



# Thermoelectric temperature sensor Ex d with heat sink DIN without converter or with converter

## PRODUCT MANUAL

type series 330  
type 334

**FOR DESIGNS WITH CONVERTER A MANUAL IS ENCLOSED TO THE RELEVANT CONVERTER**

### APPLICATION

- For exact remote measurement of temperature of steady and running liquids (gases and fluids), for which the properties of the heat sink of the sensor are suitable; measurement may be realized up to max. temperature 450°C and nominal pressure PN 160
- For explosive environment pursuant to ČSN EN 60079-10 (ČSN EN 61241-10)
  - o Heat sink of the sensor may be installed in zone 0(20), zone 1(21) or zone 2(22);
  - o Other parts of the sensor (screw-joint, adapter, connecting head) may be located in zone 1(21) or zone 2(22)
  - o In case of using the converter Ex ia or connection into circuit Ex ia, the sensor may be used in zone 0 (20)
- As pressure equipment of category III pursuant to the Decree of the Government 26/2003 Coll. (compliance assessment module B+D)
- In a set with control or diagnostic systems for process monitoring
- In design with converter for transfer of thermoelectric sensor signal to unified output signal 4 to 20 mA or digital signal (converter with HART protocol)

The sensors are rated products pursuant to the Act No. 22/1997 Coll. and Compliance Certificate **EC-334000** is issued for them.

### DESCRIPTION

The sensor consists of a replaceable measuring insert with a flange and a ceramic terminal board or an installed two-wire converter (insulated or non-insulated, even in design Ex i) and a protective armature consisting of a head and a heat sink with an adapter and a connecting screw-joint. The head with measuring insert and outlet form a fixed closure Ex d. It is provided with a lid, which can be screwed, and a cable outlet for the connecting wiring. The cable outlet (pursuant to the required diameter of the cable) forms optional accessories to the sensor. The terminal board (of the converter) of the sensor is accessible after removing the lid of the head, which is fixed, after being tightened, with a pin against spontaneous releasing. The sensor is provided with an external clamp on the head for the connection of the grounding wire or wire for mutual interconnection.

The sensor with converter is supplied from an external source. The installed converter is pre-set to the required range at the sensor manufacturer.

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

### TECHNICAL DATA

The sensor design is based on DIN 43772. The sensor is designed pursuant to ČSN EN 61140 ed.2 as an electric equipment of protection class III for the application in networks with category of overvoltage in installation II and pollution grade 2 pursuant to ČSN EN 61010-1; the follow-up (evaluation) device shall comply with Article 6.3 of the said standard.

#### Measuring range:

Sensor with standard adapter  $L_n = 117$  (107) mm  
-70 to 450 °C

Sensor with shortened adapter  $L_n \text{ min} = 47$  mm  
-70 to 250 °C

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

If it is ensured by a suitable way of installation that the surface temperature of a part of the sensor located in the explosive area does not exceed the temperature of the required temperature class (T1+T6), the upper limit of the measuring range may be even higher (max. 1100°C for thermocouple K, max. 800°C for thermocouple J).

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

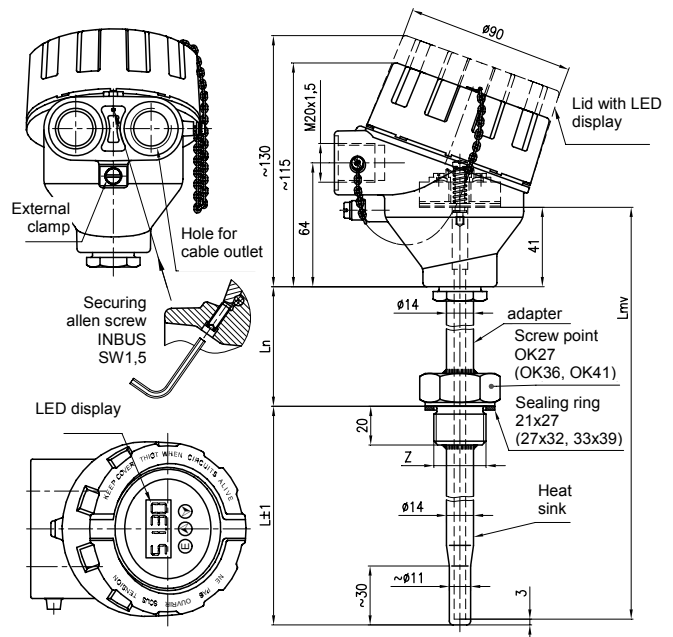
and **dust-tight closure** pursuant to ČSN EN 50281-1-1:

Ex II 1/2 GD Ex d IIC T1+T6 T=T media

(meaning of designation refer to Figure 4)

**Electric strength** pursuant to ČSN EN 61010-1, Article 6.8.4: 500 V eff

(only measuring insert without converter or design with insulated converter)



L nominal length  
 $L_n$  length of adapter  
 $L_{mv}$  length of measuring insert  
 Z connecting thread of sensor adapter G 1/2, (G 1, M27 x 2, G 3/4, 3/4-14NPT, ...)

**Electric insulation resistance** pursuant to ČSN EN 61515: min. 1000 M $\Omega$ , at ambient temperature 20±15°C and max. 80% relative humidity

#### Power supply of converter:

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

**Other data of converter:** refer to the enclosed manual

**Ingress protection** pursuant to ČSN EN 60529 IP 68

#### Operation position:

discretionary; the outlet shall not be situated upwards

**Type of operation:** continuous

#### Sensor weight:

with adapter 117 mm 1.05 kg

#### Used materials:

Heat sink	steel 1.4541
Stem tube of measuring insert	steel 1.4541
Adapter	steel 1.4541
Head	aluminium alloy painted with blue epoxy colour
Head clamps of the terminal board	brass with Ni surface
Connecting elements of the sensor	stainless steel

### OPERATION CONDITIONS

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

**Ambient temperature for head and outlet of the sensor:**

-40 °C ≤ Ta ≤ 70 °C

for design with converter pursuant to the type of converter (refer to enclosed converter manual)

**Maximum surface temperature of the sensor:**

it complies with maximum temperature of the measured medium

**Maximum surface temperature** for equipment operating in the environment with a threat of explosion of gases, steam and mist pursuant to ČSN EN 60079-0 and temperature class of the sensor are determined in dependency on the temperature of measured medium pursuant to the following table:

Temperature class	Maximum surface temperature	Maximum temperature of measured medium
T6	85°C	85°C
T5	100°C	100°C
T4	135°C	135°C
T3	200°C	200°C
T2	300°C	300°C
T1	450°C	450°C

**Maximum permitted surface temperature** for the equipment operating in the environment with a threat of explosion of dust pursuant to ČSN EN 61241-14:

a) Temperature limitation due to occurrence of stirred dust:

$$T_{max} = 2/3 T_{ci}$$

where  $T_{ci}$  is the temperature of ignition of stirred dust

b) Temperature limitation due to occurrence of layers of dust to 5mm thickness:  $T_{max} = T_{5mm} - 75 °C$

where  $T_{5mm}$  is the temperature of ignition of dust layer 5mm thick

c) Dust layers over 5 mm – refer to ČSN EN 61241-14

**Maximum permitted surface temperature is defined by the lower value of the values specified above.**



**WARNING**



The user shall guarantee that the maximum surface temperature of any part of the sensor does not exceed the temperatures of ignition of any gas, steam or dust, which can occur, due to effects of external thermal sources.

**Vibrations:**

Sensor	with converter		without converter	
Nominal length L [mm]	130, 140, 160	220, 280	130, 140, 160	220, 280
Frequency range [Hz]	10 to 500			
Drift amplitude [mm]	0.2	0.15	0.5	0.2
Acceleration amplitude [ms <sup>-2</sup> ]	29.4	19.6	68.7	39.2

**Relative ambient humidity:**

10 to 100 % with condensation, with upper limit of water content 29 g H<sub>2</sub>O/kg of dry air

**Atmospheric pressure:** 70 to 106 kPa

**Maximum speed of flow of liquids:**

Nominal length L [mm]	130	140	160	220	280
Water steam, gas, air [m/s]	50	35	25	10	8
Water [m/s]	5	4	3	3	3

**METROLOGICAL DATA**

**Probe:** measuring thermocouple **J** (Fe-CuNi) or **K** (NiCr-NiAl) pursuant to ČSN EN 60584-1, Ø 6 or Ø 3 mm, tolerance class 2 or 1 pursuant to ČSN IEC 584-2 single or double with insulated measuring connection

**Output signal**

of analogue converter (linear with thermoelectric voltage): 4 to 20 mA

of programmable converter (linear with measured temperature):

4 to 20 mA (+ digital for HART protocol)

**Calibration depth of immersion of the measuring insert of the sensor**

for temperature points within range -70 to 250°C: 200 mm (min. 160 mm)

for temperature points above 250°C: 300 mm (min. 260 mm)


The distance of flange of the measuring insert from the level of medium in the calibration bath shall be at least 40 mm at temperatures to 250°C and min. 70 mm at temperatures above 250°C.

**Temperature response time** pursuant to ČSN IEC 751 in whirling water (characteristic value):

with heat sinks, shape 3G pursuant to DIN


L = 130, 140, 160, 220 and 280 mm	0.5	25 s
	0.9	75 s

**CERTIFICATION**

- Pressure equipment pursuant to the Decree of the Government 26/2003 Coll., EC-Type Examination Certificate SZÚ Brno
- Non-explosiveness  II 1/2 GD Ex d IIC T1÷T6 T=T media EC-Type Examination Certificate pursuant to the Decree of the Government 23/2003 Coll. FTZÚ 06 ATEX ???X
- Non-explosiveness Ex i, EC-Type Examination Certificate pursuant to the Decree of the Government 23/2003 Coll., (pursuant to the converter type)

**DESIGNATION :**

**Data of head label**

- Trademark of the manufacturer
- Made in Czech Republic
- Type of thermoelectric sensor / tolerance class
- Measuring range or set-up converter range
- Product ordering number
- Ingress protection
- Manufacturing number
- Output signal 4 to 20 mA (design with converter)
- Ambient temperature -40 °C ≤ Ta ≤ 70 °C
- Mark of non-explosiveness:  II 1/2 GD Ex d IIC T1÷T6 T=T media and number of the EC-Type Examination Certificate
- Mark of non-explosiveness and number of the EC-Type Examination Certificate (for design with converter Ex i)
- CE mark 1026 and CE 1015
- CE mark with identification number of notified person (for design with converter Ex i)

**Data on label of measuring insert**

- Trade mark
- Sensor type / tolerance class
- Manufacturing number

**Data on converter label**

- Sensor type
- Pre-set temperature range

**DELIVERY**

Unless agreed otherwise with the customer, each delivery includes

- Delivery note
- Sensor pursuant to the purchase order
- Sealing ring
  - o 21x27 TPD 62-014-91 for connecting thread G ½
  - o Cu 27 x 32 x1.5 (ČSN 02 9310.2) for thread M27 x 2 and G¾
  - o Cu 33 x 39 x 2 (ČSN 02 9310.2) for thread G1
- Allen key 1.5 mm
- A suitable cable outlet can be delivered; it shall be ordered separately pursuant to the catalogue of accessories, type 991. An instruction sheet is delivered with each cable outlet
- Suitable weld-on pieces ordered separately pursuant to the catalogue of accessories, type 991
- 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 quality and completeness certificate, which also serves as the warranty certificate
  - o EC Compliance Certificate
  - o Calibration sheet (for uncertified calibrated design)
  - o Product manual

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 stem tube and heat sink with the casting number

- Copy of EC-Type Examination Certificate pursuant to the Decree of the Government 23/2003 Coll. for fixed closure
- Copy of EC-Type Examination Certificate pursuant to the Decree of the Government 23/2003 Coll. for design with converter Ex i
- Copy of EC-Type Examination Certificate pursuant to the Decree of the Government 26/2003 Coll.

**DESIGN OF TEMPERATURE SENSORS Ex d WITH HEAT SINK, DIN - TYPE 334**

SPECIFICATION					ORDERING NUMBER																	
					334	x	x	x	x	x	x	x	x	/xxxxxx	/xxx							
Nominal length L [mm]	130	Length of adapter L <sub>n</sub> [mm]	107	Length of measuring insert L <sub>mv</sub> [mm]	275	1																
	160				315	2																
	220				375	3																
	280				435	4																
	400				555	5																
	Other (min. 130) *)								9													
Nominal length L [mm]	130	Length of adapter L <sub>n</sub> [mm]	47	Length of measuring insert L <sub>mv</sub> [mm]	215	1																
	160				245	2																
	220				305	3																
	280				365	4																
	400				485	5																
	Other (min. 130) *)								9													
Length of adapter	117mm (107mm)					1																
	47 mm *) max. -70 to 250°C					2																
	Other **) (min. 47 mm)					9																
Heat sink material	1.4571 *) -70 to 400°C						1															
	1.4541 *) -70 to 450°C						2															
	Other *)						9															
Connecting thread	G1/2							1														
	G1 *)							2														
	M27x2							3														
	G3/4 *)							4														
	3/4-14 NPT *)							5														
	Other *)							9														
Head of sensor with thread for outlet (Ex d)	M20x1.5							1														
	1/2-14NPT *)							2														
Thermocouple	K											K										
	J											J										
Accuracy class	1 *)												1									
	2												2									
Design of measuring ends of thermocouple pursuant to figure 5	Single thermocouple, insulated end																	/JI				
	Double thermocouple, independent end																	/DU				
Converter type		Galvanic separation		Ex	Range [°C]																	
Analogue linear output signal with thermoelectric voltage	APAQ-HCF				Adjustable range													/HCF				
	APAQ-HCFX *)			•															/HCFX			
Programmable linear output signal with temperature	TK		•		Programmable range													/TK				
	TK-ex *)		•	•															/TKX			
	IPAQ-H		•																/IPAQH			
	IPAQ-HX *)		•	•															/IPAQHX			
Programmable with HART protocol linear output signal with temperature	MINIPAQ-H																	/MINIPAQ				
	TK-H		•															/TKH				
	TK-H-ex *)		•	•														/TKHX				
	MESO-H		•															/MESOH				
	MESO-HX *)		•	•														/MESOHX				
Other *)	644 H NA		•															/644HNA				
	644 H I1 *)		•	•														/644HI1X				
Without converter (for installation of the converter by customer)																		/99				
LED display to loop 4-20mA (only with converter)																		/00				
LED display *)																		/LD				
LED display-ex (only for converter Ex) *)																		/LDX				

**standard design**

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

\*\*) In case of adapter length below 117 mm (minimum 47 mm), the temperature range is decreased to -70 to 250 °C.

**ORDERING TEMPERATURE SENSORS**

The purchase order shall specify

- Name
- Product ordering number
- Measuring range
- If calibration is required and in what temperature points

- If the delivery of a weld-on piece pursuant to the type 991 is required for the sensor as accessories
- If the delivery of outlet for output cable pursuant to the type 991 is required for the sensor as accessories
- If optional accessories to the sensor with programmable converter is required

- Other (special) requirements
- Number of pieces

Behind the ordering number specified pursuant to the above mentioned table, the customer shall identify the required range of measured temperature (i.e. 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.).

## PURCHASE ORDER EXAMPLE

### Standard design:

Thermoelectric temperature sensor Ex d with heat sink DIN without converter  
334 412 11K2/JI – 6 pcs  
range -70 to 450°C

### Special requirement:

Thermoelectric temperature sensor Ex d with heat sink DIN with converter  
334 912 11J2/HCF – 6 pcs  
nominal length L = 380 mm, range 0 to 300°C

## ORDERING WELD-ON PIECES AND OUTLETS

The purchase order shall specify:

- Name
- Ordering number of weld-on piece
- Number of pieces

## ORDERING NUMBERS OF WELD-ON PIECES, type 991

Direct weld-on piece - 991 NVP4 M27 13 (material 11 353.0)  
- 991 NVP4 M27 72 (material 1.4541)

Angular weld-on piece - 991 NVS4 M27 13 (material 11 353.0)  
- 991 NVS4 M27 72 (material 1.4541)

## ORDERING NUMBERS OF OUTLETS, type 991

Outlet M 20 x 1.5 (with clamp against cable pull-out)  
for cable Ø4 8.5mm VM 408  
for cable Ø 6 12mm VM 612  
for cable Ø 8.5 16mm VM 816  
(the set consists of the outlet itself, cable clamp and sealing under outlet 20x24)

Outlet 1/2-14NPT (with clamp against cable pull-out)  
for cable Ø 4 8.5mm VK 408  
for cable Ø 6 12mm VK 612  
for cable Ø 8.5 15.5mm VK 815  
(the set consists of the outlet itself and cable clamp)

## 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 ČSN 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 ČSN 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 3322-94 and in compliance with ČSN EN 584, 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.

## INSTALLATION AND CONNECTION SENSOR INSTALLATION


Install the sensors by screwing into the weld-on piece on the piping (technological equipment) or welded into the piping wall. Before the installation, put on the enclosed sealing ring in advance. During the installation, torque of 150 Nm is recommended.

Examples of application of weld-on pieces are provided in Figure 1

With respect to maintaining metrological properties and the longest possible service life, it is not recommended to install the sensors in places with high turbulence of the medium, which is caused e.g. by a rapid transition from a small diameter of the piping to a larger one (when failing to comply with the required shape and dimensions of diffuser behind the flow meter), etc. Recommended distance of the temperature sensor from the installation flange of the flow meter is min. 1 m.

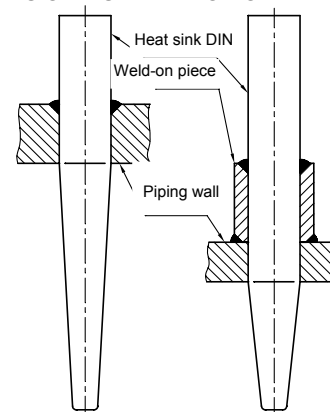


### WARNING


Distance of the fixed closure  II 1/2 GD Ex d IIC from close structures or between the suspensions shall be at least 40 mm.



## EXAMPLES OF INSTALLATION OF HEAT SINKS DIN



## INSTALLATION OF CABLE OUTLET

To secure the fixed closure, only the certified cable outlet  II 2 GD Ex d IIC with Ingress protection IP 68 shall be used (refer to accessories 991 or another similar outlet). It shall be tightened in the sensor head in the prescribed way.

Torque of outlet body:

- for outlet with thread 1/2 - 14NPT 25 – 30Nm
- for outlet with thread M20x1.5 30 – 35Nm

Installation of the cable in the outlet, its sealing and securing against pull-out shall be realized pursuant to the instruction sheet of the outlet supplier.



### WARNING

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.

## ELECTRICAL CONNECTION

The electrical connection may be only realized by qualified workers pursuant to § 5 of the Decree 50/1978 Coll.

**The sensor installation in conditions with explosive gaseous atmosphere shall comply with the requirements of ČSN EN 60079-14 ed. 2.**

**The sensor installation in conditions with flammable dust shall comply with the requirements of ČSN EN 61241-14.**

The terminal board of the sensor (converter) is accessible after unscrewing the lid of the head.

Connect the evaluation devices to the sensor with a cable with double insulation; internal wires with Cu core (sensor with converter) or compensation wiring (sensor without converter) 0.5 to 1.5 mm<sup>2</sup>. Seal the cable in the outlet by prescribed tightening of the closing nut pursuant to instruction sheet of the outlet. Then secure it with clamp against pull-out.



### WARNING

Do not use independent wires without jacket for electrical connection. To ensure the Ingress protection grade in the outlet, the connecting cable shall have circular cross-



section. Temperature resistance of the cable shall comply with the ambient temperature! Its permanent temperature resistance to at least 70°C is required.

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 mm<sup>2</sup>. Recommended HART communicator, model 275, is connected to the power supply loop of the sensor with converter pursuant to Figure 2. To achieve reliable communication, resistor 250 shall be introduced 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.



#### WARNING for sensor with converter Ex i

Ex i parameters shall be complied with pursuant to the enclosed converter manual.



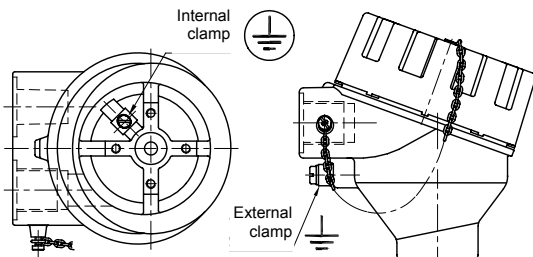
To ensure safety, an intrinsically safe source shall be always used pursuant to the converter manual, e.g. INAP 901 ordering number 901 000 101.

Surface temperature of the converter may not exceed maximum surface temperature for that particular temperature class.

For the installations in dangerous areas, mutual connection 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 connection independently if it is installed firmly and has metal interconnection with structural parts or the piping, which is connected to the system of mutual connection.

#### SENSOR HEAD WITH TERMINALS



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

Internal terminal: stranded wire 1.5 mm<sup>2</sup>, full wire 2.5 mm<sup>2</sup>

External terminal: stranded wire 4.0 mm<sup>2</sup>, full wire 6.0 mm<sup>2</sup>

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

#### CLOSING HEAD OF FIXED CLOSURE Ex d

After electrical connection of the sensor, the lid of the head shall be fully tightened by hand, then released slightly to ensure matching with the closest groove against the securing pin and fixed by this screw against releasing. If the lid of the sensor is not tightened and secured by the above mentioned screw, the sensor does not comply with the requirements of fixed closure Ex d.



#### WARNING:

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



#### COMMISSIONING

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

#### OPERATION AND MAINTENANCE

The sensor does not require any operation and maintenance.



#### WARNING

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



#### SENSOR UNINSTALLATION



#### WARNING

Warning: Temperature sensor is in design Ex and must be disconnected from the supply source before opening the lid of the head and releasing the cable outlet in the explosive environment!



Release the securing screw of the lid by ALLEN key 1.5 mm (a part of accessories). The terminal board of the sensor (converter) is accessible after unscrewing the lid of the head.

Measuring insert of the sensor can be replaced and is uninstalled from the head after disconnecting the cable by releasing two screws.

Before a complete uninstallation of the sensor, the wire for mutual interconnection shall be released from the external terminal on the sensor.

Disconnect the connecting cable from the terminal board, then release it from the clamp on the outlet and from closing nut of the outlet. Unscrew the sensor from the heat sink; torque for releasing is approx. 70 Nm. While releasing the screw-joint of the sensor, the heat sink may never be released.

#### SPARE PARTS

Spare parts shall be delivered by the manufacturer.

Relevant measuring inserts can be ordered pursuant to the offered price list of spare parts.

#### WARRANTY

Pursuant to § 429 of the Commercial Code and the provisions of § 620 (2) of the Civil Code, the manufacturer warrants for technical and operation parameters of the product specified in the manual. 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

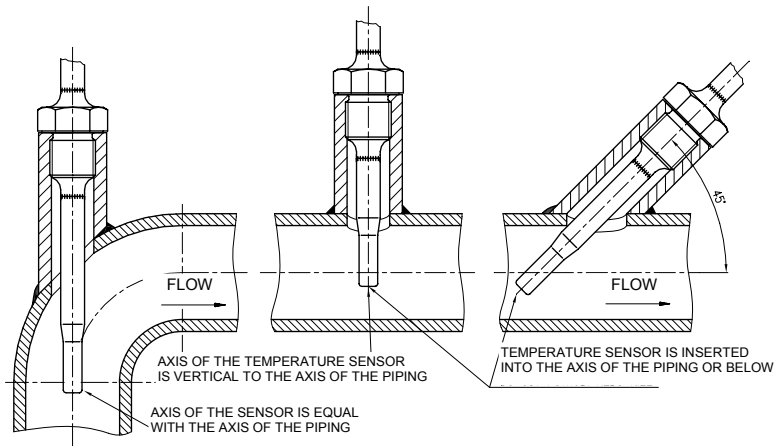
They shall be realized in compliance with the Waste Act No. 106/2005 Coll.

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.

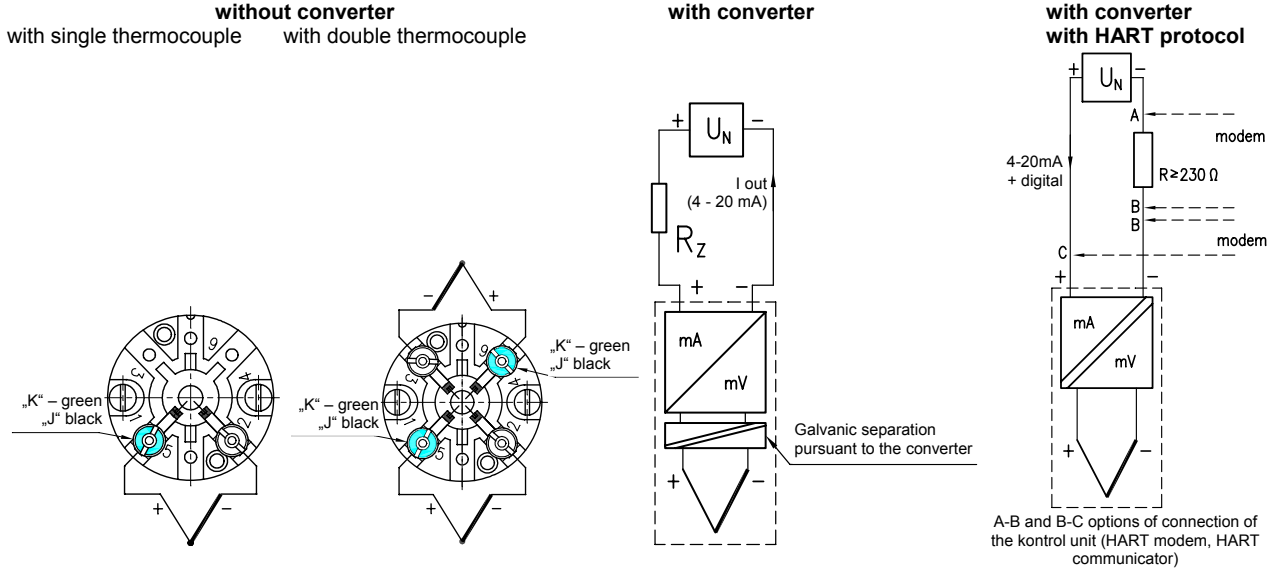
The manufacturer realizes free return withdrawal of marked electrical equipment (from 13.8.2005) from the consumer and points out the danger connected with their illegal disposal. The package of the sensor can be recycled completely. Metal parts of the products are recycled, non-recyclable plastic materials and electrical waste shall be disposed of in compliance with the aforesaid Act.

**FIGURE 1 – EXAMPLES OF INSTALLATION OF DIRECT AND ANGULAR WELD-ON PIECES PURSUANT TO ČSN EN 1434-2**



- ! WARNING**
- When using the sensor with an angular weld-on piece, locate the sensor with heat sink at an angle against the direction of flow
  - The sensor may not touch the opposite side of the piping
  - It is also advantageous to use the temperature sensors in the piping elbow. In such a case, locate the sensor with the heat sink against the direction of flow so that the measured medium flows around evenly

**FIGURE 2 - SCHEME OF CONNECTION OF TEMPERATURE SENSORS**



**FIGURE 3 - EXAMPLE OF OPERATION CONNECTION OF TEMPERATURE SENSOR WITH CONVERTER IN LOOP 4 - 20 mA**

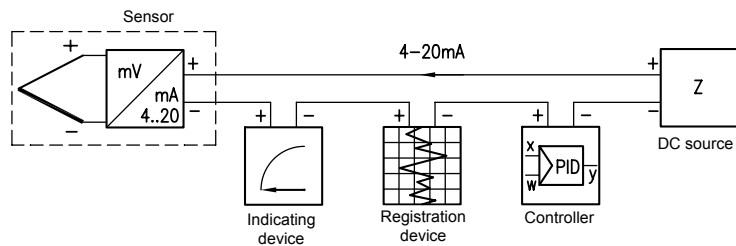


FIGURE 4 - MARK OF NON-EXPLOSIVENESS

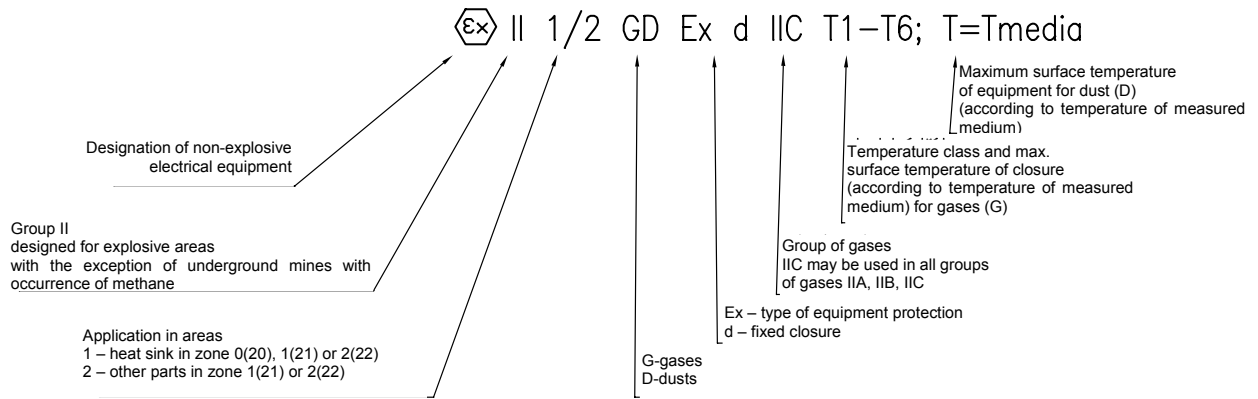


FIGURE 5 - DESIGN OF MEASURING ENDS OF JACKETED THERMOCOUPLES (SCHEMATIC ILLUSTRATION)

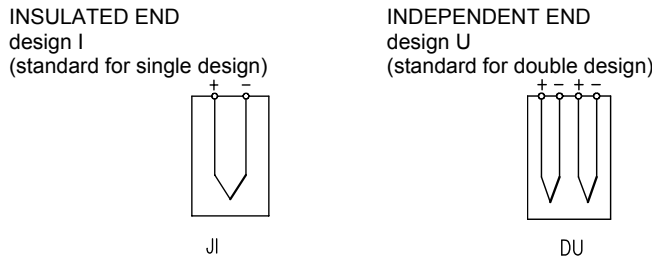
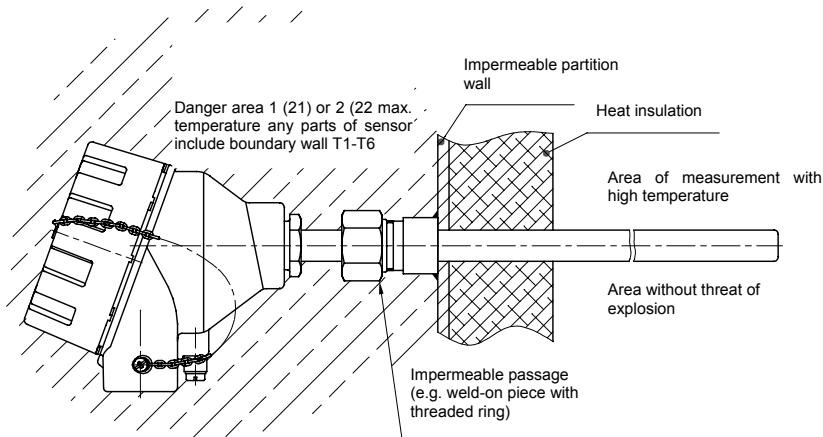


FIGURE 6 - EXAMPLES OF INSTALLATION OF TEMPERATURE SENSORS Ex d WITH METAL PROTECTIVE TUBE (in case a higher upper limit of the range of measurement is required than the required temperature class)



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