



# Thermoelectric temperature sensor Ex d to thermowell DIN with connecting screw-joint on adapter without converter or with converter type series 330 type 335

## PRODUCT MANUAL

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

### APPLICATION

- For exact remote measurement of temperature of steady and running liquids (gases and fluids), for which the properties of the thermowell of the sensor selected by the customer are suitable; measurement may be realized up to temperature (max. 450°C) and pressure determined by thermowell resistance
- For environment with explosive gaseous atmosphere according to EN 60079-10-1 and explosive atmospheres with combustible dust according to EN 60079-10-2
  - o Sensor may be installed into the thermowell located in zone 0, 1, 2, 20, 21 and 22; for zone 0 the thermowell must comply with the requirements pursuant to EN 60079-26 (see Figure 6)
  - o Other parts of the sensor (screw-joint, adapter, connecting head) may be located in zone 1(21) or zone 2(22)
  - o Sensor without converter or converter with Ex ia version, when connected to Ex ia circuit according to EN 60079-25 in zone 0, 1, 2, 20, 21 and 22
- 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)
- In design with display to display the value of the measured value
- 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 are rated products pursuant to the Directive 2014/34/EU, 2014/30/EU of the European Parliament and the Council and EU Declaration of Conformity **EU -335000** is issued for them.

### DESCRIPTION

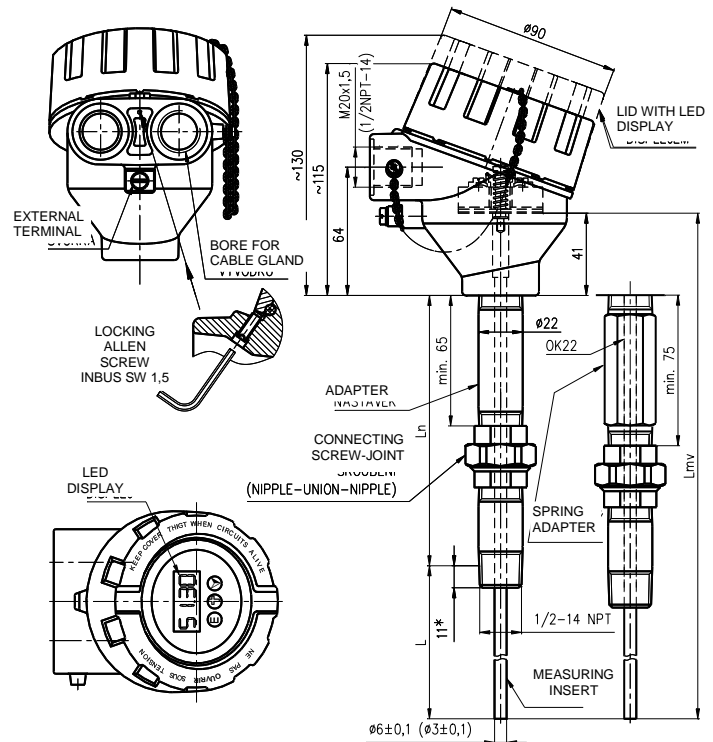
The sensor consists of a replaceable measuring insert with flange and ceramic terminal board or installed two-wire converter (insulated or non-insulated, even in design Ex ia) and protective armature consisting of a head and an adapter with a screw-joint for the connection of the sensor into the thermowell selected by the customer. The head with measuring insert and gland form a fixed closure Ex d. It is provided with a lid, which can be screwed, and a cable gland for the connecting wiring. The cable gland (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 wires 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 EN 61140 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 EN 61010-1; the follow-up (evaluation) device shall comply with Article 6.3 of the said standard.



- L nominal length
- $L_n$  length of adapter
- $L_{mv}$  length of measuring insert (does not apply to spring adapter)
- 11\* standard length of screwing

### Measuring range:

Min. length of adapter $L_n$ [mm]	Measuring range [°C]
125	-70 to 450 *)
65	-70 to 250

The upper limit of the measuring range is limited by resistance of the material of the thermowell; however, it may not exceed 450°C.

If it is ensured in a suitable way that the surface temperature of the part of the sensor located in the dangerous area does not exceed the temperature of the required temperature class (T1...T6), the upper limit of the range of measurement may also be higher (max. 1150°C for thermocouple K, max. 800°C for thermocouple J). Example of installation - refer to Figure 6.

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

### Design for explosive atmospheres:

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

Ex II 2 G Ex db IIC T1...T6 Gb

(Meaning of designation - refer to figure 3)

**Dust-tight closure** pursuant to EN 60079-0 and EN 60079-31:

Ex II 2 D Ex tb IIIC T=T media Db

(Meaning of designation - refer to figure 3)

**Intrinsically safe version with converter:**

according to built-in converter

**Electric strength** pursuant to EN 61010-1, Article 6.8.3:

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

**Electric insulation resistance** pursuant to EN 61515, Article 5.3.2.4:

min. 1000 MΩ, at ambient temperature 20±15°C and max. 80% relative humidity, test voltage 500 V DC

**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

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

**Ingress protection** pursuant to EN 60529  
IP 68, 1m, 30 min

**Operation position:**  
discretionary; the outlet shall not be situated upwards

**Type of operation:** continuous

**Sensor weight:**  
with adapter 135 mm 0.93 kg

#### Applied materials:

Stem tube of measuring insert	for thermocouple of type "J"	Steel 1.4541
	for thermocouple of type "K"	INCONEL 600
Adapter with connecting screw-joint		Steel 1.4541
Head	Aluminium alloy painted with polyester paint	
	Steel 1.4401	
Sealing of lid of head and gland		Oil-resistant rubber
Head terminals of terminal board		Brass with Ni surface
Connecting items of sensor		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 head and outlet of the sensor:

- for design without converter  $-50\text{ °C} \leq T_a \leq 85\text{ °C}$
- for design with converter pursuant to the type of converter (refer to the enclosed converter manual) max.  $-50\text{ °C} \leq T_a \leq 75\text{ °C}$
- for design with converter and display pursuant to the type of converter and display (refer to the enclosed converter and display manual) max  $-50\text{ °C} \leq T_a \leq 75\text{ °C}$

#### 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 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	80°C
T5	100°C	95°C
T4	135°C	130°C
T3	200°C	195°C
T2	300°C	290°C
T1	450°C	440°C

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

- 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
- Temperature limitation due to occurrence of layers of dust to 5mm thickness:  $T_{\max} = T_{5\text{mm}} - 75\text{ °C}$   
where  $T_{5\text{mm}}$  is the temperature of ignition of dust layer 5mm thick
- Dust layers over 5 mm – refer to 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 external thermal effects.

#### 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
- For design with converter pursuant to type of converter (refer to enclosed converter manual)
- For design with converter and display (refer to enclosed converter and display manual)

**Atmospheric pressure:** 70 to 106 kPa

#### Vibrations:

Sensor	with converter		without converter	
	Nominal length L [mm]	130, 140, 170	220, 260	130, 140, 170
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

#### Maximum speed of flow of liquids:

pursuant to parameters of thermowell used by the customer

## METROLOGICAL DATA

**Sensing probe:** measuring thermocouple J (Fe-CuNi) or K (NiCr-NiAl) pursuant to EN 60584-1, Ø 6 or Ø 3 mm, tolerance class 2 or 1, single with insulated measuring end or double with independent measuring end

#### 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 EN 60751 in whirling water (characteristic value):

without thermowell (separate measuring insert)

$\tau_{0.5}$  5.5 s

with thermowells pursuant to DIN 43772, shape 4 (L = 100, 140))

$\tau_{0.5}$  85 s

$\tau_{0.9}$  250 s

with thermowells pursuant to DIN 43772, shape 4 (L = 200, 260))

$\tau_{0.5}$  53 s

$\tau_{0.9}$  115 s

## 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
- Serial number
- Output signal 4 to 20 mA (design with converter)
- Ambient temperature
- Designation of non-explosiveness:
  - ⊕ II 2 G Ex db IIC T1...T6 Gb
  - ⊕ II 2 D Ex tb IIIC T=T media Db
- EU-Type Examination Certificate number
- Designation of non-explosiveness and EU-Type Examination Certificate number (for design with converter Ex ia)
- CE mark 1026

#### Data on label of measuring insert

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

#### Data on converter label

- Trademark
- Sensor type
- 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 Ex ia)

#### Data on display

- Trademark
- CE mark



TABLE 1 - DESIGN OF TEMPERATURE SENSORS Ex d (Ex t) TO THERMOWELL DIN - TYPE 335

SPECIFICATIONS					ORDERING NUMBER															
					335	x	x	x	x	x	x	x	x	x	/xxxxxx	/xxx				
Nominal length L [mm]	110	Length of adapter L <sub>n</sub> [mm]	125 (135) ***	Length of measuring insert L <sub>mv</sub> [mm]	275	1														
	140		135		315	2														
	170		125 (135) ***		335	3														
	200		135			375	4													
	260					435	5													
	410					585	6													
	Other (min. 75)*							9												
Nominal length L [mm]	110	Length of adapter L <sub>n</sub> [mm]	65 (75) *** (without connecting screw-joint)	Length of measuring insert L <sub>mv</sub> [mm]	215	1														
	140				245	2														
	170				275	3														
	200				305	4														
	260				365	5														
	410				515	6														
	Other (min. 75)*						9													
Length of adapter L <sub>n</sub> [mm]	Adapter	135mm (125mm)			1															
		65 mm (without connecting screw-joint) max. measuring range [°C] -70 to 250			2															
		Other (min. 65 mm) **)			9															
	Spring adapter	75 mm (without connecting screw-joint) max. measuring range [°C] -70 to 250			3															
		135			4															
Other (min. 65 mm) **)				9																
Thermowell material	without thermowell				0															
Connecting thread	1/2-14 NPT									5										
	Other *)									9										
Sensor head with thread for gland Ex d (Ex t)	Aluminium alloy painted with blue epoxy colour	M20x1.5											1							
		1/2-14NPT												2						
	Corrosion-resistant steel 1.4401	M20x1.5												3						
		1/2-14NPT												4						
Tube of measuring insert [mm]	Ø6 ± 0,1												1							
Thermocouple	K													K						
	J													J						
	Other *)													9						
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 (design of thermocouple measuring ends: single thermocouple, isolated end)	Converter type		Galvanic separation	Ex ia	Range [°C]															
	Analogue linear output signal with thermoelectric voltage	APAQ-HCF			Adjustable range												/HCF			
		APAQ-HCFX		•														/HCFX		
	Programmable linear output signal with temperature	TH 200	•		Programmable range												/TH200			
		TH 200-ex	•	•													/TH200X			
		IPAQ-H	•														/IPAQH			
		IPAQ-HX	•	•													/IPAQHX			
		MINIPAQ-HLP															/MINIPAQ			
		IPAQ C330	•														/C300			
	Programmable with HART protocol linear output signal with temperature	IPAQ C330X	•	•												/C300X				
		TH 300	•													/TH300				
		TH 300-ex	•	•												/TH300X				
		MESO-H	•													/MESOH				
		MESO-HX	•	•												/MESOHX				
		248 HA NA	•													/248HANA				
Other *)	248 HA I1	•	•												/248HA11X					
	644 HA NA	•													/644HANA					
	644 HA I1	•	•												/644HA11X					
Without converter (for converter installation by the customer)															/99					
LED display to loop 4-20 mA (not possible with head from corrosion resistant steel) (only with converter APAQ-HRF, MINIPAQ-HLP)					LPI-02											/LD				

**Standard design**

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

\*\*) In case of adapter length below 125 mm (minimum 65 mm), the temperature range is decreased to -70 to 250 °C.

\*\*) In case of spring adapter length below 135 mm (minimum 75 mm), the temperature range is decreased to -70 to 250 °C.

\*\*\*) The value in brackets applies to the spring adapter

\*\*\*\*) Lengths of measuring inserts for spring extension are not listed

**TABLE 2 – ADDITIONAL REQUIREMENT FOR DESIGN OF TEMPERATURE SENSORS Ex d (Ex t) TO THERMOWELL, TYPE 335**

SPECIFICATIONS			CODE	
CALIBRATION	NUMBER OF CALIBRATION POINTS	CALIBRATION RANGE		
Calibration by TPM 3342-94, define calibration points	3	0 to 800 °C	/Q4	
	3	0 to 1100 °C	/Q42	
	Other	0 to 1100 °C	/Q9	
REQUIREMENT FOR OTHER DOCUMENTATION			USE	
EU Declaration of Conformity			for design with converter	
Copy of EU-Type Examination Certificate acc to the 2014/34/EU (ATEX)			for converter and display Ex ia	
Declaration of Conformity with purchase order 2.1 pursuant to EN 10204				
			/EU	
			/Exi	
			/2.1	

Specify the code behind ordering number. Define calibration points for codes Q4, Q42 a Q9.

**TABLE 3 - OVERVIEW OF DESIGNS AND ORDERING OF WELDING THERMOWELLS PURSUANT TO DIN, SHAPE 4 (4F) PURSUANT TO DIN 43772, TYPE 991 (ordered separately)**

SPECIFICATIONS						ORDERING NUMBER									
						991	DIN	x	x	x	x	x	x	x	
Cone welding thermowell	Shape 4	pursuant to DIN	Without flange	PN 250				4	0						
	Shape 4F	43772	With flange *) **)					4	F						
	Internal bore [mm]				ø 7						7				
	Internal thread / internal Ø thermowell [mm]				1/2 - 14 NPT/ Ø 26							5			
	Nominal length of thermowell L [mm]	110	L1 [mm]	65	L2 [mm]	105									1
		140		65		135								2	
		170		133		165								3	
		200		65		195								4	
		200		125		195								5	
		260		125		255								6	
		410		275		405								7	
		Other (max. 410) *)												9	
	Material of thermowell II	1.7335 ***)	Maximum operation temperature [°C]		550										1
		1.7380 ***)		580										2	
		1.4541 ****)		580											3
		1.4571 *****)		400											4
		1.5415 *) ***)		530											5
		1.4903 *) ****)		620											6
		A105, C22.8 or 1.0460 (P250GH) *) ***)		425											7
		1.4404 *) ****)		550											
Other *)													9		

- \*) As a special requirement after an agreement with the manufacturer
- \*\*) Design of flange (shape, PN, DN and material) pursuant to the requirement of the customer
- \*\*\*) Thermowells of these materials cannot be used for zone 0
- \*\*\*\*) Surface treatment of thermowells: preservation with grease – oil
- \*\*\*\*\*) For zone 0, it is necessary to use a thermowell from corrosion resistant steel (pursuant to EN 60079-26)
- \*\*\*\*\*) thermowells of these materials are suitable for contact with food

**TABLE 4 – ACCESSORIES - OVERVIEW OF DESIGNS RECOMMENDED NIPPLES FOR WELDING THERMOWELLS, TYPE 991 (order separately)**

SPECIFICATION					ORDERING NUMBER					
					991	xxx	x	xxx	xx	
Nipple pursuant to DIN 43772 for welding thermowell shape 4 pursuant to DIN 43772	Direct nipple					NVD	4			
	Internal bore [mm]		Ø 26					D26		
	Material	15 128.5 **)		maximum operation temperature [°C]	550					51
		1.4541			550					72
		1.5415 *) **)			530					50
		1.4903 *)			620					71
		A105, C22.8 or 1.0460 (P250GH) *) **)			425					20
		1.4404 *)			550					73
Other *)								99		

- \*) upon a special requirement after an agreement with the manufacturer
- \*\*) surface treatment of thermowells: preservation with grease – oil

**TABLE 5 – ACCESSORIES - OVERVIEW OF DESIGNS RECOMMENDED SCREW-IN THERMOWELLS SHAPE 7 PURSUANT TO DIN 43772, TYPE 991 (order separately)**

SPECIFICATION					ORDERING NUMBER												
					991	DIN	K	x	x	x	x	x	x				
Cone screw-in thermowell	Shape 7 pursuant to DIN 43772		PN 250				K										
	Internal bore [mm]		Ø 7					7									
	External fixing thread		½ - 14 NPT						5								
			¾ - 14 NPT						7								
			1- 11,5 NPT						8								
			other *)						9								
	Internal thread for sensor		½ - 14 NPT							5							
	Nominal length of thermowell L [mm]		L1 [mm]		110									1			
					140										2		
					170											3	
					200												4
					260 *)												6
					410 *)												7
					Other (maximum 1200) *)												9
					Material of thermowell		maximum operation temperature [°C]		1.7335 *) **)								
	1.7380 *) **)															2	
	1.4541 ****)																3
	1.4571 ****)																4
	1.5415 *) **)																5
	1.4903 *) ****)																6
A105, C22.8 or 1.0460 (P250GH) *) **)																	7
1.4404 *) ****)																	8
Other *) **)																	9

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

\*\*) Thermowells of these materials cannot be used for zone 0 surface treatment of thermowells: preservation with grease – oil

\*\*\*) For zone 0, thermowell from corrosion resistant steel shall be used (pursuant to (pursuant to EN 60079-26)

\*\*\*\*) thermowells of these materials are suitable for contact with food

**TABLE 6 – ACCESSORIES - OVERVIEW OF DESIGNS RECOMMENDED NIPPLES FOR SCREW-IN THERMOWELLS, TYPE 991 (order separately)**

SPECIFICATION					ORDERING NUMBER					
					991	xxx	x	xxx	xx	
Nipple for screw-in thermowells pursuant to DIN 43772 shape 6 a 7	Direct nipple					NVP				
	Oblique (chamfer 45°)					NVS				
	Internal thread	3/4 – 14 NPT		PN	160			4	N34	
		Other *)							999	
	Material	1.0308 or 1.0122 **)		maximum operation temperature [°C]	300 (only PN 40)				N34	13
		15 128.5 **)			550				G34	51
		1.4541			550					
Other *)									99	

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

\*\*) surface treatment of thermowells: preservation with grease – oil

**TABLE 7 - OVERVIEW OF DESIGNS AND ORDERING OF CABLE GLANDS Ex d (Ex t) BRASS – TYPE 991**

SPECIFICATION								Ordering number		
								991	xx	xxx
Gland Ex d (Ex t) brass		Cable clamp (clamping module)			Thread	Torque of gland body	For cable Ø [mm]			
Size	Wrench		Size	Dimension						
	A	B		C	Ds					
No. 4	OK 17	OK 24	No. 4	5	20	M20×1.5	30 - 35 Nm	4,5-8.5	VM	458
No. 5	OK 19		No. 5	5	22			7-11	VM	711
No. 6	OK 24		No. 6	6	27.5			10-16	VM	016
No. 4	OK 17		No. 4	5	20	1/2-14 NPT	25 - 30 Nm	4,5-8.5	VK	458
No. 5	OK 19		No. 5	5	22			7-11	VK	711
No. 6	OK 24		No. 6	6	27.5			10-15.5	VK	015

**TABLE 8 - OVERVIEW OF DESIGNS AND ORDERING OF CABLE GLANDS Ex d (Ex t) BRASS – TYPE 991**

These glands will be delivered until stocks sell out

SPECIFICATION								Ordering number		
								991	xx	xxx
Gland Ex d (Ex t) brass		Cable clamp (clamping module)			Thread	Torque of gland body	For cable Ø [mm]			
Size	Wrench		Size	Dimension						
	A	B		C	Ds					
No. 5	OK 19	OK 24	No. 5	5	22	1/2-14 NPT	25 - 30 Nm	6-12	VM	612



## INSTALLATION AND CONNECTION

### SENSOR INSTALLATION

Install the sensors by screwing into the relevant thermowell screwed into the nipple on the piping (technological equipment) or welded into the piping wall. During the installation, torque of 40 Nm is recommended.

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

The temperature sensor may be installed to the thermowell located in the zone 0 (20), zone 1 (1) or zone 2 (22), **thermowell for zone 0 must be in accordance with the EN 60079-26.** (See figure 2).

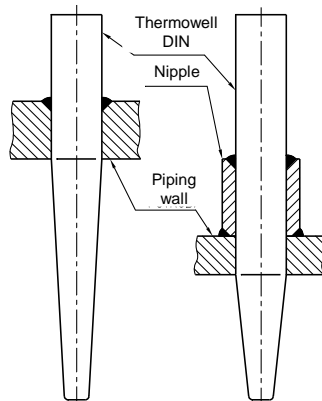
The other parts of the sensor (fitting, adapter, connecting head) may be located in zone 1 (21) or zone 2 (22).

**When installing sensor in the thermowell located in zone 20, a pre-fuse with the following parameters must be used in the converter encoder circuit: Ceramic, quick break (F), short circuit resistance 1500A (H), eg ceramic tube fuse Ø5 x 20 mm, F100mA.**

**Distance of the fixed closure Ex d IIC from close structures or between the suspensions shall be at least 40 mm.**

**The temperature sensor with a paint finish must be installed in an explosive atmosphere with dust so as to avoid the occurrence of creep discharges**

### EXAMPLES OF INSTALLATION OF THERMOWELLS DIN



### INSTALLATION OF CABLE GLAND

To secure the fixed closure (dust-tight closure), only the certified cable gland Ex d IIC (Ex tb IIIC) with coverage IP 68 shall be used (see accessories 991 or another similar gland). For temperature sensors with converter, a barrier cable gland must be used in zone 1 of the IIC gas gauge, or an Ex ia converter.

The gland shall be tightened in the sensor head in the prescribed way.

Torque of outlet body:

- |    |                                    |           |
|----|------------------------------------|-----------|
| a) | for outlet with thread 1/2 - 14NPT | 25 – 30Nm |
| b) | 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.

**The sensor installation in conditions with explosive gaseous atmosphere or flammable dust shall comply with the requirements of EN 60079-14.**

The terminal board of the sensor (converter) is accessible after the removal of the cover 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>. Sensors without converter connect with unarmoured shielded compensation or double insulated thermocouple wiring with cross section 0.5 to 1.5 mm<sup>2</sup> and outer diameter according to cable gland.

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. 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 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. Shielding may be only grounded (earthed) in one point. In the environment with interfering signals, use shielded cable in the power supply circuit. 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>. HART communicator is connected to the supply loop of the 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.**

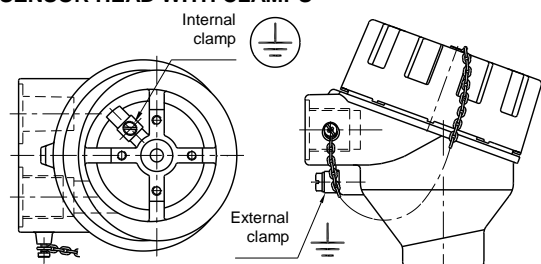


The surface temperature of the converter must not exceed the maximum surface temperature for a given temperature class.

For the installations in dangerous areas, mutual connection is required (bringing to the same potential). To achieve it, clamps 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 the structural parts of piping, which is connected to the system of mutual connection.

### SENSOR HEAD WITH CLAMPS



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



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

External clamp: 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 pit 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!**

**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.



In intrinsically safe circuits, only insulated cables that are capable of withstanding an electrical strength test with a voltage equal to twice the voltage in the intrinsically safe circuit or 500 V eff (DC 750 V) must be used, with a larger value being taken.

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 sensor installation, including 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.



 **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 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 gland 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 clamp on the sensor.

Disconnect the connecting cable from the terminal board, then release it from the clamp on the gland and from closing nut of the gland. Unscrew the sensor from the thermowell; torque for releasing is approx. 40 Nm. While releasing the screw-joint of the sensor, the thermowell may never be released.

**REPAIRS**

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

**SPARE PARTS**

Spare parts shall be delivered by the manufacturer. Relevant measuring inserts can be ordered pursuant to the following table (the table applies only to the version without a spring adapter):

SPECIFICATIONS		ORDERING NUMBER					
		MV330	/xxx/	x	x	x	/xxxx
Length of measuring insert [mm]			Pursuant to tab. 1				
ø measuring insert [mm]	6 ± 0,1			1			
	3 ± 0,1			3			
Sensing probe	Thermocouple K				K		
	Thermocouple J				J		
Accuracy class	1					1	
	2					2	
Connection of the terminal board and design of measuring ends of thermocouple or converter	Single thermocouple, insulated end						/JI
	Double thermocouple, independent end						/DU
Converter pursuant to tab. 1							/converter

To order the certified measuring inserts, specify the code according to Table 2 – Additional requirements – behind the ordering number.

The measuring inserts are marked according to Article DESIGNATION. Designation is completed with the ordering number.

Each delivery includes

- Delivery note
- Measuring insert pursuant to the purchase order
- Optional accessories to the measuring insert with a programmable converter
  - o Configuration program according to the required converter
  - o Communication modem (for serial port RS 232C) according 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

- Calibration sheet (for calibrated design)
- EU Declaration of Conformity (for design with converter)
- Copy of EU-Type Examination Certificate pursuant to the Directive No 2014/34/EU for design with converter Ex ia

**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



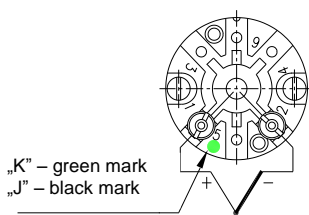
shall do so in the original package of the manufacturer and/or in another package ensuring safe transport. The warranty shall not apply to defects caused by unauthorized intervention into the device, its forced mechanical damage or failure to comply with operation conditions of the product and the product manual.

**DISABLING AND LIQUIDATION**

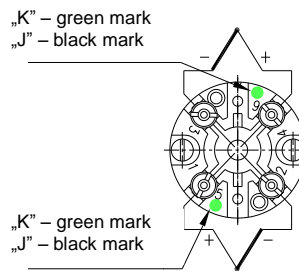
The product and its package do not include any parts that could impact the environment. Products that are withdrawn from operation, including their packages (with the exception of products marked as electrical equipment for the purposes of return withdrawal and separate salvage of electrical waste), 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 - SCHEME OF CONNECTION OF TEMPERATURE SENSORS**

**SCHEME OF CONNECTION WITHOUT CONVERTER**  
with single thermocouple



with double thermocouple



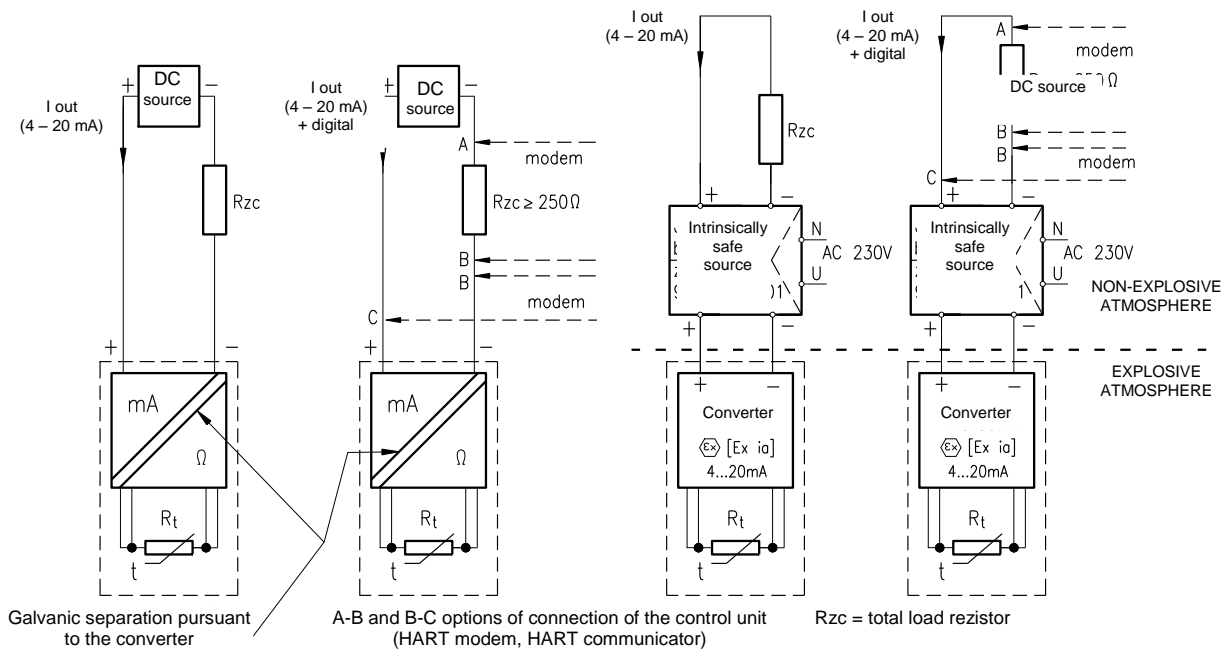
**SCHEME OF CONNECTION WITH CONVERTER AND DISPLAY**

with converter

with HART protocol

with converter Ex ia

with converter Ex ia with HART protocol



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

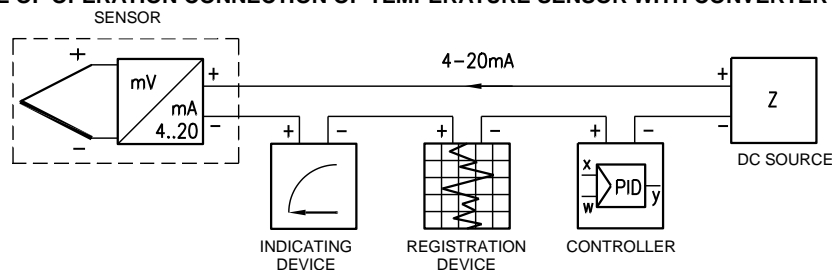


FIGURE 3 – MARK OF NON-EXPLOSIVENESS

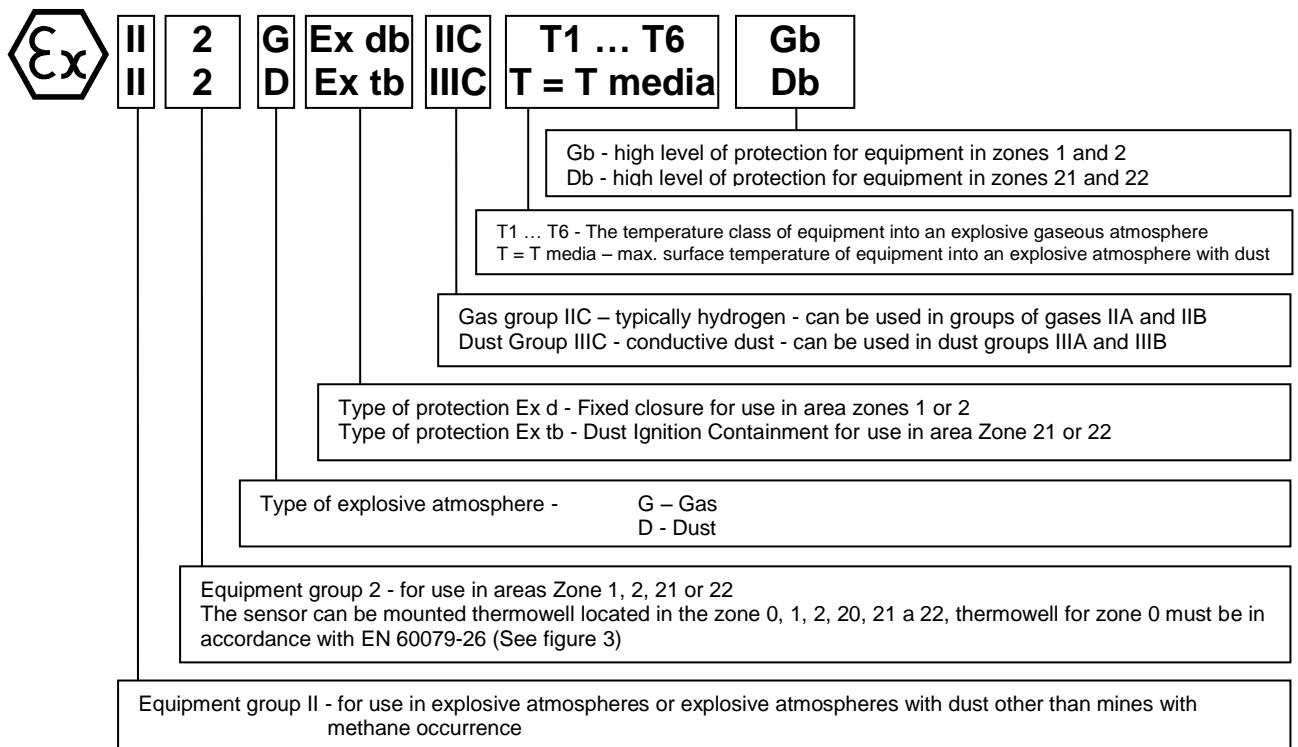


FIGURE 4 – THERMOWELL FOR TEMPERATURE SENSOR Ex d FOR ZONE 0 (pursuant to EN 60079-26)

The thermowell, which is used in the function of the partition wall between the zones 1 or 2 and zone 0, shall be made of corrosion-resistant metal and with wall thickness  $t \geq 1$  mm.

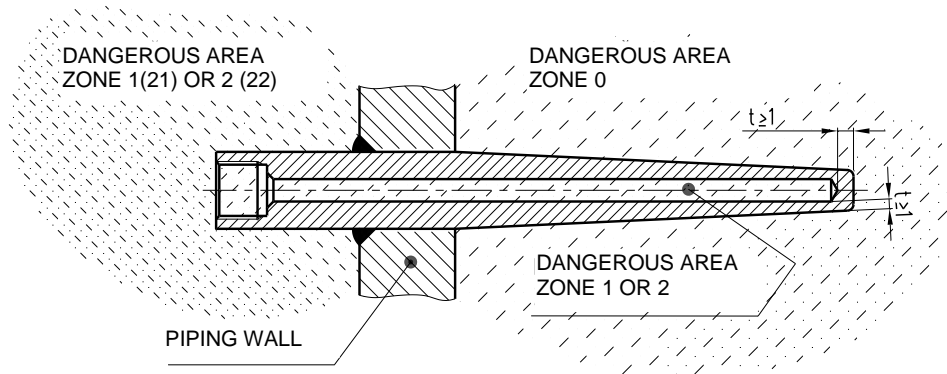
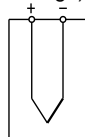


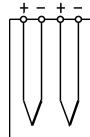
FIGURE 5 - DESIGN OF MEASURING ENDS OF PLASTIC THERMOCOUPLES (SCHEMATIC ILLUSTRATION)

INSULATED END  
design I  
(standard for single design)



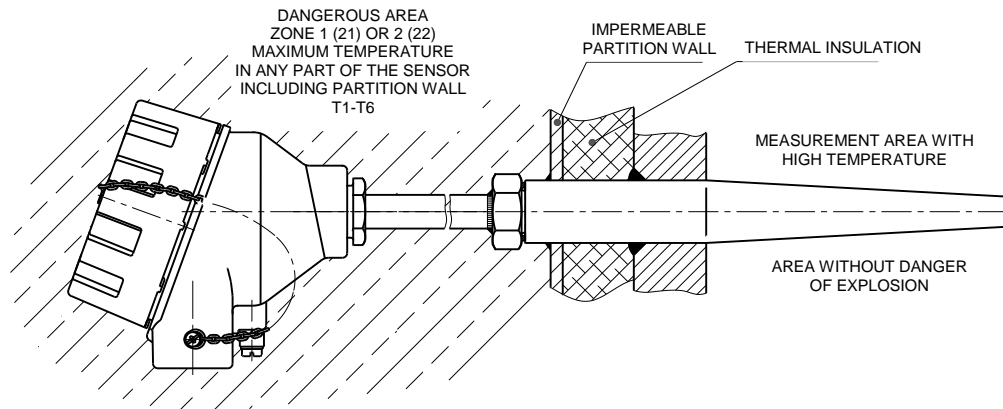
J1

INDEPENDENT END  
design U  
(standard for double design)



DU

**FIGURE 6 – EXAMPLE OF INSTALLATION OF TEMPERATURE SENSORS Ex d TO THERMOWELL DIN**  
 (for cases when a higher upper limit of the measurement range is required than the required temperature class)



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