	IP 67 in accordance with EN 60529
Case dimension	32 x 30 x 10 mm
Case material	brass
Lead-in cable	RADOX shielded 2 x 0.5 mm <sup>2</sup> RADOX shielded 4 x 0.5 mm <sup>2</sup>
Wire resistance	0.07 $\Omega$ for 1 m of cable for 2-wire connection
Insulation resistance	> 200 M $\Omega$ at 500 V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity < 80%
Shock and vibration tests	category 1, class B in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.95 \times 10^6$ hrs

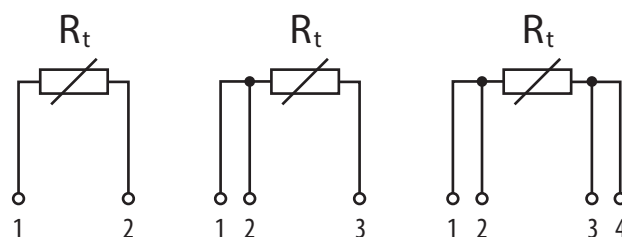
\* Under the environmental and operational conditions specified in approved testing methodology.

### WIRING DIAGRAM ↓

■ 2wire

■ 3wire

■ 4wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, etc.)

**In case of change cable to silicone shielded 2 x 0.22 mm<sup>2</sup> or silicone shielded 4 x 0.15 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 200 °C (the measuring range can be extended – see the modifications)
- possibility of encasing two sensors

## SENSOR INSTALLATION ↓

1. Prior to mounting the sensor it is necessary to clean the surface to be measured, to make it flat and to apply a heat transfer paste or silicone vaseline, which will ensure a faster response and minimize the error of the method during contact sensor temperature measurement.
2. Place the sensor on the surface to be measured and attach by means of two M4 screws of a suitable length. When the sensor is to be used in an environment with the occurrence of vibrations and shocks, use suitable means to secure the threads. Secure the cable against oscillation in all directions by means of a fixed holder at a distance of 10 to 15 cm from the brass housing.
3. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation. **The operating position of the sensor is adjustable according to need.**



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Z018.6a | 09/18

replace Z018.5a



## KTR 107

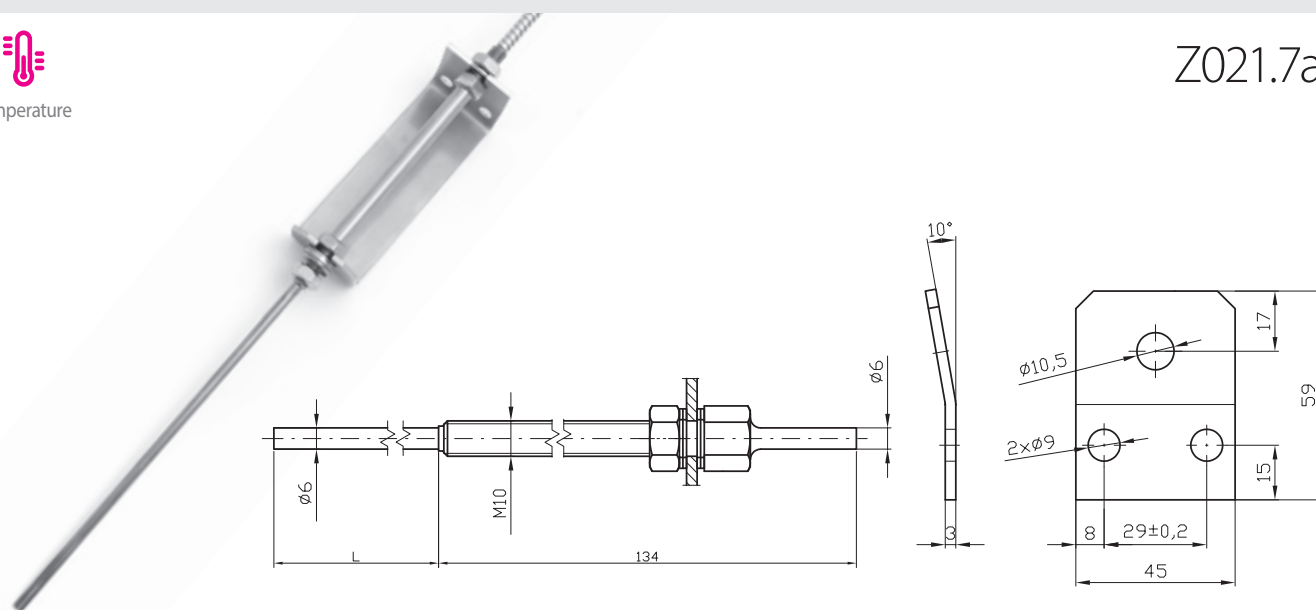
For secondary temperature measurements  
of electric resistors of electrodynamic breaks



Z021.7a



temperature



### DESCRIPTION AND APPLICATION ↓

The KTR 107 resistance temperature sensor is designed to measure temperature of gaseous or liquid substances. In the application segment of Railway Vehicles, it is intended for secondary measurement of temperature of electrical resistors of electrodynamic brakes of electric and diesel-electric locomotives.

Maximum temperature range is  $-40^{\circ}\text{C}$  to  $400^{\circ}\text{C}$  and these limits may be exceeded for a brief period. The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 65 according to EN 60529 standard, as amended.

The temperature sensor is intended for operation in chemically non-aggressive environment.

### TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

### SPECIFICATIONS ↓

Sensor type	KTR 107
Type of sensing element	Pt 100/3850; Pt 1000/3850
Temperature range	$-40^{\circ}\text{C}$ to $400^{\circ}\text{C}$
Ingress protection	IP 65 in accordance with EN 60529
Case dimension	$6 \pm 0.1$ mm
Length of case L	10 to 500 mm
Thread / OK	M 10 x 1 / OK 17
Case material	stainless steel DIN 1.4301
Lead-in cable	silicone shielded $2 \times 0.34$ mm <sup>2</sup> silicone shielded $4 \times 0.15$ mm <sup>2</sup>
Wire resistance	$0.11 \Omega$ for 1 m of cable for 2-wire connection
Time response	$\tau_{0.5} < 9$ s (in flowing water at $0.4$ ms <sup>-1</sup> )
Accessories	metal holder
Insulation resistance	$> 200$ M $\Omega$ at $500$ V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	$3$ kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.2 \times 10^6$ hrs, based on a theoretical calculation

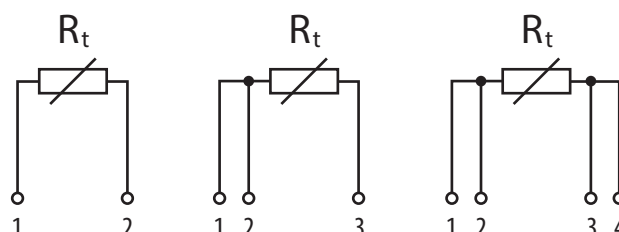
\* Under the environmental and operational conditions specified in approved testing methodology.

### WIRING DIAGRAM ↓

■ 2wire

■ 3wire

■ 4wire





## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- possibility of encasing two sensing elements
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)

## SENSOR INSTALLATION ↓

1. Installation of the sensor in the measured place – the sensor is mounted by means of the threading, which is part of the sensor, screwed into a special holder. Use OK17 wrenches for the sensor assembling and fixing. The supply includes stainless steel nuts M10 x 1 and special anti-vibration washers Nord-Lock.
2. Connect the wires of the lead-in cable according to the wiring diagram. Supply cable with the length of 3 m is shielded, silicone insulated and protected at by 1.5 m long by metal hose with the diameter of 10 mm that is attached to the sensor.
3. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The operating position of the sensor is adjustable according to need.**



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Z021.7a | 09/18

replace Z021.6a



## KTR 149

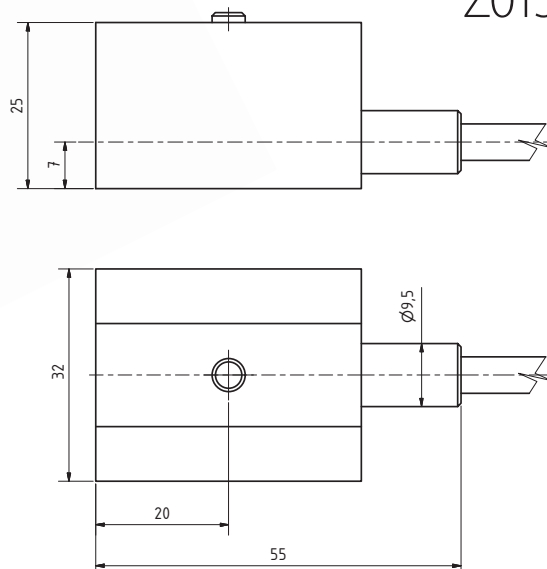
Measuring temperature of rail for automatic heating of track exchanges



temperature



Z015.5a



### DESCRIPTION AND APPLICATION ↓

The KTR 149 temperature sensors are designed to measure surface temperature of solid substances. In the application segment of Railway Vehicles, it is intended to measure temperature of rails and is a part of the system for automatic heating of railroad switches. The sensor has double insulation, which provides high value of electrical breakdown in its own sensor.

The temperature range is  $-40^{\circ}\text{C}$  to  $100^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. The sensor meets ingress protection IP 68 (1 bar) according to EN 60529 standard, as amended. The KTR 149 temperature sensor is attached to the rail from the bottom side with a special elastic holder D001 or D006 (depending on the rail) that is delivered separately. The sensor design ensures meeting the conditions for security equipment according to requirements of EN 50125-3 standard and EN 60068-2-1 and EN 60068-2-2 standards. Because of this, they can be used to measure surface temperature of the rails. The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters.

The sensor is intended for operation in chemically non-aggressive environment.

### SPECIFICATIONS ↓

Sensor type	KTR 149
Type of sensing element	all types
Temperature range	$-40^{\circ}\text{C}$ to $100^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)
Ingress protection	IP 68 h (1 bar) in accordance with EN 60529
Case dimensions / diameter	40 x 25 mm / diameter 32 mm
Case material	stainless steel DIN 1.4301
Lead-in cable	Polyuretan unshielded H05BQ 2 x 0.75 mm <sup>2</sup>
Wire resistance	0.047 $\Omega$ for 1 m of cable for 2-wire connection
Type of protection tube	PMAFLEX PCST-10
Accessories	metal holder D001 or D006 according rail type
Insulation resistance	> 200 M $\Omega$ at 500 V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity < 80%
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50124-1
Mean working life $\approx$ MTTF *	$1.95 \times 10^6$ hrs

\* Under the environmental and operational conditions specified in approved testing methodology.

### TESTS, DECLARATION, CALIBRATIONS ↓

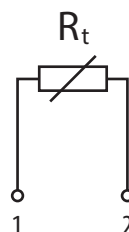
- Shock and Vibration Test in accordance with **EN 50125-3** standard, as amended
- Cold Test (AC) in accordance with **EN 60068-2-1** standard, as amended
- Dry Heat Test in accordance with **EN 60068-2-2** standard, as amended
- Insulation Test in accordance with **EN 50124-1** standard, as amended

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

### WIRING DIAGRAM ↓

- 2wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, etc.)
- possibility of encasing two sensing elements

## SENSOR INSTALLATION ↓

- 1. Prior to mounting the switch it is necessary to clean the surface to be measured, to make it flat and to apply a heat transfer paste or silicone vaseline, which will ensure a faster response and minimize the error of the method during contact sensor temperature measurements.**
- 2.** Place the temperature sensor on the surface of the rail. Stainless steel spring D 001 with arresting opening, supplied as separate accessories, serves for mounting on the bottom side of the rail.
- 3.** Connection of the wires of the lead-in cable according to the wiring diagram.
- 4.** After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z015.5a | 09/18

replace Z015.4a





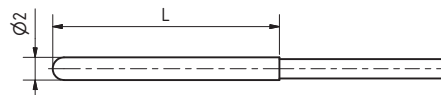
## KTG 12

Temperature sensor with case  $\varnothing$  2 mm


Z050.3a



temperature



### DESCRIPTION AND APPLICATION

The KTG 12 resistance temperature sensor is designed to measure temperature of gaseous or liquid substances. In the application segment of Railway Vehicles, it is intended to be used for example in the air conditioning system and the temperature control system.

Temperature range of the sensor use is  $-50^{\circ}\text{C}$  to  $200^{\circ}\text{C}$ . The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended. Case diameter of 2 mm ensures fast sensor response to temperature changes.

The sensors are intended for operation in chemically non-aggressive environment.

### TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

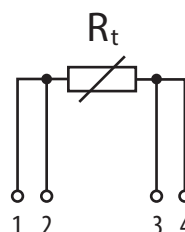
### SPECIFICATIONS

Sensor type	KTG 12
Type of sensing element	Pt 100/3850, Pt 1000/3850
Temperature range	$-50^{\circ}\text{C}$ to $200^{\circ}\text{C}$
Ingress protection	IP 67 in accordance with EN 60529
Case dimension	$2 \pm 0.1$ mm
Length of case L	25 to 60 mm
Case material	stainless steel DIN 1.4301
Lead-in cable	teflon unshielded $4 \times 0.02$ mm <sup>2</sup> (4 x AWG 34)
Wire resistance	$0,07 \Omega$ for 1 m of cable for 2-wire connection
Time response	$\tau_{0.5} < 1.5$ s (in flowing water at $0.4$ ms <sup>-1</sup> )
Insulation resistance	$> 200$ M $\Omega$ at $500$ V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	$4$ kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.2 \times 10^5$ hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology.

### WIRING DIAGRAM

■ 4wire



## SENSOR INSTALLATION ↓

1. If the sensor is used for contact temperature measurements of surface, purify surface and use a thermal conductive paste or silicone vaseline on a surface.
2. Install the sensor in the measured location and ensure fix installation of the sensor to prevent its movement.
3. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.  
The connection terminals must be adapted to the wire cross section.
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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**KTG 3**
**KTG 3A**

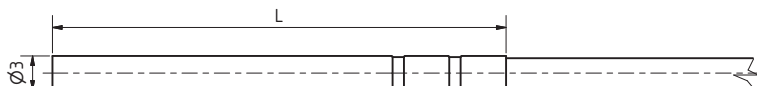
Temperature sensor with case  $\varnothing$  3 mm

CE



temperature

Z067.3a



## DESCRIPTION AND APPLICATION ↓

The KTG 3 and KTG 3A resistance temperature sensor is designed to measure temperature of gaseous or liquid substances. In the application segment of Railway Vehicles, it is intended to be used for example in the air condition system and the temperature control system.

Temperature range of the sensor use is  $-50\text{ }^{\circ}\text{C}$  to  $200\text{ }^{\circ}\text{C}$ . The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended. Case diameter of 3 mm ensures fast sensor response to temperature changes.

The sensors are intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS ↓

Sensor type	KTG 3	KTG 3A
Type of sensing element	Pt 100/3850, Pt 500/3850, Pt 1000/3850	
Temperature range	$-50\text{ }^{\circ}\text{C}$ to $200\text{ }^{\circ}\text{C}$	$-50\text{ }^{\circ}\text{C}$ to $260\text{ }^{\circ}\text{C}$
Ingress protection	IP 67	IP 64
	in accordance with EN 60529	
Case dimension	$3 \pm 0.1\text{ mm}$	
Length of case L	25 to 60 mm	
Case material	stainless steel DIN 1.4301	
Lead-in cable	teflon unshielded 2 x AWG24 teflon shielded 4 x AWG30	
Wire resistance	$0.178\text{ }\Omega$ for 1 m of cable for 2-wire connection	
Time response	$\tau_{0.5} < 3\text{ s}$ (in flowing water at $0.4\text{ ms}^{-1}$ )	
Insulation resistance	$> 200\text{ M}\Omega$ at $500\text{ V}_{DC}$ , $25\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ , humidity $< 80\%$	
Shock and vibration tests	category 2 in accordance with EN 61373	
Insulation test	$4\text{ kV}_{DC}$ for time 1 minute in accordance with EN 50155	
Mean working life $\approx$ MTTF *	$1.2 \times 10^5$ hrs, based on a theoretical calculation	

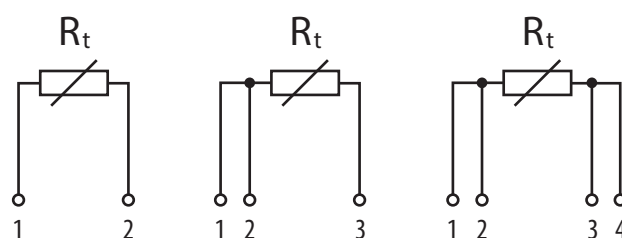
\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM ↓

■ 2wire

■ 3wire

■ 4wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- A class precision
- possibility of connecting cable shielding to the case (KTG 3H)

## SENSOR INSTALLATION ↓

1. If the sensor is used for contact temperature measurements of surface, purify surface and use a thermal conductive paste or silicone vaseline on a surface.
2. Install the sensor in the measured location or insert it in the thermowell and ensure fix installation of the sensor to prevent its movement.
3. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.  
**For 3 and 4wire connection with shielded cable, The lead-in cable shielding is not conductively connected with the external housing of the sensor or with the sensing element. For 3 and 4wire connection is necessary customize connection terminals to cross-section of the cable.**
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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replace Z067.2a



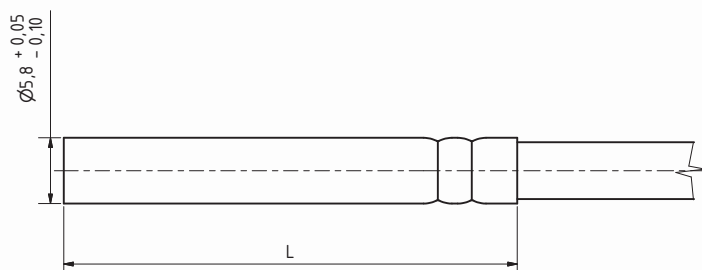
## KTG 8/R

Temperature sensor with case  $\varnothing$  5,8 mm


Z049.3a



temperature



## DESCRIPTION AND APPLICATION

The KTG 8/R resistance temperature sensor is designed to measure temperature of gaseous or liquid substances. In the application segment of Railway Vehicles, it is intended to be used for example in the air condition system and the temperature control system.

Temperature range of the sensor use is  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ . The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended.

The sensors are intended for operation in chemically non-aggressive environment.

## ACCESSORIES

- thermowell JTG 8

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTG 8/R
Type of sensing element	all types
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)
Ingress protection	IP 67 in accordance with EN 60529
Case dimension	$5.8 \pm 0.1$ mm
Length of case L	40 to 100 mm
Case material	stainless steel DIN 1.4301
Lead-in cable	RADOX shielded $2 \times 0.5$ mm <sup>2</sup> RADOX shielded $4 \times 0.5$ mm <sup>2</sup>
Wire resistance	$0.07 \Omega$ for 1 m of cable for 2-wire connection
Time response	$\tau_{0.5} < 7$ s (in flowing water at $0.4$ ms <sup>-1</sup> )
Insulation resistance	$> 200$ M $\Omega$ at $500$ V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	$4$ kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.95 \times 10^6$ hrs

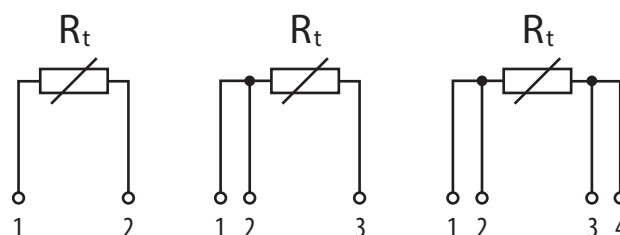
\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

■ 2wire

■ 3wire

■ 4wire





## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, TC, etc.)

**In case of change cable to silicone shielded 2 x 0.34 mm<sup>2</sup> or silicone shielded 4 x 0.22 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 200 °C (the measuring range can be extended – see the modifications)
- possibility of encasing two sensing elements

## SENSOR INSTALLATION ↓

1. If the sensor is used in combination with the thermowell, screw the thermowell in the welded-on piece on the piping or in the specific threaded location.
2. Install the sensor in the measured location or insert it in the thermowell and ensure fix installation of the sensor to prevent its movement.
3. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.

**The lead-in cable shielding is not conductively connected with the external housing of the sensor or with the sensing element.**

4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.

**The sensor does not require any special manipulation or maintenance.**



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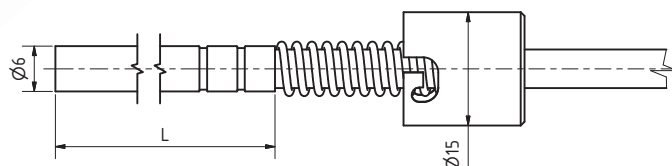
# KTG 68B/R

Temperature sensor with case  $\varnothing$  6 mm


Z019.7a



temperature



## DESCRIPTION AND APPLICATION

The KTG 68B/R resistance temperature sensor has been developed for the segment of Railway Vehicles to measure the temperature of diesel oil in tanks of diesel and diesel-electric locomotives as a part of measurement system and an indication of operation economy. In the diesel tank, there is a tube with a special adapter for bayonet mount. The temperature sensor with the bayonet mount preventing the mechanical loosening is inserted into the tube.

The temperature range is  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 68 (1 bar) according to EN 60529 standard, as amended.

The sensor is intended for operation in non-aggressive environment.

## ACCESSORIES

- thermowell JS 130G
- bayonet adapter

## TESTS, DECLARATION, CALIBRATIONS

The **type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

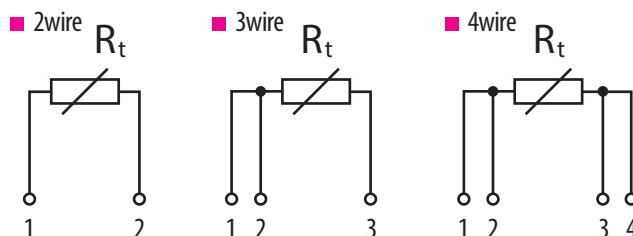
**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTG 68B/R
Type of sensing element	all types
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)
Ingress protection	IP 68 (1 bar) in accordance with EN 60529
Case dimension	$6 \pm 0.1$ mm
Length of case L	10 to 100 mm
Case material	stainless steel DIN 1.4301
Material/Dimension of bayonet head	nickel-plated brass /L = 16 mm, inner $\varnothing$ 12.8 mm
Material/Dimension of spring	stainless steel DIN 1.4301 /L = 200 mm, outer $\varnothing$ 6 mm, $\varnothing$ of wire 0.7 mm
Lead-in cable	RADOX shielded 2 x 0.5 mm <sup>2</sup> RADOX shielded 4 x 0.5 mm <sup>2</sup>
Wire resistance	0.07 $\Omega$ for 1 m of cable for 2-wire connection
Time response	$\tau_{0.5} < 9$ s (in flowing water at 0.4 ms <sup>-1</sup> )
Insulation resistance	> 200 M $\Omega$ at 500 V <sub>DC</sub> , 25 $^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity < 80%
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Accessories	thermowell, bayonet adapter
Mean working life $\approx$ MTTF *	$1.95 \times 10^6$ hrs

\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, TC, etc.)

**In case of change cable to silicone shielded 2 x 0.22 mm<sup>2</sup> or silicone shielded 4 x 0.15 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 200 °C (the measuring range can be extended – see the modifications)
- possibility of encasing two sensing elements

## SENSOR INSTALLATION ↓

1. Turn the bayonet head placed on a spring in one direction or the other direction to adjust desired distance of nut from the case.  
By moving the nut, the depth of sensor placement in the measurement point as well as spring pressure can be adjusted.
2. Install the sensor in the measured location or insert it in the thermowell and ensure fix installation of the sensor to prevent its movement.
3. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.  
**The lead-in cable shielding is not conductively connected with the external housing of the sensor or with the sensing element.**
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z019.7a | 09/18

replace Z019.6a



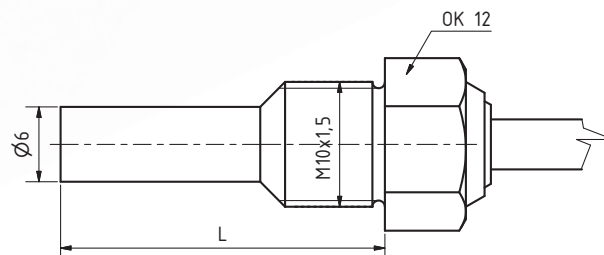
## KTG 2/R

Temperature sensor with case  $\varnothing 6$  mm, thread M10x1.5


Z024.9a



temperature



## DESCRIPTION AND APPLICATION

The temperature sensor KTG 2/R is designed to measure temperature of gaseous, liquid or solid substances. In the application segment of Railway Vehicles, it is intended to be used for example in the air condition system and the temperature control system or for measurement of temperature in pipeline.

The standard thread M10 x 1.5 allowing installation of the sensor directly into the environment measured is a part of the case of the KTG 2/R sensor. Maximum temperature range of the sensor use is  $-50^{\circ}\text{C}$  to  $200^{\circ}\text{C}$ . The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 as amended, and it is designed for temperature measurement in pipelines. Its design allows faster response to changes in temperature compared to sensors with a thermowell.

The temperature sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTG 2/R
Type of sensing element	all types
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)
Ingress protection	IP 67 in accordance with EN 60529
Case dimension	$6 \pm 0.1$ mm
Length of case L	10 to 100 mm
Thread / OK	M 10 x 1.5 / OK 12
Case material	stainless steel DIN 1.4301
Lead-in cable	RADOX shielded $2 \times 0.5$ mm <sup>2</sup> RADOX shielded $4 \times 0.5$ mm <sup>2</sup>
Wire resistance	$0.07 \Omega$ for 1 m of cable for 2-wire connection
Time response	$\tau_{0.5} < 8$ s (in flowing water at $0.4$ ms <sup>-1</sup> )
Insulation resistance	$> 200$ M $\Omega$ at $500$ V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.95 \times 10^6$ hrs

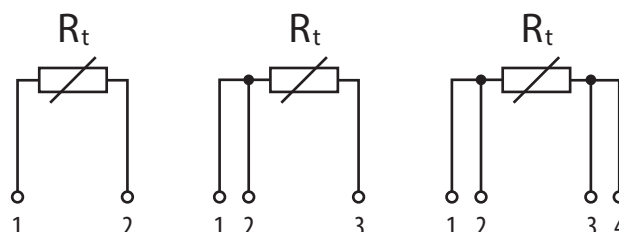
\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

■ 2wire

■ 3wire

■ 4wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- possibility to change the thread
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, TC, etc.)

**In case of change cable to silicone shielded 2 x 0.22 mm<sup>2</sup> or silicone shielded 4 x 0.15 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -30 °C to 200 °C (the measuring range can be extended – see the modifications)
- possibility of encasing two sensing elements

## SENSOR INSTALLATION ↓

1. Install the sensor to the measured place – for own installation and mounting of the sensor use an OK 12 wrench. As a sealant, you can use suitable sealing cements, oakum or a sealling tape.
2. Ensure fix installation of the sensor to prevent its movement.
3. Connect the wires of the lead-in cable to the evaluation unit according to the wiring diagram.  
**The lead-in cable shielding is not conductively connected with the external housing of the sensor or with the sensing element.**
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z024.9a | 09/18

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**KTG 6/R**
**KTG 6E/R**

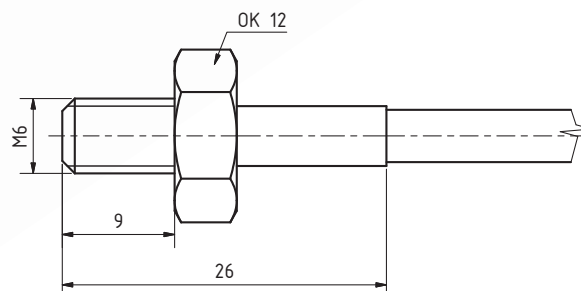
Temperature sensor, thread M6, OK 12

CE



temperature

Z013.7a



## DESCRIPTION AND APPLICATION

The KTG 6/R and KTG 6E/R temperature sensors are designed to measure temperature of solid substances. In the application segment of Railway Vehicles, the temperature sensors are used for example to measure surface temperature of baseboards of converters and coolers of performance elements of electric locomotives (drive units) where, due to the lack of space, the lead-in cable is needed to guide at a right angle to the base board and in close proximity to the performance elements under power. The sensor is attached to the surface of measured parts with the thread M6, which is a part of the sensor.

The temperature range of temperature sensor KTG 6/R and KTG 6E/R is  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$ , these limits must not be exceeded even for a brief period. The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended. The temperature sensors are intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
  - Shock and Vibration tests in accordance with **EN 61373**, as amended
- The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

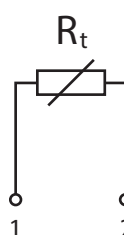
## SPECIFICATIONS

Sensor type	KTG 6/R	KTG 6E/R
Type of sensing element	Pt, Ni, NTC, TCx	
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)	
Ingress protection	IP 67 in accordance with EN 60529	
Length of thread	9 mm	
Thread / OK	M 6 / OK 12	
Case material	brass	
Lead-in cable	RADOX shielded $2 \times 0.5 \text{ mm}^2$	
Wire resistance	0.142 $\Omega$	0.16 $\Omega$
	for 1 m of cable for 2-wire connection	
Time response	$\tau_{0.5} < 4 \text{ s}$ (in flowing water at $0.4 \text{ ms}^{-1}$ )	
Insulation resistance	$> 200 \text{ M}\Omega$ at $500 \text{ V}_{\text{DC}}$ , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$	
Shock and vibration tests	category 2 in accordance with EN 61373	
Insulation test	4 $\text{kV}_{\text{DC}}$	6 $\text{kV}_{\text{DC}}$
	for time 1 minute in accordance with EN 50155	
Mean working life $\approx$ MTTF *	$8.2 \times 10^5 \text{ hrs}$	

\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

- 2wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- possibility to change the thread
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing thermocouples

**In case of change cable to silicone shielded 2 x 0.22 mm<sup>2</sup> or silicone shielded 4 x 0.15 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 200 °C (the measuring range can be extended – see the modifications)

## SENSOR INSTALLATION ↓

1. Install the sensor to the measured place – for own installation and mounting of the sensor use an OK 12 wrench.  
**When installing, the cable has to be laid freely and it has to be allowed to rotate together with the case.**
2. Connection of the wires of the lead-in cable according to the wiring diagram.  
**The shielding of the lead-in cable is not connected to the outer case of the sensor or with the sensing element.**
3. After installing and connecting to the electrical measuring equipment, the sensor is ready for use.  
**The sensor does not require any special servicing maintenance.**



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Z013.7a | 09/18

replace Z013.6a



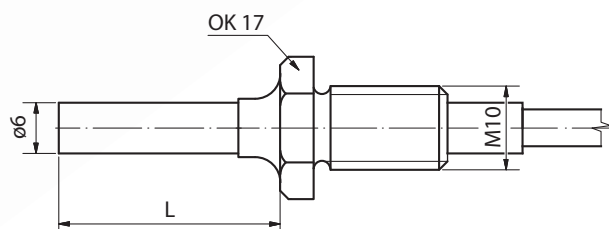
# KTR 028A/R

Temperature sensor with case  $\varnothing$  6 mm, thread M10x1.5


Z030.5a



temperature



## DESCRIPTION AND APPLICATION

The KTR 028A/R resistance temperature sensor is designed to measure temperature of gaseous or liquid substances. In the application segment of Railway Vehicles, the temperature sensor is used for example as an indicator of inlet and outlet temperature control of hot air heating units in passenger compartments of railway vehicles.

The temperature range is  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. Threaded mounting screw oriented towards the lead-in cable is a fixed part of the temperature sensor. The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended.

The temperature sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

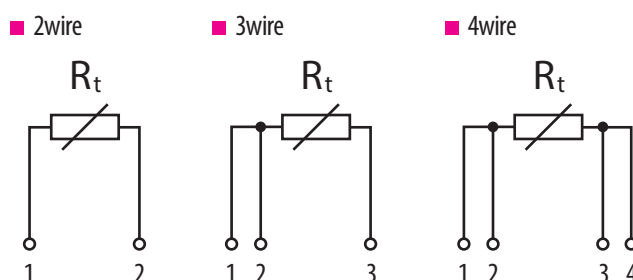
**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTR 028A/R
Type of sensing element	all types
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)
Ingress protection	IP 67 in accordance with EN 60529
Case dimension	$6 \pm 0.1$ mm
Length of case L	10 to 100 mm
Thread / OK	M 10 x 1.5 / OK 17
Case material	stainless steel DIN 1.4301
Lead-in cable	RADOX shielded $2 \times 0.5$ mm <sup>2</sup> RADOX shielded $4 \times 0.5$ mm <sup>2</sup>
Wire resistance	$0.07 \Omega$ for 1 m of cable for 2-wire connection
Time response	$\tau_{0.5} < 8$ s (in flowing water at $0.4$ ms <sup>-1</sup> )
Insulation resistance	$> 200$ M $\Omega$ at $500$ V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.95 \times 10^6$ hrs

\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- possibility to change the thread
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, TC, etc.)

**In case of change cable to silicone shielded 2 x 0.34 mm<sup>2</sup> or silicone shielded 4 x 0.15 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 200 °C (the measuring range can be extended – see the modifications)
- possibility of encasing two sensing elements

## SENSOR INSTALLATION ↓

1. Place the sensor in the location of temperature measurement. To install and attach the sensor use a combination wrench OK according to the type of supplied screw, which is a part of the stem. As a seal can be used suitable sealing mastic or sealing tape.
2. Provide fix installation of the sensor to prevent its movement.
3. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.  
**The shielding of the lead-in cable is not connected to the outer case of the sensor or with the sensing element.**
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z030.5a | 09/18

replace Z030.4a



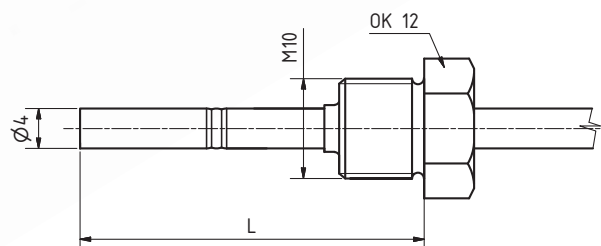
KTR 030A

KTR 030F

Temperature sensor with case  $\varnothing$  4 mm, thread M10x1.5


temperature

Z022.6a



## DESCRIPTION AND APPLICATION

The KTR 030A and KTR 030F resistance temperature sensors are designed to measure temperature of gaseous or liquid substances. In the application segment of Railway Vehicles, they are intended to measure temperature of air in air condition units of carriages and passenger compartments of train units in order to control the temperature in spaces for passengers.

The temperature range is  $-30^{\circ}\text{C}$  to  $150^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. These sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. These sensors meet ingress protection IP 67 according to EN 60529 standard, as amended. The stem design allows the use of sensors for direct temperature measurement in pipelines and at the same time, provides a fast sensors response to changes in temperature compared to sensors with a thermowell.

These sensors are intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTR 030A	KTR 030F
Type of sensing element	all types	
Temperature range	$-30^{\circ}\text{C}$ to $150^{\circ}\text{C}$	
Ingress protection	IP 67 in accordance with EN 60529	
Case dimension	$4 \pm 0.1$ mm	$5,7 \pm 0,1$ mm
Length of case L	10 to 100 mm	
Thread / OK	M 10 x 1.5 / OK 12	M 12 x 1,5 / OK 19
Case material	stainless steel DIN 1.4301	
Lead-in cable	silicone shielded $2 \times 0,14$ mm <sup>2</sup> / $4 \times 0,15$ mm <sup>2</sup>	silicone unshielded $2 \times 0,5$ mm <sup>2</sup> / $4 \times 0,25$ mm <sup>2</sup>
Wire resistance	$0.254 \Omega$	$0,07 \Omega$
	for 1 m of cable for 2-wire connection	
Time response	$\tau_{0,5} < 5$ s	$\tau_{0,5} < 73$ s
	(in flowing water at $0.4$ ms <sup>-1</sup> )	
Insulation resistance	$> 200$ M $\Omega$ at $500$ V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$	
Shock and vibration tests	category 2 in accordance with EN 61373	
Insulation test	$4$ kV <sub>DC</sub> for time 1 minute in accordance with EN 50155	
Mean working life $\approx$ MTTF *	$8.2 \times 10^5$ hrs	

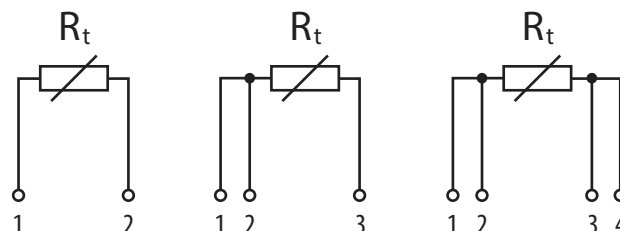
\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

■ 2wire

■ 3wire

■ 4wire





## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- possibility to change the thread
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSiC, KTY, SMT, TC, etc.)
- possibility of encasing two sensing elements

## SENSOR INSTALLATION ↓

1. Install the sensor to the measured place – for own installation and mounting of the sensor use an OK 12 wrench.  
As a sealant, you can use suitable sealing cements, oakum or a sealling tape.
2. Provide fix installation of the sensor to prevent its movement.
3. Connection of the wires of the lead-in cable according to the wiring diagram.
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.

**The sensor does not require any special manipulation or maintenance.**



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KTR 141A/R

KTR 141E/R

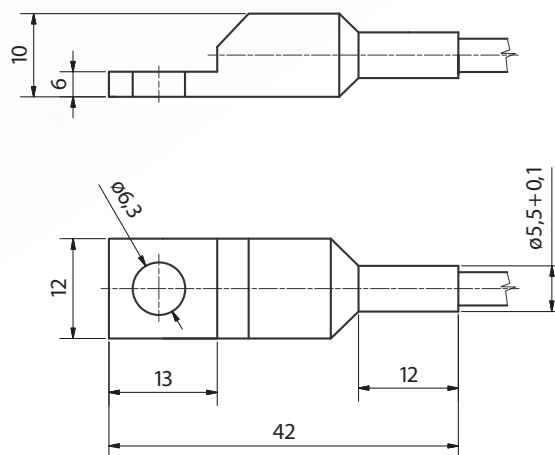
Contact temperature sensor  
aluminium alloy or steel

CE

Z016.8a



temperature



## DESCRIPTION AND APPLICATION

The KTR 141A/R and KTR 141E/R resistance temperature sensors are designed to measure surface temperature of solid substances with a smooth surface. In the application segment of Railway Vehicles, the sensors are intended for example to measure surface temperature of baseboards of converters and coolers of performance elements and backup battery sources of electric locomotives.

The temperature range is  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 65 according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTR 141A/R	KTR 141E/R
Type of sensing element	all types	
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)	
Ingress protection	IP 65 in accordance with EN 60529	
Case dimensions	40 x 12 x 8 mm	
The diameter of the hole for attachment	4.1 mm	
Case material	stainless steel DIN 1.4301	aluminium alloy 424441.6
Lead-in cable	RADOX shielded 2 x 0.5 mm <sup>2</sup> RADOX shielded 4 x 0.5 mm <sup>2</sup>	
Wire resistance	0.07 $\Omega$ for 1 m of cable for 2-wire connection	
Time response	$\tau_{0.5} < 10$ s (in flowing water at $0.4\text{ ms}^{-1}$ )	
Insulation resistance	$>200\text{ M}\Omega$ at 500 V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$	
Shock and vibration tests	category 2 in accordance with EN 61373	
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155	
Mean working life $\approx$ MTTF *	$1.95 \times 10^6$ hrs	

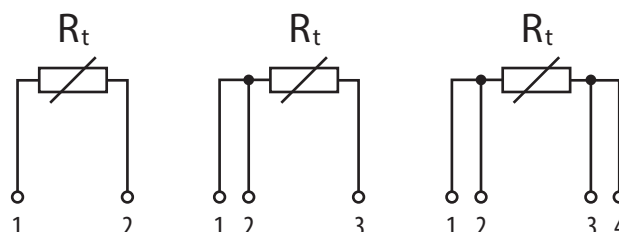
\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

■ 2wire

■ 3wire

■ 4wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- possibility of dimension and material of the case
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, TC, etc.)

**In case of change cable to silicone shielded 2 x 0.22 mm<sup>2</sup> or silicone shielded 4 x 0.15 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 200 °C (the measuring range can be extended – see the modifications)
- possibility of encasing two sensing elements

## SENSOR INSTALLATION ↓

1. Make a M4 thread in the measured material for attaching the sensor. The minimum material thickness is 3 mm.  
In thinner materials which do not allow making a thread, drill a 4.2 mm hole through material.
2. Before placing the sensor in the place measured, clean the contact surface with a file or use a thermally conductive paste between the measured surface and the metal sensor case.
- 3a. Place the temperature sensor on the surface of the measured material and fasten it using a mounting screw M4.  
For the materials in which the thickness is less than 3 mm, use a screw and a nut.
- 3b. If the hole is not possible to be drilled in the material surface, use a special adhesive bonding technology suitable for the case material (Duralumin) and the surface measured to attach to the surface to be measured.
4. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.  
**The shielding of the lead-in cable is not connected to the outer case of the sensor or with the sensing element.**
5. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z016.8a | 09/18

replace Z016.7a



# KTR 026D/R

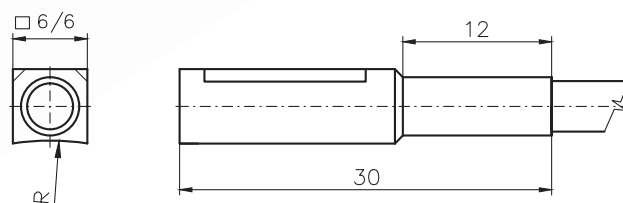
Contact temperature sensor made of brass



Z012.7a



temperature



## DESCRIPTION AND APPLICATION

The KTR 026D/R temperature sensor is designed to measure surface temperature of solid substances with a smooth surface. In the application segment of Railway Vehicles, it is used for example to measure temperature of water and sewage pipelines of carriage or cooling system pipelines of diesel engines or diesel-electric locomotives and units. Sensor is a part of the system ensuring the non-freezing of pipelines.

The temperature range is  $-40^{\circ}\text{C}$  to  $120^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. The sensor consists of a brass block, whose one area has a concave recess of particular radius for surface contact with the pipeline measured. The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended.

The sensor is attached to the pipeline using a mounting tape with a screw lock and as part of anti-freezing systems, it absolutely must not be thermal isolated, unlike in other applications.

The sensor is intended for operation in non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

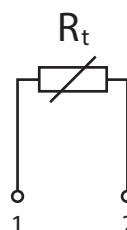
## SPECIFICATIONS

Sensor type	KTR 026D/R
Type of sensing element	all types
Temperature range	$-40^{\circ}\text{C}$ to $120^{\circ}\text{C}$ (the measuring range can be extended – see the modifications)
Ingress protection	IP 67 in accordance with EN 60529
Case dimensions	6 x 6 mm
Length of case	30 to 60 mm
The radius of curvature of the contact surfaces	$R$ = according $R$ of pipe
Case material	brass
Lead-in cable	RADOX shielded 2 x 0.25 mm <sup>2</sup>
Wire resistance	0.142 $\Omega$ for 1 m of cable for 2-wire connection
Time response	$\tau_{0.5} < 4$ s (in flowing water at $0.4$ ms <sup>-1</sup> )
Insulation resistance	$> 200$ M $\Omega$ at 500 V <sub>DC</sub> , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.95 \times 10^6$ hrs

\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

- 2wire



## MODIFICATIONS ↓

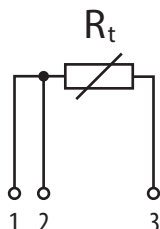
FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing thermocouples

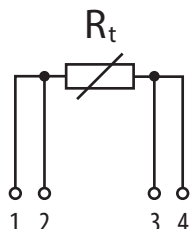
**In case of change cable to silicone shielded 2 x 0.22 mm<sup>2</sup> or silicone shielded 4 x 0.15 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:**

- temperature range -50 °C to 200 °C (the measuring range can be extended – see the modifications)
- possibility of encasing two sensing elements
- possibility of 3wire or 4wire connection:

3wire



4wire



## SENSOR INSTALLATION ↓

1. Before placing the sensor in the place measured, clean the contact surface with a file or use a thermally conductive paste between the measured surface and the metal sensor case.
2. Place the temperature sensor onto the measured surface and attach it using a fixing tape with temperature resistance up to 200 °C.
3. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.

**The shielding of the lead-in cable is not connected to the outer case of the sensor or with the sensing element.**

4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.

**The sensor does not require any special manipulation or maintenance.**



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Z012.7a | 09/18

replace Z012.6a





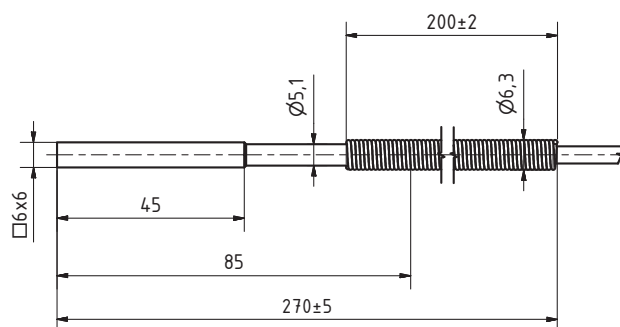
# KTR 026H

Contact temperature sensor made of stainless steel



temperature

Z051.3a



## DESCRIPTION AND APPLICATION

The KTR 026H temperature sensor is designed to measure surface temperature of solid substances with a smooth surface. In the application segment of Railway Vehicles, was developed to control the heating of trolleybus pulleys.

The temperature range of the sensor use, relating only to the square-shaped part of the case is from -30 °C to 350 °C; the sensor may be exposed to temperature up to 450 °C for a short period. The sensor consists of a metal case, in which the sensing element and the lead-in cable are placed. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTR 026H
Type of sensing element	Pt 100/3850, Pt 1000/3850
Temperature range	-30 °C to 350 °C, shorttime up to 450 °C
Ingress protection	IP 67 in accordance with EN 60529
Case dimensions	6 x 6 mm
Length of case	45/85 mm
Case material	stainless steel DIN 1.4301
Lead-in cable	silicone shielded 2 x 0.22 mm <sup>2</sup> silicone shielded 4 x 0.15 mm <sup>2</sup>
Wire resistance	0.162 Ω for 1 m of cable for 2-wire connection
Time response	$\tau_{0.5} < 4$ s (in flowing water at 0.4 ms <sup>-1</sup> )
Insulation resistance	> 200 MΩ at 500 V <sub>DC</sub> , 25 °C ± 3 °C, humidity < 80%
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	2.5 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>6</sup> hrs, based on a theoretical calculation

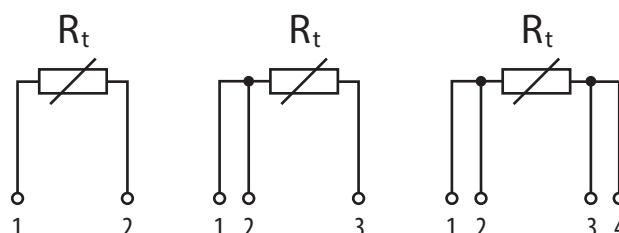
\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM

■ 2wire

■ 3wire

■ 4wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing two sensing elements
- possibility of encasing thermocouples

## SENSOR INSTALLATION ↓

1. Place the temperature sensor into the measured place and provide fix installation of the sensor to prevent its movements.
2. Connect the wires of the lead-in cable to the evaluation unit according the wiring diagram.  
**The shielding of the lead-in cable is not connected to the outer case of the sensor or with the sensing element.**
3. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z051.3a | 09/18

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# KTR 021

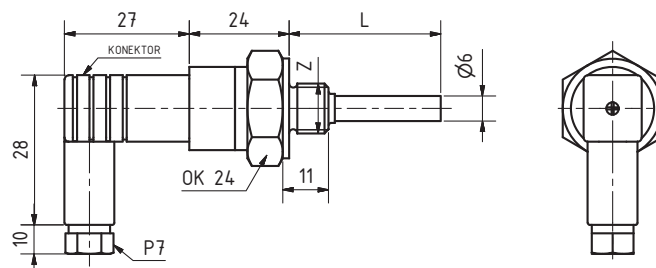
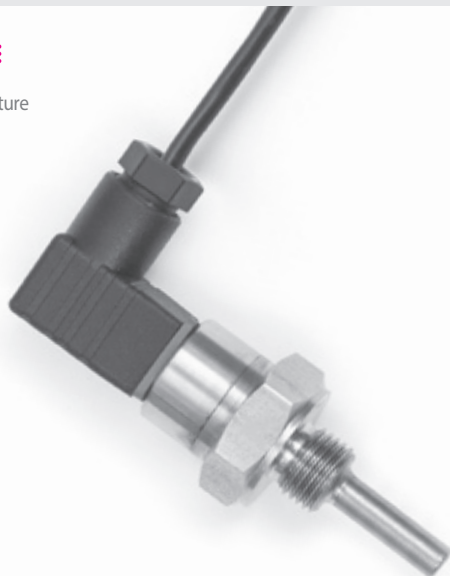
Temperature sensors with case  $\varnothing$  6 mm with connector



Z011.7a



temperature

DESCRIPTION AND APPLICATION 

The KTR 021 resistance temperature sensor is designed to measure temperature of gaseous or liquid substances. In the application segment of Railway Vehicles, it is used for example for specific needs of temperature measurement on engines, both compression ignition engines and electric engines, and on gearboxes or machines and equipment, for which operation vibrations are typical.

The temperature range is -50 °C to 150 °C and these limits must not be exceeded even for a brief period. The sensor can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended  
Fire protection on railway vehicles - Part 2: Requirements for fire behavior  
of materials and components.

Manufacturer provides **EU Declaration of Conformity**.

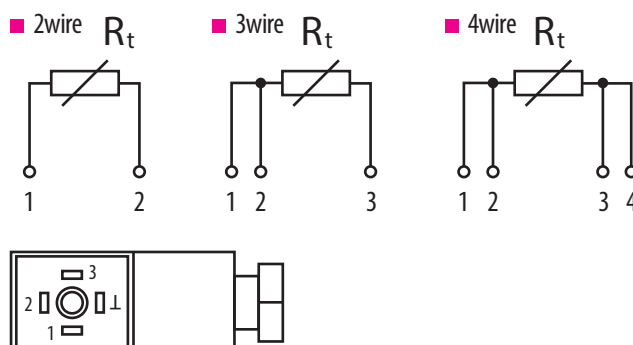
**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS

Sensor type	KTR 021
Type of sensing element	all types
Temperature range	-50 °C to 200 °C
Ingress protection	IP 67 in accordance with EN 60529
Diameter of case	6 ± 0.1 mm
Length of case L	20 to 350 mm
Thread / OK	M 10 x 1, M12 x 1.5, M20 x 1.5, G ½" and another according customer / OK according thread type
Case material	stainless steel DIN 1.4301
Connector	according to DIN 43650
Time response	$\tau_{0.5} < 9 \text{ s}$ (in flowing water at 0.4 ms <sup>-1</sup> )
Insulation resistance	> 200 MΩ at 500 V <sub>DC</sub> , 25 °C ± 3 °C, humidity < 80%
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	1,5 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>5</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- possibility of encasing two sensors
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSiC, KTY, SMT, etc.)

## SENSOR INSTALLATION ↓

1. Place the sensor in the location of temperature measurement. For assembly and attachment of sensor must be used hexagonal key with the size specified in the table of technical parameters. As a seal can be used suitable sealing mastic or sealing tape.
2. Provide fix installation of the sensor to prevent its movement.
3. Connect the wires of the supply cable to the connector according the wiring diagram.  
**For connecting must be used only the compatible connector.**
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z011.7a | 09/18

replace Z011.6a



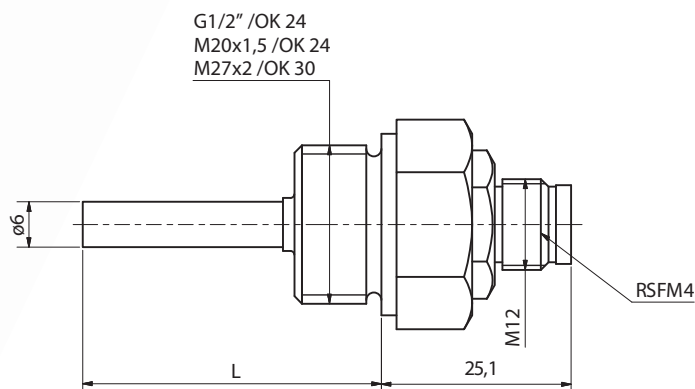
## KTR 021A

Temperature sensors with case  $\varnothing$  6 mm, with connector


Z048.3a



temperature



### DESCRIPTION AND APPLICATION

The KTR 021A resistance temperature sensor is designed to measure temperature of gaseous or liquid substances. In the application segment of Railway Vehicles, it is used for example for specific needs of temperature measurement on engines, both compression ignition engines and electric engines, and on gearboxes or machines and equipment, for which operation vibrations are typical.

The temperature range is  $-50^{\circ}\text{C}$  to  $150^{\circ}\text{C}$  and these limits must not be exceeded even for a brief period. The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 67 according to EN 60529 standard, as amended.

The sensors are intended for operation in chemically non-aggressive environment.

### TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The product meets parameters in accordance with **EN 45545-2**, as amended Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components.

Manufacturer provides **EU Declaration of Conformity**.

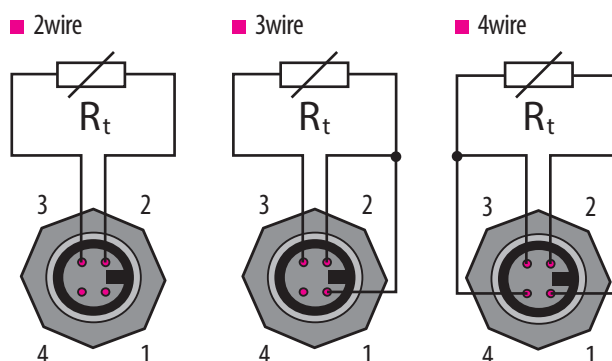
**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

### SPECIFICATIONS

Sensor type	KTR 021A
Type of sensing element	all types
Temperature range	$-50^{\circ}\text{C}$ to $150^{\circ}\text{C}$
Ingress protection	IP 67 in accordance with EN 60529
Diameter of case	$6 \pm 0.1$ mm
Length of case L	20 to 350 mm
Thread / OK	M 10 x 1, M12 x 1.5, M20 x 1.5, G 1/2" and another according customer / OK according thread type
Case material	stainless steel DIN 1.4301
Connector	LUMBERG RSFM4, M12
Time response	$\tau_{0.5} < 9$ s (in flowing water at $0.4\text{ ms}^{-1}$ )
Insulation resistance	$> 200\text{ M}\Omega$ at $500\text{ V}_{\text{DC}}$ , $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , humidity $< 80\%$
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	3 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	$1.2 \times 10^5$ hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology.

### WIRING DIAGRAM



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, etc.)
- possibility of encasing two sensors

## SENSOR INSTALLATION ↓

1. Place the sensor in the location of temperature measurement. For assembly and attachment of sensor must be used hexagonal key with the size specified in the table of technical parameters. As a seal can be used suitable sealing mastic or sealing tape.
2. Provide fix installation of the sensor to prevent its movement.
3. Connect the wires of the lead-in cable to the connector according the wiring diagram.  
**For connecting must be used only the compatible connector, for example connector ELKA 4012.**
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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**KNS 100**

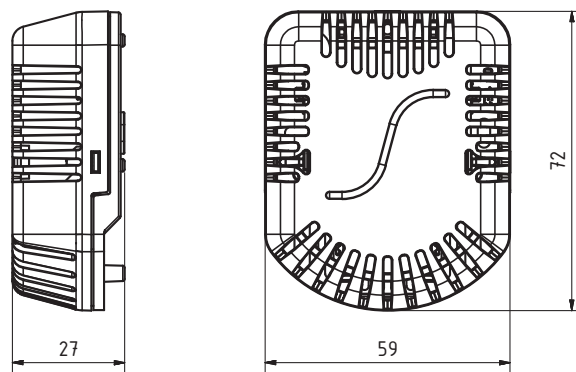
Series of resistance temperature sensor for interior

CE



temperature

Z053.3a



## DESCRIPTION AND APPLICATION ↓

The series of KNS 100 temperature sensors is designed to measure temperature of gaseous substances in spaces protected against water. In the application segment of Railway Vehicles, the sensors are used to measure temperature in passenger compartments of train units and carriages and is a part of the temperature control system.

The sensors consist of the plastic ribbing head, where the sensing element is placed. Maximum temperature range of sensor use is -40 °C to 100 °C. The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensor meets ingress protection IP 30 according to EN 60529 standard, as amended.

The sensors are intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The material of the plastic box and PCB meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-HL2-HL3 of the **EN 45545-2** standard, as amended. Can be supplied with materials complying with fire safety standard **NFPA 130**, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

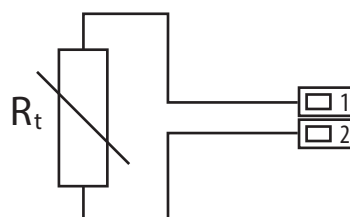
## SPECIFICATIONS ↓

Sensor type	KNS 100
Type of sensing element	all types
Temperature range	-40 °C to 100 °C
Ingress protection	IP 30 in accordance with EN 60529
Dimensions of the head	71.9 x 59 x 27 mm
Head material	LEXAN (meets standard EN 45545-2)
Recommended wire cross section	0.35 to 1 mm <sup>2</sup>
Time response	$\tau_{0.5} < 8$ s (in flowing water at 0.4 ms <sup>-1</sup> )
Shock and vibration tests	category 1, class B in accordance with EN 61373
Insulation test	1.5 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life $\approx$ MTTF *	1.2 x 10 <sup>6</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology.

## WIRING DIAGRAM ↓

- 2wire

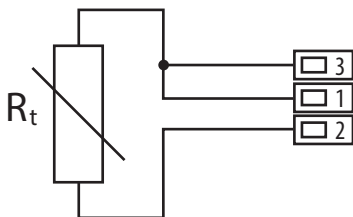


## MODIFICATIONS ↓

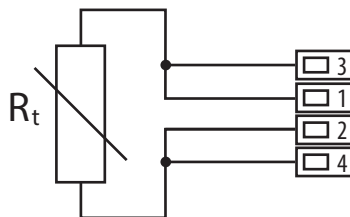
FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSiC, KTY, SMT, etc.)
- possibility of 3wire or 4wire connection:

3wire



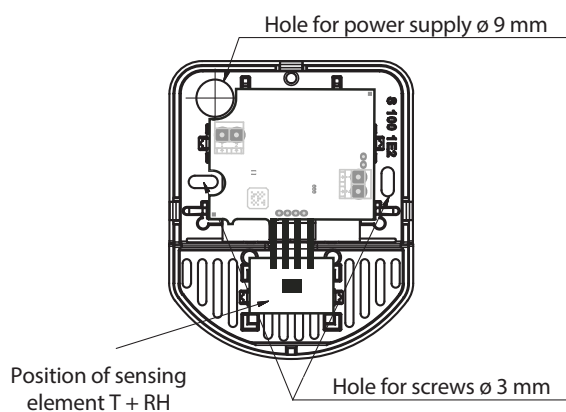
4wire



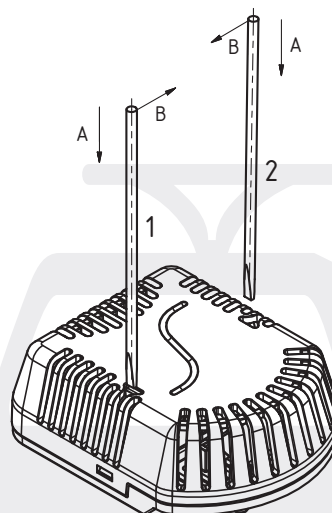
## SENSOR INSTALLATION ↓

1. Prior to connecting the lead-in cable, separate the perforated lid from the plastic box base.  
**While doing this, proceed carefully not to mechanically damage the sensing element or the converter components.**
2. The lead-in cable is connected according to the wiring diagram by pushing it through the 9 mm opening and fastening it in the terminals.
3. The sensor is mounted on a flat surface by screw with a maximum diameter of 4 mm. Last operation of the mounting sensor is deployment of a perforated cover into the holes of the plastic base. The length of the mounting bolts or screws for fastening must be chosen with regard to the thickness of the plastic head base.
4. After installing the sensor, put and secure the perforated cover to base holes.
5. After installing and connecting the sensor to the appropriate evaluating electrical equipment, the sensor is ready to use.  
**The sensor does not require any special manipulation or maintenance.**

## OPERATING POSITION ↓



## COVER DISMANTLING ↓



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**KNS 500**

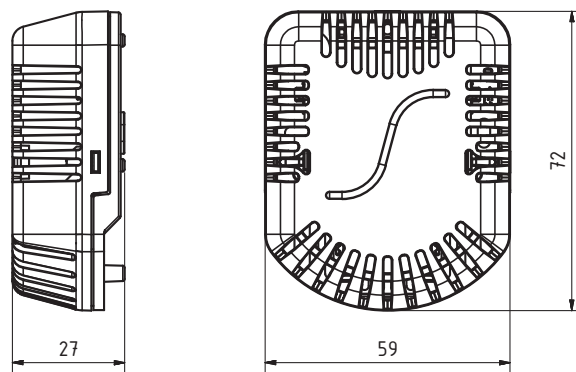
Temperature sensor with output 4 to 20 mA

CE



temperature

Z056.3a



## DESCRIPTION AND APPLICATION

The KNS 500 temperature sensor is designed to measure temperature of gaseous substances in spaces protected against water. In the application segment of Railway Vehicles, it is used to measure temperature in passenger compartments of train units and carriages and is a part of the temperature control system.

The temperature sensor consists of a plastic ribbing head, where a printed circuit board with a temperature–current converter and a resistance temperature sensor is placed. The sensors can be used for any control systems compatible with the current output of 4 to 20 mA. Standard temperature ranges of the sensor are shown in the table of technical parameters, while the maximum temperature around the sensor head is 80 °C. The sensor meets ingress protection IP 30 according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

The type tests are carried out by a notified body according to EN 50155 standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.7, 12.2.8 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with EN 50121-3-2 standard, as amended
- Insulation test in accordance with EN 50155 standard, as amended
- Shock and Vibrations test in accordance with EN 61373 standard, as amended

The material of the plastic box and PCB meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-HL2-HL3 of the EN 45545-2 standard, as amended. Can be supplied with materials complying with fire safety standard NFPA 130, as amended.

Manufacturer provides EU Declaration of Conformity.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

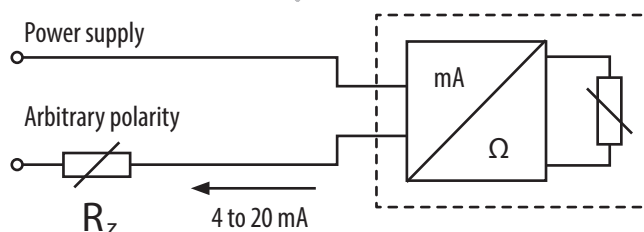
## SPECIFICATIONS

Sensor type	KNS 500
Output signal	4 to 20 mA
Standard ranges of measurement **	-30 °C to 60 °C 0 °C to 100 °C, 0 °C to 150 °C, 0 °C to 200 °C
Supply voltage U	12 to 30 V <sub>DC</sub>
Rated supply voltage U <sub>n</sub>	12 V <sub>DC</sub>
Output signal when the sensor is interrupted	> 23 mA
Output signal when the sensor is short-circuited	< 3.5 mA
Measurement error is dependence to supply voltage for the flow rate 0 to 0.4 m/s	in range U <sub>NS</sub> = 12V: ± (0,5 °C) 0–40°C U <sub>NS</sub> = 24V: (-0,2 až +0,80 °C) in range U <sub>NS</sub> = 12V: ± (0,5 °C + 0,2% from range) -30–70 °C U <sub>NS</sub> = 24V: (-0,2 až +0,80 °C) ± 0,2% from range
Ambient temperature	-40 °C to 80 °C
Material of the head	LEXAN (meets standard EN 45545-2)
Ingress protection	IP 30 in accordance with EN 60529
Dimension of the head	71.9 x 59 x 27 mm
Time response	τ <sub>0,5</sub> ≤ 8 s (in flowing air at 1 ms <sup>-1</sup> )
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1.5 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>6</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology

\*\* see modifications

## WIRING DIAGRAM



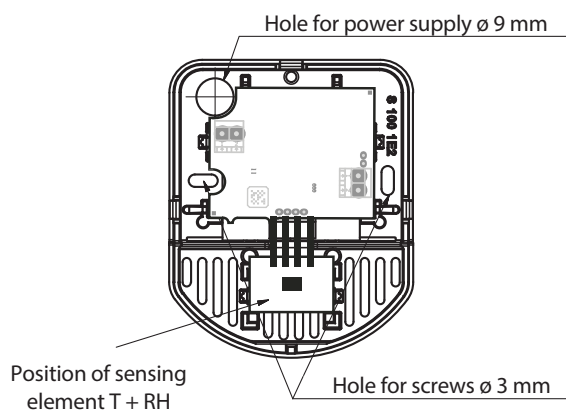
## MODIFICATIONS ↓

According to the customer's requirement, it is possible to provide a customized measuring range from  $-40\text{ }^{\circ}\text{C}$  to  $150\text{ }^{\circ}\text{C}$ ; the minimum span of the range must be  $35\text{ }^{\circ}\text{C}$  (e.g.  $-20\text{ }^{\circ}\text{C}$  to  $15\text{ }^{\circ}\text{C}$ ;  $-30\text{ }^{\circ}\text{C}$  to  $80\text{ }^{\circ}\text{C}$ )

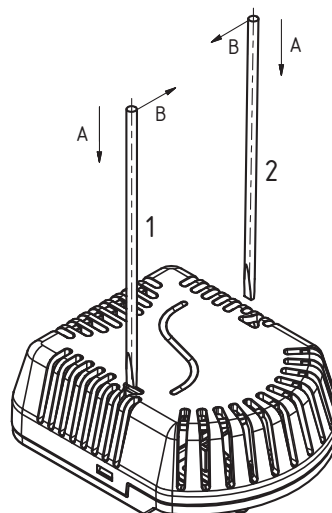
## SENSOR INSTALLATION ↓

1. Before connecting the power supply cable separate perforated plastic cover from the base of the head.  
**Take care to avoid mechanical damage to the sensor during this operation.**
2. The power supply cable through the hole in the base and connect to the terminals according to the wiring diagram.
3. The base of plastic head place on horizontal surface using the screw with diameter 4 mm locate in the inner hole of the base plastic case.  
**Operating sensor position is shown in the diagram and it must be followed.** The length of the mounting screws for mounting must be chosen with regard to the thickness of the base of plastic head.
4. After mounting the sensor, put and secure the perforated cover into the holes in the base.
5. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**

## OPERATING POSITION ↓



## COVER DISMANTLING ↓



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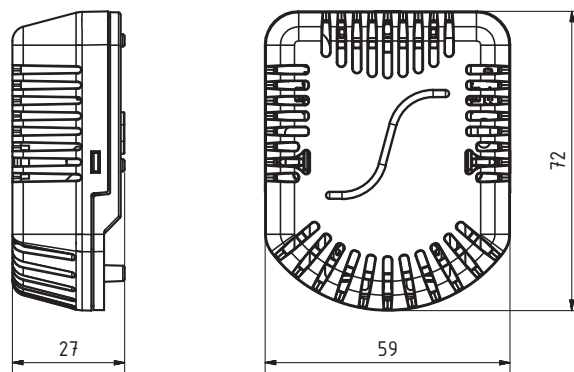
## KNS 700

Temperature sensor with output 0 to 10 V



temperature

Z059.3a



## DESCRIPTION AND APPLICATION

The KNS 700 temperature sensor is designed to measure temperature of gaseous substances in spaces protected against water. In the application segment of Railway Vehicles, it is used to measure temperature in passenger compartments of train units and carriages and is a part of the temperature control system.

The temperature sensor consists of a plastic ribbing head, where a printed circuit board with a temperature–voltage converter and a resistance temperature sensor is placed. The sensors can be used for any control systems compatible with the current output of 0 to 10 V. Standard temperature ranges of the sensor are shown in the table of technical parameters, while the maximum temperature around the sensor head is 80 °C. The sensor meets ingress protection IP 30 according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

The **type tests** are carried out by a notified body according to **EN 50155** standard, as amended. Railway applications – Electronic equipment used on rolling stock, Art. 12.2.7, 12.2.8 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic box and PCB meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-HL2-HL3 of the **EN 45545-2** standard, as amended. Can be supplied with materials complying with fire safety standard **NFPA 130**, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

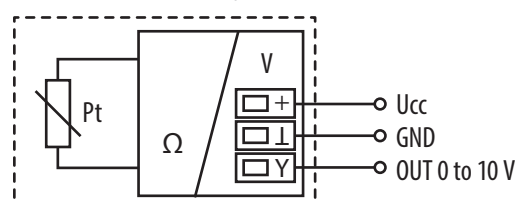
## SPECIFICATIONS

Sensor type	KNS 700
Output signal	0 to 10 V
Standard ranges of measurement **	-30 °C to 60 °C 0 °C to 100 °C, 0 °C to 150 °C, 0 °C to 200 °C
Supply voltage U	15 to 30 V <sub>DC</sub>
Rated supply voltage U <sub>n</sub>	15 V <sub>DC</sub>
Output signal when the sensor is interrupted	> 10.5 V
Output signal when the sensor is short-circuited	~ 0 V
Measurement error is dependence to supply voltage for the flow rate 0 to 0.4 m/s	in range U <sub>NS</sub> = 12V: ± (0,5 °C) 0–40°C U <sub>NS</sub> = 24V: (-0,2 až +0,80 °C) in range U <sub>NS</sub> = 12V: ± (0,5 °C + 0,2% from range) -30–70 °C U <sub>NS</sub> = 24V: (-0,2 až +0,80 °C) ± 0,2% from range
Ambient temperature	-40 °C to 80 °C
Material of the head	LEXAN (meets standard EN 45545-2)
Ingress protection	IP 30 in accordance with EN 60529
Dimension of the head	71.9 x 59 x 27 mm
Time response	τ <sub>0,5</sub> ≤ 8 s (in flowing air at 1 ms <sup>-1</sup> )
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1.5 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>5</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology

\*\* see modifications

## WIRING DIAGRAM



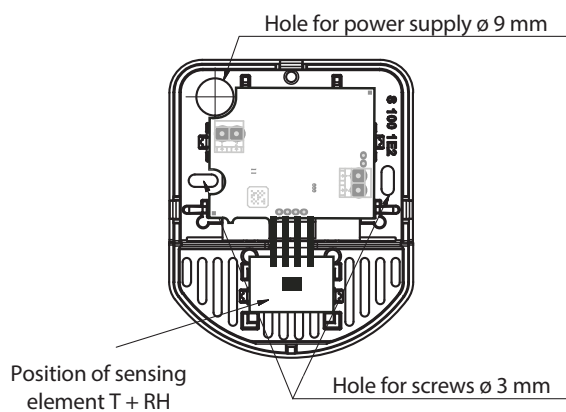
## MODIFICATIONS ↓

According to the customer's requirement, it is possible to provide a customized measuring range from  $-40\text{ }^{\circ}\text{C}$  to  $150\text{ }^{\circ}\text{C}$ ; the minimum span of the range must be  $35\text{ }^{\circ}\text{C}$  (e.g.  $-20\text{ }^{\circ}\text{C}$  to  $15\text{ }^{\circ}\text{C}$ ;  $-30\text{ }^{\circ}\text{C}$  to  $80\text{ }^{\circ}\text{C}$ )

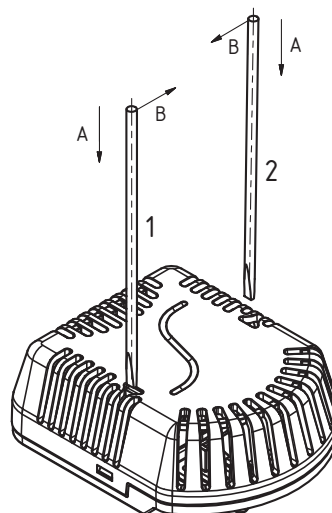
## SENSOR INSTALLATION ↓

1. Before connecting the power supply cable separate perforated plastic cover from the base of the head.  
**Take care to avoid mechanical damage to the sensor during this operation.**
2. The power supply cable through the hole in the base and connect to the terminals according to the wiring diagram.
3. The base of plastic head place on horizontal surface using the screw with diameter 4 mm locate in the inner hole of the base plastic case.  
**Operating sensor position is shown in the diagram and it must be followed.** The length of the mounting screws for mounting must be chosen with regard to the thickness of the base of plastic head.
4. After mounting the sensor, put and secure the perforated cover into the holes in the base.
5. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**

## OPERATING POSITION ↓



## COVER DISMANTLING ↓



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## KNS 110A

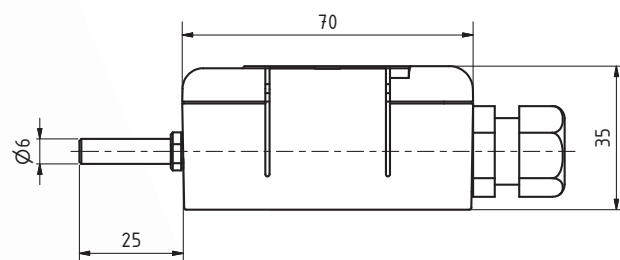
Series of resistance temperature sensor for outdoor use



Z054.3a



temperature



### DESCRIPTION AND APPLICATION

The series of KNS 110A temperature sensors is designed to measure outdoor air temperature. In the application segment of Railway Vehicles, the sensors are used for example to measure temperature of the air in locomotive engine rooms; it can be a part of the temperature control system in passenger compartments or is used to indicate temperature in the engine room as a part of the fire protection system.

The sensors consist of the plastic head, where the sensing element is placed. All metal parts are made of stainless steel DIN 1.4301. The length of the stem is 25 mm. The supply cable is connected to the terminal board through a grommet, which is a part of the plastic head. The basic material of the head is LEXAN. The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. Maximum temperature range of sensor use is -40 °C to 100 °C. The sensors meet ingress protection IP 65 according to EN 60529 standard, as amended.

The sensors are intended for operation in chemically non-aggressive environment.

### TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

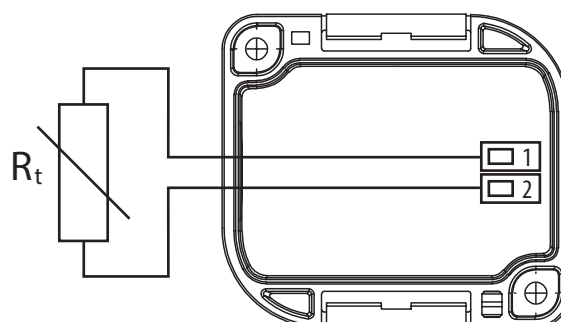
### SPECIFICATIONS

Sensor type	KNS 110A
Type of sensing element	all types
Temperature range	-40 °C to 100 °C (the measuring range can be extended – see the modifications)
Ingress protection	IP 65 in accordance with EN 60529
Connection head material	LEXAN (meets standard EN 45545-2)
Stem material	stainless steel DIN 1.4301
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Time response	$\tau_{0.5} < 9$ s (in flowing water at 0.4 ms <sup>-1</sup> )
Insulation resistance	> 200 MΩ at 500 V <sub>DC</sub> , 25 °C ± 3 °C, humidity < 80%
Shock and vibration tests	category 1, class B in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>5</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology.

### WIRING DIAGRAM

- 2wire

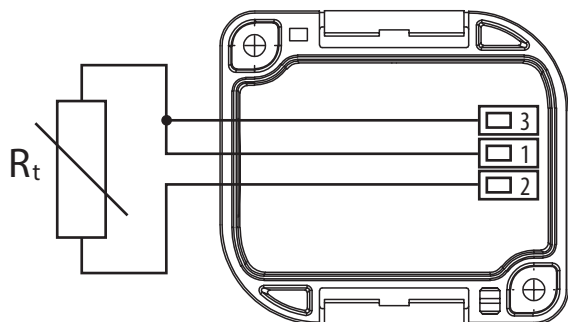


## MODIFICATIONS ↓

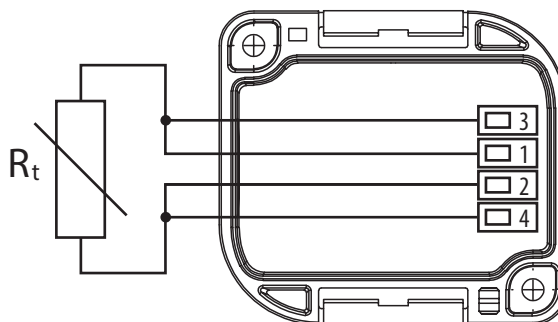
FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, etc.)
- possibility of encasing two sensors
- possibility of 3wire or 4wire connection:

3wire



4wire



## SENSOR INSTALLATION ↓

1. Before connecting the lead-in cable, lift off the lid of the plastic connection head by means of a flat screwdriver, which will be gradually engaged in to the one's and second groove in the lid and its misalignment will release the lid.
2. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet.  
**Tighten the bushing to ensure the tightness after connecting the power cable.**
3. Install the sensors on a horizontal surface using two mounting bolts or screws of 4 mm located within inner holes of the sensor head. The holes are accessible after removing the head cap. The length of the mounting bolts or screws for fastening must be chosen with regard to the depth of inner holes of the plastic head – 13 mm.
4. After installing the sensor, close the head by placing the cap. **The holds on the plastic head must to click into the original position.**
5. After installing and connecting the sensor to the appropriate evaluating electrical equipment, the sensor is ready to use.  
**The sensor does not require any special attendance or maintenance. The operating position is optional but the bushing should not be directed upwards.**



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## KNS 510A

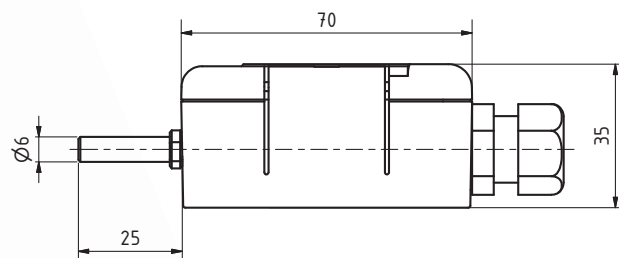
Temperature sensor with output 4 to 20 mA



temperature



Z057.3a



### DESCRIPTION AND APPLICATION

The KNS 510A temperature sensor is designed to measure outdoor air temperature. In the application segment of Railway Vehicles, it is used for example to measure temperature of the air in locomotive engine rooms, it can be a part of the temperature control system in passenger compartments or is used to indicate temperature in the engine room as a part of the fire protection system.

The temperature sensor consists of a plastic head, where a converter of the resistance signal of the temperature sensor to the current signal of 4 to 20 mA and a metal stem are placed. All metal parts are made of stainless steel DIN 1.4301. The length of the stem is 50 mm. The lead-in cable is connected to the terminal board through a grommet, which is a part of the connection head. The basic material of the head is LEXAN. The sensor can be used for any control systems compatible with the output signal of 4 to 20 mA. Standard temperature ranges are shown in the table of technical parameters, while the maximum temperature around the connection head is 80 °C and must not be exceeded even for a brief period. The sensor meets ingress protection IP 65 according to EN 60529.

The sensor is intended for operation in chemically non-aggressive environment.

### TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

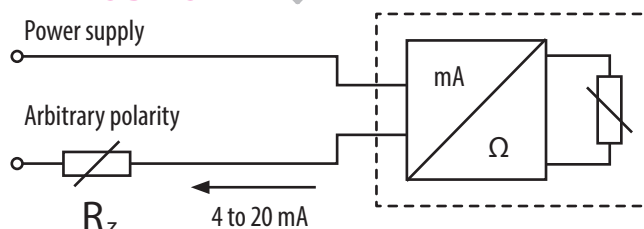
### SPECIFICATIONS

Sensor type	KNS 510A
Output signal	4 to 20 mA
Standard ranges of measurement **	-30 °C to 60 °C 0 °C to 35 °C, 0 °C to 100 °C, 0 °C to 150 °C
Supply voltage U	12 to 30 V <sub>DC</sub>
Rated supply voltage U <sub>n</sub>	12 V <sub>DC</sub>
Output signal when the sensor is interrupted	> 24 mA
Output signal when the sensor is short-circuited	< 3.5 mA
Measurement error	< 0.6% for range with span, min. 0.5 °C
Ambient temperature	-40 °C to 80 °C
Connection head material	LEXAN (meets standard EN 45545-2)
Material of the stem	stainless steel DIN 1.4301
Diameter / length of the stem	6 ± 0.1 mm / 50 mm
Ingress protection	IP 65 dle EN 60529
Insulation resistance	>200 M Ω at 500 V <sub>DC</sub> , 25° ± 3°C, humidity < 80%
Time response	τ <sub>0,5</sub> ≤ 9 s (in flowing air at 1 ms <sup>-1</sup> )
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1.5 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>6</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology

\*\* see modifications

### WIRING DIAGRAM



## MODIFICATIONS ↓

According to the customer's requirement, it is possible to provide a customized measuring range from -40 °C to 150 °C; the minimum span of the range must be 35 °C (e.g. -20 °C to 15 °C; -30 °C to 80 °C)

## SENSOR INSTALLATION ↓

1. Before connecting the power lead-in cable open the plastic head. To open gradually slide a flat screwdriver into the first and the second lid grooves and release the lid by deflecting the handles.
2. Connect the lead-in cable to the terminals according to the wiring diagram through the loosened grommet.  
**To insure the ingress protection value of IP 65, the grommet has to be tightened.**
3. Place the sensor directly on flat surface using two screws Ø 4 mm placed in the inner hole in head corners. The holes are available after opening the plastic head. The length of the screws must be chosen regarding to depth of the internal holes of plastic head – the minimum length is 13mm.
4. The lid has to be put on after connecting the lead-in cable. **The holds on the plastic head must to click into the original position.**
5. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation. The sensor does not require any special manipulation or maintenance. **Operating position is arbitrary, it is recommended to lead the power cable to the grommet from the bottom and the grommet must not be directed upwards.**



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## KNS 710A

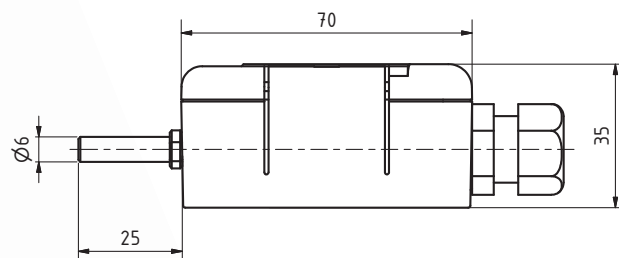
Temperature sensor with output 0 to 10 V



temperature



Z060.3a



### DESCRIPTION AND APPLICATION

The KNS 710A temperature sensor is designed to measure outdoor air temperature. In the application segment of Railway Vehicles, it is used for example to measure temperature of the air in locomotive engine rooms, it can be a part of the temperature control system in passenger compartments or is used to indicate temperature in the engine room as a part of the fire protection system.

The temperature sensor consists of a plastic head, where a converter of the resistance signal of the temperature sensor to the voltage signal of 0 to 10 V and a metal stem are placed. All metal parts are made of stainless steel DIN 1.4301. The length of the stem is 50 mm. The lead-in cable is connected to the terminal board through a grommet, which is a part of the connection head. The basic material of the head is LEXAN. The sensor can be used for any control systems compatible with the output signal of 0 to 10 V. Standard temperature ranges are shown in the table of technical parameters, while the maximum temperature around the connection head is 80 °C and must not be exceeded even for a brief period. The sensor meets ingress protection IP 65 according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

### TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

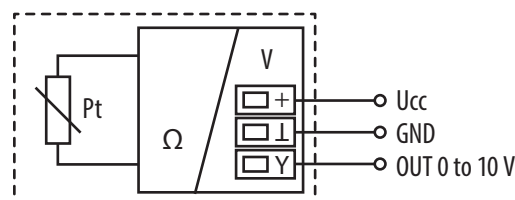
### SPECIFICATIONS

Sensor type	KNS 710A
Output signal	0 to 10 V
Standard ranges of measurement **	-30 °C to 60 °C 0 °C to 35 °C, 0 °C to 100 °C, 0 °C to 150 °C
Supply voltage U	15 to 30 V <sub>DC</sub>
Rated supply voltage U <sub>n</sub>	15 V <sub>DC</sub>
Output signal when the sensor is interrupted	> 12 V
Output signal when the sensor is short-circuited	~ 0 V
Measurement error	< 0.6% for range with span, min. 0.5 °C
Ambient temperature	-40 °C to 80 °C
Connection head material	LEXAN (meets standard EN 45545-2)
Stem material	stainless steel DIN 1.4301
Diameter / length of the stem	6 ± 0.1 mm / 50 mm
Ingress protection	IP 65 in accordance with EN 60529
Insulation resistance	>200 M Ω at 500 V <sub>DC</sub> , 25° ± 3°C, humidity < 80%
Time response	τ <sub>0,5</sub> ≤ 9 s (in flowing air at 1 ms <sup>-1</sup> )
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1.5 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>6</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology

\*\* see modifications

### WIRING DIAGRAM



## MODIFICATIONS ↓

According to the customer's requirement, it is possible to provide a customized measuring range from -40 °C to 150 °C; the minimum span of the range must be 35 °C (e.g. -20 °C to 15 °C; -30 °C to 80 °C)

## SENSOR INSTALLATION ↓

1. Before connecting the power supply cable open the plastic head. To open gradually slide a flat screwdriver into the first and the second lid grooves and release the lid by deflecting the handles.
2. Connect the lead-in cable to the terminals according to the wiring diagram through the loosened grommet.  
**To insure the ingress protection value of IP 65, the grommet has to be tightened.**
3. Place the sensor directly on flat surface using two screws Ø 4 mm placed in the inner hole in head corners. The holes are available after opening the plastic head. The length of the screws must be chosen regarding to depth of the internal holes of plastic head – the minimum length is 13mm.
4. The lid has to be put on after connecting the lead-in cable. **The holds on the plastic head must to click into the original position.**
5. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation. The sensor does not require any special manipulation or maintenance. **Operating position is arbitrary, it is recommended to lead the power cable to the grommet from the bottom and the grommet must not be directed upwards.**



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Z060.3a | 09/18

replace Z060.2a





## KNS 120

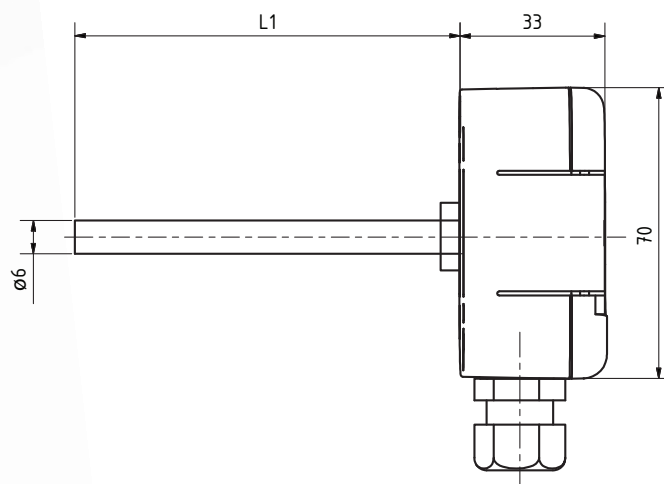
Series of resistance temperature sensor with measuring stem



temperature



Z055.3a



### DESCRIPTION AND APPLICATION ↓

The series of KNS 120 temperature sensors is designed to measure temperature of liquid or gaseous substances. In the application segment of Railway Vehicles, the sensors are used for example to measure temperature of the outdoor air under the vehicle floor. For this purpose, the sensors are equipped with a stem with high mechanical resistance.

The sensors consist of the plastic head, where the sensing element is placed, and the measuring metal case. All metal parts are made of stainless steel DIN 1.4301. The lead-in cable is connected to the terminal board through a grommet, which is a part of the connection head. The basic material of the head is LEXAN. The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. Maximum temperature range of sensor use is -40 °C to 150 °C. The sensor meets ingress protection IP 65 according to EN 60529 standard, as amended.

The sensors are intended for operation in chemically non-aggressive environment.

### TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

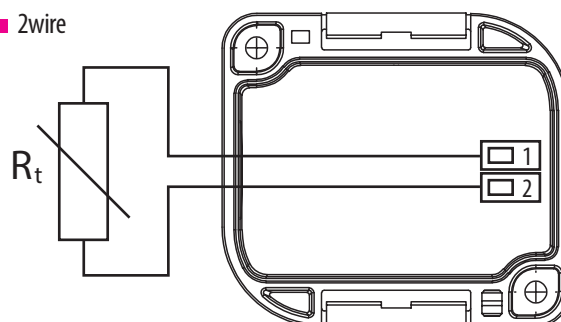
### SPECIFICATIONS ↓

Sensor type	KNS 120
Type of sensing element	all types
Temperature range	-40 °C to 150 °C (the measuring range can be extended – see the modifications)
Ingress protection	IP 65 in accordance with EN 60529
Connection head material	LEXAN (meets standard EN 45545-2)
Stem material	stainless steel DIN 1.4301
Stem diameter	6 ± 1 mm
Stem length	70, 120, 180 mm (others according to customer)
Recommended wire cross section	0.35 to 1.5 mm <sup>2</sup>
Time response	$\tau_{0.5} < 9$ s (in flowing water at 0.4 ms <sup>-1</sup> )
Insulation resistance	> 200 MΩ at 500 V <sub>DC</sub> , 25 °C ± 3 °C, humidity < 80%
Shock and vibration tests	category 1, class B in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTF *	1.2 x 10 <sup>5</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology.

### WIRING DIAGRAM ↓

■ 2wire

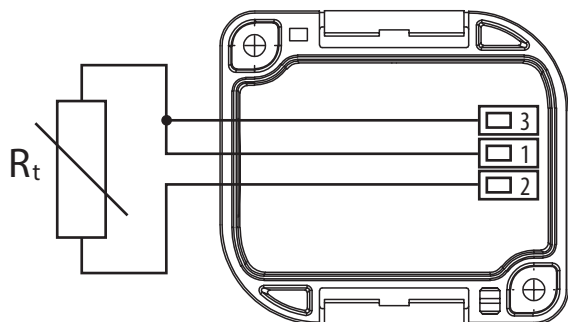


## MODIFICATIONS ↓

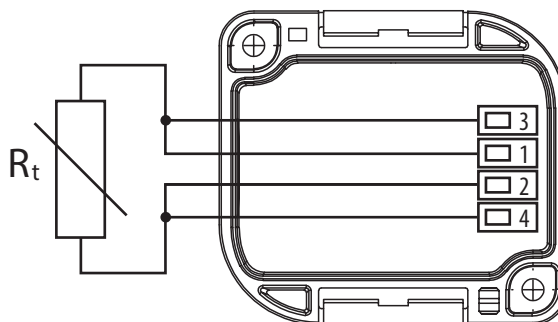
FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L
- A class precision (with the exception Ni 10000/5000, Ni 10000/6180, T1 = Ni 2226, NTC 20 kΩ)
- possibility of encasing non-standard temperature sensors (DALLAS, TSIC, KTY, SMT, etc.)
- possibility of encasing two sensors
- possibility of 3wire or 4wire connection:

3wire



4wire



## SENSOR INSTALLATION ↓

1. Before connecting the supply lead-in cable, lift off the lid of the plastic connection head by means of a flat screwdriver, which will be gradually engaged in to the one's and second groove in the lid and its misalignment will release the lid.
2. The lead-in cable is connected to the terminals according to the wiring diagram through the loosened grommet.  
**Tighten the bushing to ensure the tightness after connecting the power cable.**
3. Place the selected accessories (central holder or tube) into the point of temperature measurement, then insert the sensor into the holder or up to the tube bottom and fasten it with a screw. The holes for the holder mounting are to be drilled according to the attached template, on which the hole diameters are indicated.
4. After installing and connecting the sensor to the appropriate evaluating electrical equipment, the sensor is ready to use.  
**The sensor does not require any special attendance or maintenance. The operating position is optional but the bushing should not be directed upwards.**



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Z055.3a | 09/18

replace Z055.2a



**KNS 520**

Temperature sensor with output 4 to 20 mA

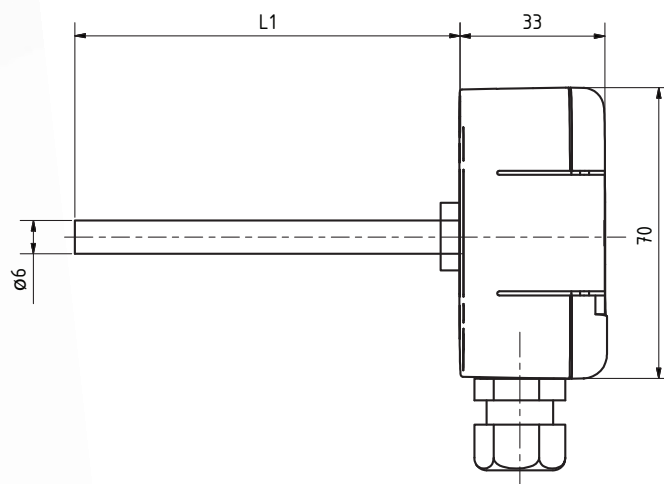
CE



temperature



Z058.3a



## DESCRIPTION AND APPLICATION

The KNS 520 temperature sensor is designed to measure temperature of liquid or gaseous substances. In the application segment of Railway Vehicles, it is used for example to measure temperature of the outdoor air under the vehicle floor. For this purpose, the sensor is equipped with a stem with high mechanical resistance.

The sensor consists of a plastic head, where a converter of the resistance signal of the temperature sensor to the current signal of 4 to 20 mA and a metal measuring case are placed. All metal parts are made of stainless steel DIN 1.4301. The lead-in cable is connected to the terminal board through a grommet, which is a part of the connection head. The basic material of the head is LEXAN. The sensor can be used for any control systems compatible with the output signal of 4 to 20 mA. Standard temperature ranges are shown in the table of technical parameters, while the maximum temperature around the connection head is 80 °C and must not be exceeded even for a brief period. The sensor meets ingress protection IP 65 according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

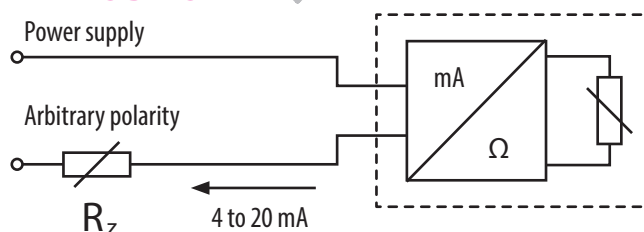
## SPECIFICATIONS

Sensor type	KNS 520
Output signal	4 to 20 mA
Standard ranges of measurement **	-30 °C to 60 °C 0 °C to 35 °C, 0 °C to 100 °C, 0 °C to 150 °C
Supply voltage U	12 to 30 V <sub>DC</sub>
Rated supply voltage U <sub>n</sub>	12 V <sub>DC</sub>
Output signal when the sensor is interrupted	> 24 mA
Output signal when the sensor is short-circuited	< 3.5 mA
Measurement error	< 0.6% for range with span, min. 0.5 °C
Ambient temperature	-40 °C to 80 °C
Connection head material	LEXAN (meets standard EN 45545-2)
Stem material	stainless steel DIN 1.4301
Stem diameter	6 ± 0.2 mm
Stem lengths L1	70, 120, 180 mm (others according to customer)
Ingress protection	IP 65 in accordance with EN 60529
Insulation resistance	>200 M Ω at 500 V <sub>DC</sub> , 25° ± 3°C, humidity < 80%
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1.5 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>6</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology

\*\* see modifications

## WIRING DIAGRAM



## MODIFICATIONS ↓

According to the customer's requirement, it is possible to provide a customized measuring range from -40 °C to 150 °C; the minimum span of the range must be 35 °C (e.g. -20 °C to 15 °C; -30 °C to 80 °C)

## SENSOR INSTALLATION ↓

1. Before connecting the power supply cable open the plastic head. To open gradually slide a flat screwdriver into the first and the second lid grooves and release the lid by deflecting the handles.
2. Connect the lead-in cable to the terminals according to the wiring diagram through the loosened grommet.  
**To insure the ingress protection value of IP 65, the grommet has to be tightened.**
3. Place the selected accessories (central holder or termowell) into the point of temperature measurement, then insert the sensor into the holder or up to the tube bottom and fasten it with a screw. The holes for the holder mounting are to be drilled according to the attached template, on which the hole diameters are indicated.
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation. The sensor does not require any special manipulation or maintenance. **Operating position is arbitrary, it is recommended to lead the power cable to the grommet from the bottom and the grommet must not be directed upwards.**



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## KNS 720

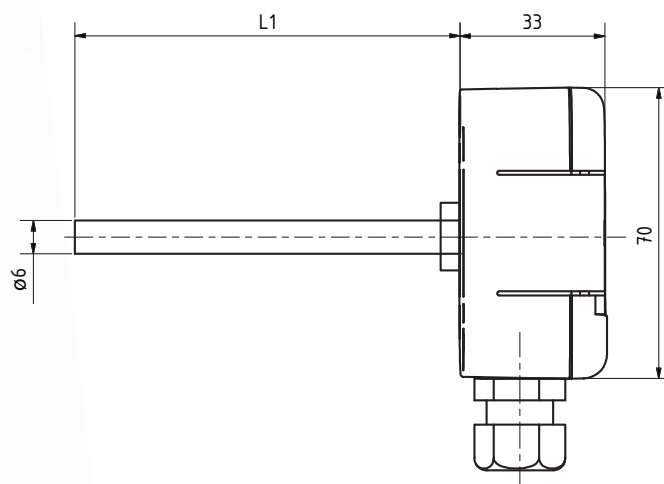
Temperature sensor with output 0 to 10 V



temperature



Z061.3a



### DESCRIPTION AND APPLICATION ↓

The KNS 720 temperature sensor is designed to measure temperature of liquid or gaseous substances. In the application segment of Railway Vehicles, it is used for example to measure temperature of the outdoor air under the vehicle floor. For this purpose, the sensor is equipped with a stem with high mechanical resistance.

The sensor consists of a plastic head, where a converter of the resistance signal of the temperature sensor to the current signal of 0 to 10 V and a metal measuring case are placed. All metal parts are made of stainless steel DIN 1.4301. The lead-in cable is connected to the terminal board through a grommet, which is a part of the connection head. The basic material of the head is LEXAN. The sensor can be used for any control systems compatible with the output signal of 0 to 10 V. Standard temperature ranges are shown in the table of technical parameters, while the maximum temperature around the connection head is 80 °C and must not be exceeded even for a brief period. The sensor meets ingress protection IP 65 according to EN 60529 standard, as amended.

The sensor is intended for operation in chemically non-aggressive environment.

### TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

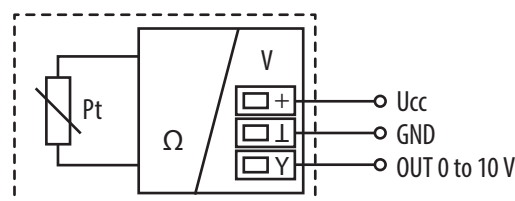
### SPECIFICATIONS ↓

Sensor type	KNS 720
Output signal	0 to 10 V
Standard ranges of measurement **	-30 °C to 60 °C 0 °C to 35 °C, 0 °C to 100 °C, 0 °C to 150 °C
Supply voltage U	15 to 30 V <sub>DC</sub>
Rated supply voltage U <sub>n</sub>	24 V <sub>DC</sub>
Output signal when the sensor is interrupted	> 12 V
Output signal when the sensor is short-circuited	~ 0 V
Measurement error	< 0.6% for range with span, min. 0.5 °C
Ambient temperature	-40 °C to 80 °C
Connection head material	LEXAN (meets standard EN 45545-2)
Stem material	stainless steel DIN 1.4301
Stem diameter	6 ± 0.2 mm
Standard lengths of the stem	70, 120, 180 mm (others according to customer)
Ingress protection	IP 65 in accordance with EN 60529
Insulation resistance	>200 M Ω at 500 V <sub>DC</sub> , 25° ± 3°C, humidity < 80%
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1.5 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>6</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology

\*\* see modifications

### WIRING DIAGRAM ↓



## MODIFICATIONS ↓

According to the customer's requirement, it is possible to provide a customized measuring range from -40 °C to 150 °C; the minimum span of the range must be 35 °C (e.g. -20 °C to 15 °C; -30 °C to 80 °C)

## SENSOR INSTALLATION ↓

1. Before connecting the power supply cable open the plastic head. To open gradually slide a flat screwdriver into the first and the second lid grooves and release the lid by deflecting the handles.
2. Connect the lead-in cable to the terminals according to the wiring diagram through the loosened grommet.  
**To insure the ingress protection value of IP 65, the grommet has to be tightened.**
3. Place the selected accessories (central holder or termowell) into the point of temperature measurement, then insert the sensor into the holder or up to the tube bottom and fasten it with a screw. The holes for the holder mounting are to be drilled according to the attached template, on which the hole diameters are indicated.
4. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation. The sensor does not require any special manipulation or maintenance. **Operating position is arbitrary, it is recommended to lead the power cable to the grommet from the bottom and the grommet must not be directed upwards.**



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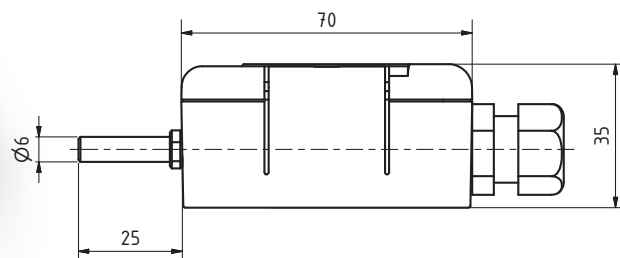
## KPTS 410A

## KPTS 410B

Measuring the air temperature  
in the cabinet of gel batteries


temperature

Z033.7a



### DESCRIPTION AND APPLICATION

The set of special temperature sensors KPTS 410A and KPTS 410B has been developed to measure temperature of air in gel battery cabinets of fast train carriage in the application segment of Railway Vehicles. Because of the paired location of battery cabinets, they are connected in series to the evaluative element, indicating the average temperature in both of the cabinets. The series connection of KPTS 410A and KPTS 410B allows internal configuration of the terminals in the KPTS 410B head so that there is no need for a specific interconnecting element. Free Wago 222 terminal board is a part of the KPTS 410B temperature sensor to connect the shielding of lead-in cable and connecting cable.

The sensors consist of the plastic head, where a printed circuit board with a terminal board for connecting the supply cable or serial connecting the both sensors and with a stainless steel stem, in which the temperature sensing element is located. The sensors can be used for any control systems compatible with types of sensing elements listed in the table of technical parameters. The sensors meet ingress protection IP 65 according to EN 60529 standard, as amended.

The sensors are intended for operation in chemically non-aggressive environment.

### SPECIFICATIONS

Sensor type	KPTS 410A and KPTS 410B
Type of sensing element	Pt 50/3850 and Pt 50/3850, output Pt 100/3850
Temperature range	-40 °C to 100 °C
Ingress protection	IP 65 in accordance with EN 60529
Stem dimension	6 ± 0.1 mm
Stem length	25 mm
Stem material	stainless steel DIN 1.4301
Connection head material	LEXAN (meets standard EN 45545-2)
Time response	$\tau_{0.5} < 9$ s (in flowing water at 0.4 ms <sup>-1</sup> )
Insulation resistance	> 200 MΩ at 500 V <sub>DC</sub> , 25 °C ± 3 °C, humidity < 80%
Shock and vibration tests	category 1, class B in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Mean working life ≈ MTTF *	1.2 x 10 <sup>6</sup> hrs, based on a theoretical calculation

\* Under the environmental and operational conditions specified in approved testing methodology.

### TESTS, DECLARATION, CALIBRATIONS

The **type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Insulation test in accordance with **EN 50155**, as amended
- Shock and Vibration tests in accordance with **EN 61373**, as amended

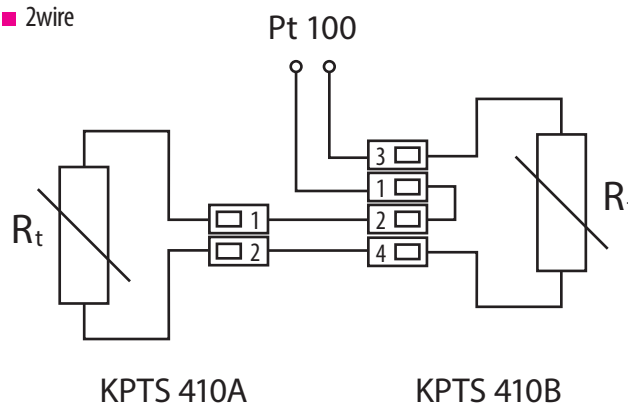
The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

### WIRING DIAGRAM OF TWO SENSORS

■ 2wire



## MODIFICATIONS ↓

FOR STANDARD MANUFACTURED SENSORS, IT IS POSSIBLE TO MODIFY THE FOLLOWING PARAMETERS:

- variable stem design – length L

## SENSOR INSTALLATION ↓

1. Before connecting the supply lead-in cable, lift off the lid of the plastic connection head by means of a flat screwdriver, which will be gradually engaged in to the one's and second groove in the lid and its misalignment will release the lid.
2. Mount the sensors to the required position by means of two M4 screws (use a drilling template) or  $\varnothing$  4 mm common screws inserted in the inside holes in the head of the sensor. The holes can be accessed after removing the head cap. The length of the mounting screws or common screws must be chosen with respect to the depth of the inside holes of the plastic head, which is 13 mm.
3. Connect terminals 2 and 4 in PTS 410A with terminals 2 and 4 in PTS 410B via the cable grommets. Connect the input cable from the analyzing equipment to terminals 3 and 1 of the sensor PTS 410B according to the wiring diagram. The recommended cross-section of the leads is 0.35 to 1.5 mm<sup>2</sup> and the outside diameter of the round section cable is 4 to 8 mm. Having connected all the cables, always tighten the grommets to ensure tightness.
4. After the cables have been connected and the grommets tightened, cap the sensor heads. The holds on the plastic head must click into the original position.
5. After assembling and connecting to the related electric measuring equipment, the set of sensor is ready for operation.  
**Sensors do not require any special attendance or maintenance.**



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Z033.7a | 09/18

replace Z033.6a



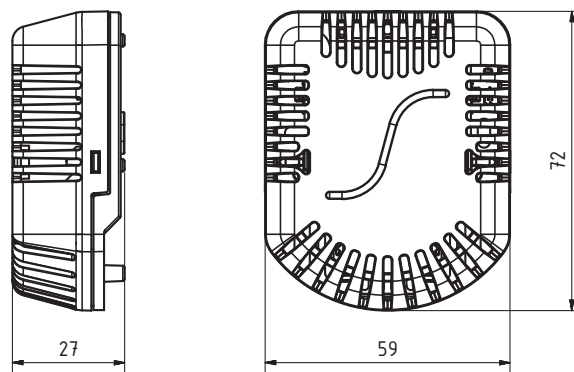
## KSTH 102

Temperature and relative humidity sensor to the interior with RS 485 output (MODBUS)



temperature humidity

Z070.2a



### DESCRIPTION AND APPLICATION ↓

The sensor of temperature and relative humidity KSTH 102 is designed to measure the temperature and relative humidity of the air in spaces protected against water. In the application segment of railway vehicles, it is used to measure both of the variables in passenger compartments of train units and carriages and is a part of the temperature and relative humidity control system.

The sensor of temperature and relative humidity KSTH 102 consists of a plastic ribbing head, where a printed circuit board with the individual sensors and a converter is placed to establish a communication via the RS 485 bus. The temperature and relative humidity are measured by a common internal sensor whose signal is processed in a microprocessor and is converted to an output signal of MODBUS RTU. The sensors meet ingress protection IP 30 according to EN 60529 standard, as amended. Suitable design and high-quality material ensure that the sensors do not feel disturbing even in the interiors with high aesthetic requirements. The installation is recommended on an inner wall at the height of 1.5 m, in areas with moving persons, not exposed to direct sunlight and not influenced by heat from walls, heat sources or lighting.

The sensor of temperature and relative humidity KSTH 102 is designed to be operated in a chemically non-aggressive environment; the use must be chosen with regard to the temperature and chemical resistance of the sensor head and of the individual sensors. The operating conditions to establish the correct function are:

- Ambient temperature in the vicinity of the sensor: - 40 °C to 80 °C
- Relative ambient humidity: 0 to 95% (non-condensing humidity)
- Atmospheric pressure: 87 to 106 kPa

### TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

### SPECIFICATIONS ↓

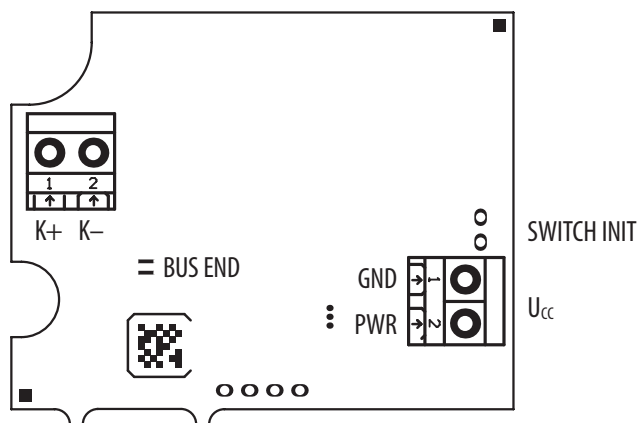
Sensor type	KSTH 102
Temp. measurement range	-40 °C to 80 °C
Temperature measurement accuracy	± 0.5 °C in the range from 0 °C to 65 °C ± 0.7 °C in the range from 65 °C to 80 °C ± 1.1 °C in the range from -40 °C to 0 °C
Relative humidity measurement range	0 to 95 %
Relative humidity measurement accuracy	± 3 % in the range from 10 to 90 % ± 4.5 % in the range from 0 to 10 % a 90 to 95 %
Output signal	RS 485 / MODBUS RTU
Supply voltage U	15 to 30 V <sub>DC</sub>
Rated supply voltage U <sub>N</sub>	24 V <sub>DC</sub>
Consumption	maximum: 500 mW, typical: 250 mW
Ingress protection	IP 30 in accordance with EN 60529
Dimension of the head	71.9 x 59 x 27 mm
Material of the head	LEXAN (meets standard EN 45545-2)
Weight	min 35 g
Recommended wire cross section	0.14 to 1 mm <sup>2</sup>
Insulation test	1.5 kV <sub>DC</sub> for 1 minute in accordance with EN 50155
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## WIRING DIAGRAM ↓

RS 485



GND, PWR –  $U_{CC}$  supply voltage  
K+/K– – communication line  
BUS END – RS 485 termination

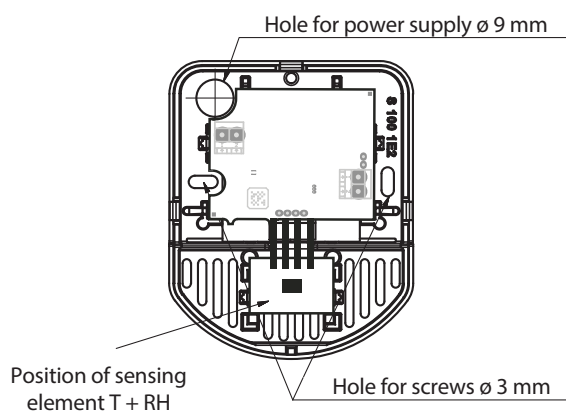
## SENSOR INSTALLATION ↓

The sensors are designed to be mounted on a wall or other horizontal surfaces and for the attachment it is necessary to prepare required holes for mounting screws using a template (delivered with the sensor).

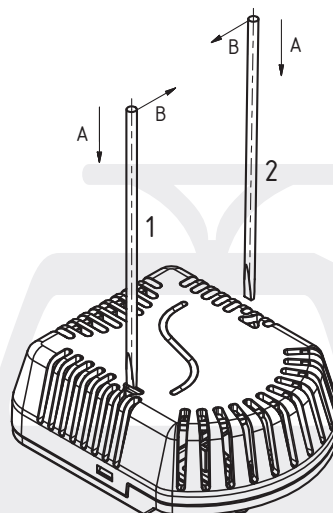
1. Before connecting the supply cable, it is necessary to separate the perforated cover from the plastic head base.
2. Remove the cover and insert the power cable through the 9 mm hole, apply the base to the surface and screw on with two screws or bolts. The length of the mounting bolts or screws for fastening must be chosen with respect to the thickness of the plastic head base. **Connect the power cable to the terminals according to the "Wiring diagram"**, position the perforated cover onto the attached base and lock it by clicking in.
3. After installing and connecting to the electrical measuring equipment, the sensor is ready for use. The sensor does not require any special servicing or maintenance.

For more detailed description of the installation, see the operating instructions for the sensor.

## OPERATING POSITION ↓



## COVER DISMANTLING ↓



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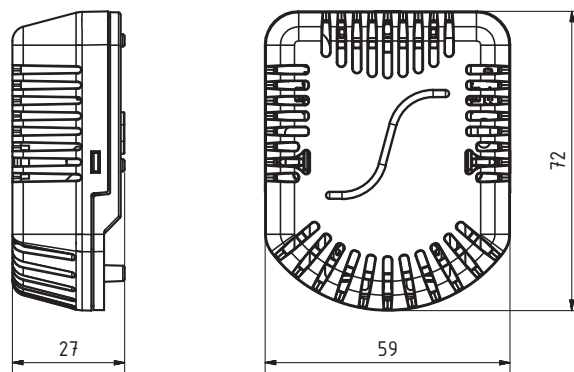
## KSTH 104

Temperature and relative humidity sensor to the interior with CAN protocole output (CANopen)



temperature humidity

Z071.2a



### DESCRIPTION AND APPLICATION ↓

The KSTH 104 temperature and relative humidity sensor is designed to measure the temperature and relative humidity of the air in spaces protected against water. In the application segment of railway vehicles, it is used to measure both of the variables in passenger compartments of train units and carriages and is a part of the temperature and relative humidity control system. The KSTH 104 temperature and relative humidity sensor consists of a plastic ribbing head where a printed circuit board with the individual sensors and a converter is placed to establish a communication via the CAN bus. The temperature and relative humidity are measured by a common internal sensor whose signal is processed in a microprocessor and is converted to a CANopen output signal with CiA DS 301 specification. The sensors meet the ingress protection of IP 30 according to EN 60529 standard, as amended. Suitable design and high-quality material ensure that the sensor does not feel disturbing even in the interiors with high aesthetic requirements.

The KSTH 104 temperature and relative humidity sensor is designed to be operated in a chemically non-aggressive environment; its use must be chosen with regard to temperature and chemical resistance of the individual sensors. The operating conditions to establish the correct function are:

- Ambient temperature in the vicinity of the sensor: - 40 °C to 80 °C
- Relative ambient humidity: 0 to 95% (non-condensing humidity)
- Atmospheric pressure: 87 to 106 kPa

### TESTS, DECLARATION, CALIBRATIONS ↓

The **type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended. Can be supplied with materials complying with fire safety standard **NFPA 130** as amended.

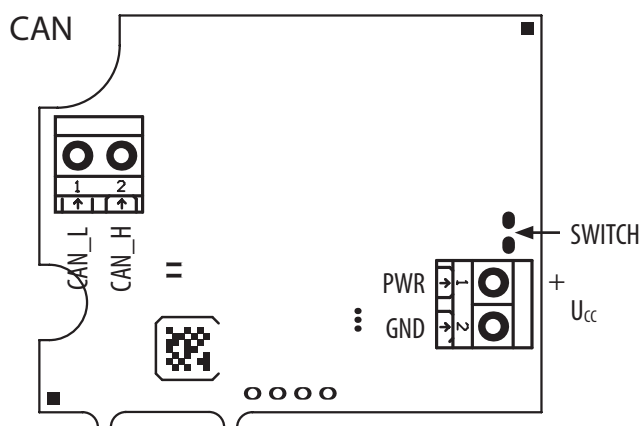
### SPECIFICATIONS ↓

Sensor type	KSTH 104
Temp. measurement range	-40 °C to 80 °C
Temperature measurement accuracy	± 0.5 °C in the range from 0 °C to 65 °C ± 0.7 °C in the range from 65 °C to 80 °C ± 1.1 °C in the range from -40 °C to 0 °C
Relative humidity measurement range	0 to 95 %
Relative humidity measurement accuracy	± 3 % in the range from 10 to 90 % ± 4.5 % in the range from 0 to 10 % a 90 to 95 %
Output signal	CAN / CANopen – CiA DS 301
Supply voltage U	15 to 30 V <sub>DC</sub>
Rated supply voltage U <sub>N</sub>	24 V <sub>DC</sub>
Consumption	maximum: 500 mW, typical: 250 mW
Ingress protection	IP 30 in accordance with EN 60529
Dimension of the head	71.9 x 59 x 27 mm
Material of the head	LEXAN (meets standard EN 45545-2)
Weight	min 35 g
Recommended wire cross section	0.14 to 1 mm <sup>2</sup>
Insulation test	1.5 kV <sub>DC</sub> for 1 minute in accordance with EN 50155
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## WIRING DIAGRAM ↓



GND, PWR –  $U_{cc}$  supply voltage  
CAN\_L/CAN\_H – communication line

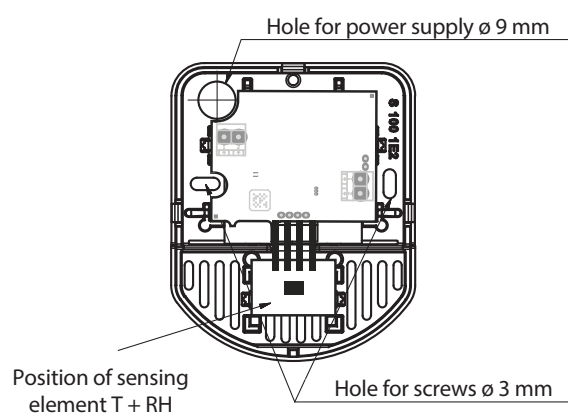
## SENSOR INSTALLATION ↓

The sensors are designed to be mounted on a wall or other horizontal surfaces and for the attachment it is necessary to prepare required holes for mounting screws using a template (delivered with the sensor).

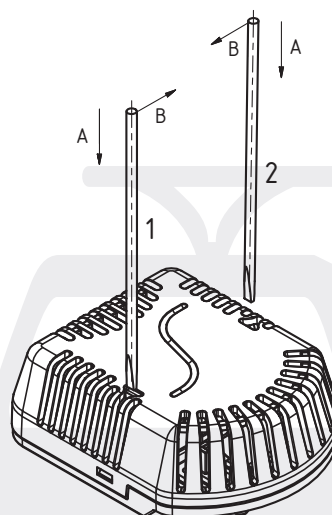
1. Before connecting the supply cable, it is necessary to separate the perforated cover from the plastic head base.
2. Remove the cover and insert the power cable through the 9 mm hole, apply the base to the surface and screw on with two screws or bolts. The length of the mounting bolts or screws for fastening must be chosen with respect to the thickness of the plastic head base. **Connect the power cable to the terminals according to the "Wiring diagram"**, position the perforated cover onto the attached base and lock it by clicking in.
3. After installing and connecting to the electrical measuring equipment, the sensor is ready for use. The sensor does not require any special servicing or maintenance.

For more detailed description of the installation, see the operating instructions for the sensor.

## OPERATING POSITION ↓



## COVER DISMANTLING ↓



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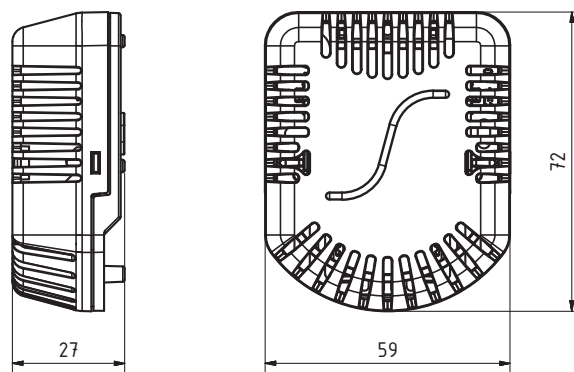


## KSTHC 102

Temperature, relative humidity and CO<sub>2</sub> sensor to the interior with RS 485 output (MODBUS)



Z072.2a



### DESCRIPTION AND APPLICATION ↓

The KSTHC 102 temperature, relative humidity and CO<sub>2</sub> sensor is designed to measure the carbon dioxide concentration, temperature and relative humidity of the air in spaces protected against water. In the application segment of railway vehicles, it is used to measure all of the three variables in passenger compartments of train units and carriages and is a part of the temperature, relative humidity and CO<sub>2</sub> concentration control system.

The KSTHC 102 temperature, relative humidity and CO<sub>2</sub> sensor consists of a plastic ribbing head where a printed circuit board with the individual sensors and a converter is placed to establish a communication via the RS 485 bus. The temperature and relative humidity are measured by a common internal sensor whose signal is processed in a microprocessor and is converted to an output signal of MODBUS RTU. The CO<sub>2</sub> value is measured by a NDIR module whose digital signal is also converted to an output signal of MODBUS RTU. For the CO<sub>2</sub> concentration sensor, there is an autocalibration function available to set the sensor at the minimum CO<sub>2</sub> value corresponding to the outside concentration level. The KSTHC 102 temperature, relative humidity and CO<sub>2</sub> sensor meets the ingress protection of IP 30 according to EN 60529 standard, as amended. Suitable design and high-quality material ensure that the sensor does not feel disturbing even in the interiors with high aesthetic requirements.

The KSTHC 102 temperature, relative humidity and CO<sub>2</sub> sensor is designed to be operated in a chemically non-aggressive environment; its use must be chosen with regard to temperature and chemical resistance of the head and of the individual sensors. The operating conditions to establish the correct function of modul CO<sub>2</sub> are:

- Ambient temperature in the vicinity of the sensor: 0 °C to 45 °C
- Relative ambient humidity: 0 to 95% (non-condensing humidity)
- Atmospheric pressure: 87 to 106 kPa

### TESTS, DECLARATION, CALIBRATIONS ↓

The **type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended. Can be supplied with materials complying with fire safety standard **NFPA 130** as amended.

### SPECIFICATIONS ↓

Sensor type	KSTHC 102
Temperature measurement range*	0 °C to 45 °C with guaranteed accuracy of CO <sub>2</sub> measurement, -30 °C to 70 °C without guaranteed accuracy of CO <sub>2</sub> measurement, -40 °C to 80 °C short-term
Temp. measurement accuracy*	± 0,5 °C
Relative humidity measurement range*	0 to 85 % with guaranteed accuracy of CO <sub>2</sub> measurement, 0 to 95 % without guaranteed accuracy of CO <sub>2</sub> measurement
Relative humidity measurement accuracy*	± 3 % in the range from 10 to 90 % ± 4.5 % in the range from 0 to 10 %
CO <sub>2</sub> measuring range*	400 to 5000 ppm
CO <sub>2</sub> measuring accuracy*	± 100 ppm
Time response CO <sub>2</sub> (90%)	90 s
Output signal	RS 485 / MODBUS RTU
Supply voltage U	15 to 30 V <sub>DC</sub>
Rated supply voltage Un	24 V <sub>DC</sub>
Consumption	maximum: 500 mW, typical: 250 mW
Ingress protection	IP 30 in accordance with EN 60529
Dimension of the head	71.9 x 59 x 27 mm
Material of the head	LEXAN (meets standard EN 45545-2)
Weight	min 35 g
Recommended wire cross section	0.14 to 1 mm <sup>2</sup>
Insulation test	1.5 kV <sub>DC</sub> for 1 minute in accordance with EN 50155
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2

\* The stated measurement ranges and accuracies for the individual sensors refer to operating conditions when the supply voltage is connected.

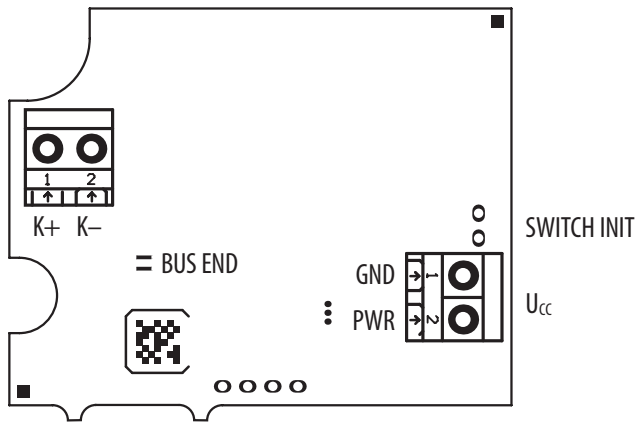
Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.



## WIRING DIAGRAM ↓

RS 485



GND, PWR –  $U_{CC}$  supply voltage  
K+/K– – communication line  
BUS END – RS 485 termination

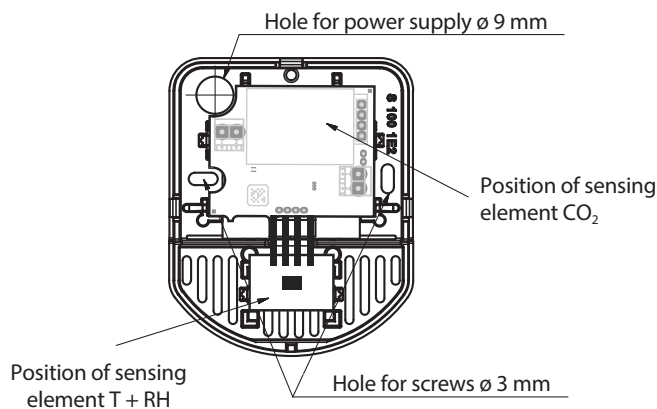
## SENSOR INSTALLATION ↓

The sensors are designed to be mounted on a wall or other horizontal surfaces and for the attachment it is necessary to prepare required holes for mounting screws using a template (delivered with the sensor).

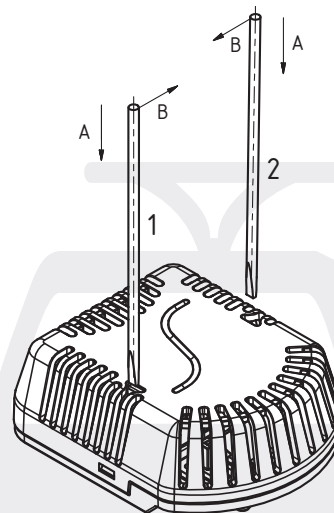
1. Before connecting the supply cable, it is necessary to separate the perforated cover from the plastic head base.
2. Remove the cover and insert the power cable through the 9 mm hole, apply the base to the surface and screw on with two screws or bolts. The length of the mounting bolts or screws for fastening must be chosen with respect to the thickness of the plastic head base. **Connect the power cable to the terminals according to the "Wiring diagram"**, position the perforated cover onto the attached base and lock it by clicking in.
3. After installing and connecting to the electrical measuring equipment, the sensor is ready for use. The sensor does not require any special servicing or maintenance.

For more detailed description of the installation, see the operating instructions for the sensor.

## OPERATING POSITION ↓



## COVER DISMANTLING ↓



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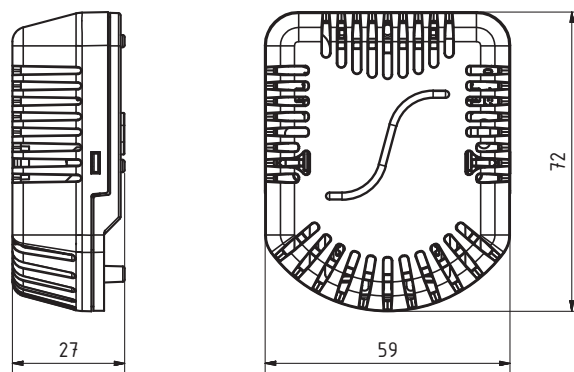


## KSTHC 104

Temperature, relative humidity and CO<sub>2</sub> sensor to the interior with CAN protocol output (CANopen)



Z073.2a



### DESCRIPTION AND APPLICATION ↓

The KSTHC 104 temperature, relative humidity and CO<sub>2</sub> sensor is designed to measure the carbon dioxide concentration, temperature and relative humidity of the air in spaces protected against water. In the application segment of railway vehicles, it is used to measure all of the three variables in passenger compartments of train units and carriages and is a part of the temperature, relative humidity and CO<sub>2</sub> concentration control system. The KSTHC 104 temperature, relative humidity and CO<sub>2</sub> sensor consists of a plastic ribbing head where a printed circuit board with the individual sensors and a converter is placed to establish a communication via the CAN bus. The temperature and relative humidity are measured by a common internal sensor whose signal is processed in a microprocessor and is converted to a CANopen output signal with CiA DS 301 specification. The CO<sub>2</sub> value is measured by a NDIR module whose digital signal is also converted to an output signal of MODBUS RTU. For the CO<sub>2</sub> concentration sensor, there is an autocalibration function available to set the sensor at the minimum CO<sub>2</sub> value corresponding to the outside concentration level. The KSTHC 104 temperature, relative humidity and CO<sub>2</sub> sensor meets the ingress protection of IP 30 according to EN 60529 standard, as amended. Suitable design and high-quality material ensure that the sensor does not feel disturbing even in the interiors with high aesthetic requirements.

The KSTHC 104 temperature, relative humidity and CO<sub>2</sub> sensor is designed to be operated in a chemically non-aggressive environment; its use must be chosen with regard to temperature and chemical resistance of the head and of the individual sensors. The operating conditions to establish the correct function of CO<sub>2</sub> modul are:

- Ambient temperature in the vicinity of the sensor: 0 °C to 45 °C
- Relative ambient humidity: 0 to 95% (non-condensing humidity)
- Atmospheric pressure: 87 to 106 kPa

### TESTS, DECLARATION, CALIBRATIONS ↓

The **type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended. Can be supplied with materials complying with fire safety standard **NFPA 130** as amended.

### SPECIFICATIONS ↓

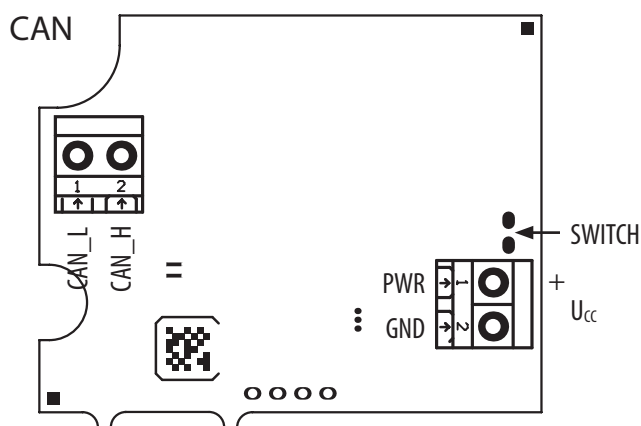
Sensor type	KSTHC 104
Temperature measurement range*	0 °C to 45 °C with guaranteed accuracy of CO <sub>2</sub> measurement, -30 °C to 70 °C without guaranteed accuracy of CO <sub>2</sub> measurement, -40 °C to 80 °C short-term
Temp. measurement accuracy*	± 0,5 °C
Relative humidity measurement range*	0 to 85 % with guaranteed accuracy of CO <sub>2</sub> measurement, 0 to 95 % without guaranteed accuracy of CO <sub>2</sub> measurement
Relative humidity measurement accuracy*	± 3 % in the range from 10 to 90 % ± 4.5 % in the range from 0 to 10 %
CO <sub>2</sub> measuring range*	400 to 5000 ppm
CO <sub>2</sub> measuring accuracy*	± 100 ppm
Time response CO <sub>2</sub> (90%)	90 s
Output signal	CAN / CANopen – CiA DS 301
Supply voltage U	15 to 30 V <sub>DC</sub>
Rated supply voltage Un	24 V <sub>DC</sub>
Consumption	maximum: 500 mW, typical: 250 mW
Ingress protection	IP 30 in accordance with EN 60529
Dimension of the head	71.9 x 59 x 27 mm
Material of the head	LEXAN (meets standard EN 45545-2)
Weight	min 35 g
Recommended wire cross section	0.14 to 1 mm <sup>2</sup>
Insulation test	1.5 kV <sub>DC</sub> for 1 minute in accordance with EN 50155
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2

\* The stated measurement ranges and accuracies for the individual sensors refer to operating conditions when the supply voltage is connected.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## WIRING DIAGRAM ↓



GND, PWR –  $U_{cc}$  supply voltage  
C+ / C– – communication line

## SENSOR INSTALLATION ↓

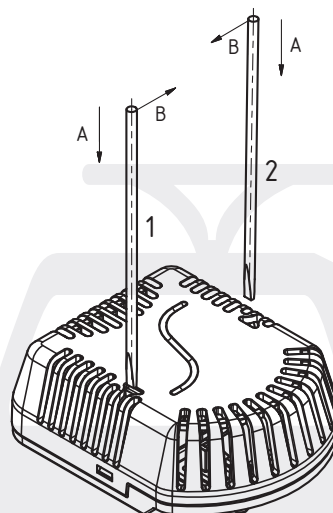
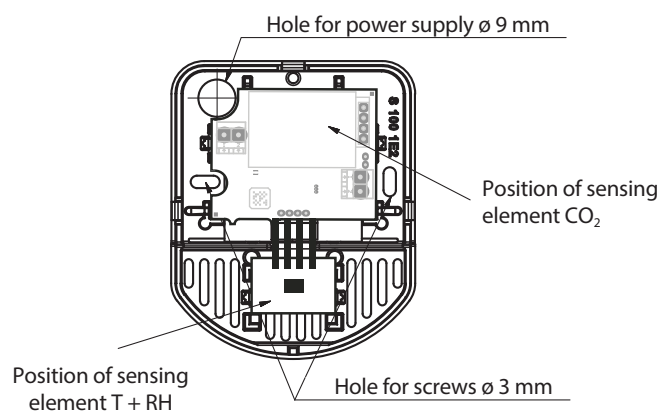
The sensors are designed to be mounted on a wall or other horizontal surfaces and for the attachment it is necessary to prepare required holes for mounting screws using a template (delivered with the sensor).

1. Before connecting the supply cable, it is necessary to separate the perforated cover from the plastic head base.
2. Remove the cover and insert the power cable through the 9 mm hole, apply the base to the surface and screw on with two screws or bolts. The length of the mounting bolts or screws for fastening must be chosen with respect to the thickness of the plastic head base. **Connect the power cable to the terminals according to the "Wiring diagram"**, position the perforated cover onto the attached base and lock it by clicking in.
3. After installing and connecting to the electrical measuring equipment, the sensor is ready for use. The sensor does not require any special servicing or maintenance.

For more detailed description of the installation, see the operating instructions for the sensor.

## OPERATING POSITION ↓

## COVER DISMANTLING ↓



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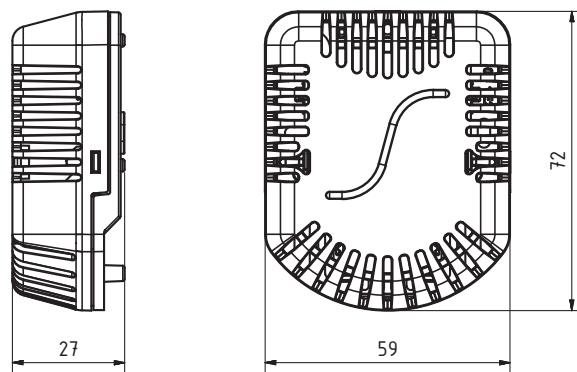


## KSTHPV 102

Temperature, relative humidity, atmospheric pressure  
and VOC interior sensor with RS 485 (MODBUS) output



Z075.1a



### DESCRIPTION AND APPLICATION

Temperature, relative humidity, atmospheric pressure and VOC sensor – KSTHPV 102 is designed to measure carbon dioxide concentrations, air temperature, air relative humidity, atmospheric pressure and concentrations of volatile organic compounds. In the application segment of rail vehicles, it is used to measure all variables in passenger compartments of train units and carriages and is a part of the temperature, relative humidity, atmospheric pressure and air quality control system.

This combined sensor KSTHPV 102 consists of a plastic ribbing head containing a printed circuit board with the individual sensors and a converter to establish a communication via the RS 485 bus. Temperature, relative humidity, atmospheric pressure and VOC are measured by a common internal sensing element whose signal is processed in a microprocessor and is converted to a MODBUS RTU output signal. The KSTHPV 102 temperature, relative humidity, atmospheric pressure and VOC sensor meets the ingress protection of IP 30 according to EN 60529 standard, as amended. The pleasant design and high-quality material ensure that this combined sensor does not seem intrusive even in interiors with high aesthetic requirements. Combined sensors KSTHPV 102 sensor is recommended to be installed on an inner wall at a height of 1.5 m, in areas with moving persons, not exposed to direct sunlight and not influenced by heat from walls, heat sources or lighting.

The KSTHC 102 temperature, relative humidity, atmospheric pressure, CO<sub>2</sub> and VOC sensor is designed to be operated in a chemically non-aggressive environment; its use must be chosen with regard to the temperature and chemical resistance of the head and of the individual sensors. Correct sensor function requires the following operating conditions:

- Ambient temperature around the sensor: -30 °C to 70 °C, for short periods -40 °C to 80 °C
- Relative ambient humidity: 0 to 95% (non-condensing humidity)
- Atmospheric pressure: 87 to 110 hPa

### TESTS, DECLARATION, CALIBRATIONS

The type tests are carried out by a notified body according to EN 50155 standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with EN 50121-3-2 standard, as amended
- Insulation test in accordance with EN 50155 standard, as amended
- Shock and Vibrations test in accordance with EN 61373 standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the EN 45545-2 standard, as amended. Can be supplied with materials complying with fire safety standard NFPA 130 as amended.

### SPECIFICATIONS

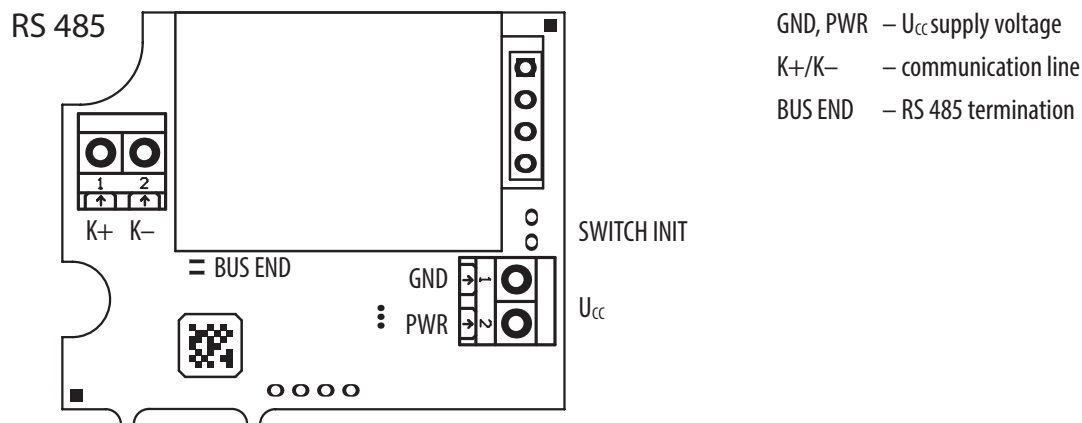
Sensor type	KSTHPV 102
Temperature measurement range*	-30 °C to 70 °C / -40 °C to 80 °C short-term
Temperature measurement accuracy*	± 0,5 °C at 25 °C / ± 1,0 °C in the range of 0 to 65 °C
Relative humidity measurement range*	0 to 95 %
Relative humidity measurement accuracy*	± 3 % in the range of 20 to 80 % ± 4,5 % in the range of 0 to 19 % a 81 to 95 %
VOC measurement range (IAQ index)*	0 to 500
VOC measurement accuracy*	± 15 %
Atmospheric pressure measurement range*	300 to 1100 hPa
Atmospheric pressure measurement accuracy* (in the temperature range of 0 °C to 65 °C in the range of 300–1100 hPa)	absolute deviation: ±0,6 hPa long-term temperature stability: ±1,0 hPa
Atmospheric pressure measurement accuracy* (in the temperature range of 25 °C to 40 °C in the range of 700–1100 hPa)	absolute deviation: ±0,12 hPa
Output signal	RS 485 / MODBUS RTU
U <sub>CC</sub> supply voltage range	15 to 30 V <sub>DC</sub>
Recommended U <sub>CC</sub> supply voltage	24 V <sub>DC</sub>
Consumption	maximum: 500 mW, typical: 250 mW
Ingress protection	IP 30 in accordance with EN 60529
Dimensions of the head	71,9 x 59 x 27 mm
Material of the head	LEXAN (meet standard EN 45545-2)
Recommended wire cross section	0,14 to 1 mm <sup>2</sup>
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1,5 kV <sub>DC</sub> for 1 minute in accordance with EN 50155
Shock and vibration test	Category 1, class B in accordance with EN 61373
Weight	min 35 g

\* The stated measurement ranges and accuracies for the individual sensors refer to operating conditions when the supply voltage is connected.

Manufacturer provides EU Declaration of Conformity.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## WIRING DIAGRAM ↓



## SENSOR INSTALLATION ↓

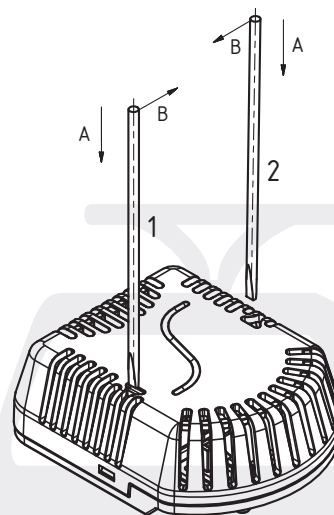
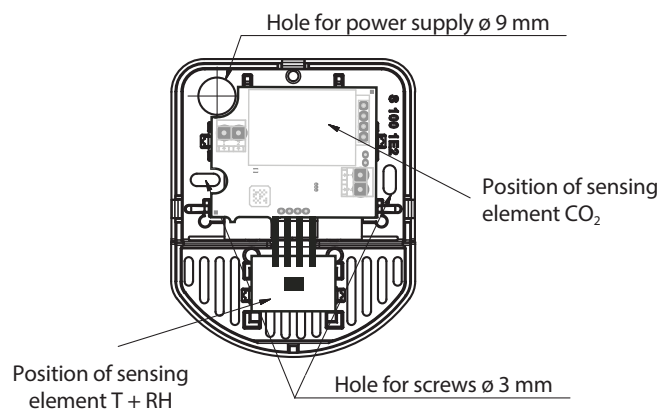
The sensors are designed to be mounted on a wall or other horizontal surfaces and for the attachment it is necessary to prepare required holes for mounting screws using a template (delivered with the sensor).

1. Before connecting the supply cable, it is necessary to separate the perforated cover from the plastic head base.
2. Remove the cover and insert the power cable through the 9 mm hole, apply the base to the surface and screw on with two screws or bolts. The length of the mounting bolts or screws for fastening must be chosen with respect to the thickness of the plastic head base. **Connect the power cable to the terminals according to the "Wiring diagram"**, position the perforated cover onto the attached base and lock it by clicking in.
3. After installing and connecting to the electrical measuring equipment, the sensor is ready for use. The sensor does not require any special servicing or maintenance.

For more detailed description of the installation, see the operating instructions for the sensor.

## OPERATING POSITION ↓

## COVER DISMANTLING ↓



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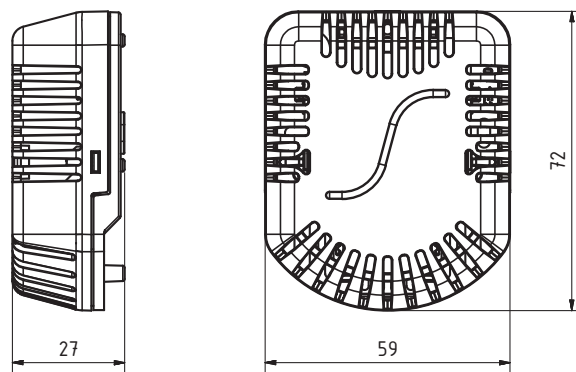


## KSTHPV 104

Temperature, relative humidity, atmospheric pressure  
and VOC interior sensor with CAN protocole output (CANopen)



Z076.1a



### DESCRIPTION AND APPLICATION

Temperature, relative humidity, atmospheric pressure and VOC sensor – KSTHPV 104 is designed to measure carbon dioxide concentrations, air temperature, air relative humidity, atmospheric pressure and concentrations of volatile organic compounds. In the application segment of rail vehicles, it is used to measure all variables in passenger compartments of train units and carriages and is a part of the temperature, relative humidity, atmospheric pressure and air quality control system.

This combined sensor KSTHPV 104 consists of a plastic ribbing head containing a printed circuit board with the individual sensors and a converter to establish a communication via the CAN bus. Temperature, relative humidity, atmospheric pressure and VOC are measured by a common internal sensing element whose signal is processed in a microprocessor and is converted to a CANopen output signal with CiA DS 301 specification output signal. Combined sensors KSTHPV 104 sensor meets the ingress protection of IP 30 according to EN 60529 standard, as amended. The pleasant design and high-quality material ensure that the combined sensor KSTHPV 104 does not seem intrusive even in interiors with high aesthetic requirements. Combined sensor KSTHPV 104 is recommended to be installed on an inner wall at a height of 1.5 m, in areas with moving persons, not exposed to direct sunlight and not influenced by heat from walls, heat sources or lighting.

The KSTHPV 104 temperature, relative humidity, atmospheric pressure, CO<sub>2</sub> and VOC sensor is designed to be operated in a chemically non-aggressive environment; its use must be chosen with regard to the temperature and chemical resistance of the head and of the individual sensors. Correct sensor function requires the following operating conditions:

- Ambient temperature around the sensor: -30 °C to 70 °C, for short periods -40 °C to 80 °C
- Relative ambient humidity: 0 to 95% (non-condensing humidity)
- Atmospheric pressure: 87 to 110 hPa

### TESTS, DECLARATION, CALIBRATIONS

The type tests are carried out by a notified body according to EN 50155 standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with EN 50121-3-2 standard, as amended
- Insulation test in accordance with EN 50155 standard, as amended
- Shock and Vibrations test in accordance with EN 61373 standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the EN 45545-2 standard, as amended. Can be supplied with materials complying with fire safety standard NFPA 130 as amended.

### SPECIFICATIONS

Sensor type	KSTHPV 104
Temperature measurement range*	-30 °C to 70 °C / -40 °C to 80 °C short-term
Temperature measurement accuracy*	± 0,5 °C at 25 °C / ± 1,0 °C in the range of 0 to 65 °C
Relative humidity measurement range*	0 to 95 %
Relative humidity measurement accuracy*	± 3 % in the range of 20 to 80 % ± 4,5 % in the range of 0 to 19 % a 81 to 95 %
VOC measurement range (IAQ index)*	0 to 500
VOC measurement accuracy*	± 15 %
Atmospheric pressure measurement range*	300 to 1100 hPa
Atmospheric pressure measurement accuracy* (in the temperature range of 0 °C to 65 °C in the range of 300–1100 hPa)	absolute deviation: ±0,6 hPa long-term temperature stability: ±1,0 hPa
Atmospheric pressure measurement accuracy* (in the temperature range of 25 °C to 40 °C in the range of 700–1100 hPa)	absolute deviation: ±0,12 hPa
Output signal	CAN / CANopen – CiA DS 301
U <sub>cc</sub> supply voltage range	15 to 30 V <sub>DC</sub>
Recommended U <sub>cc</sub> supply voltage	24 V <sub>DC</sub>
Consumption	maximum: 500 mW, typical: 250 mW
Ingress protection	IP 30 in accordance with EN 60529
Dimensions of the head	71,9 x 59 x 27 mm
Material of the head	LEXAN (meet standard EN 45545-2)
Recommended wire cross section	0,14 to 1 mm <sup>2</sup>
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1,5 kV <sub>DC</sub> for 1 minute in accordance with EN 50155
Shock and vibration test	Category 1, class B in accordance with EN 61373
Weight	min 35 g

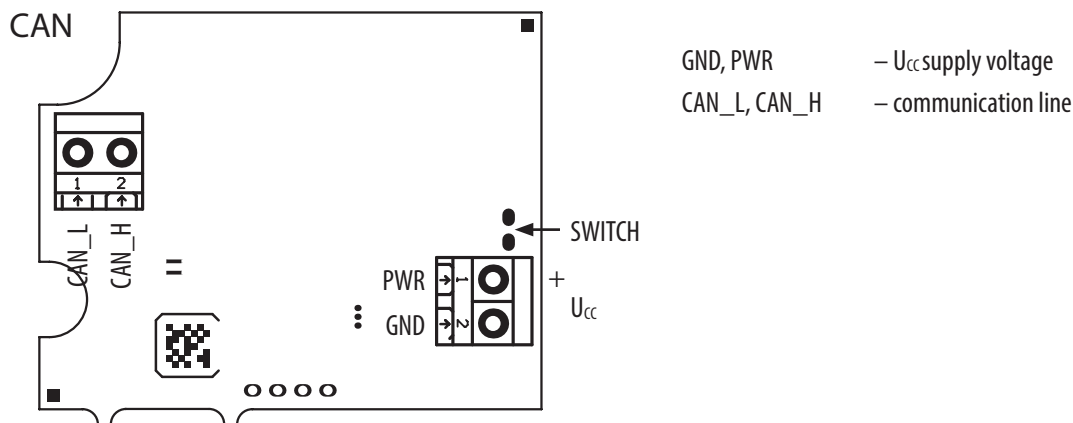
\* The stated measurement ranges and accuracies for the individual sensors refer to operating conditions when the supply voltage is connected.

Manufacturer provides EU Declaration of Conformity.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.



## WIRING DIAGRAM ↓



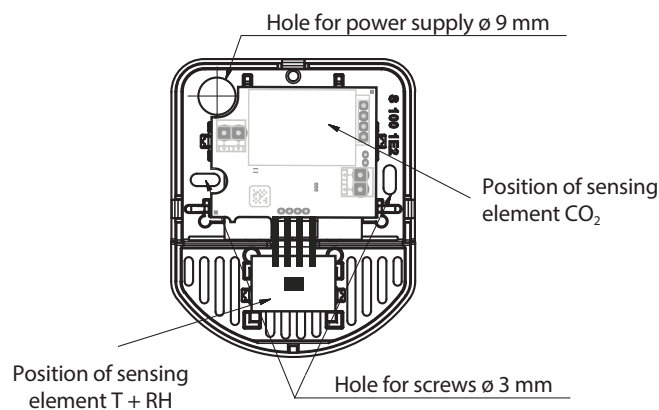
## SENSOR INSTALLATION ↓

The sensors are designed to be mounted on a wall or other horizontal surfaces and for the attachment it is necessary to prepare required holes for mounting screws using a template (delivered with the sensor).

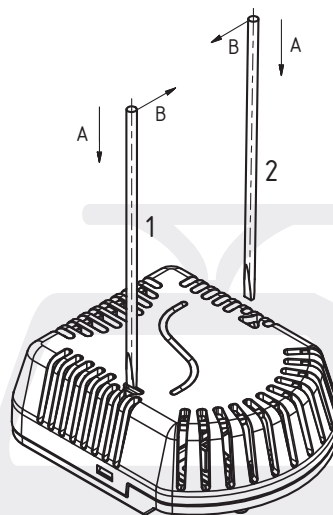
1. Before connecting the supply cable, it is necessary to separate the perforated cover from the plastic head base.
2. Remove the cover and insert the power cable through the 9 mm hole, apply the base to the surface and screw on with two screws or bolts. The length of the mounting bolts or screws for fastening must be chosen with respect to the thickness of the plastic head base. **Connect the power cable to the terminals according to the "Wiring diagram"**, position the perforated cover onto the attached base and lock it by clicking in.
3. After installing and connecting to the electrical measuring equipment, the sensor is ready for use. The sensor does not require any special servicing or maintenance.

For more detailed description of the installation, see the operating instructions for the sensor.

## OPERATING POSITION ↓



## COVER DISMANTLING ↓



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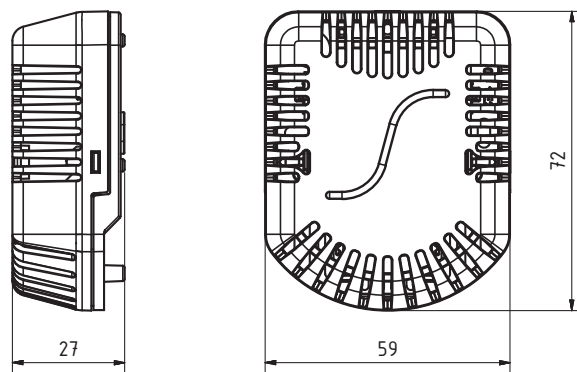


## KSTHCPV 102

Temperature, relative humidity, atmospheric pressure, CO<sub>2</sub> and VOC interior sensor with RS 485 (MODBUS) output



Z077.1a



### DESCRIPTION AND APPLICATION

Temperature, relative humidity, atmospheric pressure, CO<sub>2</sub> and VOC sensor - KSTHCPV 102 is designed to measure carbon dioxide concentrations, air temperature, air relative humidity, atmospheric pressure and concentrations of volatile organic compounds. In the application segment of rail vehicles, it is used to measure all variables in passenger compartments of train units and carriages and is a part of the temperature, relative humidity, atmospheric pressure and air quality control system.

This combined sensor KSTHCPV 102 consists of a plastic ribbing head containing a printed circuit board with the individual sensors and a converter to establish a communication via the RS 485 bus. Temperature, relative humidity, atmospheric pressure and VOC are measured by a common internal sensing element whose signal is processed in a microprocessor and is converted to a MODBUS RTU output signal. The CO<sub>2</sub> value is measured by a NDIR module whose digital signal is also converted to a MODBUS RTU output signal. For the CO<sub>2</sub> concentration sensor, there is an autocalibration function available to set the sensor to the minimum CO<sub>2</sub> value corresponding to the outside concentration level. This sensor meets the ingress protection of IP 30 according to EN 60529 standard, as amended. The pleasant design and high-quality material ensure that combined sensor KSTHCPV 102 does not seem intrusive even in interiors with high aesthetic requirements. Combined sensor KSTHCPV 102 is recommended to be installed on an inner wall at a height of 1.5 m, in areas with moving persons, not exposed to direct sunlight and not influenced by heat from walls, heat sources or lighting.

The KSTHCPV 102 temperature, relative humidity, atmospheric pressure, CO<sub>2</sub> and VOC sensor is designed to be operated in a chemically non-aggressive environment; its use must be chosen with regard to the temperature and chemical resistance of the head and of the individual sensors.

Correct function of the CO<sub>2</sub> sensor requires the following operating conditions:

- Ambient temperature around the sensor: 0 to 45 °C
- Relative ambient humidity: 0 to 85% (non-condensing humidity)
- Atmospheric pressure: 87 to 110 kPa

### SPECIFICATIONS

Sensor type	KSTHCPV 102
Temperature measurement range*	0 to 45 °C with guaranteed accuracy of CO <sub>2</sub> measurement -30 to 70 °C without guaranteed accuracy of CO <sub>2</sub> measurement. -40 to 80 °C short-term
Temperature measurement accuracy*	± 0,5 °C in temp. 25 °C / ± 1,0 °C in temp. 0 až 65 °C
Relative humidity measurement range*	0 to 85 % with guaranteed accuracy of CO <sub>2</sub> measurement 0 to 95 % without guaranteed accuracy of CO <sub>2</sub> measurement.
Relative humidity measurement accuracy*	± 3 % in the range of 20 to 80 % ± 4,5 % in the range of 0 to 19 % a 81 to 95 %
CO <sub>2</sub> measuring range*	400 to 5000 ppm
CO <sub>2</sub> measuring accuracy*	± 100 ppm*
Time response CO <sub>2</sub> (90%)	90 s
VOC measurement range (IAQ index)*	0 to 500
VOC measurement accuracy*	± 15 %
Atmospheric pressure measurement range*	300 to 1100 hPa
Atmospheric pressure measurement accuracy* (in the temperature range of 0 °C to 65 °C in the range of 300–1100 hPa)	absolute deviation: ±0,6 hPa long-term temperature stability: ±1,0 hPa
Atmospheric pressure measurement accuracy* (in the temperature range of 25 °C to 40 °C in the range of 700–1100 hPa)	absolute deviation: ±0,12 hPa
Output signal	RS 485 / MODBUS RTU
U <sub>cc</sub> supply voltage range	15 to 30 V <sub>DC</sub>
Recommended U <sub>cc</sub> supply voltage	24 V <sub>DC</sub>
Consumption	maximum: 500 mW, typical: 250 mW
Ingress protection	IP 30 in accordance with EN 60529
Dimensions of the head	71,9 x 59 x 27 mm
Material of the head	LEXAN (meet standard EN 45545-2)
Recommended wire cross section	0,14 to 1 mm <sup>2</sup>
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1,5 kV <sub>DC</sub> for 1 minute in accordance with EN 50155
Shock and vibration test	Category 1, class B in accordance with EN 61373
Weight	min 35 g

\* The stated measurement ranges and accuracies for the individual sensors refer to operating conditions when the supply voltage is connected.

## TESTS, DECLARATION, CALIBRATIONS ↓

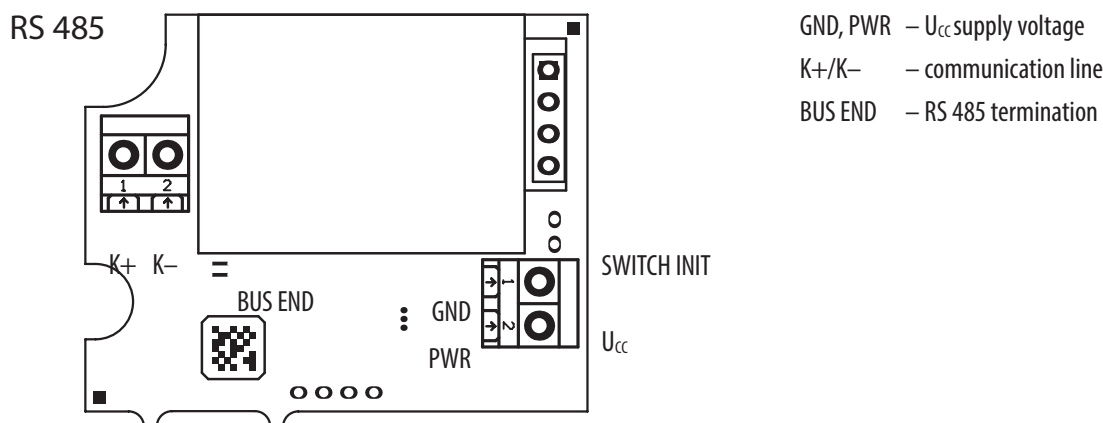
The **type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended. Can be supplied with materials complying with fire safety standard **NFPA 130** as amended.

Manufacturer provides **EU Declaration of Conformity. Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## WIRING DIAGRAM ↓



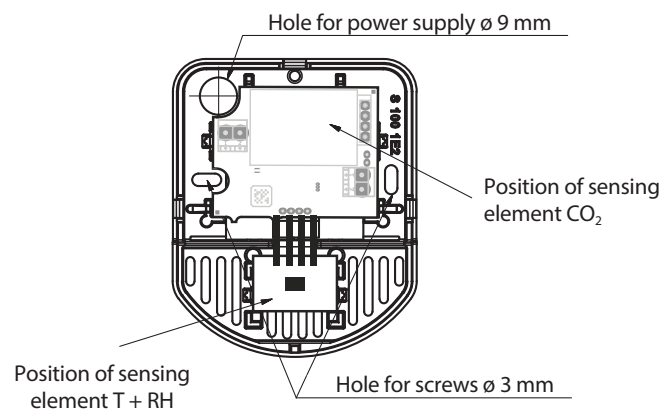
## SENSOR INSTALLATION ↓

The sensors are designed to be mounted on a wall or other horizontal surfaces and for the attachment it is necessary to prepare required holes for mounting screws using a template (delivered with the sensor).

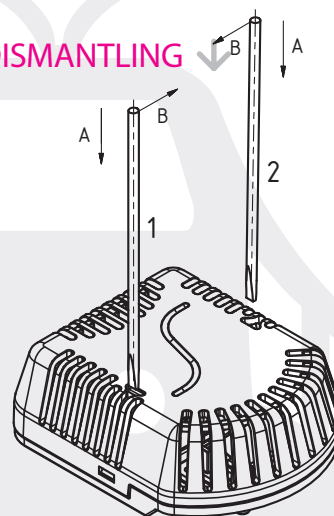
1. Before connecting the supply cable, it is necessary to separate the perforated cover from the plastic head base.
2. Remove the cover and insert the power cable through the 9 mm hole, apply the base to the surface and screw on with two screws or bolts. The length of the mounting bolts or screws for fastening must be chosen with respect to the thickness of the plastic head base. **Connect the power cable to the terminals according to the "Wiring diagram"**, position the perforated cover onto the attached base and lock it by clicking in.
3. After installing and connecting to the electrical measuring equipment, the sensor is ready for use. The sensor does not require any special servicing or maintenance.

**For more detailed description of the installation, see the operating instructions for the sensor.**

## OPERATING POSITION ↓



## COVER DISMANTLING ↓



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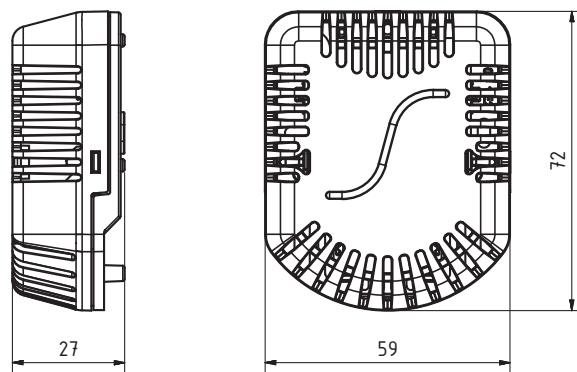


## KSTHCPV 104

Temperature, relative humidity, atmospheric pressure, CO<sub>2</sub> and VOC interior sensor with CAN protocol output (CANopen)



Z078.1a



### DESCRIPTION AND APPLICATION

Temperature, relative humidity, atmospheric pressure, CO<sub>2</sub> and VOC sensor - KSTHCPV 104 is designed to measure carbon dioxide concentrations, air temperature, air relative humidity, atmospheric pressure and concentrations of volatile organic compounds. In the application segment of rail vehicles, it is used to measure all variables in passenger compartments of train units and carriages and is a part of the temperature, relative humidity, atmospheric pressure and air quality control system.

This combined sensor KSTHCPV 104 consists of a plastic ribbing head containing a printed circuit board with the individual sensors and a converter to establish a communication via the RS 485 bus. Temperature, relative humidity, atmospheric pressure and VOC are measured by a common internal sensing element whose signal is processed in a microprocessor and is converted to a MODBUS RTU output signal. The CO<sub>2</sub> value is measured by a NDIR module whose digital signal is also converted to a MODBUS RTU output signal. For the CO<sub>2</sub> concentration sensor, there is an autocalibration function available to set the sensor to the minimum CO<sub>2</sub> value corresponding to the outside concentration level. This sensor meets the ingress protection of IP 30 according to EN 60529 standard, as amended. The pleasant design and high-quality material ensure that combined sensor KSTHCPV 104 does not seem intrusive even in interiors with high aesthetic requirements. Combined sensor KSTHCPV 104 is recommended to be installed on an inner wall at a height of 1.5 m, in areas with moving persons, not exposed to direct sunlight and not influenced by heat from walls, heat sources or lighting.

The KSTHCPV 104 temperature, relative humidity, atmospheric pressure, CO<sub>2</sub> and VOC sensor is designed to be operated in a chemically non-aggressive environment; its use must be chosen with regard to the temperature and chemical resistance of the head and of the individual sensors.

Correct function of the CO<sub>2</sub> sensor requires the following operating conditions:

- Ambient temperature around the sensor: 0 to 45 °C
- Relative ambient humidity: 0 to 85% (non-condensing humidity)
- Atmospheric pressure: 87 to 110 kPa

### SPECIFICATIONS

Sensor type	KSTHCPV 102
Temperature measurement range*	0 to 45 °C with guaranteed accuracy of CO <sub>2</sub> measurement -30 to 70 °C without guaranteed accuracy of CO <sub>2</sub> measurement. -40 to 80 °C short-term
Temperature measurement accuracy*	± 0,5 °C in temp. 25 °C / ± 1,0 °C in temp. 0 až 65 °C
Relative humidity measurement range*	0 to 85 % with guaranteed accuracy of CO <sub>2</sub> measurement 0 to 95 % without guaranteed accuracy of CO <sub>2</sub> measurement.
Relative humidity measurement accuracy*	± 3 % in the range of 20 to 80 % ± 4,5 % in the range of 0 to 19 % a 81 to 95 %
CO <sub>2</sub> measuring range*	400 to 5000 ppm
CO <sub>2</sub> measuring accuracy*	± 100 ppm*
Time response CO <sub>2</sub> (90%)	90 s
VOC measurement range (IAQ index)*	0 to 500
VOC measurement accuracy*	± 15 %
Atmospheric pressure measurement range*	300 to 1100 hPa
Atmospheric pressure measurement accuracy* (in the temperature range of 0 °C to 65 °C in the range of 300–1100 hPa)	absolute deviation: ±0,6 hPa long-term temperature stability: ±1,0 hPa
Atmospheric pressure measurement accuracy* (in the temperature range of 25 °C to 40 °C in the range of 700–1100 hPa)	absolute deviation: ±0,12 hPa
Output signal	CAN / CANopen - CiA DS 301
U <sub>CC</sub> supply voltage range	15 to 30 V <sub>DC</sub>
Recommended U <sub>CC</sub> supply voltage	24 V <sub>DC</sub>
Consumption	maximum: 500 mW, typical: 250 mW
Ingress protection	IP 30 in accordance with EN 60529
Dimensions of the head	71,9 x 59 x 27 mm
Material of the head	LEXAN (meet standard EN 45545-2)
Recommended wire cross section	0,14 to 1 mm <sup>2</sup>
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	1,5 kV <sub>DC</sub> for 1 minute in accordance with EN 50155
Shock and vibration test	Category 1, class B in accordance with EN 61373
Weight	min 35 g

\* The stated measurement ranges and accuracies for the individual sensors refer to operating conditions when the supply voltage is connected.

## TESTS, DECLARATION, CALIBRATIONS ↓

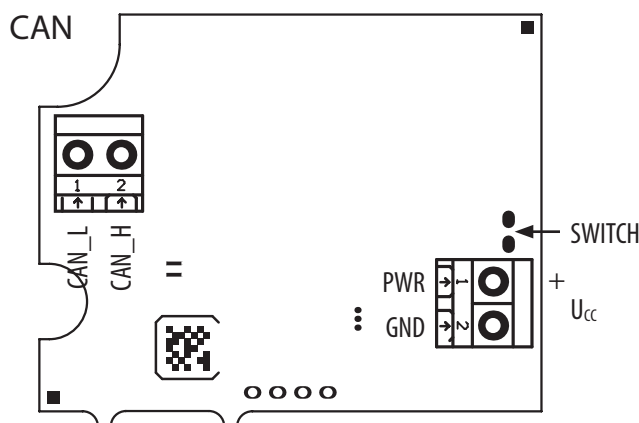
The **type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended. Can be supplied with materials complying with fire safety standard **NFPA 130** as amended.

Manufacturer provides **EU Declaration of Conformity. Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## WIRING DIAGRAM ↓



GND, PWR –  $U_{CC}$  supply voltage  
CAN\_L, CAN\_H – communication line

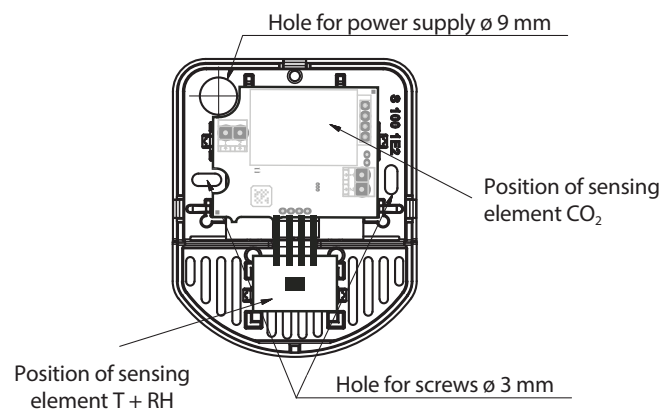
## SENSOR INSTALLATION ↓

The sensors are designed to be mounted on a wall or other horizontal surfaces and for the attachment it is necessary to prepare required holes for mounting screws using a template (delivered with the sensor).

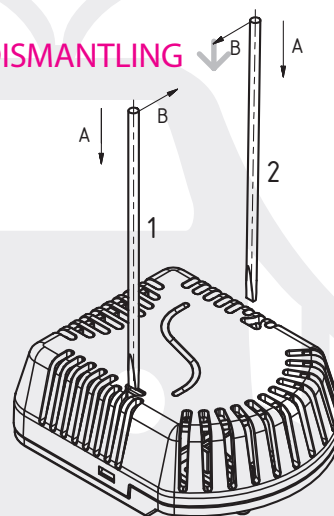
1. Before connecting the supply cable, it is necessary to separate the perforated cover from the plastic head base.
2. Remove the cover and insert the power cable through the 9 mm hole, apply the base to the surface and screw on with two screws or bolts. The length of the mounting bolts or screws for fastening must be chosen with respect to the thickness of the plastic head base. **Connect the power cable to the terminals according to the "Wiring diagram"**, position the perforated cover onto the attached base and lock it by clicking in.
3. After installing and connecting to the electrical measuring equipment, the sensor is ready for use. The sensor does not require any special servicing or maintenance.

For more detailed description of the installation, see the operating instructions for the sensor.

## OPERATING POSITION ↓



## COVER DISMANTLING ↓



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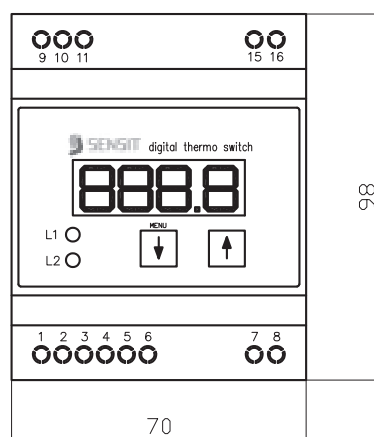


## KTSZ3H-24

Temperature switch



Z032.5a



### DESCRIPTION AND APPLICATION ↓

These temperature switches KTSZ3H-24 with display are designed for using as two-state controllers (ON/OFF type control). They compare the temperature set-point with the actual temperature value and enable switching the galvanically separated (electrically insulated) contacts of a connected relay when the set temperature is reached. Supply voltage of the switches is 7 to 36 V<sub>DC</sub> / V<sub>AC</sub>. Two temperature sensing elements can be connected to the switches. The display indicates the present value of the measuring temperature during measuring process. Setting of individual parameters is executed by two control buttons. The switch can be used in 5 different modes:

- Mode no. 1: the switch operates as a single controller which switches the first relay by the set temperature interval and the second relay is switched at the exceeding set emergency temperature (only one sensing element is used)
- Mode no. 2: the switch operates as a double controller which switches each relay by the set temperature interval (only one sensing element is used)
- Mode no. 3: the switch operates as a double controller, which switch each relay separately according to temperature interval (two sensing elements are used, each separately for each relay)
- Mode no. 4: the switch operates as a differential controller which switches on the base of temperature difference of two sensing elements (analogous to mode no. 1)
- Mode no. 5: the switch operates as a differential controller which switches on the base of temperature difference of two sensing elements (analogous to mode no. 2)

The time delay of switching-off for the relay 1 within the limits 0–300 s can be set in each mode. The switches are intended for assembly to the DIN slat. the temperature range of the switch applications depends on used temperature sensing element type (for example for the sensor in the TG 8 case the range is -50 °C to 200 °C). Maximum operating temperature range of the switch is -50 °C to 250 °C.

The switches are intended for operating in a chemically non-aggressive environment.

### SPECIFICATIONS ↓

Switch type	KTSZ3H-24
Output	2 relays
Type of sensing element	Pt 1000/3850 or Ni 1000/6180 – standardly Pt 100/3850 – modification
Maximum temperature operating range	-50 °C to 250 °C
Power supply	7 to 36 V <sub>DC</sub> / V <sub>AC</sub>
Maximum switched voltage	250 V <sub>AC</sub> / 6 A
Maximum error of the switch *	± (0.2 % from the value + 2 dig)
Resolution	0.1 °C
Setting range	-50 °C to 250 °C, step 0.1 °C
Display	4 digits - red LED, high of the digits 10 mm
Brightness of the display setting	4 levels
Updating of the display	< 0.2 s
Type of terminal board	terminal board ARK 210, wire cross section 0.35 to 1.5 mm <sup>2</sup>
Material of the case	LEXAN (meet standard EN 45545-2)
Case dimensions	98 x 70 x 61 mm
Ingress protection	IP 20 in accordance with EN 60529
Working conditions	ambient temperature: -5 °C to 60 °C, relative humidity: max 85 % (at the ambient temperature 25 °C), atmospheric pressure: 87 to 107 kPa
Weight	0.15 kg (without sens. element)
Shock and vibration tests	category 1, class B in accordance with EN 61373
Electromagnetic compatibility	in accordance with EN 50121-3-2
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155

\* Error of the sensing element is not incorporated.



## TESTS, DECLARATION, CALIBRATIONS ↓

The **type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

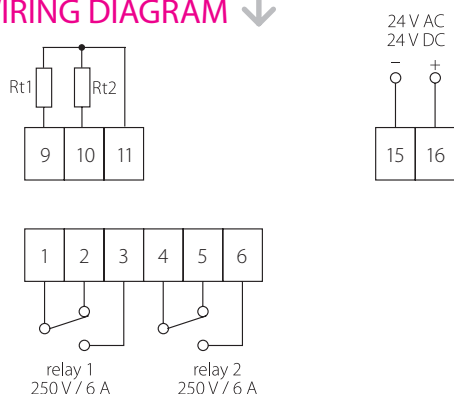
- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

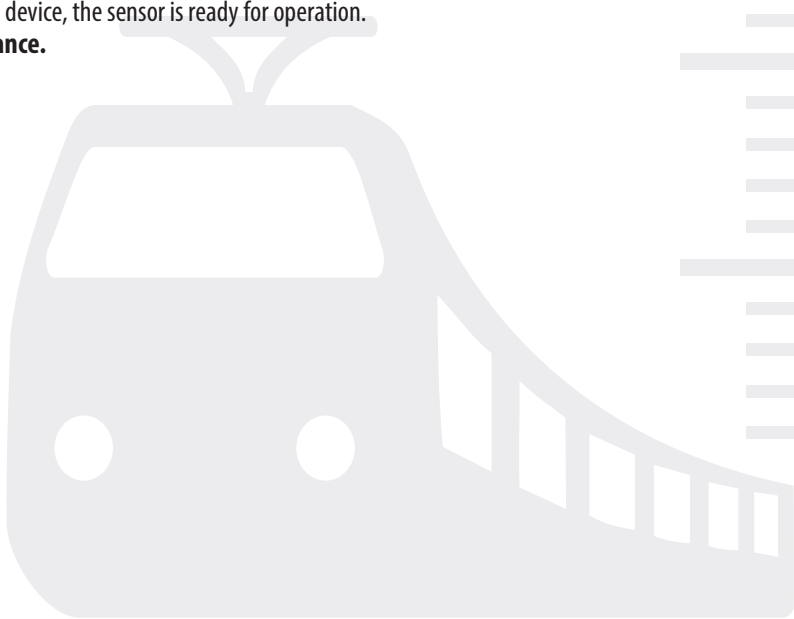
**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## WIRING DIAGRAM ↓



## SWITCH INSTALLATION ↓

1. Place the converter to the DIN standard rail using a grip, which is a part of the plastic box.
2. Connect the cable from resistance sensor Pt 1000/3850 or Ni 1000/6180 and from power supply into appropriate terminals according to wiring diagram. Connect the cable to the output relay contacts according to the wiring diagram.
3. After installation and connection to the consequential electrical measuring device, the sensor is ready for operation.  
**The sensor does not require any special manipulation or maintenance.**



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Z032.5a | 09/18

replace Z032.4a

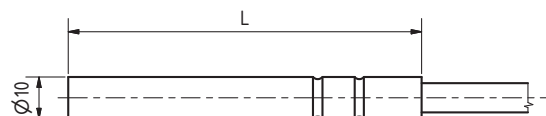


## KTSB 087/R

Bimetallic switch with cable and smooth case



Z079.1a



### DESCRIPTION AND APPLICATION ↓

Bimetallic temperature switches series KTSB 087/R are designed as two-state controllers (ON/OFF control) that compare the preset and instantaneous temperature and immediately disconnect the contact when a defined temperature is reached. The required temperature of switching is defined according to the customer's needs by the selection of a bimetal thermal cutoff and cannot be changed.

Bimetallic temperature switches series KTSB 087/R consist of a stainless steel housing containing a bimetal switch (thermal cutoff) and supply cable.

They are used to signal exceeded temperature in various applications, e.g. to protect transformers, power semiconductor stages, motors and powerful batteries. The bimetallic temperature switches KTSB 087/R series are intended for operation in chemically non-aggressive environments.

### TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.7, 12.2.8, 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The product meets parameters in accordance with **EN 45545-2** standard, as amended - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

### MODIFICATIONS ↓

In case of change cable to silicone shielded 2 x 0.34 mm<sup>2</sup> (does not meet standard EN 45545-2) applies: temperature range: 70°C to 180 °C

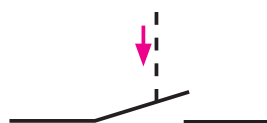
### SPECIFICATIONS ↓

Sensor type	KTSB 087R
Sensor	bimetal TMC – C1B
Temperature range (selection of the tripping temperature)	70 °C to 120 °C (the measuring range can be extended – see modification)
Contact design	normally closed / snap action
Maximum switching voltage/current	10 000 cycles 250 V <sub>AC</sub> / 2,5 A 3 000 cycles 250 V <sub>AC</sub> / 6,3 A
Switching tolerance	± 5 °C
Case material	stainless steel DIN 1.4301
Case diameter	10 mm
Case length	60 mm
Working range	-25 °C to 180 °C
Ingress protection	IP 67 in accordance with EN 60529
Insulation resistance in normal environment	min. 20 MΩ
Contact connection	2wires
Lead-in cable	RADOX shielded 2 x 0,5 mm <sup>2</sup>
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Weight	min. 0.2 kg acc. to design

### WIRING DIAGRAM ↓

■ Normally closed

■ Snap action

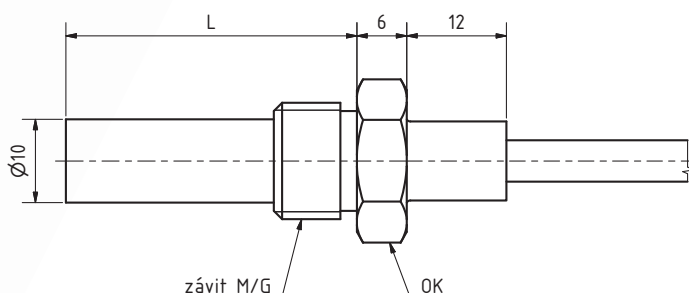


## KTSB 060/R

Bimetallic switch with cable and smooth case



Z080.1a



### DESCRIPTION AND APPLICATION ↓

Series KTSB 060/R bimetal temperature sensors are designed as two-state controllers (ON/OFF control) that compare the preset and instantaneous temperature and immediately disconnect the contact when a defined temperature is reached. The required temperature is defined according to the customer's needs by the selection of a bimetal thermal cutoff and cannot be changed.

Bimetal switches KTSB 060/R series consist of a stainless steel housing containing a bimetal switch (thermal cutoff) and supply cable.

Bimetal switches KTSB 060/R series are used to signal exceeded temperature in various industrial applications, e.g. to protect transformers, power semiconductor stages, motors and powerful batteries. The Bimetal switches TSB 060/R series are intended for operation in chemically non-aggressive environments.

### TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.7, 12.2.8, 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The product meets parameters in accordance with **EN 45545-2** standard, as amended - Fire protection on railway vehicles - Part 2: Requirements for fire behavior of materials and components. The materials also meet the requirements of the **NFPA 130** fire safety standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

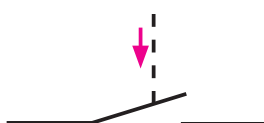
### SPECIFICATIONS ↓

Sensor type	KTSB 060/R
Sensor	bimetal TMC – C1B
Temperature range (selection of the tripping temperature)	70 °C to 120 °C (the measuring range can be extended – see modification)
Contact design	normally closed / snap action
Maximum switching voltage/current	10 000 cycles 250 V <sub>AC</sub> / 2,5 A 3 000 cycles 250 V <sub>AC</sub> / 6,3 A
Switching tolerance	± 5 °C
Case material	stainless steel DIN 1.4301
Case diameter	10 mm
Case length	60 mm
Working range	-25 °C to 180 °C
Ingress protection	IP 67 in accordance with EN 60529
Insulation resistance in normal environment	min. 20 MΩ
Contact connection	2wires
Lead-in cable	RADOX shielded 2 x 0,5 mm <sup>2</sup>
Shock and vibration tests	category 2 in accordance with EN 61373
Insulation test	4 kV <sub>DC</sub> for time 1 minute in accordance with EN 50155
Weight	min. 0.2 kg acc. to design

### WIRING DIAGRAM ↓

■ Normally closed

■ Snap action



### MODIFICATIONS ↓

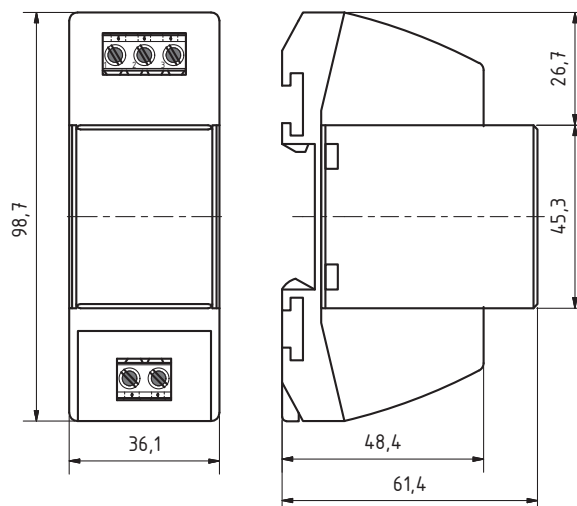
**In case of change cable to silicone shielded 2 x 0.34 mm<sup>2</sup> (does not meet standard EN 45545-2) applies:** temperature range: 70°C to 180 °C

**KSTID**

Temperature to current (4 to 20 mA) converter



Z062.3a



## DESCRIPTION AND APPLICATION ↓

KSTID converters are intended for converting the signal of Ni 1000/6180, Pt 100/3850 or Pt 1000/3850 resistance-type temperature sensing elements to the unified signal 4 to 20 mA. These converters can be utilised in any control system compatible with 4 to 20 mA current output. Standard measuring ranges of the converter are listed in a table of technical parameters. Operating temperature range is -40 °C to 80 °C. These limits must not be exceeded even for a short time.

The sensors are designed to be operated in a chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

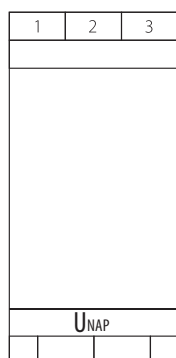
Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS ↓

Converter type	KSTID Pt 100	KSTID Pt 1000	KSTID Ni 1000
Input signal	Pt 100/3850	Pt 1000/3850	Ni 1000/6180
Output signal	4 to 20 mA		
Standard measuring range	-30 °C to 60 °C 0 °C to 100 °C, 0 °C to 150 °C, 0 °C to 200 °C other according to customer		
Power supply U	12 to 30 V <sub>DC</sub>		
Nominal supply voltage U <sub>n</sub>	24 V <sub>DC</sub>		
Maximum voltage ripple U <sub>n</sub>	0.5 %		
Measurement error	< 0.6 % of the measuring range, minimum 0.5 °C		
Ambient temperature	-40 °C to 80 °C		
Box material	LEXAN (meets standard EN 45545-2)		
Ingress protection box / terminal board	IP 20 / IP 00 according to EN 60529		
Output voltage for sensing element break	> 24 mA		
Output voltage for sensing element short	< 3.5 mA		
Shock and vibration tests	category 1, class B in accordance with EN 61373		
Electromagnetic compatibility	in accordance with EN 50121-3-2		
Insulation test	1.5 kVDC for time 1 minute in accordance with EN 50155		

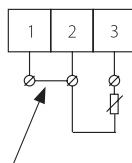
## WIRING DIAGRAM ↓



1, 2, 3 – sensor connection terminals

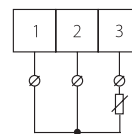
$U_{NAP}$  – power supply arbitrary polarity, output 4 to 20 mA

■ 2wire connection  
(Pt 100, Pt 1000, Ni 1000)



**NOTE:** For 2wire connection must be short circuit of jumper between terminals 1 and 2 plugged in.

■ 3wire connection  
(Pt 100, Pt 1000)



## SENSOR INSTALLATION ↓

1. Connect converter to wall or DIN bar by using clamping strip, which is part of the box.
2. The lead-in cable is connected to the terminals according to the wiring diagram.
3. After installing and connecting the sensor to the appropriate evaluating electrical equipment, the sensor is ready to use.

**The sensor does not require any special attendance or maintenance.**



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Z062.3a | 09/18

replace Z062.2a

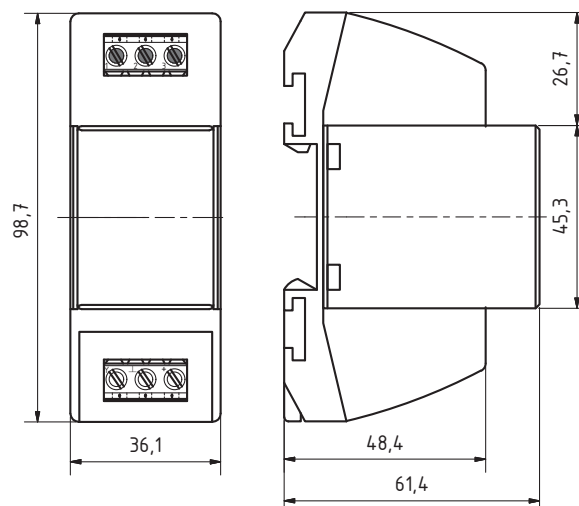


**KSTUD**

Temperature to voltage (0 to 10 V) converter

CE

Z063.3a



## DESCRIPTION AND APPLICATION ↓

The converters of the type KSTUD are intended for converting the signal of the Ni 1000/6180, Pt 100/3850 or Pt 1000/3850 resistance-type temperature sensing elements to a unified signal 0 to 10 V. These converters can be utilised in any control system compatible with 0 to 10 V voltage output. Standard measuring ranges of the converter are listed in a table of technical parameters. Operating temperature range is -40 °C to 80 °C. These limits must not be exceeded even for a short time.

The sensors are designed to be operated in a chemically non-aggressive environment.

## TESTS, DECLARATION, CALIBRATIONS ↓

**The type tests** are carried out by a notified body according to **EN 50155** standard, as amended Railway applications – Electronic equipment used on rolling stock, Art. 12.2.9, 12.2.11

- Electromagnetic Compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation test in accordance with **EN 50155** standard, as amended
- Shock and Vibrations test in accordance with **EN 61373** standard, as amended

The material of the plastic connection head meets a set of requirements for the R 24 materials according to the Table 5 for the fire hazard level HL1-KL2-HL3 of the **EN 45545-2** standard, as amended.

Manufacturer provides **EU Declaration of Conformity**.

**Calibration** – The final metrological inspection – comparison with standards or working instruments – is carried out for all the products. Continuity of the standards and working measuring instruments is ensured within the meaning of the Section 5 of Act no.505/1990 on metrology. The manufacturer offers a possibility to supply the sensors calibrated in SENSIT s.r.o.'s laboratory (according to requirements of the EN ISO/IEC 17025 standard, as amended) or in an Accredited laboratory.

## SPECIFICATIONS ↓

Converter type	KSTUD Pt 100	KSTUD Pt 1000	KSTUD Ni 1000
Input signal	Pt 100/3850	Pt 1000/3850	Ni 1000/6180
Output signal	0 to 10 V		
Standard measuring range	-30 °C to 60 °C 0 °C to 100 °C, 0 °C to 150 °C, 0 °C to 200 °C other according customer		
Power supply U	15 to 30 V <sub>DC</sub>		
Nominal supply voltage U <sub>n</sub>	24 V <sub>DC</sub>		
Measurement error	< 0.6 % of the measuring range, minimum 0.5 °C		
Ambient temperature	-40 °C to 80 °C		
Box material	LEXAN (meets standard EN 45545-2)		
Ingress protection box / terminal board	IP 20 / IP 00 according to EN 60529		
Output voltage for sensing element break	> 14 mA		
Output voltage for sensing element short	~ 0 V		
Shock and vibration tests	category 1, class B in accordance with EN 61373		
Electromagnetic compatibility	in accordance with EN 50121-3-2		
Insulation test	1.5 kVDC for time 1 minute in accordance with EN 50155		

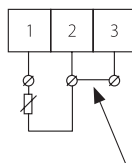


## WIRING DIAGRAM ↓

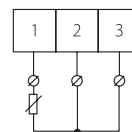


1, 2, 3 – sensor connection terminals  
 Y – output 0 to 10 V  
 ⊥ – negative pole of power supply  
 + – positive pole of power supply

■ 2wire connection  
 (Pt 100, Pt 1000, Ni 1000)



■ 3wire connection  
 (Pt 100, Pt 1000)



**NOTE:** For 2wire connection must be short circuit of jumper between terminals 2 and 3 plugged in.

## SENSOR INSTALLATION ↓

1. Connect converter to wall or DIN bar by using clamping strip, which is part of the box.
  2. The lead-in cable is connected to the terminals according to the wiring diagram.
  3. After installing and connecting the sensor to the appropriate evaluating electrical equipment, the sensor is ready to use.
- The sensor does not require any special attendance or maintenance.**



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Z063.3a | 09/18

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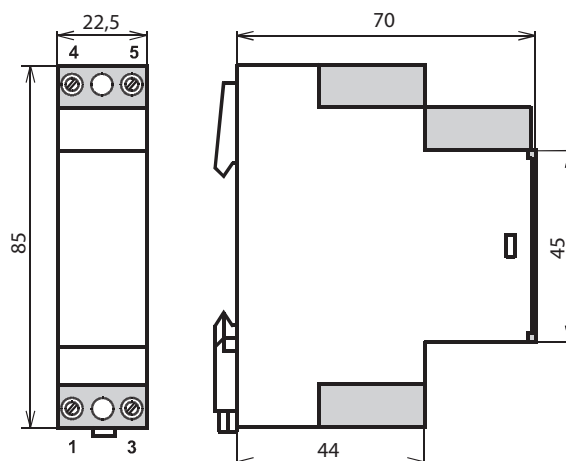


## PX24/R

Isolated converter of direct current and voltage



Z081.1a



### DESCRIPTION AND APPLICATION ↓

The module PX24/R is designed for the measurement of direct current or voltage signals of railway vehicles. It converts the input signal to isolated unified output signal 4 to 20 mA, 0 to 20mA, 0 to 10V, 0 to  $\pm 10V$  or 0 to  $\pm 20$  mA. It can process DC signals in the voltage range of  $\pm 10$  mV to  $\pm 1500$  V and current range of  $\pm 50$   $\mu$ A to  $\pm 10$  A. The module is typically used for measuring signals from shunts and from medium voltage dividers. The converter output is an active signal isolated from the input and from the auxiliary power supply.

PX24/R output loop powered.

- measures and isolates an input direct current or voltage signal
- it enables bipolar input and output signal
- rated impulse voltage Uni: 8 kV
- air and surface distance input/output: min. 8 mm
- test voltage  $U_a$  input / output: 5 kV RMS
- auxiliary power supply: 16-300  $V_{DC}$  90-250  $V_{AC}$
- installation on DIN 35 rail
- conversion accuracy:  $< 0.1\%$
- time constant: 1 ms, up to 300 ms on request

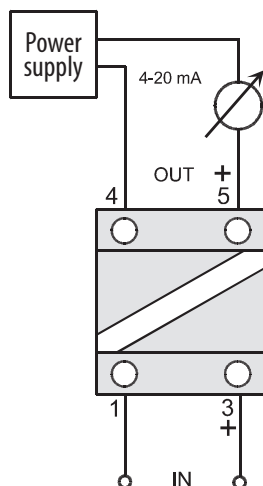
### TESTS, DECLARATIONS, CALIBRATIONS ↓

- Electronic equipment used on rolling stock in accordance with **EN 50155** standard, as amended
- Electromagnetic compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation coordination in accordance with **EN 50124-1** standard, as amended
- Shock and vibration tests in accordance with **EN 61373** standard, as amended
- Fire protection in accordance with **EN 45545-2+A1** standard, as amended, meets the set of requirements for monitored products according to Table 2 – the printed circuit board meets the set of requirements R24 – the box meets the set of requirements R26

### SPECIFICATIONS ↓

Converter type	PX24/R		
Working temperature range	-25 °C to 70 °C		
Storage temperature range	-40 °C to 80 °C		
Supply voltage	12 to 30 V <sub>DC</sub>		
Power supply without interruption	class S1 art.: 5.1.1.2		
Consumption	max. 1,5 VA		
Input signal	voltage: from ± 10 mV to ± 1500 V current: from ± 50 uA to ± 10 A		
Output signal	4 to 20 mA		
Output loop swing	min. 15 V (R <sub>z</sub> – 750 Ω) at 20 mA		
Voltage output load	max. 10 mA		
Input resistance of voltage input	typ. 100 kΩ / V		
Current input voltage drop	< 0,54 V		
Input current limit	typ. 30 mA (electronic fuse)		
Max. transfer error	< 0,1 %		
Linearity error	< 0,1 %		
Temperature error	< 0,01 % / °C		
Time constant	1 ms, up to 300 ms on request		
Ingress protection housing / terminal block	IP 40 / IP 20 in accordance with EN 60529		
Weight	90 g		
Environment	pollution degree PD1, PD2		
Max.working voltage through insulation	wiring overvoltage category	Insulation level	
		basic	enhanced
	OVI	up to 1000V RMS	up to 1000V RMS
	OVII	up to 1000V RMS	up to 600V RMS
OVIII	up to 1000V RMS	up to 300V RMS	
Air and surface distance	input / output + power supply: min. 8 mm output / power supply: min. 6,5 mm		
Test voltage U <sub>a</sub> input / output	5 kV RMS		
Rated impulse voltage Uni	8 kV		

## WIRING DIAGRAM ↓



terminals 1 and 3... input signal (3 is +)  
terminals 4 and 5... input signal (5 is +)



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Z081.1a

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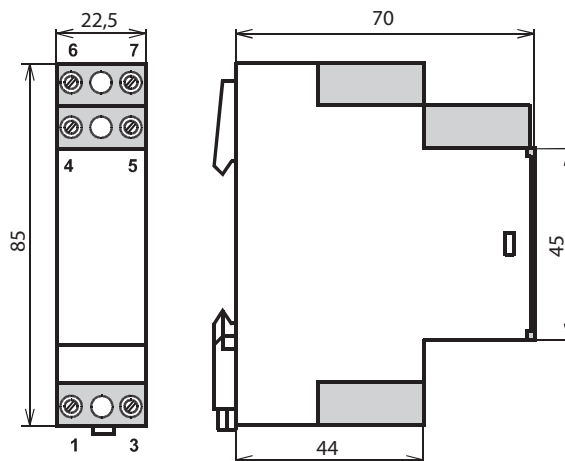


**PXN/R**

Isolated converter of direct current and voltage



Z082.1a



## DESCRIPTION AND APPLICATION ↓

The module PXN/R is designed for the measurement of direct current or voltage signals of railway vehicles. It converts the input signal to isolated unified output signal 4 to 20 mA, 0 to 20 mA, 0 to 10 V, 0 to  $\pm 10$  V or 0 to  $\pm 20$  mA. It can process DC signals in the voltage range of  $\pm 10$  mV to  $\pm 1500$  V and current range of  $\pm 50$   $\mu$ A to  $\pm 10$  A. The module is typically used for measuring signals from shunts and from medium voltage dividers. The converter output is an active signal isolated from the input and from the auxiliary power supply.

PXN/R output loop powered.

- measures and isolates an input direct current or voltage signal
- it enables bipolar input and output signal
- rated impulse voltage Uni: 8 kV
- air and surface distance input/output: min. 8 mm
- test voltage  $U_a$  input / output: 5 kV RMS
- auxiliary power supply: 16-300  $V_{DC}$  90-250  $V_{AC}$
- installation on DIN 35 rail
- conversion accuracy:  $< 0.1\%$
- time constant: 1 ms, up to 300 ms on request

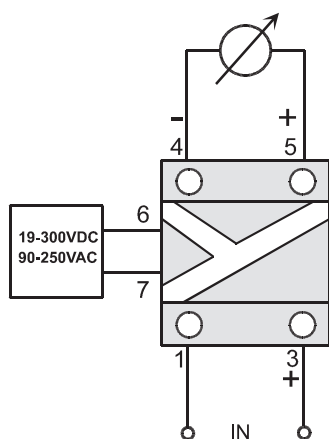
## TESTS, DECLARATIONS, CALIBRATIONS ↓

- Electronic equipment used on rolling stock in accordance with **EN 50155** standard, as amended
- Electromagnetic compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation coordination in accordance with **EN 50124-1** standard, as amended
- Shock and vibration tests in accordance with **EN 61373** standard, as amended
- Fire protection in accordance with **EN 45545-2+A1** standard, as amended, meets the set of requirements for monitored products according to Table 2 – the printed circuit board meets the set of requirements R24 – the box meets the set of requirements R26

## SPECIFICATIONS ↓

Converter type	PXN/R		
Working temperature range	-25 °C to 70 °C		
Storage temperature range	-40 °C to 80 °C		
Auxiliary power supply	16 to 300 V <sub>DC</sub> , 90 to 250 V <sub>AC</sub> on request: 20 to 60 V <sub>AC</sub>		
Power supply without interruption	class S1 art.: 5.1.1.2		
Consumption	max. 1,5 VA		
Input signal	voltage: from ± 10 mV to ± 1500 V current: from ± 50 uA to ± 10 A		
Output signal	0 to 20 mA, 4 to 20 mA, 0 to 10 V 0 to ± 20 mA, 0 ± 10 V		
Output loop swing	min. 15 V (R <sub>z</sub> – 750 Ω) at 20 mA		
Voltage output load	max. 10 mA		
Input resistance of voltage input	typ. 100 kΩ / V		
Current input voltage drop	< 0,54 V		
Input current limit	typ. 30 mA (electronic fuse)		
Max. transfer error	< 0,1 %		
Linearity error	< 0,1 %		
Temperature error	< 0,01 % / °C		
Time constant	1 ms, up to 300 ms on request		
Ingress protection housing / terminal block	IP 40 / IP 20 in accordance with EN 60529		
Weight	90 g		
Environment	pollution degree PD1, PD2		
Max.working voltage through insulation	wiring overvoltage category	Insulation level	
		basic	enhanced
	OVI	up to 1000V RMS	up to 1000V RMS
	OVI	up to 1000V RMS	up to 600V RMS
	OVI	up to 1000V RMS	up to 300V RMS
Air and surface distance	input / output + power supply: min. 8 mm output / power supply: min. 6,5 mm		
Test voltage U <sub>a</sub> input / output	5 kV RMS		
Rated impulse voltage U <sub>ni</sub>	8 kV		

## WIRING DIAGRAM ↓



terminals 1 and 3... input signal (3 is +)

terminals 4 and 5... input signal (5 is +)

terminals 6 and 7... auxiliary power supply without polarity



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Z082.1a

09/18

new

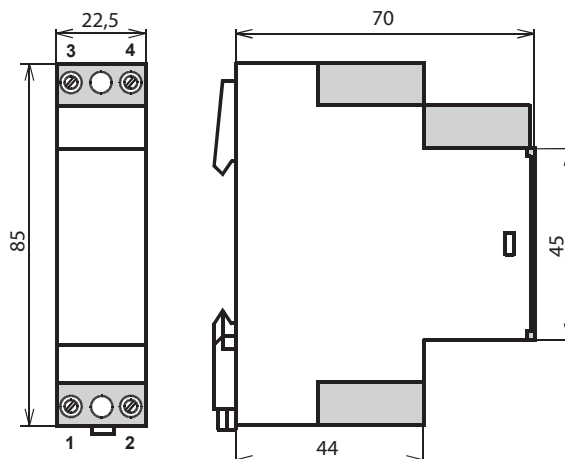


## AC24/R

Converter of alternating current or voltage



Z083.1a



### DESCRIPTION AND APPLICATION ↓

The converter AC24/R converts the true RMS value of a measured AC signal to a unified DC signal. There is a measuring transformer on the input of the current converter. It isolates the input measured circuit and converts the input signal to voltage suitable for further processing. After two-way rectification, calculation of the RMS value and signal filtering, an output DC signal is created on the converter output. The voltage output is isolated using an optocoupler. The calculation of the RMS value is carried out in an Analog Devices monolithic converter. The input and output circuits are protected against overload.

The converter AC24/R is also suitable for processing severely distorted waveforms of the input signal. It can be used even if there are frequency converters or other non-linear control elements in the system. When measuring distorted signal waveforms by mean value converters, errors can reach tens of percent. The following table shows the difference between measuring the signal mean value and RMS value for various distorted waveforms.

AC24/R – measurement of the effective TRMS value

- 4 to 20 mA loop-powered
- signal processing with crest factor of 10
- frequency range 40 to 1000 Hz
- isolation output – output – power supply 4000 Vef
- measuring range 0 to 120 % of rated input
- conversion accuracy < 0.5 %
- small size
- mounting on a DIN rail 35

### TESTS, DECLARATIONS, CALIBRATIONS ↓

- Electronic equipment used on rolling stock in accordance with **EN 50155** standard, as amended
- Electromagnetic compatibility in accordance with **EN 50121-3-2** standard, as amended
- Insulation coordination in accordance with **EN 50124-1** standard, as amended
- Shock and vibration tests in accordance with **EN 61373** standard, as amended
- Fire protection in accordance with **EN 45545-2+A1** standard, as amended, meets the set of requirements for monitored products according to Table 2 – the printed circuit board meets the set of requirements R24 – the box meets the set of requirements R26

### SPECIFICATIONS ↓

Converter type	AC24/R		
Working temperature range	-25 °C to 70 °C		
Storage temperature range	-40 °C to 80 °C		
Supply voltage	112 to 30 V <sub>AC</sub>		
Input rated signal	class S1 art.: 5.1.1.2		
Consumption	max. 1,5 VA		
Input rated signal	1A, 2,5A, 5A AC, 57,7 V, 100 V, 110 V, 230 V, 380 V, 400 V, 500V <sub>AC</sub> , 65 V, 115 V, 127 V, 265 V, 440 V, 460 V, 600V <sub>AC</sub> , other on request		
Output signal	4 to 20 mA passive		
Voltage input consumption	max. 0.5 mA		
Current input consumption	< 0.015 VA		
Input overload capacity	voltage: 2 U <sub>jm</sub> – 1 s current: 2 I <sub>jm</sub> – 1 min, 20 I <sub>jm</sub> – 1 s		
Standard measurement range	0 to 1 I <sub>jm</sub> (U <sub>jm</sub> ), other on request		
Maximum measurement range	0 to 1,2 I <sub>jm</sub> (U <sub>jm</sub> )		
Input current limit	typ. 28 mA (electronic fuse)		
Transfer	linear		
Max. transfer error	< 0,5% at crest factor <10		
Temperature error	< 0,02 % / °C		
Air and surface distance I/O	min. 8 mm		
Rated impulse voltage Uni	8 kV		
Test voltage U <sub>a</sub> input / output	4 kVef		
Signal stabilization time	300 ms		
Ingress protection housing / terminal block	IP 40 / IP 20 in accordance with EN 60529		
Weight	120 g		
Environment	pollution degree PD1, PD2		
Max.working voltage through insulation	wiring overvoltage category	Insulation level	
		basic	enhanced
		OVI	up to 1000V RMS
		OVI	up to 1000V RMS
		OVI	up to 1000V RMS
		OVI	up to 300V RMS





*Custom production of temperature sensors is a natural part of company SENSIT s.r.o. This means design and production of unit quantities of special temperature sensors for specific customer applications, including all relevant standards for railway vehicles.*

## WE CAN OFFER ↓

1. Cooperation, our experience and support for the development of suitable sensor for your application. The personal negotiation with our technician in your company.
2. Ensure the required certification, norm declaration in english, german, russian and other languages.
3. Design and production of temperature sensors in "customs case"
  - production of sensors according to samples or drawings
  - modification of the standard cases
  - production of sensors with difficult and unusual case design
  - production of sensors with small case diameter – from 1.5 mm
  - proposing of assembly according to the application
4. Encapsulation of special sensing element
  - KTY ■ NTC ■ TSic
  - SMT 160
  - two and more sensing elements to the case
5. Sensors compliant with special requirements for
  - resistance to vibration
  - high resistance to abrasive action
  - use at cryogenic temperatures
  - frequent repeatability and stability
  - required high accuracy
  - execution and compliance standards (tests) el. strenght and puncture
  - very fast response to temperature changes
6. Standardly used materials are replaced according to your requirements, as for example in areas such as housing material
  - tin bronze CuSn9 ■ plastics - makromelt ■ aluminium (alloy)
  - stainless steel DIN 1.4571 ■ brassFor cable, shrinking tubes
  - PFA ■ Viton ■ Kynar ■ flame retardant cable – FM 4910
  - cables for application under soil, and others

## COMPLEX SERVICE INCLUDES ↓

- technical support and consulting to design the sensor which you need, personal approach
- production and delivery of samples
- our quotation is calculated on the base of your required quantity
- production of sensors including control of every sensor, for every piece
- delivery date between 7 to 21 days
- express production and delivery within possibilities of technological process



[illegible]

## ↓ The Story of the SENSIT (interview in magazine AUTOMA 2/2014)

We meet Jan Janíček regularly at trade fairs and there are only few people who can talk about temperature metering in such an engaging manner as he does. In this interview he talks about the SENSIT located in Rožnov pod Radhoštěm for which temperature metering has also become a core topic.

### **Do you remember how the Sensit Company was founded?**

Shortly after the Velvet Revolution, in 1990, after the trade barriers came down, it became obvious that Tesla Rožnov would not be able to survive in its current form. And since this colossus could produce almost anything “from a pin to a locomotive”, it soon disintegrated into eighteen individual entities - some of them joint-stock companies, some limited liability companies. The Sensor Company was also one of them. I joined it as an Assistant Director after the termination of the General Directorate of the Tesla - Elektronické součástky Company, where I had been responsible for coordinating the development of electronic components for the electronic equipment of the Škoda Favorit passenger car. The Sensor Company was involved in the development and manufacture of pressure sensors. At the former Tesla Rožnov Company these sensors were produced as a by-product requisite for the utilisation of monocrystalline silicon wafers. Based on the skill and the determination of Zdeněk Holý and František Machala, their production was implemented under pilot conditions, separate from the main focus of the management.

### **How did you get involved in the development of temperature sensors?**

At the Sensor Company, we focused on the development of temperature sensors based on a PN junction (a diode connected in the reverse direction); there was a technology available for this and we anticipated good sales to the automotive industry. A rapid course of events developed when the entire design group behind “Basic Logic” from the Research and Development Department of the former Tesla, comprising Alois Procházka, František Jánek and František Haman arrived to join us as the development team. At the disintegrating Tesla Company a group had been formed around Jiří Holoubek, specialists in the vacuum deposition of thin metallic films, which provided us with a worldwide innovation – miniature metal thin-layer temperature sensors based on platinum and nickel. At that time only the Japanese could make them. Most of the engineers working on sensors were aware of the opportunity this method provided, apart from the director, Milan Tomeš, who insisted on the exclusive development of semiconductor temperature sensors. There was a sharp conflict of opinions, which led to a situation whereby my colleagues and I left the Development Department of the Sensor Company and established Sensit.

### **What was your intention when you founded the Sensit Company?**

Our intention was clear. To be the first company in Czechoslovakia to offer modern sensors on the market at affordable prices, together with their supporting electronic accessories, such as “tailor-made” digital thermometers. After time, weight and length, the fourth most measured physical quantity is the temperature and at that time there were only three companies that manufactured

temperature gauges, i.e. ZPA Nová Paka, Rego and Metra Blansko, leaving aside Mesit Uherské Hradiště with its special gauges for aircraft. Instinctively, rather than through marketing research, we sensed that there was an opportunity to be seized and also the possibility of having a lasting viable source of livelihood. The Company was founded on the 9th May 1991 as an association of individuals. There were seven of us. Jarda Číp, Robert Lovecký (who both left later and founded the Liss Company), František Haman, František Jánek, Alois Procházka, Jana Zemanová and myself. We clubbed together to provide some tens-of-thousands of crowns, stated what we intended to do, and worked hard, including on Saturdays and Sundays in container-type cabins located on rented premises. We had divided the responsibilities between us and it worked. When I think about all that enthusiasm and creativity, I can hardly even believe it. For a year none of us brought home a single crown.

### **Who were your first customers? Alongside the well-established ZPA Nová Paka entity a new company in the market for temperature sensors could not have seemed exactly trustworthy.**

(Smiling) It is always about coincidence and the ever-valid adage that “Luck Favours the Prepared”. Thanks to our friends and former colleagues from the development group of thin metallic films of already mentioned Jirka Holoubek we had features available enabling the reproducible metering of temperature for incredibly low prices. (In the end they did not reach understanding with the then management of Tesla Rožnov that was closing down, and therefore they were participating in the foundation of the now world famous Swiss company IST that primarily produces chips for metal RTDs - but that is another story.) We were building the “chips” that this group supplied to us into sleeves of various shapes and we also developed and produced the requisite electronics.

### **Did you also have the opportunity to promote your products?**

Sometime in 1992 we learned by chance that a three-day exhibition “Temperature Metering in Industry” was taking place in what was at that time the VŽKG Cultural Centre in Ostrava. I piled samples of our entire range of products into a cardboard suitcase and took the bus to Ostrava. After talking with the organisers, for a hundred crowns I was allocated a small table and a chair on the staircase landing. Those who went by stopped, looked at our products and were given contact information for Sensit. Included amongst the visitors was a technical assistant at RICO Veverská Bitýška, Oto Baďuřík, who ordered 26 temperature-metering sets on the spot. This then was a godsend! Based to our still ongoing friendship, I know that the last of these sets are still in use today. The Director of the Ostrava branch of the Landis+Gyr Company, Jiří Neuwirth, had a significant influence on the development of Sensit. He tried out our temperature sensors containing Ni 1000/5000ppm and he

decided to replace the original sensors of most of the controllers at his Landis+Gyr branch using ours as equivalents. The advantage was that they cost almost half the price and had the same technical characteristics and degree of reliability. And at that price it was possible at that time to win one tender after another.

### **How did Sensit develop over time? What kind of periods did it go through?**

The historical development of any business is never straightforward nor ideal. And it also was not for Sensit either. Some types of milestones included purchasing the premises, including the land, together with the container-type cabins in which Sensit resided; then in 1995 the establishment of a limited liability company and also the departure of František Jánek and the initiation of his own competing company, Regmet. Following this came the construction of a new company plant, the building acceptance and the move in 1998. Then we started producing paired temperature sensors for heat metering for billing purposes and also associated with that was the establishment of an Accredited Metrology Centre. In 2005 Alois Procházka left the Company and in 2008 we introduced and certified a new Management System in accordance with ISO 9001, 14001 and 18001.

Also a certain milestone was the decision to produce sleeves for the temperature sensors, mainly from stainless steel, and the acquisition of the appropriate technology – a plasma micro-welder.

I guess that I should not forget to mention the short period (1993 – 1994) during which we produced relays for the PASI Company in Berlin. This was contract work, whereby they brought us all the material from Berlin while the relays were assembled here in a specialised workshop in accordance with the submitted documentation and after the requisite checking they were delivered back to Berlin. This activity ended with the acquisition of PASI by the Siemens Company and its subsequent demise as an independent entity.

### **What do you think has been crucial for the success of the company?**

Unlike economists, I believe that it is not only the development of turnover and profit that defines how the company is doing and the position that it has and particular the position that it will have in the market. What is important is how its management deals with its customers, employees, partners and competitors. These are communicating vessels with long Time responses. If there are not good relations within the company or if my employees are not satisfied, sooner or later this will have a negative effect on product quality. This will soon be registered by the customers who, without any justification, will go to the competition. And, with a certain time lag, both the turnover and the profit will decline. And it is similar in regard to suppliers. We have a rule: to not keep any payables overdue. And, even though we are “small”, contractors consider us to be VIPs and they approach us in this manner regarding our requirements. The result

is a long-term relationship that brings positives to both sides and I am proud of that.

**You have mentioned competition in the market. How is Sensit doing in relation to that aspect?**

I think that the Czech Republic has the highest density of manufacturers of temperature sensors per million inhabitants, if not in the world then certainly in Europe. Nine manufacturers operate here and that is not counting those who produce temperature sensors solely for their own use, nor those who import them and offer them as a commercial product. The positive aspect is that we do know each other very well and we know in what segment and with what we are competing. We even do business with some of the competitor companies. Why develop and produce something that our competitors have already mastered and at which they are the best in the market? I would rather make a deal and buy it from them.

**So you are not at odds with the competition?**

Of course very often a fight with the competition is unavoidable in regard to both domestic and foreign competitors equally. Our goal in such cases is to do more than just use the advantage of lower prices, as has become customary in the last few years. We also rely on other values, such as quality, speed, flexibility and reliability. In no case, however, does it become a fight at all costs; in some cases that would be ineffective anyway. If Sensit is unable to offer customers what they require, we do not hesitate to recommend the competition to them. I consider this as representing a professional approach to the customer who appreciates this helpful attitude, for example by approaching us when he again needs services in the area of temperature metering.

**So are you the leader in the Czech market for temperature sensors?**

How is leadership defined? By market- share? That is so complex and tangled that nobody has actually mapped it. If leadership is judged, for example, based on the fact that most of the competition awaits for the publication of its price list until Sensit shows up with theirs then, maybe, yes. But not everybody knows us. Nevertheless every year some expert in the field of measurement and control has shown up, to whom Sensit's approach was a novel concept.

**But let's get back to the history. Which was the most difficult period for your business?**

I consider the year 2008 as having been the most difficult period for our company. At that time, due to a marked decline in the construction industry, we lost an appreciable part of our turnover. The company managed to survive this decline, however, based on extensive changes to its management. As of the 1st April 2009 Petr Brzezina was appointed to the function of Director. This long-term full-time employee of the company, who knows it "from top to bottom", was also prepared for fulfilling this function, amongst others, by completing four semesters of MBA Management Studies. The period of amateurs implementing the function of director has ended. What this resulted in was many more qualified decisions and actions leading to improved efficiency and work productivity. Deep analysis was implemented in regard to the budget expenditure and the costs that the company was able to avoid were minimised and at the same time the long

process of the market orientation of the company was initiated.

**What is meant by the term "market orientation"? That is to say that all businesses are dependent on the market.**

According to certain globally recognised and taught theories, there are several strategies in regard to business approaches and one of these is the strategy of market orientation. This states something to the effect that the customer's requirements are precisely the main driver of what you do in a specific market segment. For us that means, inter alia, communicating a lot with customers. In addition to the experts in this field, there are ordinary people who have naive ideas concerning temperature metering. We have to explain to those people how their problem with temperature should be optimally dealt with. And it works.

**How does the company develop in terms of its expertise? How do you sustain the necessary overview of how the field is evolving?**

Our vision is to be a modern and developing company, one that actively enters into cooperation with its customers and constantly cares about traditional values, including, specifically the supplying of quality, reliable and competitive sensors of physical quantities. This covers a huge scope. Currently, in addition to temperature sensors, we also offer combined temperature sensors and relative humidity and also gas-flow sensors. Our driving force is primarily the market's requirements, but also significant is the legislation that indicates in which direction the market will move and which sensors the manufacturers of final equipment will require. We obtain this information from personal contact with our customers and by participating in exhibitions and fairs, analysing the skills of the competition and, of course, from the literature. The development of the company is one of the priorities of Director Petr Brzezina; it is he who follows the regular meetings of traders with developers to determine what will be developed and in which order.

**How has the number of people working for the company evolved over the years?**

We started with seven people who did everything. As our reputation grew and with it also our position in the market, our turnover and our number of employees also increased. Currently Sensit has 42 high-quality, skilled and, I believe, also motivated employees.

**How is the company doing currently?**

In the years 2010-2012 our Sales Manager, Taňa Ondryášová, was able to both stabilise the staffing of the Sales Department and to diversify our customer portfolio into ten segments, according to their specific needs. Our high-quality sales team, in conjunction with Petr Brzezina and his explicitly defined corporate policy and progressively implemented motivational system have also borne fruit. Year-by-year Sensit has increased its turnover, which brings-up additional issues that need to be addressed.

**What are the future plans of the Sensit Company?**

In such a highly competitive environment as the Czech turf is, it would be really unwise for us to reveal our plans and our intentions. Generally speaking, we want to additionally strengthen our strengths and minimise our weaknesses, to seek

for and to take advantage of opportunities and to be prepared to face any threats. Quality improvement determines our ongoing programme, while improving our reliability represents a relatively new programme. Sensit is not going to pander to its customers by providing cheap and unreliable products, although we have heard repeatedly, literally: "... We are satisfied to the max with your sensors, but couldn't you offer us something cheaper, even if it's of lower quality?" There is only one answer to this - we cannot and we do not want to. But to be less sparing of words - a specific big task that faces the Sales Department is increasing the company's share of foreign trade.

**And finally, a few personal questions - what experience have you acquired during the time that you have spent with the company?**

If you have a team of people around you and you can also understand each other in other situations than just at work, if they respect each other and they also know how to make fun of themselves, it is possible to deal even with something that is seemingly insoluble.

**What has working for the company brought you personally?**

I will try to be brief by encapsulating: joy, fulfilment, satisfaction.

**And what illusions have you had to surrender?**

That I can get along on a long-term basis with all types of people. And that I will be as effective when I am sixty as I was at fifty. You cannot go head-to-head with time and I thank nature that I have had the opportunity to recognise this in a timely manner and to take steps that have had the right impact on the current state of Sensit and thereby also on my own state-of-mind.

**Thank you for this interview and I wish you good luck.**

*This interview was conducted by Eva Vaculíková.*



RNDr. Jan Janíček, co-owner of SENSIT s.r.o.  
(foto: Ondřej Zeman)





temperature



humidity



CO<sub>2</sub>



atm. pressure



VOC



level



flow



position

Germany

Poland

Prague

Brno

Slovakia

Austria



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