



Resistance temperature sensor Ex d with connecting cable (bearing type), with high mechanical resistance type 112 70

PRODUCT MANUAL

APPLICATION

- for remote measurement of a temperature of steady and flowing liquids in an environment with a danger of explosion, but especially a temperature of bearings (bearing oil), a temperature of technical liquids or other similar applications up to the nominal pressure of a thermowell PN 40
- in the environment with the explosive atmosphere Zone 1 and Zone 2 pursuant to EN 60079-10-1
- For the environment, where mechanical resistance is required pursuant to EN 60068-2-6 (class AH2) and seismic capability of the electrical equipment of the safety system of the nuclear power stations pursuant to IEC 980 (MVZ level SL-2)

The sensors with converter are rated products pursuant to the Directive 2014/34/EU of the European Parliament and the Council and EU Declaration of Conformity **EU -112700** is issued for them.

DESCRIPTION

Measuring resistor with internal wiring is inserted into the thermowell that is welded with connecting screw joint of the sensor. The screw joint is ended with a cable gland with permanently connected connecting cable. The thermowell with the screw joint and the cable gland form fixed closure Ex d. On the fastening screw joint, the sensor is provided with a terminal for the grounding wire or wire for mutual interconnection. The sensor cannot be dismantled; in the cable gland is the cable secured against pulling out. To measure a temperature is uses a defined change of the sensor resistance in dependence on the change of a temperature of the measured environment.

TECHNICAL DATA

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

Measuring range:

nominal length from 160 mm -70 to 180 °C

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

Ex II 2 G Ex db IIC T3 to T6 Gb

Electric strength pursuant to EN 61010-1: 500 V eff

Electric insulation resistance pursuant to EN 60751:

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

Nominal pressure pursuant to ČSN 13 0010: PN 40

Ingress Protection pursuant to EN 60529 : IP 67

Operation position: discretionary

Weight of sensor without cable:

for L = 63 approx. 285 g
 for L = 100 approx. 290 g
 for L = 160 approx. 300 g
 for L = 250 approx. 320 g

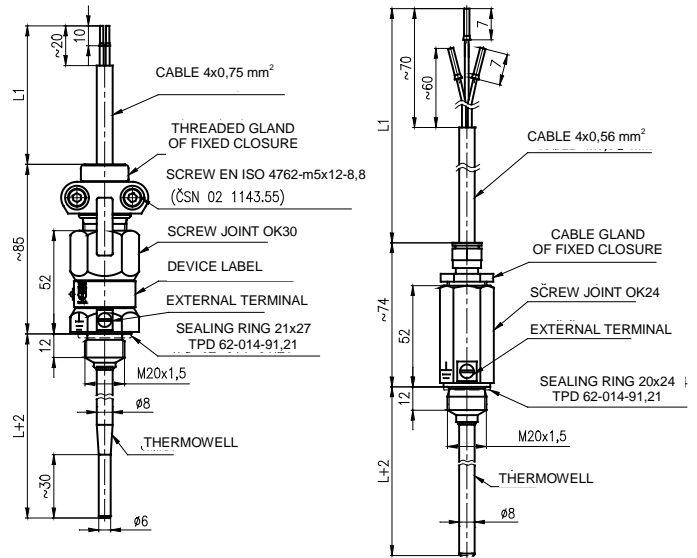
only cable: approx. 75 g/m

Type of operation: continuous

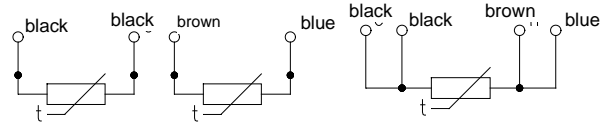
Applied materials:

Sensor parts	Design of sensor with body	
	of galvanized steel	
Thermowell	steel 1.4541	
Sensor body with the screw joint	steel class. 11, galvanic zinc coating	steel 1.4541
Cable gland with a lock	Aluminium alloy, chromated and lacquered with synthetic enamel	nickel brass
Internal wiring	Cu	
Connecting cable	Cu core	4 x 0,75 mm ² / 4 x 0,56 mm ²
	isolation	silicone / Fluoroplastic FEP

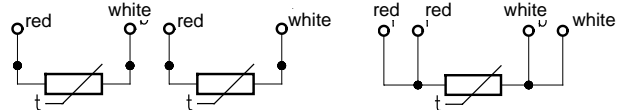
FIGURE 1 – SENSOR WITH BODY of galvanized steel of stainless steel



Connection scheme - sensor with body of galvanized steel
 with double measuring resistor in two wire connection (2x Pt 100/B/2) with single measuring resistor in four wire connection (Pt 100/ /4)



Connection scheme - sensor with body of stainless steel
 with double measuring resistor in two wire connection (2x Pt 100/B/2) with single measuring resistor in four wire connection (Pt 100/ /4)



OPERATION CONDITIONS

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

Ambient temperature: - 20 to + 40 °C



WARNING

The user shall guarantee that the maximum surface temperature of the sensor does not reach the temperature of ignition of any gas or steam, which could be present. Orientation values of surface temperatures of the sensor - refer to Figure 3.

Range of measurement (temperature of medium):

Design unverified and verified with L from 160 mm	Design verified with L to 150 mm	Temperature class
-70 to 80 °C	-20 to 80 °C	T6
-70 to 95 °C	-20 to 95 °C	T5
-70 to 130 °C	-20 to 130 °C	T4
-70 to 180 °C	-20 to 180 °C	T3

Relative ambient humidity:

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

Atmospheric pressure: 70 to 106 kPa

Maximum speed of flow of liquids:

Maximum speed of flow [m/s]	Nominal length L [mm]			
	63	100	160	250
Water steam and air	100	40	15	6
Water	15	6	2.5	1

Vibrations:

Vibrations	Nominal length L [mm]			
	63	100	160	250
Frequency range [Hz]	10 to 150			
Drift amplitude [mm]	0.35		0.15	
Acceleration amplitude [ms ⁻²]	39.2		19.6	

METROLOGICAL DATA

Setting probe: measuring resistor Pt 100 single or double in the connection pursuant to the connection scheme and table of designs $\alpha = 0.00385 [K^{-1}]$, tolerance class B or A (only for 4-wire) pursuant to EN 60751

Internal wiring resistance of two cores at 20 °C: 0.052 Ω /m

Maximum current load of measuring resistor: 5 mA

Recommended measuring current: 1 mA

Calibration depth of immersion:

for L = 63 mm 63 mm

for L = 100 mm 100 mm

for L = 160, 250 mm 160 mm

Time of temperature response pursuant to EN 60751:

in whirling water (characteristic value):

for L = 63 mm $\tau_{0.5}$ 9.9 s

$\tau_{0.9}$ 29.7 s

for L = 100, 160, 250 mm $\tau_{0.5}$ 3.4 s

$\tau_{0.9}$ 10.8 s

DESIGNATION**Data on sensor label**

- Trademark of the manufacturer
- Type of resistance sensor, nominal value R_0 / tolerance class / configuration of wires of the internal wiring
- Product ordering number
- Ingress Protection
- Serial number
- Measuring range
- Mark of non-explosiveness:
 - Ⓔ II 2 G Ex db IIC T3 to T6 Gb (temperature class pursuant to the measuring range) and number of EU-Type Examination Certificate

Data on sensor

- marking CE 1026

CERTIFICATION

- Non-explosiveness Ⓔ II 2 G Ex db IIC T3 to T6 Gb EU-Type Examination Certificate pursuant to the Directive 2014/34/EU FTZÚ 02 ATEX 0221X, with supplementary No. 1, 2, 3 and 4

DELIVERY

Unless agreed otherwise with the customer, each delivery includes:

- delivery note
- sensor pursuant to the purchase order, output wires are twisted into a bundle and ensured against unrolling
- sealing ring 21x27 TPD 62-014-91.21
- Accompanying technical documentation in Czech:
 - o Product manual
 - o Certificate of product quality and completeness, which also serves as the warranty certificate
 - o EU Declaration of Conformity

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

- Copy of the Inspection Certificate 3.1 for material of thermowell with the heat number
- Copy of the Inspection Certificate 3.1 for material of thermowell with the heat number
- Calibration sheet (for calibrated design)
- Copy of EU-Type Examination Certificate pursuant to the Directive No 2014/34/EU for fixed closure
- Supplier's declaration of conformity pursuant to EN ISO/IEC 17050-1

RELIABILITY

Indicators of reliability in operation conditions and conditions of the environment specified in this manual

- mean time of operation between failures 96 000 hours (information value)
- expected service life 10 years

PACKING

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

TRANSPORT

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

STORAGE

The sensors may be stored on conditions corresponding to the set of combinations of classes IE 11 pursuant to EN 60721-3-1 (i.e. in places with continuous regulation of temperature from 5 to 40 °C and humidity from 5 to 85 %, without a special threat of an attack with biological agents, with vibrations of small significance and not situated close to sources of dust and sand).

CALIBRATION

It is realized pursuant to TPM 3342-94 and in compliance with EN 60751, usually in three temperature points evenly distributed in the operation range of the sensor or in the points according to the requirement of the customer. Calibration sheet with measured data is issued for calibrated sensors. Calibrate is possible of the sensor with nominal length L greater than 100 mm.

ORDERING

The purchase order shall specify:

- name
- product ordering number
- if is required calibration and in what temperature points
- if is required delivery nipples pursuant to type 991 as accessories for the sensors
- other (special) requirements
- number of pieces

PURCHASE ORDER EXAMPLE**Standard design**

Resistance temperature sensor Ex d with connecting cable, with high mechanical resistance
112 705 803
15 pcs

Special request:

Resistance temperature sensor Ex d with connecting cable, with high mechanical resistance
112 705 799
6 pcs
four-wire connection, tolerance class A, nominal length L = 200 mm, cable length $L_1 = 12$ m, material of sensor body with screw joint steel 1.4541

ORDERING ACCESSORIES

The purchase order shall specify:

- name
- ordering number
- number of pieces

PURCHASE ORDER EXAMPLE**Standard design:**

Nipple
991 NVP3 M20 72
6 pcs

Special request:

Nipple
991 NVP3 M20 99
Material 1.5415
6 pcs

TABLE 1 - DESIGN OF TEMPERATURE SENSORS

SPECIFICATION		ORDERING NUMBER				
		112 70	x	x	x	x
Sensor body	of galvanized steel		5			
	of stainless steel		6			
Measuring resistor pursuant to EN 60751 tolerance class B or A *) **)	Pt 100/ /4		7			
	2x Pt 100/B/2		8			
Measuring resistor	Other *)		9			
Nominal length L [mm]	63				0	
	100				1	
	160				2	
	250				3	
	Other *)				9	
Length of cable L ₁ [m]	2.5					3
	4					4
	6.3					5
	10					6
	16					7
	Other *)					9

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

**) measuring resistor in tolerance class A only in four-wire connection

TABLE 2 - OVERVIEW OF THE SEALING RINGS OF TYPE 991 SUPPLIED FOR THE TEMPERATURE SENSORS

EXTERNAL CONNECTING THREAD OF TEMPERATURE SENSOR	SEALING RING			
	DIMENSION [mm] Ød x ØD x t	MATERIAL	NUMBER	ORDERING NUMBER
M20 x 1.5	21 x 27 x 2	copper thermally insulating insert	1 pcs	991 TK 21

The sealing ring is supplied to each sensor by default. The sealing ring can also be ordered separately using ordering number.

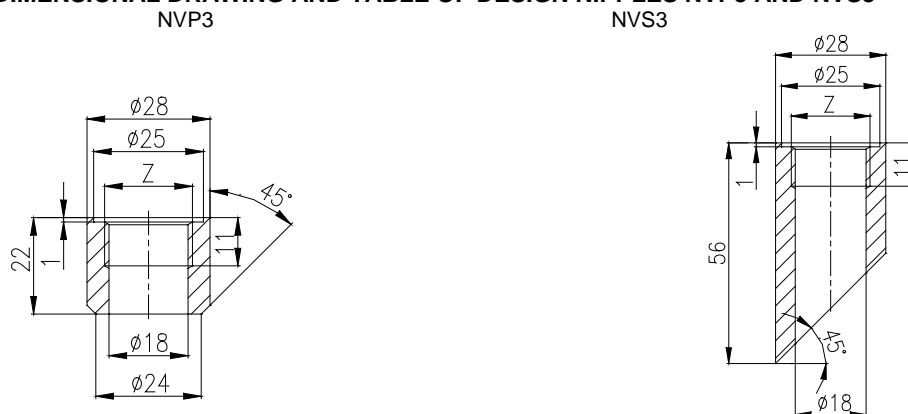
TABLE 3 - ACCESSORIES - OVERVIEW OF DESIGN AND ORDERING NIPPLES - TYPE 991

SPECIFICATION				ORDERING NUMBER				
				991	xxx	x	xxx	xx
Shape	Direct				NVP			
	Oblique (chamfer 45°)				NVS			
Design according to	Figure 2	PN	40			3		
	Other *)							
Internal thread	M20 x 1.5						M20	
Material	1.0308 **)	Maximum operation temperature [°C]	300					13
	1.4541		550					72
	Other *)							99

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

**) surface treatment of nipples: conservation by fat - by oil

FIGURE 2 – DIMENSIONAL DRAWING AND TABLE OF DESIGN NIPPLES NVP3 AND NVS3



Thread	Material	Ordering number
M20 x 1.5	1.0308	991 NVP3 M20 13
	1.4541	991 NVP3 M20 72

Thread	Material	Ordering number
M20 x 1.5	1.0308	991 NVS3 M20 13
	1.4541	991 NVS3 M20 72

INSTALLATION AND CONNECTION

INSTALLATION OF THE SENSOR

Put the enclosed sealing ring on the thermowell of the sensor. Install the sensor by screwing it into the nipple on the piping on the wall of the tank (technological equipment) etc. Operation position is discretionary; the cable gland shall not be situated upwards. During the installation, tightening torque of 50 Nm is recommended.

! WARNING

Distance of the fixed closure Ex db IIC from close structures or between the fixed closure shall be at least 40 mm. The sensor installation in the environment with explosive gaseous atmosphere shall be in compliance with the requirements of EN 60079-14.



ELECTRICAL CONNECTION

The electrical connection may be only realized by qualified workers.

The cable leading from the sensor must be connected to the certified a box or must be connected outside the danger zone.

**WARNING**

Cable gland of the sensor may not ensure sufficient attachment cable. The user must therefore ensure corresponding attachment cable so as to the prevent transmission tension from cable at connection.

The connecting cable is recommended to support.

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

The sensor not has to be independently connected at the interconnection system, if it is firmly attached and metallicly connected with the structural parts or pipe that is connected to the interconnection system.

**WARNING for a silicone cable**

The cable outlet of the sensor shall be protected against the impact of oil substances and organic solvents!

It is resistant to temperatures up to 180°C; its surface temperature shall comply with the temperature class of the sensor. Further on, the cable is resistant to ozone, UV radiation, fungi, diluted acids and alkali.

COMMISSIONING

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

**WARNING**

After the installation must be carried out initial the revision equipment and installation pursuant to EN 60079-17.

OPERATION AND MAINTENANCE

The sensor does not require any operation, pursuant to EN 60079-17 is carried out maintenance and subsequent regular periodic revision or continuous supervision by the specialist staff.

**WARNING**

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

All screws on the sensor and the cable gland, which secure the connection of parts of the fixed closure, shall be tightened properly.

SPARE PARTS

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

REPAIRS

The repairs of the sensor are not allowed by users themselves. The sensors shall be repaired by the manufacturer. They shall be sent for repair in the original or equal package without accessories.

WARRANTY

The warranty period is 24 months from the receiving of the product by the customer, unless established otherwise in the purchase contract or other document.

Rejection of defects shall be enforced in writing at the manufacturer within the warranty period. The rejecting side shall specify the product name, ordering and serial number, 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.

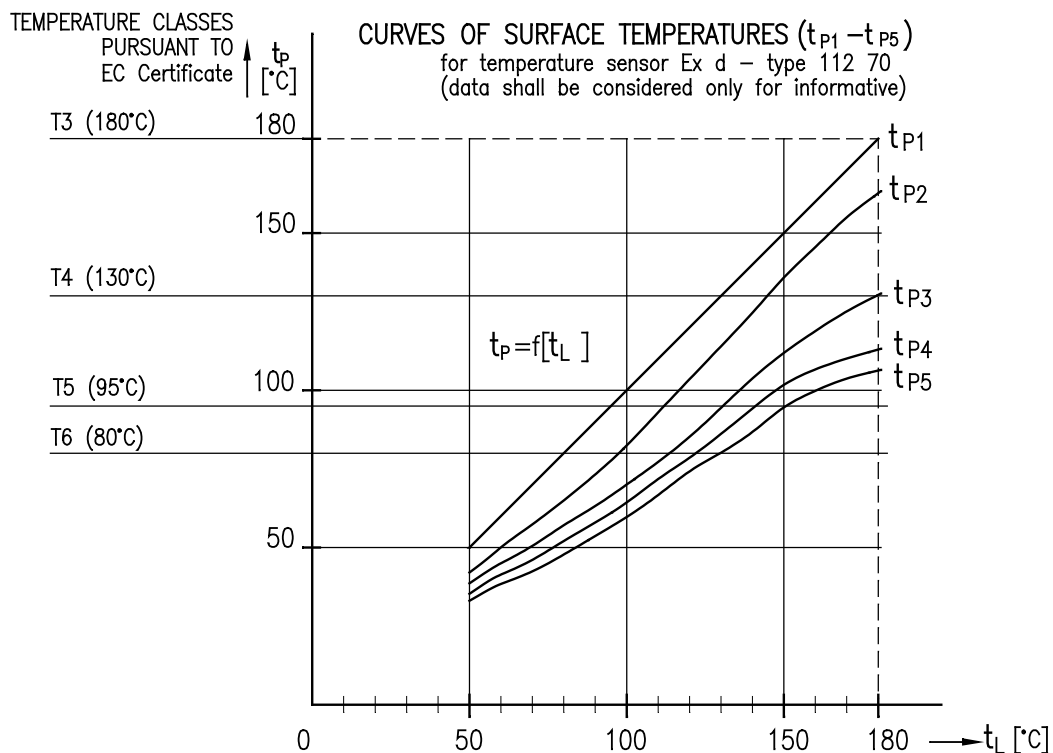
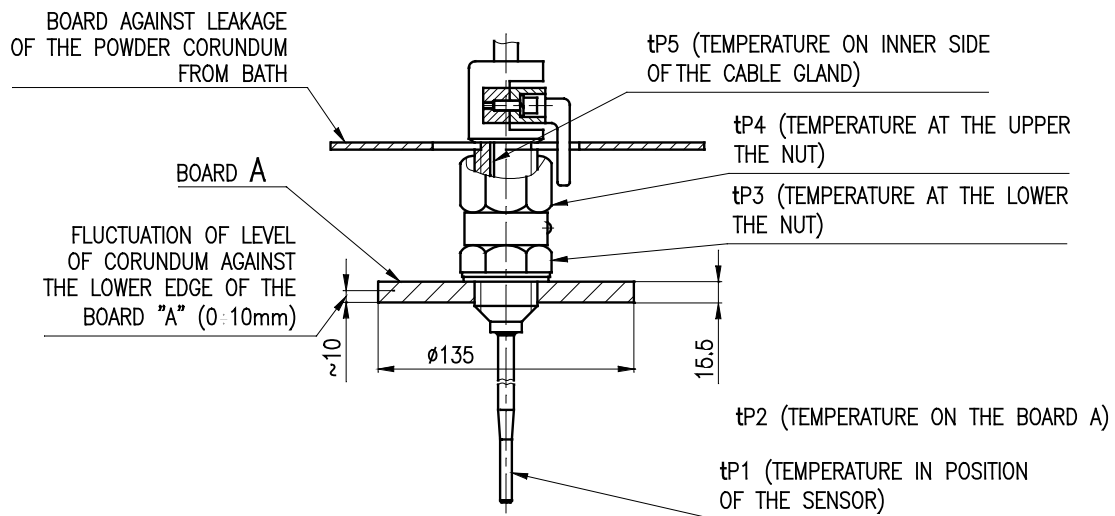
Products that are withdrawn from operation, including their packages (with the exception of products marked as electrical equipment for the purposes of return withdrawal and separate salvage of electrical waste), may be disposed of to sorted or unsorted waste pursuant to the type of waste.

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 product are recycled, non-recyclable plastic materials and electrical waste shall be disposed of in accordance with applicable legislation.

FIGURE 3 - GRAPH OF DEPENDENCY OF SURFACE TEMPERATURES ON THE TEMPERATURE OF THE MEASURED MEDIUM

Laboratory measurement in a fluid bath FB-08, immersion at least to the lower edge of the board "A" at ambient temperature approximately 22 °C.



t_p – temperature of surfaces on sensor in points $t_{p2} - t_{p5}$
 t_L – temperature of measured medium in the fluid bath
 t_{p1} – temperature of the thermowell in position of the sensor

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