



# Thermoelectric temperature sensor to thermowell DIN with connecting screw-union on adapter without converter, with converter or Ex ia design type series 330 type 336

## PRODUCT MANUAL

FOR DESIGNS WITH CONVERTER, A MANUAL IS ENCLOSED TO THE RELEVANT CONVERTER  
FOR DESIGNS WITH CONVERTER AND DISPLAY, MANUALS ARE 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. 600°C) and pressure determined by thermowell resistance
- For explosive conditions 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
- In a set with control or diagnostic systems for process monitoring
- In design with converter to convert signal of the thermoelectric 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

The sensors with converter and in Ex ia design are rated products pursuant to the Directive 2014/30/EU of the European Parliament and the Council and EU Declaration of Conformity **EU-231000** 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 connecting screw-union and thread for the connection of the sensor into the thermowell selected by the customer. The connecting screw-union enables turning of the sensor or, as the case may be, separation of its top part. The head is provided with a lid and a cable gland for the connecting wiring. The terminal board of the sensor (of the converter) is accessible after tilting the lid of the head away; it is fixed with one screw.

On the head, the sensor with converter in the Ex ia design is provided with an external terminal and an internal terminal for the connection of the grounding wire or the 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 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 corresponds to 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.

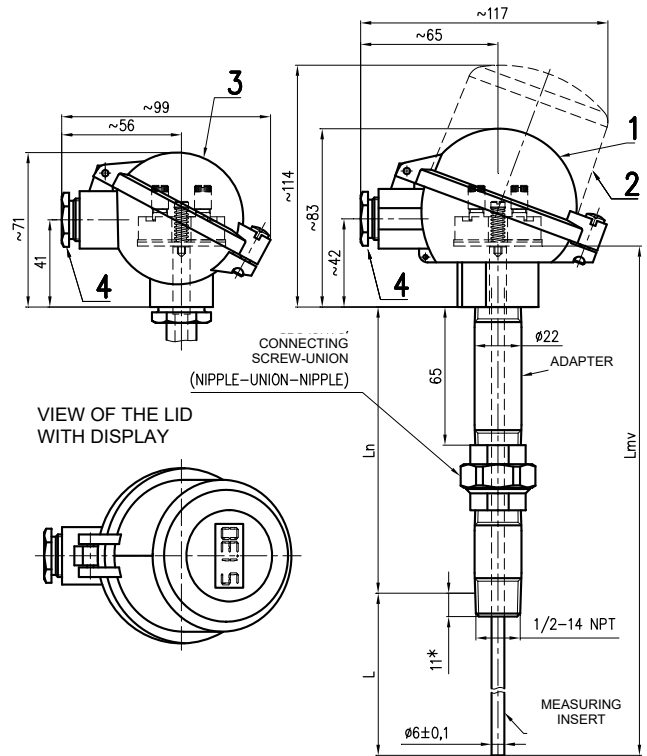
#### Measuring range of the sensor:

| Min. length of adapter<br>$L_n$ [mm] | Type of thermocouple | Measuring range<br>[°C] |
|--------------------------------------|----------------------|-------------------------|
| 140                                  | J                    | -200 to 800 *)          |
|                                      | K                    | -200 to 1150 *)         |
| 80                                   | J, K                 | -200 to 250             |

\*) The upper limit of the range of the measurement is limited by the resistance of the material of the used thermowell. Measuring range of the sensor with converter is established with the range of the selected 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)



- 1 - Ball head (alloy Al)  
(for converter Ex ia with external and internal terminals)  
or plastic ball head  
(it cannot be used for converter Ex ia)
  - 2 - Ball head with increased lid (alloy Al)  
without display for converter in the lid or with display  
(for converter Ex ia with external and internal terminals)
  - 3 - Small ball head (alloy Al)  
(only for terminal board or converters with a height of  $\leq 21$ mm)
  - 4 - Cable gland M20x1.5
- $L$  Nominal length  
 $L_n$  Length of adapter  
 $L_{mv}$  Length of measuring insert  
 $11^*$  Standard length of screwing in

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

min. 1000 M $\Omega$ , at ambient temperature 20 $\pm$ 15°C and max. 80% relative humidity, test voltage 500 V DC

#### Intrinsically safe pursuant to EN IEC 60079-0 and EN 60079-11:

Ex II 1 G Ex ia IIC T5/T6 Ga  
(Meaning of designation - see figure 4)  
 $P_i = 500$  mW  $T_6 (-60^\circ\text{C} \leq T_a \leq 68^\circ\text{C})$

#### Intrinsically safe circuit parameters:

only for thermocouple "K" and "J", with measuring insert  $\varnothing 6$

$U_i = 60$  V  $U_o = 100$  mV  
 $I_i = 100$  mA  $I_o = 50$  mA  
 $P_i = 500$  mW  $P_o = 25$  mW  
 $C_i = 850$  pF/m  
 $L_i = 16$   $\mu$ H/m



#### WARNING

The device must be installed in a housing that meets the degree of protection against intrusion of at least IP 20. The casing of the measuring insert is not separated from the inner intrinsically safe circuit according to the



standard EN 60079-11. This information must be taken into account during installation.

**Intrinsically safe version with converter:**

according to built-in converter

**Power supply of the converter:**

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

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

**Display:** LED display to loop 4-20mA

other data - refer to the enclosed manual

**Ingress Protection** pursuant to EN 60529: IP65

**Operation position:**

discretionary; the gland shall not be situated upwards

**Type of operation:** continuous

**Sensor weight:**

with ball head (alloy Al), adapter 150 mm and nominal length 200 mm approx. 0.71 kg

**Used materials:**

|  |  |                      |
|--|--|----------------------|
| Stem tube of measuring insert            | for thermocouple J                           | Steel 1.4541         |
|  | for thermocouple K                           | INCONEL 600          |
| Adapter with connecting screw-union      |  | Steel 1.4541         |
| Head                                     | Aluminium alloy painted with polyester paint |                      |
|  | Plastic PPO (phenyl polyoxide)               |                      |
| Sealing of the lid of the head and gland |  | Oil resistant rubber |
| Head terminals of the terminal board     |  | Nickel coated brass  |
| Connecting items of the 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 °C to 120 °C
- For design with converter pursuant to the type of the converter (refer to the enclosed converter manual)
- For design with converter and display pursuant to the type of the converter and the display (refer to the enclosed manuals to the converter and the display)

**Intrinsically safe measuring inserts can be used in intrinsically safe circuits of group II electrical equipment.**

**Vibrations:**

| Sensor                                     | with converter |          | without converter |          |
|--|----------------|----------|-------------------|----------|
|  | 110, 140, 170  | 200, 260 | 110, 140, 170     | 200, 260 |
| Nominal length L [mm]                      |                |          |                   |          |
| 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 humidity of the surrounding environment:**

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

**Atmospheric pressure:** 70 to 106 kPa

**Maximum speed of flow of the liquids:**

pursuant to the parameters of the thermowell used by the customer

**Resistance of material of the head PPO (phenyl polyoxide):**

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

**Resistance of lid sealing material (oil resistant rubber):**

|                          |                     |
|--------------------------|---------------------|
| Spirit                   | resistant           |
| Ether                    |                     |
| Benzole                  |                     |
| Petrol                   |                     |
| Ester                    |                     |
| Animal and vegetable oil |                     |
| Mineral oil              |                     |
| Diesel oil               |                     |
| Weak alkali hydroxides   |                     |
| Strong alkali hydroxides |                     |
| Weak acids               | resistant           |
| Strong acids             | not resistant       |
| Sea water                | resistant           |
| Trichloroethylene        | partially resistant |
| Hot water                |                     |

**METROLOGICAL DATA**

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

**Output signal**

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

of the 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 the 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 (independent meas. 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 on label of head**

- Trademark of the manufacturer
- Made in Czech Republic
- Type of thermoelectric sensor / tolerance class
- Measuring range or set-up range of the converter
- Product ordering number
- Ingress Protection
- Time code (Serial number for calibrated design, design with tolerance class 1, design with converter, Ex ia design)
- Output signal 4 to 20 mA (design with converter)
- Ambient temperature
- Mark of non-explosiveness (Ex ia design):  
 Ⓢ II 1 G Ex ia IIC T5/T6 Ga  
 and number of the EU-Type Examination Certificate
- Mark CE 1026

**Data on label of measuring insert**

- Trademark of the manufacturer
- Sensor type
- Time code (Serial number for calibrated design, design with tolerance class 1, design with converter, Ex ia design)

**Data on label of converter**

- Trademark of the manufacturer
- Sensor type
- Pre-set temperature range
- Designation of non-explosiveness and EU-Type Examination Certificate number for the converter Ex ia

- CE mark (for the converter Ex ia with the identification number of the notified body)

#### Data on display

- Trademark of the manufacturer
- Designation of non-explosiveness and EU-Type Examination Certificate number for the display Ex ia
- CE mark (for the display Ex ia with the identification number of the notified body)

#### RELIABILITY

Reliability indicators in operation conditions and ambient conditions specified herein

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

#### DELIVERY

Unless agreed otherwise with the customer, each delivery includes

- Delivery note
- Sensor pursuant to the purchase order
- Suitable thermowells and nipples ordered separately pursuant to the catalogue of accessories, type 991
- Optional accessories to the sensor with programmable converter
  - o Configuration (parameterization) program 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 EC 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

- Declaration of Conformity with purchase order 2.1 acc. to EN 10204
- Calibration sheet (for non-certified 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 Ex ia design

#### CERTIFICATION

- Non-explosiveness Ex ia, EU-Type Examination Certificate pursuant to the Directive 2014/34/EU FTZÚ 21 ATEX 0007X
- Non-explosiveness Ex ia, EU-Type Examination Certificate pursuant to the 2014/34/EU, (pursuant to the type of the converter and display)

#### CALIBRATION

It is realized pursuant to TPM 3322-94 and in compliance with EN 60584-1 and ČSN IEC 584-2, 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.

#### 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 IEC 60721-3-2 (i.e. by airplanes and trucks, in premises that are ventilated and protected against atmospheric effects).

#### STORAGE

The sensors may be stored on conditions corresponding to the set of combinations of classes IE 12 pursuant to EN IEC 60721-3-1, but with ambient temperature from -20 to 70 °C (i.e. in places where temperature and humidity are not regulated, with a threat of occurrence of condensation, dripping water and formation of ice, 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
- Ex ia design is ordered using codes JIX, or DUX according to table 1
- Completing requirements for design of the sensor pursuant to table 2
- Requirement for other documentation pursuant to table 2
- Measuring range
- If the delivery of the thermowell and nipple pursuant to the type 991 is required for the sensor as accessories
- If optional accessories to the sensor with programmable converter are required
- Requirement for other documentation pursuant to Article DELIVERY
- Other (special) requirements
- Number of pieces

Behind the required range of the measured temperature (i.e. bottom and top temperature limits in °C), the customer shall identify other non-standard required parameters for configuration of the converter (e.g. indication of sensor tripping, dampening, required designation - tagging etc.).

#### EXAMPLE OF PURCHASE ORDER

##### Standard design:

Thermoelectric temperature sensor to thermowell DIN without converter  
336 410 531 K2/JI/Q42  
Calibration points 600, 800 and 1000°C  
Range -200 to 1150°C  
6 pcs

##### Special request:

Thermoelectric temperature sensor to thermowell DIN with converter  
336 910 531 J2/HCF  
Nominal length L 380 mm  
Range 0 to 300°C  
6 pcs

#### ORDERING ACCESSORIES

The purchase order shall specify:

- Name
- Product ordering number
- Number of pieces

#### EXAMPLE OF PURCHASE ORDER

##### Standard design:

1. Welding thermowell pursuant to DIN shape 4  
991 DIN 407544  
20 pcs
2. Nipple  
NVD4 D26 72  
6 pcs

##### Special request:

Nipple  
NVD4 D26 99  
Material 1.5415  
6 pcs





**TABLE 3 - ACCESSORIES – OVERVIEW OF DESIGNS OF RECOMMENDED WELDING THERMOWELLS SHAPE 4 (4F) PURSUANT TO DIN 43772- type 991 (to be ordered independently)**

| SPECIFICATION                          |   |                                    |                    |         | ORDERING NUMBER |     |   |   |   |   |   |   |   |  |   |  |  |
|--|---|------------------------------------|--------------------|---------|-----------------|-----|---|---|---|---|---|---|---|--|---|--|--|
|  |   |                                    |                    |         | 991             | DIN | x | x | x | x | x | x | x |  |   |  |  |
| Shape 4 pursuant to DIN 43772          | Without flange                                  |                                    | PN 250             |         |                 |     | 4 | 0 |   |   |   |   |   |  |   |  |  |
|  | With flange *) **)                              |                                    |                    |         |                 |     | 4 | F |   |   |   |   |   |  |   |  |  |
| Welding conical thermowell             | Inner bore [mm]                                 |                                    | Ø 7                |         |                 |     |   |   | 7 |   |   |   |   |  |   |  |  |
|  | Internal thread / external Ø of 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. 1200) *)                            |                                    |                    |         |                 |     |   |   |   |   |   |   | 9 |  |   |  |  |
|  | Material of thermowell                          |                                    | 1.7335 ***)        |         | 550             |     |   |   |   |   |   |   |   |  | 1 |  |  |
|  |   |                                    | 1.7380 ***)        |         | 580             |     |   |   |   |   |   |   |   |  | 2 |  |  |
| 1.4541 ****)                           |   | 580                                |                    |         |                 |     |   |   |   |   |   | 3 |   |  |   |  |  |
| 1.4571 ****)                           |   | 400                                |                    |         |                 |     |   |   |   |   |   | 4 |   |  |   |  |  |
| 1.5415 *) ***)                         |   | 500                                |                    |         |                 |     |   |   |   |   |   | 5 |   |  |   |  |  |
| 1.4903 *) ****)                        |   | 620                                |                    |         |                 |     |   |   |   |   |   | 6 |   |  |   |  |  |
| A105, C22.8 or 1.0460 (P250GH) *) ***) |   | 400                                |                    |         |                 |     |   |   |   |   |   | 7 |   |  |   |  |  |
| 1.4404 *) ****)                        |   | 500                                |                    |         |                 |     |   |   |   |   |   | 8 |   |  |   |  |  |
| Other *) ****)                         |   |                                    |                    |         |                 |     |   |   |   |   |   | 9 |   |  |   |  |  |
|  |   | maximum operating temperature [°C] |                    |         |                 |     |   |   |   |   |   |   |   |  |   |  |  |

\*) As a special request on the basis of an agreement with the manufacturer  
 \*\*) Design of the flange (shape, PN, DN and material) pursuant to the requirement of the customer  
 \*\*\*) Surface treatment of thermowells: preservation with grease – oil  
 \*\*\*\*) Thermowells from these materials are suitable for contact with foods

**TABLE 4 - ACCESSORIES – OVERVIEW OF DESIGNS OF RECOMMENDED NIPPLES FOR WELDING THERMOWELLS – TYPE 991 (to be ordered separately)**

| SPECIFICATION  |                 |  |  |                                    | ORDERING NUMBER |     |   |     |    |
|--|-----------------|--|--|------------------------------------|-----------------|-----|---|-----|----|
|  |                 |  |  |                                    | 991             | xxx | x | xxx | xx |
| Nipple according to DIN 43772 for welding thermowell pursuant to DIN 43772 shape 4 | Direct          |  |  |                                    |                 | NVD | 4 |     |    |
|  | Inner bore [mm] | Ø 26                                   |  | PN                                 | 250             |     |   | D26 |    |
|  | Material        | 15 128.5 **)                           |  | Maximum operating temperature [°C] | 550             |     |   |     | 51 |
|  |                 | 1.4541                                 |  |                                    | 550             |     |   |     | 72 |
|  |                 | 1.5415 *) **)                          |  |                                    | 500             |     |   |     | 50 |
|  |                 | 1.4903 *)                              |  |                                    | 620             |     |   |     | 71 |
|  |                 | A105, C22.8 or 1.0460 (P250GH) *) ***) |  |                                    | 400             |     |   |     | 20 |
|  |                 | 1.4404 *)                              |  |                                    | 500             |     |   |     | 73 |
|  |                 | Other *)                               |  |                                    |                 |     |   |     | 99 |

\*) Only as special request on the basis of an agreement with the manufacturer  
 \*\*) Surface treatment of nipples: 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 |   |   |
| Cone screw-in thermowell              | Shape 7 pursuant to DIN 43772       |                                    |               | PN 250       |                 |     |   | K |   |   |   |   |   |   |
|                                       | Internal bore [mm]                  |                                    | Ø 7           |              |                 |     |   | 7 |   |   |   |   |   |   |
|                                       | External fixing thread              |                                    |               | 1/2 - 14 NPT |                 |     |   |   |   | 5 |   |   |   |   |
|                                       |                                     |                                    |               | 3/4 - 14 NPT |                 |     |   |   |   | 7 |   |   |   |   |
|                                       |                                     |                                    |               | 1 - 11,5 NPT |                 |     |   |   |   | 8 |   |   |   |   |
|                                       |                                     |                                    |               | other *)     |                 |     |   |   |   | 9 |   |   |   |   |
|                                       |                                     |                                    |               |              |                 |     |   |   |   |   | 5 |   |   |   |
|                                       | Nominal length of thermowell L [mm] | 110                                |               | L1 [mm]      | 105             |     |   |   |   |   |   |   |   | 1 |
|                                       |                                     | 140                                |               |              | 135             |     |   |   |   |   |   |   |   | 2 |
|                                       |                                     | 170                                |               |              | 165             |     |   |   |   |   |   |   |   | 3 |
|                                       |                                     | 200                                |               |              | 195             |     |   |   |   |   |   |   |   | 4 |
|                                       |                                     | 260 *)                             |               |              | 255             |     |   |   |   |   |   |   |   | 6 |
|                                       |                                     | 410 *)                             |               |              | 405             |     |   |   |   |   |   |   |   | 7 |
|                                       |                                     | Other (maximum 1200) *)            |               |              |                 |     |   |   |   |   |   |   |   | 9 |
|                                       |                                     | Material of thermowell             | 1.7335 *) **) |              | 550             |     |   |   |   |   |   |   |   |   |
|                                       | 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           |              |                 |     |   |   |   |   |   |   | 8 |   |
| Other *) **)                          |                                     |                                    |               |              |                 |     |   |   |   |   |   |   | 9 |   |
|                                       |                                     | maximum operation temperature [°C] |               |              |                 |     |   |   |   |   |   |   |   |   |

\*) 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                  |    |                                    |                  |     |   | 72  |    |
| Other *)  |                       |                      |    |                                    |                  |     |   | 99  |    |

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

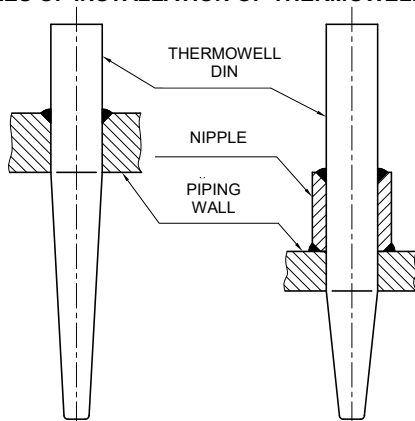
**INSTALLATION AND CONNECTION**

**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.

**EXAMPLES OF INSTALLATION OF THERMOWELLS DIN**



**ELECTRICAL CONNECTION**

The electrical connection may be only realized by qualified workers.

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

Connect the evaluation devices to the sensor (with converter) 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 mm<sup>2</sup>.

Sensors without converter connect with compensation or thermocouple wiring with cross section 0.5 to 1.5 mm<sup>2</sup>. Seal the cable gland of the sensor properly.

**WARNING**

**Do not use independent wires without jacket for electrical connection. To ensure the coverage grade in the outlet, 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 a 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>. The HART communicator is connected to the power supply loop of the sensor with converter pursuant to Figure 3. To ensure reliable communication, there shall be the total load resistance of min. 250 Ω. in the circuit of the output loop.

**INSTALLATION OF THE SENSOR WITH CONVERTER Ex ia 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 P<sub>0</sub> 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.

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.

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.

**WARNING**

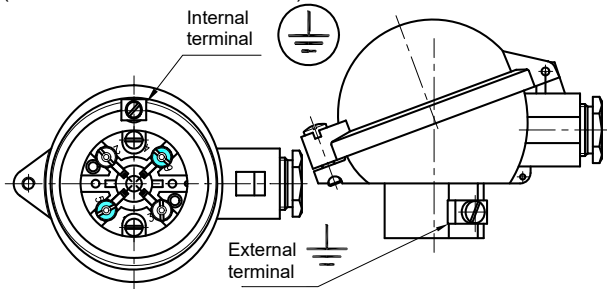
**The programmable converter may not be connected to the PC or HART communicator if the converter is located in the explosive environment.**

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 clamps:**

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.

**COMMISSIONING**

After the sensor installation 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 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.

**SENSOR UNINSTALLATION**

Disconnect the sensor from the power supply source. The terminal board of the sensor (of the converter) is accessible after tilting of the lid of the head way; it is connected with one screw. The measuring insert of the sensor is replaceable and it is removed from the head after disconnecting the cable by releasing two screws. If the sensor is connected to the system of interconnection, it is necessary to release, before the complete uninstallation of the sensor, the wire for mutual interconnection from the terminal on the head of the sensor. Unscrew the sensor from the thermowell; releasing torque is approx. 40 Nm. When releasing the screw-union of the sensor, the thermowell may not be released in any way.

**SPARE PARTS**

Spare parts shall be delivered by the manufacturer. Relevant measuring inserts can be ordered pursuant to the following table:

| SPECIFICATIONS   |                                      | ORDERING NUMBER    |       |   |   |            |       |
|--|--------------------------------------|--------------------|-------|---|---|------------|-------|
|  |                                      | MV330              | /xxx/ | 1 | x | x          | /xxxx |
| Length of measuring insert [mm]  |                                      | Pursuant to tab. 1 | 1     |   |   |            |       |
| 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        |       |
|  |                                      |                    |       |   |   | /JIX *)    |       |
|  | Double thermocouple, independent end |                    |       |   |   | /DU        |       |
|  |                                      |                    |       |   |   | /DUX *)    |       |
| Converter pursuant to tab. 1   |                                      |                    |       |   |   | /converter |       |

\*) Ex ia design(only with measuring insert ø 6, length of measuring insert L<sub>mv</sub> 100 – 3025 [mm])

**EXAMPLE OF PURCHASE ORDER OF THE MEASURING INSERT**

Thermoelectric measuring insert without converter  
 330 /375/ 1K2/JI  
 6 pcs

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

Measuring inserts are marked pursuant to Article DESIGNATION. The designation shall be completed with the ordering number.

Each delivery shall include

- Delivery note
- Measuring insert pursuant to the purchase order
- Optional accessories to the measuring insert with programmable converter
  - o Configuration program 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 Ex ia)

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

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

**WARRANTY**

The warranty period is 24 months from the receiving of the product by the customer, unless established otherwise in the contract. Rejection of defects shall be enforced in writing at the manufacturer within the warranty period. The rejecting side shall identify the product name, ordering and manufacturing numbers, date of issue and number of the delivery note, clear description of the occurring defect and the subject of the claim. If the rejecting side is invited to send the device for repair, it shall do so in the original package of the manufacturer and/or in another package ensuring safe transport. The warranty shall not apply to defects caused by unauthorized intervention into the device, its forced mechanical damage or failure to comply with operation conditions of the product and the product manual.

**REPAIRS**

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

**DISABLING AND LIQUIDATION**

The product and its package do not include any parts that could impact the environment. The products that are withdrawn from operation, including their packages (with the exception of products marked as electrical equipment for the purposes of return withdrawal and separate salvage of electrical waste), may be disposed of to sorted or unsorted waste pursuant to the type of waste. The manufacturer realizes free return withdrawal of marked electrical equipment (from 13.8.2005) from the consumer and points out the danger connected with their illegal disposal. The package of the sensor can be recycled completely. Metal parts of the products are recycled, non-recyclable plastic materials and electrical waste shall be disposed of in accordance with applicable legislation.



FIGURE 1 - DESIGN OF MEASURING ENDS OF JACKETED THERMOCOUPLES (SCHEMATIC ILLUSTRATION)

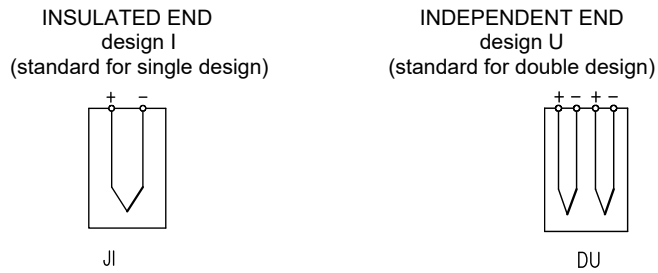
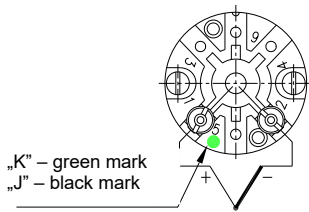


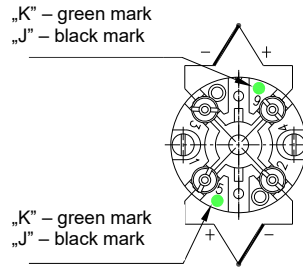
FIGURE 2 - SCHEME OF CONNECTION OF TEMPERATURE SENSORS

SCHEME OF CONNECTION WITHOUT CONVERTER

with single thermocouple

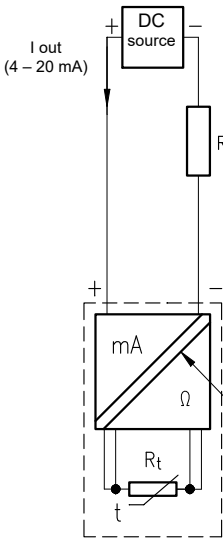


with double thermocouple

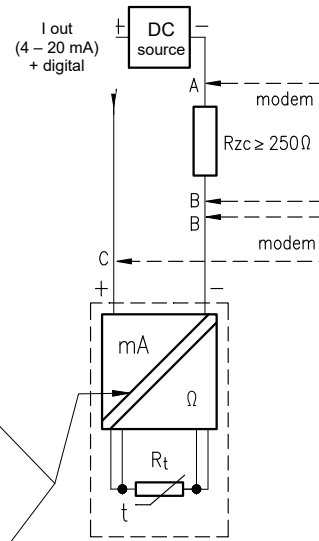


SCHEME OF CONNECTION WITH CONVERTER AND DISPLAY

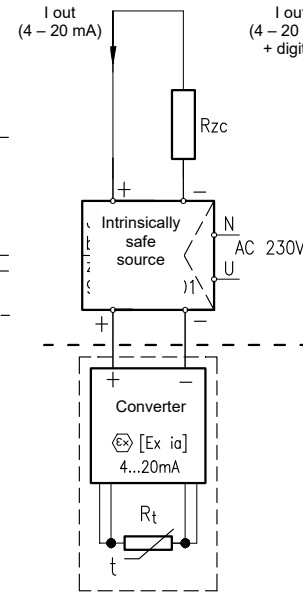
with converter



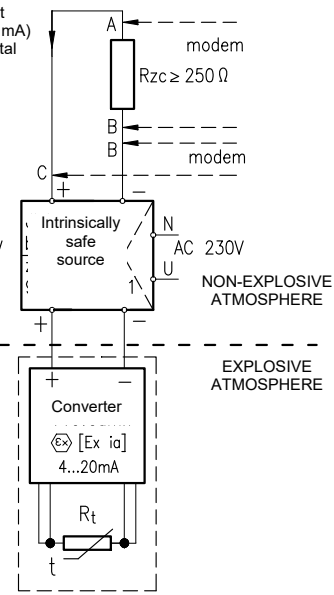
with converter with HART protocol



with converter Ex ia



with converter Ex ia with HART protocol



Galvanic separation pursuant to the converter

A-B and B-C options of connection of the control unit (HART modem, HART communicator)

R<sub>zc</sub> = total load resistor

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

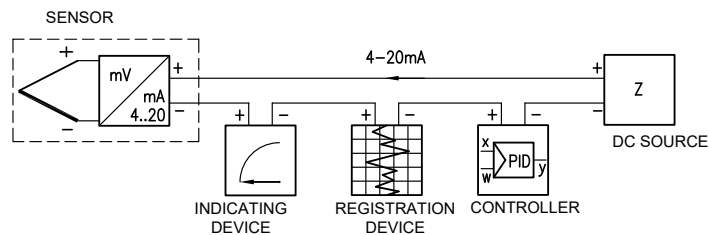
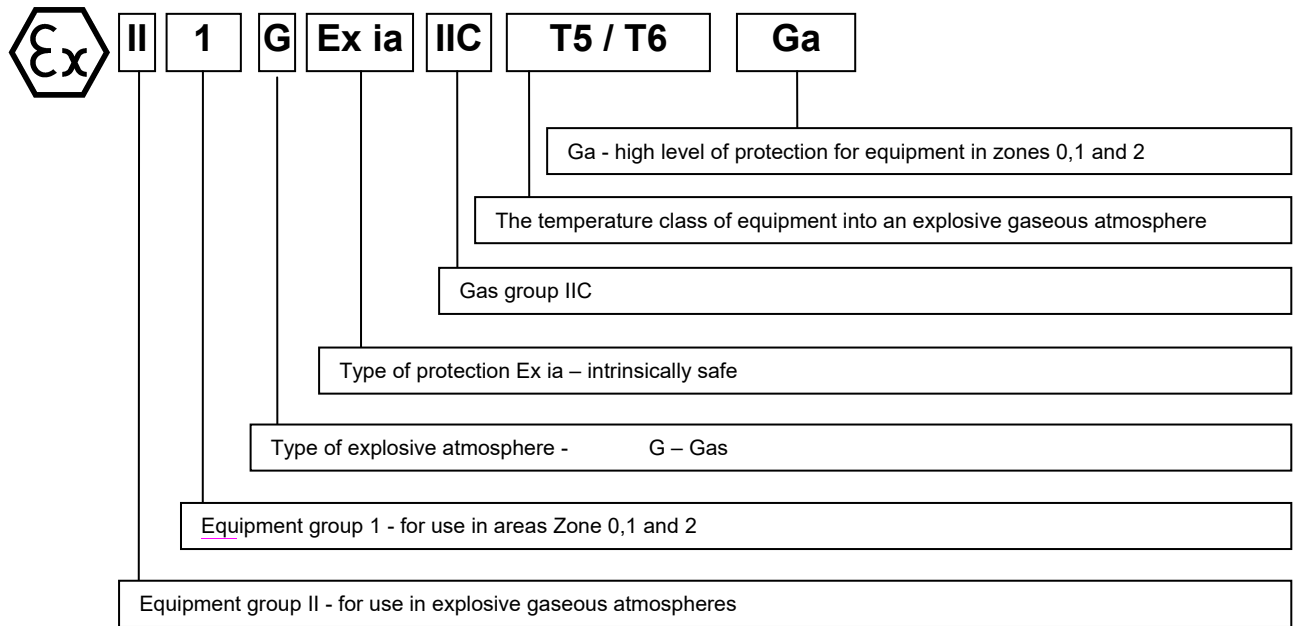


FIGURE 4 - INTRINSICALLY SAFE MARKING



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