



PRODUCT MANUAL

Attached resistance temperature sensor with head or with cable outlet without converter or with converter type 214

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

APPLICATION

- for measuring surface temperature, such as pipes or mechanical components, surface temperature measurement is used in the case
 - o when technology cannot be interfered with
 - o at high medium flow speed in the pipe where the sensor protection well is abrasive
 - o or if the thermowell would interfere with pipe cleaning
- In design with converter to convert signal of the resistance sensor to unified output signal
- 4 to 20 mA or digital signal (converter with HART protocol)
- In design with display to display the value of the measured value immediately
- For explosive atmosphere in areas Zone 2, Zone 1 and Zone 0 pursuant to EN 60079-10 in case of using the converter Ex ia or in case of connection to the Ex ia circuit pursuant to EN 60079-25
- 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 2014/30/EU of the European Parliament and the Council and EU Declaration of Conformity **EU -214000** is issued for them.

DESCRIPTION

Sensor with head

The sensor consists of a head, measuring insert and attached piece. Measuring insert with flange and ceramic terminal board or installed two-wire converter (insulated or non-insulated, even in design Ex ia) has a nickel bottom. The head is provided with a lid with and cable outlet for the connection wiring. The sensor's internal wiring is led to the ceramic terminal board or to the converter input terminals. The terminal board of the sensor (converter) is accessible after tilting away the lid of the head, which is connected with one screw. The sensor with converter in design Ex ia is provided on its head with both external and internal terminals for the connection of the grounding wire or wire for mutual interconnection. The converter is installed either directly on the flange of the measuring insert or in the lid of the head.

The sensor with converter is supplied from an external source. The installed converter is set-up to the required range at the sensor manufacturer. Installation is carried out with fastening clamps

Sensor with cable outlet

The sensor consists of a attached piece with a firmly connected cable (Teflon insulation, silicone insulation or fiberglass insulation and stainless steel braid). Teflon-insulated cables (code T) and silicone insulation (code S) are shielded. The shield is led out with a copper cable.

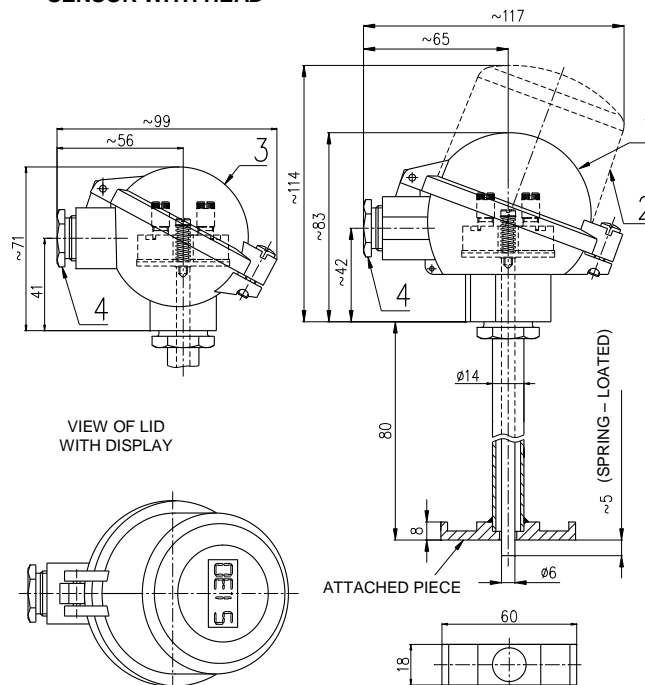
PRINCIPLE

To measure temperature, a defined change of resistance of the sensor in dependence on the change of temperature of the measured environment is used. A Pt100 measuring resistor (single or double) is used in a two-wire, three-wire or four-wire connection.

TECHNICAL DATA

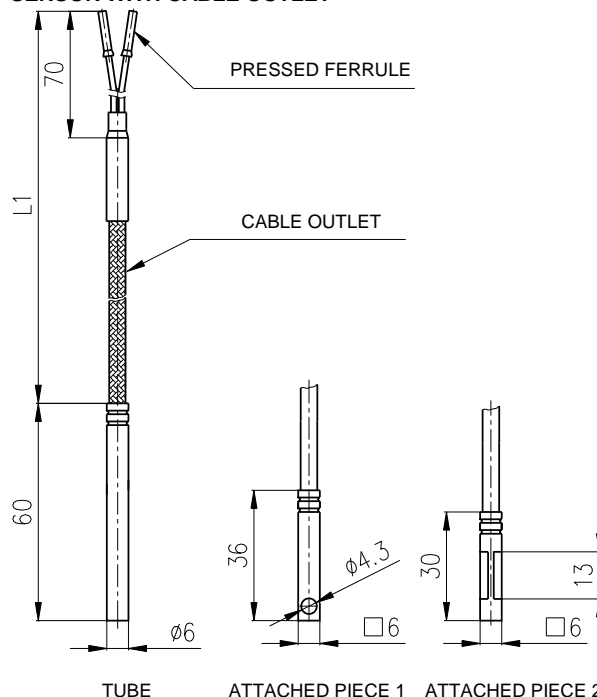
The design of the sensor corresponds to EN 1434-2. The sensor is designed pursuant to EN 61140 as an electrical equipment of protection class III for application in networks with the category of overvoltage in the installation II and pollution grade 2 pursuant to EN 61010-1; the follow-up (evaluation) device shall comply with Article 6.3 thereof.

SENSOR WITH HEAD



- 1 - Ball head (Al alloy)
(for converter Ex ia with both external and internal terminals)
or plastic ball head
(it cannot be used for converter Ex ia)
- 2 - Ball head with increased lid (Al alloy)
without display for converter in lid or with display
(for converter Ex ia with both external and internal terminals)
- 3 - Small ball head (Al alloy)
(only for terminal board or converter INPAL 420)
- 4 - Cable gland M20x1.5

SENSOR WITH CABLE OUTLET



Measuring range:

Temperature sensor			Measuring range [°C]
with head			-50 to 260
with cable outlet	cable jacket material	fluorplastic FEP	-50 to 200
		silicon	-50 to 200
		glass fiber	0 to 400

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

Electric strength pursuant to EN 61010-1:

500 V eff (only measuring insert without converter or design with insulated converter)

Electric insulation resistance pursuant to EN 60751:

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

Other data of converter: refer to enclosed manual

Display: LED display to loop 4-20mA
other data refer to enclosed manual

Ingress protection pursuant to EN 60529:

sensor with head IP65

sensor with cable outlet

cable jacket material

- fluorplastic FEP IP 60
- silicon IP 65
- glass fiber IP 60

Operation position:

discretionary; the outlet shall not be situated upwards

Type of operation: continuous**Sensor weight:**

- sensor with head L = 210 mm approx. 0,316 kg
- sensor with cable outlet 4,0 m approx. 0,125 kg

Applied materials:

Head		Aluminium alloy painted with polyester		
		Paint or plastic PPO (phenyl polyoxide)		
Sealing of lid of head and outlet		Oil-resistant rubber		
Sealing		Silicone rubber		
Internal wiring		Copper		
Head terminals of terminal board		Brass with Ni surface		
Cable outlet	Jacket fluoro plastic FEP	Cores 4x0,22 mm ²		
		Insulation of core wires		
		Shielding		
	Jacket silicon	Cores [mm ²]	2x0,56	Copper, silver-coated
			4x0,22	
			6x0,22	
	Insulation of core wires		Fluorplastic FEP	
	Shielding		Jacketing or covering with Cu tin-coated wires	
	Jacket glass fiber	Cores 4x0,5 mm ²		Brass with Ni surface
		Insulation of core wires		
	Stem tube of measuring insert		Steel 1.4541	
	Attached piece (tube) material		Stainless steel	

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 for sensor head and gland:

- For design without converter -50 °C to 120 °C
- For design with converter pursuant to type of converter (refer to enclosed converter manual)
- For design with converter and display pursuant to type of converter and display (refer to enclosed converter manual)

Relative ambient humidity:

- For design without converter 10 to 100 % with condensation, with upper limit of water content 29 g H₂O/kg of dry air
- For design with converter pursuant to type of converter (refer to enclosed converter manual)
- For design with converter and display pursuant to type of converter and display (refer to enclosed converter manual)

Atmospheric pressure: 70 to 106 kPa

Resistance of material of PPO (phenyl polyoxide) head:

Kerosene	partially resistant
Diesel oil	resistant
Benzene	partially resistant
Animal and vegetable oils	resistant
Weak hydrohides	
Strong hydroxides	
Weak acids	
Strong acids	
Sea water	
Trichloroethylene	partially resistant

Resistance of material of lid sealing (oil-sealing rubber):

Alcohol	resistant
Ether	
Benzol	
Petrol	
Ester	
Animal and vegetable oils	
Mineral oil	
Engine oil	
Weak alkali hydrohides	
Strong alkali hydroxides	
Weak acids	resistant
Strong acids	non-resistant
Sea water	resistant
Trichloroethylene	partially resistant
Hot water	

METROLOGICAL DATA

Sensing probe: Measuring resistor Pt 100 single or double in connection pursuant to scheme of connection and table of designs, $\alpha = 0.00385$ [K-1], tolerance class B pursuant to EN 60751

Internal wiring resistance at 20 °C:

- sensors 0.095 Ω/m
- cable outlets (two core)
 - core cross section 0,22 mm² 0.175 Ω/m
 - core cross section 0,562 mm² 0.066 Ω/m
 - core cross section 0,50 mm² 0.082 Ω/m

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)

DESIGNATION**DESING WITH HEAD****Data on head label**

- Trademark of the manufacturer
- Made in Czech Republic
- Type of resistance sensor, nominal value R₀ / tolerance class / configuration of wires of internal wiring *)
- Measuring range (at converter pre-set converter range)
- Product ordering number
- Ingress protection
- Time code (Serial number for design with converter)
- Ambient temperature (for design with converter Ex ia)
- Output signal 4 to 20 mA (for design with converter)
- Designation of non-explosiveness and EU-Type Examination Certificate number (for design with converter EX ia)
- CE mark(for design with converter)

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

Data on measuring insert label

- Trademark
- Type of sensor, nominal value R₀ / tolerance class / configuration of wires of internal wiring *)
- Time code (Serial number for design with converter)
- Resistance value of internal wiring (for design without converter)

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

Data on converter label

- Type of sensor
- Pre-set temperature range
- Designation of non-explosiveness and EU-Type Examination Certificate number (for design with converter EX ia)
- CE mark with identification number of the notified person (for design with converter)

Data on display

- Trademark
- Designation of non-explosiveness and EU-Type Examination Certificate number (for design with converter EX ia)
- CE mark with identification number of the notified person (for design with converter)

DESIGN WITH CABLE OUTLET**Data on aluminium label attached to cable**

- Trademark of the manufacturer
- Made in Czech Republic
- Type of resistance sensor, nominal value R_0 / tolerance class / configuration of wires of internal wiring *)
- Measuring range
- Product ordering number
- Ingress protection
- Time code

DELIVERY

Couple sensors are supplied in a common package. Unless agreed otherwise with the customer, each delivery includes

- Delivery note
- Sensor pursuant to the purchase order
- 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 (for design with converter EX ia)

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 material of attached piece with the heat number
- Declaration of Conformity with purchase order 2.1 acc. to EN 10204
- EU Declaration of Conformity (for design with converter)
- Test report about the seismic and the vibration qualification
- Copy of EU-Type Examination Certificate pursuant to the Directive No 2014/34/EU for design with converter Ex ia and display Ex ia

CERTIFICATION

- Non-explosiveness Ex ia, EU-Type Examination Certificate pursuant to the 2014/34/EU, (pursuant to the type of the converter and display)

RELIABILITY

Indicators of reliability in operation conditions and ambient conditions specified herein

- Medium time of operation between failures 96 000 hours (inf. value)

Expected service life 10 years

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 sensors 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).

ORDERING TEMPERATURE SENSORS

The purchase order shall specify

- Name
- Product ordering number
- Request for other documentation pursuant to Table 3
- If optional accessories to the sensor with programmable converter is required
- Other (special) requirements
- Number of pieces

Behind the ordering number specified pursuant to Table 1, the customer shall identify the required range of measured temperature (i.e. so-called lower and upper temperature limits in °C) and, as the case may be, other non-standard required parameters for converter configuration (e.g. indication of sensor tripping, dampening, required designation - tagging etc.).

EXAMPLE OF PURCHASE ORDER**Standard design:**

1. Attached resistance temperature sensor with head
214 831 1B/07/22
6 pcs
2. Attached resistance temperature sensor with cable outlet
214 31S 1B/J4/2500/22
6 pcs

TABLE 1 - DESIGN OF TEMPERATURE SENSORS WITH CABLE OUTLET TYPE 214

SPECIFIKACE		OBJEDNACÍ ČÍSLO								
		214	x	x		x	x	/xxx	/xxx	/xxx
Design of attached piece	Tube		1							
	Attached 1		2							
	Attached 2		3							
Attached piece material	Stainless steel		1							
Cable outlet insulation design	Glass fiber				G					
	Teflon				T					
	Silicone				S					
Measuring resistor	Pt 100					1				
Tolerance class	B						B			
Connection	Single - two-wire (1xPt100/B/2)				S			/J2		
	Single - four-wire (1xPt100B/4)							/J4		
	Double- two-wire (2xPt100/B/2)							/D2		
	Double- three-wire (2xPt100B/3)				S			/D3		
Cable outlet length L1 [mm]									/xxx	
Inner Ø of pipping [mm] (fastening clamp design) **)										/xxx

Standard design

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

**) The dimension is given only if the clamp is required

TABLE 2 - DESIGN OF TEMPERATURE SENSORS WITH HEAD TYPE 214

SPECIFIKACE					OBJEDNACÍ ČÍSLO											
					214	8	x		x	x	/xxx	/xxx	/xxx			
Attached piece material	Stainless steel						1									
Sensors head	Ball (Al alloy) (for converter EX ia with both external and internal terminals)								3							
	Ball, plastic (cannot be used for converter Ex ia)									4						
	Ball with increased lid (Al alloy) without display for converter in lid or with display (for converter Ex ia with both external and internal terminals)										5					
	Ball, small (Al alloy) (only for terminal board and converters INPAL 420, APAQ-HRF, TH 100, MINIPAQ-HLP)											6				
Measuring resistor	Pt 100										1					
Tolerance class	B											B				
Connection of the terminal board	Single - four-wire (1xPt100B/4)												/J4			
	Double- two-wire (2xPt100/B/2)												/D2			
	Double- three-wire (2xPt100B/3)												/D3			
Converter (connection for converter: single, double, three or four-wire, pursuant to the converter)	Converter type		Galvanic separation	Ex ia	Range [°C]											
	Analogue	INPAL 420			-50 to 50									/07		
					-30 to 70									/55		
					0 to 50									/15		
					0 to 100									/18		
					0 to 150									/19		
					0 to 200									/20		
	Programmable	APAQ-HRF			•	Adjustable range								/HRF		
							APAQ-HRFX							/HRFX		
		TH 100				•	Programmable range								/TH100	
								TH 100-ex							/TH100X	
								TH 200							/TH200	
								TH 200-ex							/TH200X	
								IPAQ-H							/IPAQH	
								IPAQ-HX							/IPAQHx	
								MINIPAQ-HLP							/MINIPAQ	
								IPAQ C330							/C300	
	HART protocol				•	Programmable range								/C300X		
							IPAQ C330X							/TH300		
							TH 300							/TH300X		
							TH 300-ex							/MESOH		
							MESO-H							/MESOHx		
							MESO-HX							/248HANA		
Other *)													/248HA1X			
						248 HA NA							/248HA1X			
						248 HA I1							/644HANA			
						644 HA NA							/644HA1X			
												/99				
Without converter (for converter installation by the customer)													/00			
LED display to loop 4-20 mA	LED display LPI-01 (only with converter, except converter 644 HANA)													/LD		
	LED display Ex ia *) (only with converter Ex ia, except converter 644 HAI1X)													/LDX		
Inner Ø of pipping [mm] (fastening clamp design) **)														/xxx		

Standard design

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

**) The dimension is given only if the clamp is required

TABLE 3 – ADDITIONAL REQUIREMENT FOR DESIGN OF TEMPERATURE SENSORS, TYPE 231

SPECIFICATIONS		CODE
REQUIREMENT FOR OTHER DOCUMENTATION	USE	
EU Declaration of Conformity	for design with converter	/EU
Copy of EU-Type Examination Certificate acc to the 2014/34/EU (ATEX)	for converter and display Ex ia	/Exi
Copy of the Inspection Certificate 3.1 for material of attached piece with the heat number		/3.1
Declaration of Conformity with purchase order 2.1 pursuant to EN 10204		/2.1

Specify the code behind ordering number.

INSTALLATION AND CONNECTION

SENSOR INSTALLATION

Install the sensors by fastening clamps or M4 screw. The cable outlet is suitable to lighten.

It is recommended under attached piece of sensor apply, for example, hot water paste and place the attached piece under the thermal insulation

ELECTRICAL CONNECTION

The electrical connection according scheme of connection in Figure 5

The electrical connection may be only realized by qualified workers.

1. DESIGN WITH HEAD

The terminal board of the sensor (converter) is accessible after tilting away the lid of the head, which is connected with one screw.

Connect the evaluation devices to the sensor with a non-armoured cable with double insulation with outer diameter 5 to 8 mm (internal wires with Cu core with cross section 0.5 to 1.5 mm²). Seal the cable gland adequately.



WARNING

Do not use independent wires without jacket for electrical connection. To ensure the Ingress Protection grade in the gland, the connecting cable shall have circular cross-section. Temperature resistance of the cable shall comply with the ambient temperature!

The cable insulation shall have chemical and mechanical resistances in compliance with the conditions, in which the cable will be installed. It is recommended supporting the cable along its length between the sensor and the follow-up device. In the environment with interfering signals, use shielded cable in the power supply circuit. Shielding may be only grounded (earthed) in one point. The cable should not be placed together with power cables.

In case of the sensor with HART protocol converter, the maximum length of wiring is defined by the arrangement of wires of the connecting cable. The total length of wiring may be up to 1500 m. It requires a twisted two-wire with shared shielding with the diameter of the cross section min. 0.5 mm². The HART communicator is connected to the supply loop of the sensor with converter pursuant to Figure 1.

To achieve reliable communication, the total load resistance of min. 250 Ω shall be in the circuit of the output loop.

INSTALLATION OF THE SENSOR IN ENVIRONMENT WITH EXPLOSIVE GASEOUS ATMOSPHERE

In environment with explosive gaseous atmosphere a sensor without converter or sensor with Ex ia converter can be installed.

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

The sensor without converter (with ball head from alloy Al with external and internal terminals – only on ZP (special requirement) after an agreement with the manufacturer) can be used as a simple device pursuant to EN 60079-11 Article 5.7 in an intrinsically safe circuit Ex ia pursuant to EN 60079-25. For a simple device, the maximum temperature can be determined from the value of the P₀ of the connecting device and the temperature class is determined.

The sensor with converter Ex ia may be used in case of compliance with the parameters Ex ia of the converter according to the enclosed converter manual.

In case of installation of intrinsically safe circuits, including cables, the maximum permitted inductance, capacity or ratio LiR and surface temperature may not be exceeded. Permitted values can be found out in the documentation of the follow-up

equipment or label with the designation. Locate the follow-up equipment outside of the dangerous area. An intrinsically safe source must be always used that is approved for power supply of intrinsically safe equipment in the sense of EN 60079-11. If a LED display is required, it must be in the design Ex ia.



WARNING

The programmable converter may not be connected to the PC or HART communicator if the converter is located in the explosive environment.



Only insulated cables must be used in intrinsically safe circuits which is able to withstand the electrical strength test with a voltage equal to twice the voltage in the intrinsically safe circuit, or 500 V eff (DC 750 V), taking greater of the values.

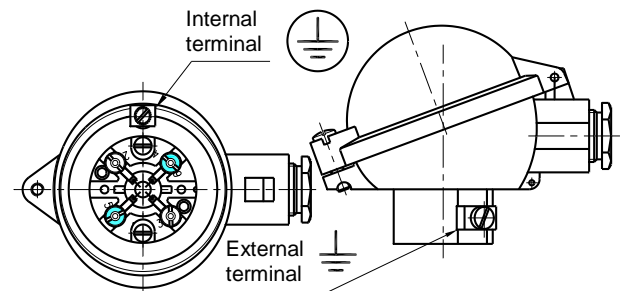
Shielding of the cable of the intrinsically safe circuit must be grounded in the same place as the intrinsically safe circuit, the connection must be outside the dangerous area

For the installations in dangerous areas, mutual interconnection is required (bringing to the same potential). To achieve it, terminals on the sensor head can be used.

The sensor need not be connected to the system of mutual interconnection separately if it is installed firmly and has metal interconnection with the structural parts or the piping, which is connected to the system of mutual interconnection.

HEAD OF THE SENSOR WITH TERMINALS

(for sensor with converter Ex ia)



Maximum cross-section of wire for connection to external and internal terminals:

Internal terminal: stranded wire 1.5 mm², full wire 2.5 mm²

External terminal: stranded wire 4.0 mm², full wire 6.0 mm²

If stranded wires are used for the interconnection, they shall be protected against fraying with pressing hollow.

2. DESIGN WITH CALBE OUTLET



WARNING

It is not permitted to combine the cable with the power wires! If it is not possible to exclude the influence of the measurement, ground the line.

Cable with flouroplastic jacket

Both the insulation and the jacket have very good mechanical properties and are highly abrasion resistant. Neither impregnating agents nor other commonly used chemicals are involved, with the exception of nascent fluorine, molten alkali metals and some fluorinated organic compounds. The cable is resistant to flame spread, mold and UV radiation.

Cable with silicone jacket

Mechanical effects on the cable jacket must be avoided (increased risk of mechanical damage). The cable is resistant to ozone, corona, UV radiation, mold, diluted acids and alkalis. Chlorinated hydrocarbons cause the jacket to swell and reduce its mechanical function. The cable is not flame-resistant.

Cable with glass fibre jacket

The cable withstands temperatures up to 400 ° C, is abrasion resistant and is absorbent.

COMMISSIONING

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



WARNING

After finish installation of the sensor in the environment with explosive gaseous atmosphere the default device revision and installation must be performed in EN 60079-17.



OPERATION AND MAINTENANCE

The sensor does not require any operation and maintenance.

For the sensor in the environment with explosive gaseous atmosphere maintenance and following regular periodic revisions or continuous supervision of professional personnel are carried out compliance with EN 60079-17.

SPARE PARTS

Spare parts shall be delivered by the manufacturer.

REPAIRS

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

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.

DISABLING AND LIQUIDATION

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

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

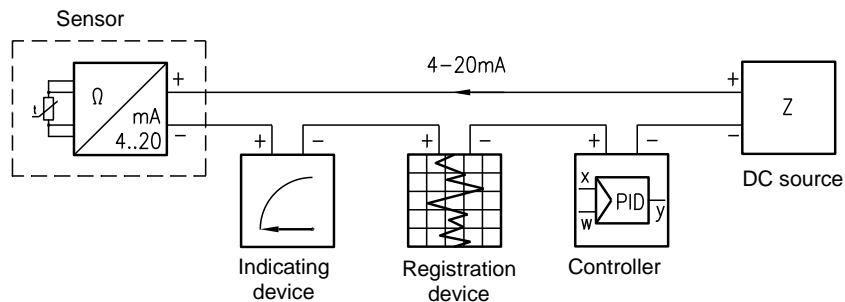
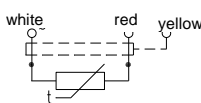
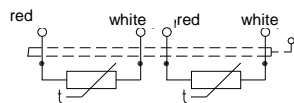


FIGURE 2 – SCHEME OF CONNECTION OF TEMPERATURE SENSORS WITH CABLE OUTLET

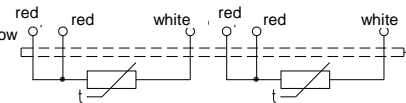
J2 - single two-wire (e.g. Pt100/B/2)



D2 - double two-wire (e.g. 2 × Pt 100/B/2)



D3 - double three-wire (e.g. 2 × Pt 100/B/3)



J4 - single four-wire (e.g. Pt 100/B/4)

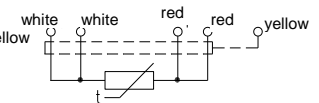
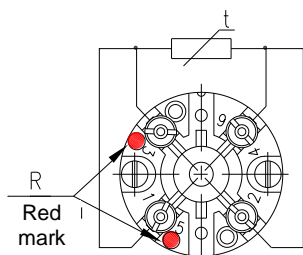


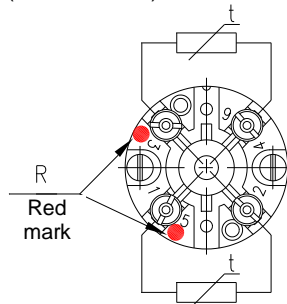
FIGURE 3 – SCHEME OF CONNECTION OF TEMPERATURE SENSORS WITH HEAD

SCHEME OF CONNECTION WITHOUT CONVERTER

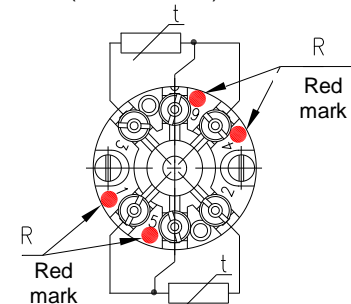
J4 - With simple measuring resistor in four-wire connection (Pt 100/B/4)



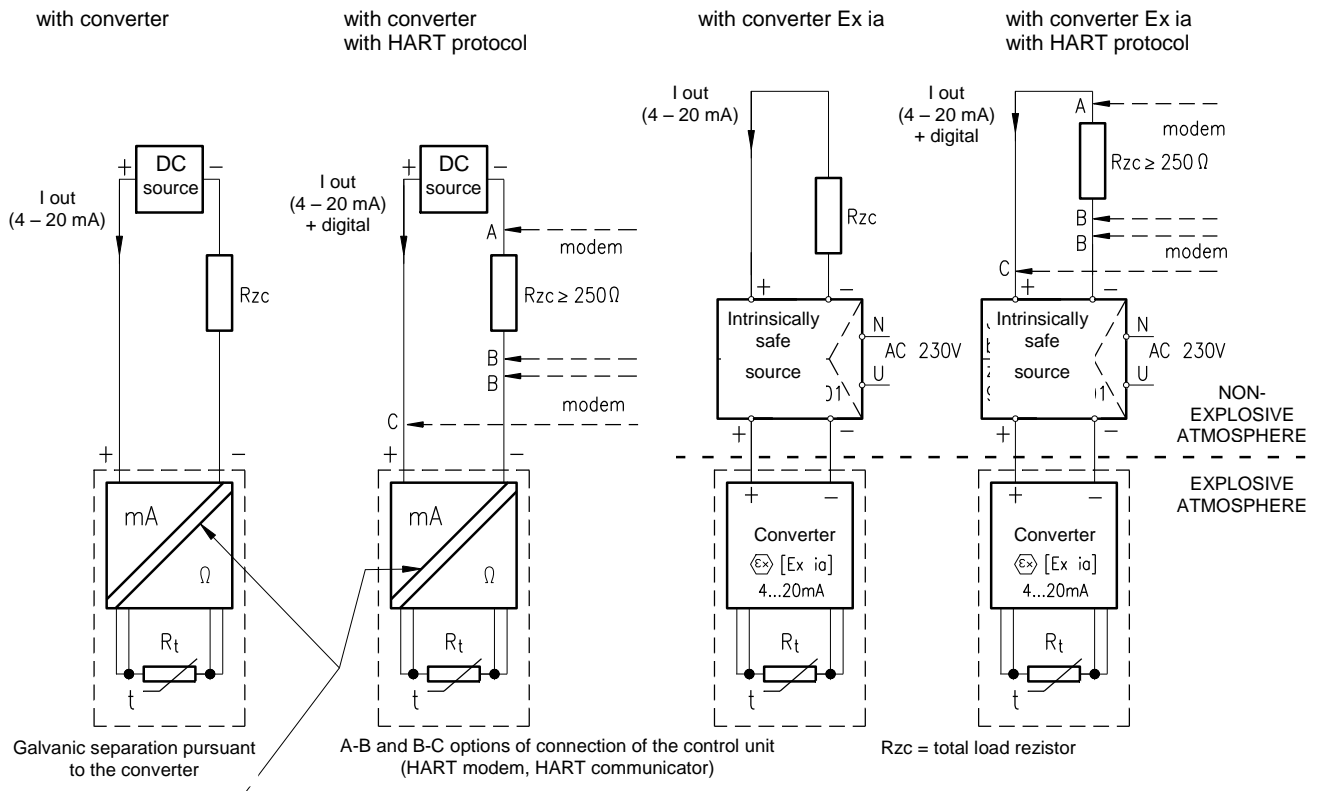
D2 - With double measuring resistor in two-wire connection (2 × Pt 100/B/2)



D3 - With double measuring resistor in three-wire connection (2 × Pt 100/B/3)



SCHEME OF CONNECTION WITH CONVERTER AND DISPLAY



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