



PRODUCT MANUAL

Spatial resistance temperature sensor Ex d without converter type 112 13 with converter type 112 13/P

FOR DESIGN WITH CONVERTER A MANUAL IS ENCLOSED TO THE RELEVANT CONVERTER

APPLICATION

- For remote measurement of temperature of air in indoor and outdoor areas
- For explosive conditions in areas Zone 1 and Zone 2 pursuant to EN 60079-10, with the use of the converter Ex ia or in case of connection to Ex ia of the circuit, the sensor may be used in Zone 0
- In design with converter to convert signal of the resistance sensor to unified output signal 4 to 20mA or digital signal (converter with HART protocol)
- For the environment, where mechanical resistance is required pursuant to EN 60068-2-6 (class AH2) and seismic capability of the electrical equipment of the safety system of the nuclear power stations pursuant to IEC 980 (MVZ level SL-2)

The sensors with converter are rated products pursuant to the Directive 2014/34/EU of the European Parliament and the Council and EU Declaration of Conformity **EU -112130** is issued for the sensors without converter and **EU -11213P** for the sensors with converter.

DESCRIPTION

The sensor as a whole forms the fixed closure Ex d. It consists of the stem protection tube with measuring resistor, which is connected to the connecting head by means of a cap flange. In the head, a sensing probe and terminal board or converter (isolated or non-isolated, also in design Ex i) are installed. The installed converter is set-up to the required range at the sensor manufacturer.

The sensor shall be connected onto the wall by means of a holder, where the external terminal for grounding is placed.

To measure temperature, a defined change of the sensor in dependence on the change of temperature of the measured environment is used.

TECHNICAL DATA

The sensor is designed pursuant to EN 61140 as an electrical equipment of protection class III for the application in networks with the category of overvoltage in the installation II and pollution grade 2 pursuant to EN 61010-1, the follow-up (evaluation) device shall comply with Article 6.3 thereof.

Measuring range: -40 to 70 °C

Measuring range of the sensor with converter is given by the range of the selected converter.

Fixed closure pursuant to EN 60079-0 and ČSN EN 60079-1:

⊕ II 2 G Ex db IIC T6 -40°C ≤ T_a ≤ 70°C

Electric strength pursuant to EN 61010-1 Article 6.8.3:

500 V eff (only design without converter or with isolated converter)

Electric insulation resistance pursuant to EN 60751:

min. 100 MΩ, at 15 to 35°C, max. 80 % relative humidity, min 100 V DC

Power supply of converter:

DC 24 V from source SELV, e.g. INAP 16, INAP 901

Other data of converter: refer to enclosed manual

Ingress protection pursuant to EN 60529: IP 54

Operation position:

discretionary; the outlet shall not be situated upwards

Weight: approx. 0.65 kg

Type of operation: continuous

Applied materials:

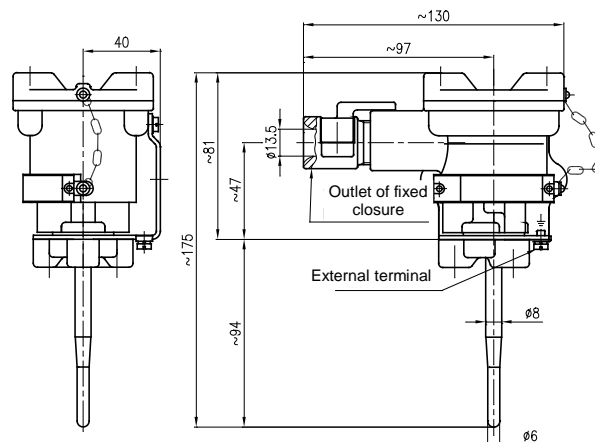
Stem tube of measuring insert steel 1.4541

Holder steel class 11 with galvanic zinc coating

Head chromated aluminium alloy and painted with grey synthetic semi-polished baking enamel

Internal wiring Cu

Head terminals of terminal board brass with Ni surface



OPERATION CONDITIONS

The environment is defined by the group of parameters and their severity grades IE 36 pursuant to EN 60721-3-3 and the following operation conditions.

Ambient temperature: -40 to 70 °C
for design with converter pursuant to the type of converter (refer to enclosed converter manual)



WARNING



The user shall guarantee that the maximum surface temperature of the sensor does not reach the temperature of ignition of any gas or steam, which could be present.

Relative ambient humidity:

10 to 100 % with condensation, with upper limit of water content 29 g H₂O/kg of dry air

Atmospheric pressure: 70 to 106 kPa

Maximum speed of air flow: 25 m/s

Vibrations:

Frequency range 10 to 55 Hz
Drift amplitude 0.15 mm
Acceleration amplitude 19.6 ms⁻²

METROLOGICAL DATA

Sensing unit: measuring resistor Pt single or double in connection pursuant to the scheme of connection and table of designs $\alpha = 0.00385 [K^{-1}]$, tolerance class B (or A only for 4-wire) pursuant to EN 60751

Internal wiring resistance at 20°C: 0.017 Ω ± 10%

Maximum current load of measuring resistor: 3 mA

Recommended measuring current: 1 mA

Output signal of the converter (linear with measured temperature): 4 to 20 mA (+ digital for HART protocol)

Calibration depth of immersion: 90 mm

Temperature response time pursuant to ČSN IEC 751 in still air, (characteristic value):

$\tau_{0.5}$ 4.5 min
 $\tau_{0.9}$ 16.5 min

DESIGNATION:**Data on head label**

- Trademark of the manufacturer
- Made in Czech Republic
- Type of measuring resistor, nominal value R_0 / tolerance class / configuration of wires of internal wiring *)
- Measuring range of the sensor or pre-set converter range
- Product ordering number
- Ingress protection
- Serial number
- Output signal 4 to 20 mA (design with converter)
- Mark of non-explosiveness
 $\text{II 2 G Ex db IIC T6 -40}^\circ\text{C}\leq\text{Ta}\leq\text{70}^\circ\text{C}$
 and No. of EU-Type Examination Certificate
- Designation of non-explosiveness and number of the EU-Type Examination Certificate (for design with converter Ex ia)

*) Configuration of wires of internal wiring is not specified for the converter

Data on converter label

- Trade mark
- Sensor type
- Pre-set temperature range
- Designation of non-explosiveness and number of the EU-Type Examination Certificate
- the conformity marking CE (for converter Ex ia with the number of the notified person)

Data on head and cover of the sensor

- Data on performed pressure test

Data on head of sensor

- Mark CE 1026
- Type and size of thread for outlet

DELIVERY

Unless agreed otherwise with the customer, each delivery includes

- Delivery note
- Sensor pursuant to the purchase order
- Rubber sealing ring \varnothing 8 to 10 mm (after an agreement with the manufacturer, sealing ring \varnothing 6 to 8 mm) and appropriate two metal washers for the cable outlet of the head, to which a rubber sealing ring \varnothing 10 to 12 mm is installed)
- Optional accessories to the sensor with programmable converter:
 - o Configuration (parameterization) programme pursuant to the required converter.
 - o Communication modem (for serial port RS 232C) pursuant to the required converter.
- Accompanying technical documentation in Czech:
 - o Product manual
 - o Product quality and completeness certificate, which also serves as the warranty certificate
 - o EU Declaration of Conformity

If it is established in the purchase contract or agreed otherwise, the following documentation can be also delivered with the product:

- Copy of the Inspection Certificate 3.1 for the stem tube material with the heat number
- Test report about the seismic and the vibration qualification
- Calibration sheet (for calibrated design)
- Copy of EU-Type Examination Certificate pursuant to the Directive No 2014/34/EU for fixed closure
- Copy of EU-Type Examination Certificate pursuant to the Directive No 2014/34/EU (ATEX) for converter Ex ia

RELIABILITY

Indicators of reliability in operation conditions and conditions of the environment specified herein

- Mean time of operation between failures 96 000 hours
(inf. value)
- Expected service life 10 years

CERTIFICATION**112 13**

- Non-explosiveness $\text{II 2 G Ex db IIC T6 -40}^\circ\text{C}\leq\text{Ta}\leq\text{70}^\circ\text{C}$, Certificate pursuant to the Directive 2014/34/EU. FTZÚ 02 ATEX 0460X with supplementary No. 1, 2 and 3

11213/P

- Non-explosiveness $\text{II 2 G Ex db IIC T6 -40}^\circ\text{C}\leq\text{Ta}\leq\text{70}^\circ\text{C}$, Certificate pursuant to the Directive 2014/34/EU. FTZÚ 02 ATEX 0460X with supplementary No. 1, 2 and 3
- Non-explosiveness Ex i, EU-Type Examination Certificate pursuant to the 2014/34/EU (pursuant to the type of the converter and display)

PACKING

Both sensors and accessories are delivered in a packing ensuring resistance to the impact of thermal effects and mechanical effects pursuant to controlled packing regulations.

TRANSPORT

The sensors may be transported on conditions corresponding to the set of combinations of classes IE 21 pursuant to EN 60721-3-2 (i.e. by airplanes and trucks, in premises that are ventilated and protected against atmospheric conditions).

STORAGE

The products may be stored on conditions corresponding to the set of combinations of classes IE 11/1K3 pursuant to EN 60721-3-1 (i.e. in places with temperature from -5 to 45 °C and humidity from 5 to 95%, without a special threat of an attack with biological agents, with vibrations of small significance and not situated close to sources of dust and sand).

CALIBRATION

It is realized pursuant to TPM 3342-94 and in compliance with EN 60751, usually in three temperature points evenly distributed within the operation range of the sensor or in the points according to the requirement of the customer. Calibration sheets with measured data are issued for calibrated sensors.

ORDERING

The purchase order shall specify

- Name
- Product ordering number
- Measuring range of the converter (for another range)
- If calibration is required and in what temperature points
- If optional accessories to the sensor with programmable converter are required
- Other requirements (documentation, ...)
- Number of pieces

PURCHASE ORDER EXAMPLE**Standard design:**

1. Spatial resistance temperature sensor Ex d
112 135 7B1
We request calibration in points -20, 0, 20 and 50°C
6 pcs
2. Spatial resistance temperature sensor Ex d with converter
112 139 7B1/55
Range -30 to 70°C
6 pcs

Special request:

1. Spatial resistance temperature sensor Ex d
112 135 7A1
6 pcs
2. Spatial resistance temperature sensor Ex d with converter
112 135 7A1/TH200
Range 0 to 50°C
6 pcs

DESIGN OF TEMPERATURE SENSORS, TYPE 112 13

SPECIFICATION		ORDERING NUMBER				
		112 13	5	x	B	1
Measuring resistor, tolerance class B pursuant to EN 60751	Pt 100/B/2			7		
	2 x Pt 100/B/2			8		

DESIGN OF TEMPERATURE SENSORS, TYPE 112 13/P

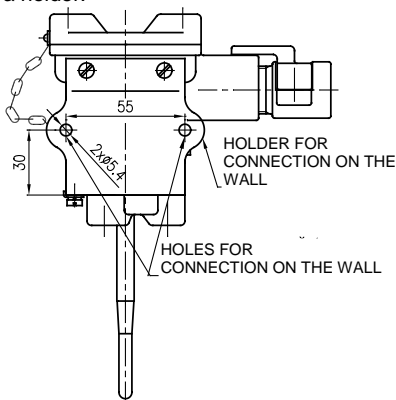
SPECIFICATION			ORDERING NUMBER				
			112 13	9	7	x	1
Measuring resistor Pt 100, tolerance class pursuant to EN 60751						B	
						A *)	
Converter type		Galvanic separation	Ex	Range [°C]			
Analogue	INPAL 420			0 to 50			/15
	APAQ-HRF			-30 to 70			/55
	APAQ-HRFX		•	Adjustable range			/HRF /HRFX
Programmable	TH 100			Programmable range			/TH100
	TH 100-ex		•				/TH100X
	TH 200	•					/TH200
	TH 200-ex	•	•				/T200X
	IPAQ-H	•					/IPAQH
	IPAQ-HX	•	•				/IPAQHX
	MINIPAQ-HLP	•					/MINIPAQ
HART protocol	IPAQ C330	•				/C300	
	IPAQ C330X	•	•			/C300X	
	TH 300	•				/TH300	
	TH 300-ex	•	•			/TH300X	
Other *)	MESO-H	•				/MESOH	
	MESO-HX	•	•			/MESOHX	
Without converter (for converter installation by customer)							/99
							/00

*) Only as a special request after an agreement with the manufacturer

Note: As a default, the sensors are delivered with converter INPAL 420 and specified default ranges. When another range is required, converter APAQ-HRF is used as a default. Specify the required measuring range for the APAQ converters and programmable converters in the purchase order in wording. Unless the measuring range is defined in the purchase order by the customer, the range from -30 to 70 °C shall be set up. Minimum range of the measured temperature and the measuring range shall be entered pursuant to the parameters of the converter. The lower limit of the temperature range is -40°C; the upper limit of the range is 70°C. With respect to that particular temperature class, it is not permitted to change (increase) the pre-set converter range beyond the said limits later on.

**INSTALLATION AND CONNECTION
SENSOR INSTALLATION**

The sensors can be connected on the wall with two screws by means of a holder.



WARNING
Distance of the fixed closure Ex db IIC from close structures or between the closures shall be at least 40 mm.

INSTALLATION OF CABLE OUTLET

The cable outlet shall ensure the applicable Ingress Protection and, at the same time, it shall secure the cable against turning over. As a default, it is designed for cables with the external diameter 8 to 12 mm, pursuant to the selected type of the rubber sealing ring. It shall be sealed properly. After tightening the body (screw joint) of the outlet to at least 5 threads, fix the cable with the yoke (shim) against turning over and against spontaneous release of the outlet.

WARNING

The cable gland of the sensor may not provide sufficient cable grip. Therefore, the user must ensure that the cable is properly attached so as to prevent the transfer of torque and torsion from the cable to the connections.

Do not use other sealing rings in the outlet than the original ones delivered by the manufacturer. Do not change artificially the outer diameter of the cable e.g. by winding it around with electrical insulating tapes.

For temperature sensors with converter must be in zone 1 gas group IIC cable gland use barrier or use a converter Ex ia

ELECTRICAL CONNECTION

The electrical connection may be only realized by qualified workers.

The sensor installation in the environment with explosive gaseous atmosphere shall be in compliance with the requirements of EN 60079-14.

The terminal board of the sensor (converter) is accessible after the removal of the lid of the head, which is connected with four screws.

Connect the evaluation devices to the sensor with a non-armoured cable with double insulation internal wires with Cu core with cross section 0.5 to 2.5 mm²(in intrinsically safe circuits insulation resistance between wires, wires and shielding and earth shielding at least AC 500V or DC 750 V). Seal the cable outlet of the sensor as required in the Article INSTALLATION OF CABLE OUTLET.

WARNING

The connecting cable must have a casing of thermoplastic, thermoset or elastomeric materials. The cable must be circular and compact, the filler or shell must be extruded and the filler material, if used, must be non-absorbent. The length of the connecting cable must be at least min. 3 m. Temperature resistance of the cable shall comply with the ambient temperature!

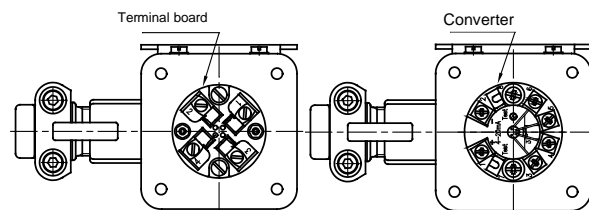
The cable insulation shall have chemical and mechanical resistance in compliance with the environment, where the cable will be installed. It is recommended supporting the cable along its length between the sensor and the follow-up device. In the conditions with interfering signals, use a shielded cable in the supply circuit. Ground (earth) the shielding in one point only. Do not lead the cable together with power cables.

For the sensors with converter with HART protocol, the maximum length of wiring is identified by the layout of the wires of the connecting cable. The overall length of wiring may be up to 1500 m. A twisted two-wire with shared shielding with the cross-section of the core min. 0.5 mm² is required. The HART communicator is connected to the supply loop of the sensor with the converter pursuant to Figure 2. To ensure reliable commutation, there shall be total load resistance of min. 250 Ω in the circuit of the output loop.

**WARNING**

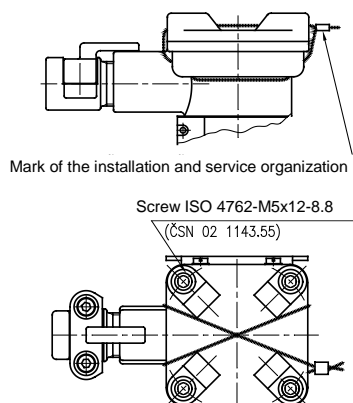
Programmable converter may not be connected to a computer or a HART communicator, if the converter is located in explosive environment.

For the installation in a dangerous area, interconnection (bringing to the same potential) is required. To achieve it, you can use the external terminal on the sensor adapter, which enables the connection of the protective wire (wire for mutual interconnection) with cross section of 4 mm².

VIEW OF THE SENSOR HEAD**CLOSING THE HEAD OF THE FIXED CLOSURE Ex d**

After the electrical connection, close the head of the sensor with four screws. Fan-shaped washers shall be installation under all screws on the head and the outlet. The rest areas of the lid and the head may not be polluted or provided with solidifying paints (with the exception of non-hardening greases). All screws on the sensor and the outlet, which secure the connection of parts of the fixed closure, shall be tightened properly so that the joint between the lid and the head is max. 0.2 mm.

The sensors may be provided with the mark (seal) of the installation and service organization by a worker of the installation and service organization. The type of sealing is illustrated in the figure.

TYPE OF SECURING THE LID**WARNING:**

Power supply of the sensor may not be connected before closing the fixed closure!

**SENSOR INSTALLATION WITHOUT CONVERTER AND SENSOR WITH CONVERTER Ex ia TO ZONE 0 (20)****WARNING:**

The user is responsible for ensuring that during operation in zone 0 is between the sensor head from an aluminium alloy and other equipment preclude any risk of ignition due to impact and friction.



The sensor without converter can be used, in case of the installation pursuant to EN 60079-11, Art. 5.7 in the intrinsically safe circuit Ex ia according to EN 60079-25), as a simple equipment. For simple equipment, the maximum temperature can be determined from the value of the P₀ of the follower and the temperature class is determined.

Sensor with converter Ex ia can be used while adhering to the Ex ia parameters of the converter shall be complied with pursuant to the enclosed converter manual.

When installing intrinsically safe circuits, including cables, do not exceed the maximum allowable inductance, capacity or ratio LiR and surface temperature. Permissible values are determined from the documentation of the connecting device or label. Place follow-up equipment out of the danger area. An intrinsically safe source approved for supplying intrinsically safe devices in accordance with EN 60079-11 must always be used.

The shield of the intrinsically safe circuit cable must be grounded in the same place as the intrinsically safe circuit, the connection must be outside the dangerous area.

If the intrinsically safe circuit is isolated from the ground, the shield must be connected in one place to the protective interconnection system. This can be using the terminals on the sensor head.

COMMISSIONING

After the installation of the sensor, including closing of the fixed closure and connection of the follow-up device to the supply voltage (and the settlement period of the converter), the equipment is prepared for operation.

**WARNING**

After installation must be require initial inspection equipment and installations according to EN 60079-17

OPERATION AND MAINTENANCE

The sensor does not require any operation; maintenance and follow-up regular periodic revision or permanent supervision of expert staff are performed pursuant to EN 60079-17

**WARNING**

Any intervention into the sensor and its design will cause a change of its properties and can result in an explosion!

SENSOR UNINSTALLATION

The installation seal may only be violated by a worker of the installation and service organization.

**WARNING**

The temperature sensor is in design Ex d and it must be disconnected from the supply source before opening the cover of the head and releasing the cable outlet!

After the removal of the lid of the head, which is connected with four screws, disconnect the connecting cable.

Before a complete uninstallation of the sensor, release the wire for mutual interconnection from the external terminal on the sensor. By releasing two connecting screws of the holder, the sensor is removed from the wall.

OUTLET REPLACEMENT

The cable outlet may only be replaced with a similar type (with securing against pull-out) that is certified for fixed closure Ex d IIC. When replacing the cable outlet, the body of the new outlet shall be tightened with torque of 30 – 35 Nm. The installation of the cable in the outlet, its sealing and securing against the pull-out shall be realized pursuant to the instruction sheet of the supplier of the outlet and in compliance with the Article *INSTALLATION OF CABLE OUTLET*.

SPARE PARTS

The design of the device does not require any delivery of spare parts.

WARRANTY

The warranty period is 24 months from the receiving of the product by the customer, unless established otherwise in the contract. Rejection of defects shall be enforced in writing at the manufacturer within the warranty period. The rejecting side shall identify the product name, ordering and manufacturing numbers, date of issue and number of the delivery note, clear

description of the occurring defect and the subject of the claim. If the rejecting side is invited to send the device for repair, it shall do so in the original package of the manufacturer and/or in another package ensuring safe transport.

The warranty shall not apply to defects caused by unauthorized intervention into the device, its forced mechanical damage or failure to comply with operation conditions of the product and the product manual.

REPAIRS

The sensors shall be repaired by the manufacturer. They shall be sent for repair in the original or equal package without accessories.

DISABLING AND LIQUIDATION

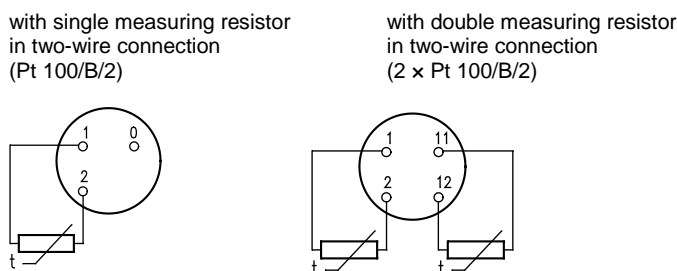
The product and its package do not include any parts that could impact the environment.

The products that are withdrawn from operation, including their packages (with the exception of products marked as electrical equipment for the purposes of return withdrawal and separate salvage of electrical waste), may be disposed of to sorted or unsorted waste pursuant to the type of waste.

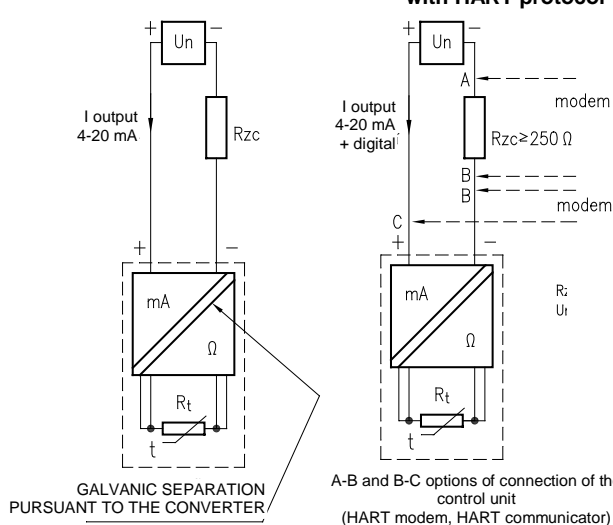
The manufacturer realizes free return withdrawal of marked electrical equipment (from 13.8.2005) from the consumer and points out the danger connected with their illegal disposal.

The package of the sensor can be recycled completely. Metal parts of the products are recycled, non-recyclable plastic materials and electrical waste shall be disposed of in accordance with applicable legislation.

FIGURE 1 - SCHEME OF CONNECTION OF TEMPERATURE SENSORS without converter

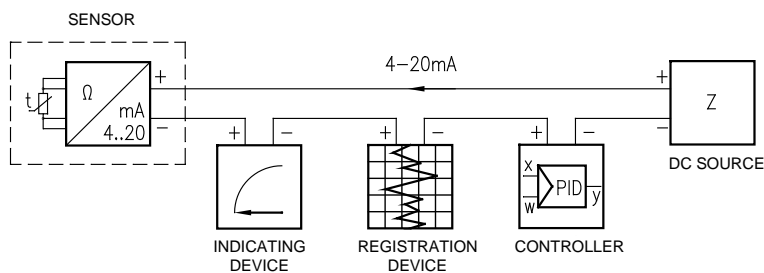


with converter



Rzc – Total load resistance, Un – supply voltage

FIGURE 2 - EXAMPLE OF OPERATION CONNECTION OF TEMPERATURE SENSOR WITH CONVERTER IN LOOP 4 - 20 mA



June 2018
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