Thermoelectric temperature sensor with metal protective tube without converter or with converter type series 350 type 351

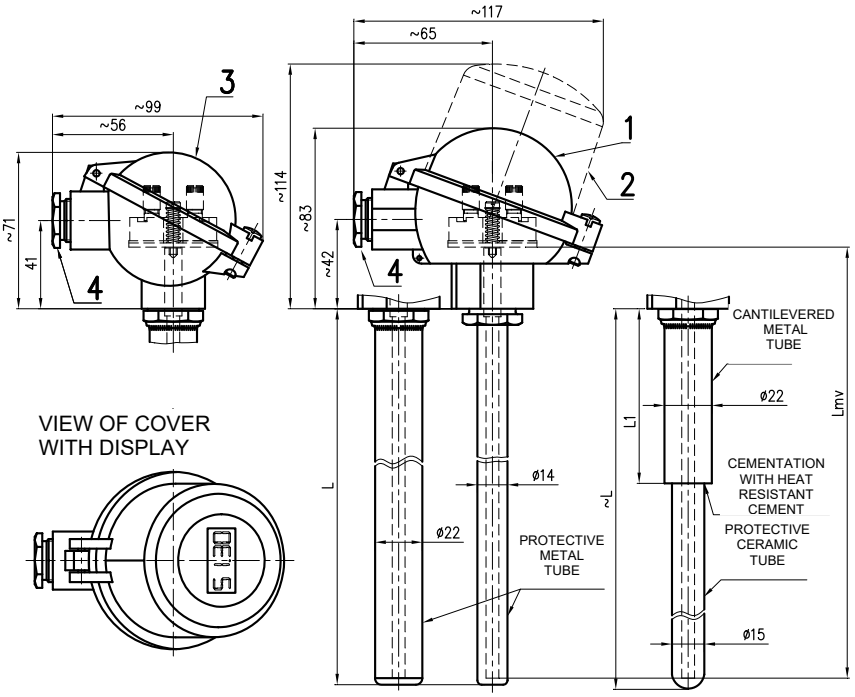
PRODUCT MANUAL

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 remote measurement of temperature of gases, for which the properties of the material of the protective tube are suitable (e.g. in furnaces)
- For explosive environment in areas Zone 2, Zone 1 and Zone 0 pursuant to EN 60079-10 -1 in case of application of the converter Ex ia or in case of connection to Ex ia circuit pursuant to EN 60079-25
- As a complete set with control or diagnostic systems for process monitoring
- Design with converter to convert the signal of the thermoelectric sensor to unified output signal 4 to 20 mA or digital signal (converter with HART protocol)
- Design with display to instantly display the value of the measured quantities
- 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 - **251000** is issued for them.



1 - *Ball head (Al alloy)*
(for converter Ex i with both external and internal terminals)
or plastic ball head
(It cannot be used for converter Ex i)
2 - *Ball head with increased lid (Al alloy)*
without display for converter in the lid or with display
(for converter Ex i with both external and internal terminals)
3 - *Small ball head (Al alloy)*
(only for terminal board or converter INPAL 420)
4 - *Cable outlet M20x1.5*
L *Nominal length*
L_{mv} *Length of measuring insert*

DESCRIPTION

The sensor consists of a replaceable measuring insert with a flange and a ceramic terminal board or installed two-wire converter (insulated or un-insulated, also in design Ex i) and protective armature consisting of a head and a protective tube. The head is provided with a lid and cable outlet for connecting wiring. The terminal board of the sensor (of the converter) is accessible after tilting away the lid of the head, which is connected with one screw. On the head, the sensor is provided with an external terminal for connection of the grounding wire or wire for mutual interconnection.
The sensor with converter in design Ex ia is provided on its head with both external and internal terminals for the connection of the grounding wire or wire for mutual interconnection. The converter is installed either directly on the flange of the measuring insert or in the lid of the head.
The sensor with converter is supplied from an external source. The installed converter is set-up to the required range at the sensor manufacturer.
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 dimensions are based on DIN 43772 and original ČSN 25 8301. The sensor is designed pursuant to EN 61140 as an electrical 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:
for thermocouple type "J" -200 to 800 °C
for thermocouple type "K" -200 to 1150 °C
For other type of thermocouple is limited by upper limit of measuring range by the resistance of this thermocouple.
The upper limit of the measuring range is limited by resistance of the material of the applied protective tube(see table 1 - Design of temperature sensors and table Application of protective tube material in Article OPERATION CONDITIONS.
Measuring range of the sensor with converter is given by 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)

Electric insulation resistance pursuant to EN 61515:
min. 1000 MΩ, at ambient temperature 20±15°C and max. 80% relative humidity

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 enclosed manual
Display: LED display to loop 4-20mA
other date refer to enclosed manual
Ingress protection pursuant to ČSN EN 60529:
sensor with metal protective tube IP65
sensor with ceramic protective tube IP65/IP60
(IP65 - head of sensor, IP60 – protective tube)

Sensor weight:
With ball head (Al alloy)

Nominal length L	
350 mm	approx. 0.96 kg
500 mm	approx. 1.10 kg
710 mm	approx. 1.28 kg
800 mm	approx. 1.36 kg
1000 mm	approx. 1.54 kg
1400 mm	approx. 1.89 kg
1600 mm	approx. 2.07 kg
2000 mm	approx. 2.42 kg

Operation position:
discretionary; the outlet shall not be situated upwards
Type of operation: continuous

Applied materials:

Protective tube	steel	1.4541
		1.4749
		1.4845 or 1.4841
	gas-tight ceramics	LUNIT 73 (content approx. 60 % Al_2O_3) corresponds to a subgroup C 610 pursuant to EN 60672-3)
		LUXAL 203 (content min. 99,5 % Al_2O_3) corresponds to a subgroup C 799 pursuant to EN 60672-3)
Measuring insert tube for thermocouple	J	steel 1.4541
	K	INCONEL 600
Cantilevered metal tube for ceramic tube		steel 1.4541
Head		aluminium alloy painted with polyester paint
		plastic PPO (phenyl polyoxide)
Sealing of cover of head and outlets		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 sensor head and outlet:
- for design without converter -50 °C to 120 °C
- for design with converter pursuant to type of the converter (refer to enclosed converter manual)
- for design with converter and display according to type of the converter and display (refer to enclosed converter and display manual)

Relative ambient humidity:
- for design without converter 10 to 100 % with condensation, with upper limit of water content 29 g H_2O/kg of dry air
- for design with converter pursuant to type of the converter
- (refer to enclosed converter manual)
- for design with converter and display according to type of the converter and display
- (refer to enclosed converter and display manual)

Atmospheric pressure: 70 to 106 kPa

Maximum speed of flow of gaseous medium: 2 m/s

Ambiances:

Nominal length L[mm]	350 to 1000	1400 to 2000
Frequency range [Hz]	10 to 55	
Drift amplitude [mm]	0.15	0.075
Acceleration amplitude [ms^{-2}]	19.6	9.8

Resistance of material of PPO (phenyl polyoxide) head:

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

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

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

Application of protective tube material:

Material	Resistance in the atmosphere			
	sulfuring		nitrogening, poor on oxygen	carbonizing
	oxidative	reductive		
1.4845 / 1.4841	good	low	good	satisfactory
1.4749	very good	good	low	low
1.4541	good	low	good	satisfactory
LUNIT 73 *)	very good (suitable for alkaline-free gases and hydrofluoric acid)			
LUXAL 203 *)	very good (contact with alkali vapors allowed to 1500 °C)			

Degree of resistence: 1 – very good 3 – satisfactory (middle)
2 – good 4 - low (unsatisfactory)
The highest temperature of use may be less than 200 ° C in atmospheres than hot air, as shown in Table 1
*) material suiteble for abrasive media, highly chemically resistant and refractory, very fragile, resistance against sudden change of temperature min. 150 K, bending strength for LUXAL 203 is min. 300 MPa, for LUNIT 73 min. 120 MPa

METROLOGICAL DATA

Sensing probe: measuring thermocouple **J** (Fe-CuNi) or **K** (NiCr-NiAl) pursuant to EN 60584-1, Ø 6 mm, tolerance class 2 or 1, single with insulated measuring connection or double with independent measuring connection
Output signal
of analogue converter (linear with thermoelectric voltage):
4 to 20 mA
of programmable converter (linear with measured temperature):
4 to 20 mA (+ digital for HART protocol)
Calibration depth of immersion of the measuring insert of the sensor
for temperature points within the range from -70 to 250°C:
200 mm (min. 160 mm)
for temperature points over 250°C:
300 mm (min. 260 mm)
The distance of the flange of the measuring insert from the medium level in the calibration bath shall be at least 40 mm at temperatures up to 250°C and min. 70 mm at temperatures over 250°C.

Temperature response time pursuant to EN 60751 in whirling water

for tube ø 14 mm (characteristic value):	$\tau_{0.5}$	75 s
	$\tau_{0.9}$	90 s
for tube ø 22 mm (characteristic value):	$\tau_{0.5}$	90 s
	$\tau_{0.9}$	370 s

DESIGNATION:

Data on head label
- Trademark of the manufacturer
- Made in Czech Republic
- Type of the thermoelectric sensor / tolerance class
- Measuring range or adjustable range of the converter
- Product ordering number
- Ingress protection
- Time code (Serial number for calibrated design, design with tolerance class A, design with converter)
- Output signal 4 to 20 mA (design with converter)
- Ambient temperature
- Designation of non-explosiveness and EU-Type Examination Certificate number (for design with converter Ex i)
- CE mark with identification number of the notified person (for design with converter)

Data on label of measuring insert
- Trademark
- Type of sensor
- Time code (Serial number for calibrated design, design with tolerance class A, design with converter)

Data on converter label
- Trademark
- Type of sensor
- Set-up temperature range
- Designation of non-explosiveness and EU-Type Examination Certificate number (for design with converter Ex i)
- CE mark with identification number of the notified person (for design with converter)

Data on display
- Trademark
- Designation of non-explosiveness and EU-Type Examination Certificate number (for design with converter Ex i)
- CE mark with identification number of the notified person (for design with converter

DELIVERY

Unless agreed otherwise with the customer, each delivery includes
- Delivery note
- Sensor pursuant to the purchase order
- Separately ordered accessories:
  - o Connecting flange or nipple with threaded ring, Instruction label is delivered with each nipple with a threaded ring
- Optional accessories to sensor with programmable converter
  - o Configuration (parameterization) programme pursuant to the required converter
  - o Communication modem (for serial port RS 232C) pursuant to the required converter
- Accompanying technical documentation in Czech
  - o Product quality and completeness certificate, which also serves as the warranty certificate
  - o EU Declaration of Conformity for design with converter Ex ia
  - o Calibration sheet (for uncertified calibrated design)
  - o Product manual

If it is established in the purchase contract or agreed otherwise, the following documentation can be also delivered with the product
- EU Declaration of Conformity (for design with converter)
- Copy of the Inspection Certificate 3.1 acc to EN 10204 for material of protective tube and tube with the heat number
- Declaration of Conformity with purchase order 2.1 acc. to EN 10204
- Copy of EU-Type Examination Certificate pursuant to the 2014/34/EU (ATEX 114). for design with converter Ex ia
- Test report about the seismic and the vibration qualification
- Declaration of Conformity of the supplier pursuant to EN ISO/IEC 17050-1

CERTIFICATION

- Non-explosiveness Ex i, EU-Type Examination Certificate pursuant to the 2014/34/EU (ATEX 114), (pursuant to the type of the converter and display)

PACKING

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

TRANSPORT

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

STORAGE

The sensors may be stored on conditions corresponding to the set of combinations of classes IE 21 pursuant to EN 60721-3-2 (i.e. in airplanes and trucks, in ventilated areasand protected against weather).

RELIABILITY

Indicators of reliability in operation conditions and ambient conditions specified herein
- Medium time of operation between failures 96 000 hours (inf. value)

Expected service life 10 years

ORDERING TEMPERATURE SENSORS

The purchase order shall specify
- Name
- Product ordering number
- Additional requirements for sensor design according to Table 2
- Request for additional documentation according to the Table 2
- Measuring range
- If calibration is required and in what temperature points
- If as sparely ordered accessories by type 991 the connecting flange or nipple with threaded ring is required to supply
- If optional accessories to the sensor with programmable converter is required
- Requirement for other documentation pursuant to Article DELIVERY
- Other (special) requirements
- Number of pieces

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

PURCHASE ORDER EXAMPLE

Standard design :

Thermoelectric temperature sensor with metal protective tube without converter
351 401 131 K2/JI/Q42
Calibration points 600, 800 a 1000°C
Range -200 to 1100°C
6 pcs

Special requirement:

Thermoelectric temperature sensor with metal protective tube with converter
351 901 131 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

PURCHASE ORDER EXAMPLE

Standard design:

Connecting flange
991 UP 14
5 pcs

TABLE 1 - DESIGN OF TEMPERATURE SENSORS WITH METAL PROTECTIVE TUBE, TYPE 351

SPECIFICATIONS						ORDERING NUMBER									
						351	x	x	x	x	x	x	x	x	/xxxxxx	/xxx
Nominal length L [mm]	350	Length of measuring insert L_{mv} [mm]	375	Length L1 [mm]	200		1									
	500		525				2									
	710		735				3									
	800		825				4									
	1000		1025		400		5									
	1400		1425				6									
	1600		1625				7									
	2000		2025				8									
	Other (max. 3000, ceramic tube max. 1600) *)						9									
Extension length	Without extension							0								
Material of protective tube and maximum measuring range of sensor ***)	1.4845 or 1.4841 -200 to 1100°C								1							
	1.4541 **) -200 to 800°C								2							
	1.4749 (only for Ø 22 mm) -200 to 1100°C								3	2						
	LUNIT 73 0 až 1300°C (short time 1500°C)								6	5						
	LUXAL 203 0 až 1600°C (short time 1800°C)								7	5						
	Other *)								9							
External ø of protective tube [mm]	14									1						
	22									2						
	22 cantilevered metal tube, 15 ceramic tube								6	5						
									7							
Sensor head	Ball (Al alloy) (for converter Ex i with both external and internal terminals)										3					
	Ball, plastic (it cannot be used for converter Ex i)										4					
	Ball head with increased lid (Al alloy) without display for converter in the lid or with display (for converter Ex i with both external and internal terminals)										5					
	Ball, small (Al alloy) (only for terminal board and converters APAQ-HCF, MINIPAQ-HLP)										6					
	Other *)										9					
Measuring insert tube for sensor with protective tube (Ø6 ± 0,1 mm)												1				
Thermocouple	K												K			
	J												J			
	Other *)												9			
Accuracy class	1 *)													1		
	2													2		
Design of measuring ends of thermocouple pursuant to figure 3	Single thermocouple, insulated end														/JI	
	Double thermocouple, independent end														/DU	
Converter (design of measuring ends of thermocouple: Single thermocouple, insulated 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	•		Programm-able range										/TH200	
		TH 200-ex	•	•											/TH200X	
		IPAQ-H	•												/IPAQH	
		IPAQ-HX	•	•											/IPAQHX	
		MINIPAQ-HLP													/MINIPAQ	
	Programmable with HART protocol linear output signal with temperature	TH 300	•												/TH300	
		TH 300-ex	•	•											/TH300X	
		MESO-H	•												/MESOH	
		MESO-HX	•	•											/MESOHX	
		248 HA NA	•												/248HANA	
		248 HA I1	•	•											/248HAI1X	
		644 HA NA	•								5				/644HANA	
		644 HA I1	•	•											/644HAI1X	
	Other *)														/99	
	Without converter (for installation of the converter by customer)														/00	
LED display to loop 4-20mA	LED display LPI-01 (only with converter, except 644 HANA)										5					/LD
	LED display Ex ia *) (only with converter Ex ia, except 644 HAI1X)															/LDX

Standard design

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

**) thermowells of this material are suitable for contact with food

***) **WARNING**

Upper limit of measuring range is limited by the resistance used thermocouple (max. 1150°C for thermocouple **K**, max. 800°C for t thermocouple **J,** for other type of thermocouple is limited by upper limit of measuring range by the resistance of this thermocouple), the upper limit of the range is considered in hot air

TABLE 2 – ADDITIONAL REQUIREMENT FOR DESIGN OF TEMPERATURE SENSORS WITH METAL PROTECTIVE TUBE, TYPE 351

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		/EU
Copy of EU-Type Examination Certificate acc to the 2014/34/EU (ATEX 114)		for converter and display Ex ia		/Exi
Copy of the Inspection Certificate 3.1 acc to EN 10204 for material of protective tube with the heat number				/3.1
Declaration of Conformity with purchase order 2.1 pursuant to EN 10204				/2.1

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

TABLE 3 - ACCESSORIES - to be ordered separately

SPECIFICATIONS			ORDERING NUMBER
Connecting flange	for protective tube Ø 14 mm		991 UP 14
	for protective tube Ø 22 mm or cantilevered metal tube of ceramic tube Ø 15 mm		991 UP 22
Nipple with threaded ring for protective tube Ø 14 mm	material	carbon steel 1.0122	991 NVP6 D14 13
		stainless steel 1.4541	991 NVP6 D14 72
Nipple with threaded ring for protective tube Ø 22 mm or cantilevered metal tube of ceramic tube Ø 15 mm		carbon steel 1.0122	991 NVP6 D22 13
		stainless steel 1.4541	991 NVP6 D22 72

CALIBRATION

It is realized pursuant to TPM 3322-94 and in compliance with EN 60584-1 usually in three temperature points evenly distributed within the operation range of the sensor or in the points according to the requirement of the customer. Calibration sheets with measured data are issued for calibrated sensors.

INSTALLATION AND CONNECTION

SENSOR INSTALLATION

The sensor installation is realized by means of a connecting flange or by means of a nipple with a threaded ring.

SENSOR WITH METAL PROTECTIVE TUBE INSTALLATION

For high temperatures, we recommend installing the sensor in a vertical position

SENSOR WITH CERAMIC PROTECTIVE TUBE INSTALLATION

WARNING
Fix sensor to the cantilevered metal tube!

Install the sensor so that the cement joint is out of reach of high temperatures due to the different thermal expansion of the cantilevered metal tube and the ceramic protective tube.
When installing or changing the sensors during operation, slide them in and out of the high-temperature environment gradually (about 20 mm in 1 minute) to avoid rupture ceramic protective tubes due to thermal stress caused by a rapid temperature change.
If slow sensor movement is not possible, ensure at least its slow and even preheating.

FLANGE INSTALLATION

Weld the bottom part of the flange into the wall of the technological equipment. In the connecting flange, you can move the sensor after releasing two screws M6x14, whereby you can achieve the required immersion of the sensor.

INSTALLATION OF THE NIPPLE WITH A THREADED RING

shall be made pursuant to the instructional label as follows:

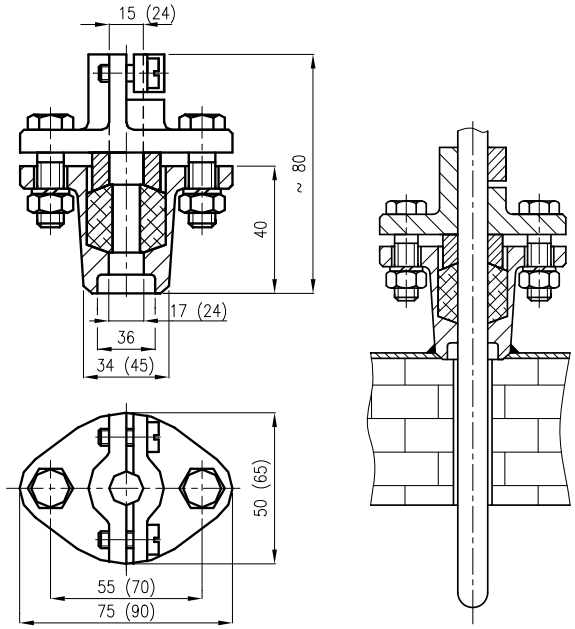
1. Uninstall the complete nipple by unscrewing the cap-nut.
2. Weld the nipple itself (after possible shortening) onto the wall of the piping or other technological equipment.
3. Put the following pieces on the metal protective tube of the temperature sensor in the said order: cap-nut, thrust ring and threaded ring.
4. Insert the temperature sensor with put-on pieces pursuant to point 3 into the prepared nipple and only after the definitive selection of immersion, tighten it duly with a torque wrench (torque 60-70 Nm for tube diameter 14, 100 Nm for tube diameter 22).

WARNING:
The length of the immersion part cannot be changed repeatedly; the sensor can only be uninstalled!

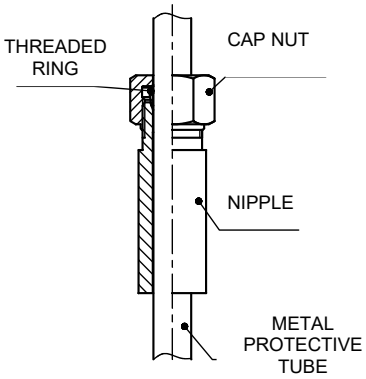
With respect to maintaining metrological properties and the longest possible service life, it is not recommended to install the sensors in places with high turbulence of the medium, which is caused e.g. by a rapid transition from a small diameter of the piping to a larger one (when failing to comply 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.

CONNECTING FLANGE 991 UP 14 A 991 UP 22

(quotation for 991 UP 22 in parentheses)



WELD-ON PIECE WITH THREADED RING



ELECTRICAL CONNECTION

The terminal board of the sensor (converter) is accessible after tilting away the lid of the head, which is connected with one screw.
Connect the evaluation devices to the sensor with a non-armoured cable with double insulation with outer diameter 5 to 8 mm, internal wires with Cu core (sensor with converter) or compensation wiring (sensor without converter) with cross section 0.5 to 1.5 mm^2). Seal the cable outlet of the sensor adequately.

WARNING

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

The cable insulation shall have chemical and mechanical resistances in compliance with the conditions, in which the cable will be installed. It is recommended supporting the cable along its length between the sensor and the follow-up device. In the environment with interfering signals, use shielded cable in the power supply circuit. Shielding may be only grounded (earthed) in one point. The cable should not be placed together with power cables.
In case of the sensor with HART protocol converter, the maximum length of wiring is defined by the arrangement of wires of the connecting cable. The total length of wiring may be up to 1500 m. It requires a twisted two-wire with shared shielding with the diameter of the cross section of the core min. 0.5 mm^2. The HART communicator is connected to the supply loop of the sensor with converter pursuant to Figure 1.
To achieve reliable communication, the total load resistance of min. 250 Ω shall be in the circuit of the output loop.

INSTALLATION OF THE SENSOR WITH CONVERTER Ex i IN ENVIRONMENT WITH EXPLOSIVE GASEOUS ATMOSPHERE

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

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.

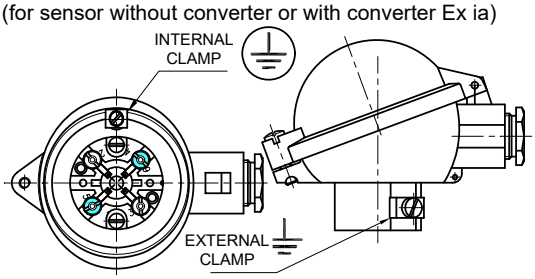
In case of installation of intrinsically safe circuits, including cables, the maximum permitted inductance, capacity or ratio L/R and surface temperature may not be exceeded. Permitted values can be found out in the documentation of the follow-up equipment or label with the designation. Locate the follow-up 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, e.g. INAP 901 ordering No. 901 000 101. If a LED display is required, it must be in the design Ex ia.

WARNING

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

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 without converter or with converter Ex ia)



Maximum cross-section of wire for connection to external and internal terminals:
Internal terminal: stranded wire 1.5 mm^2, full wire 2.5 mm^2
External terminal: stranded wire 4.0 mm^2, full wire 6.0 mm^2
If stranded wires are used for the interconnection, they shall be protected against fraying with pressing hollow.

COMMISSIONING

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

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 (converter) is accessible after tilting away the lid of the head, which is connected with one screw.
The measuring insert of the sensor is replaceable and is uninstalled from the head after disconnecting the cable by releasing two screws.
If the sensor is connected to the system of interconnection, the wire for mutual interconnection shall be released from the terminal on the head of the sensor before the complete uninstallation of the sensor.
After releasing the screws on the connecting flange (unscrewing the nut on the weld-on piece with threaded rings, remove the sensor.

SPARE PARTS

Spare parts shall be delivered by the manufacturer.

Relevant measuring inserts can be ordered pursuant to the following table:

SPECIFICATIONS		ORDERING NUMBER					
		MV350	/xxx/	1	x	x	/xxxx
Length of measuring insert [mm]			acc. to table 1	1			
Sensing probe	Thermocouple **K**				K		
	Thermocouple **J**				J		
	Other thermocouple*)				9		
Accuracy class	1					1	
	2					2	
Connection of terminal board and design of measuring ends of the thermocouple or converter	Single thermocouple insulated end						/JI
	Double thermocouple independent end						/DU
	Converter acc. to tab. 1						/converter

*) Only as a special request after agreement with the manufacturer

PURCHASE ORDER EXAMPLE OF MEASURING INSERT

Thermoelectric measuring insert without converter
MV350 /735/ 1K2/JI
6 pcs

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 quality and completeness certificate, which also serves as the warranty certificate
  - o EC Declaration of Conformity (for design with converter Ex ia)
  - o Calibration sheet (for calibrated design)
  - o Declaration of Conformity of the supplier according to ČSN EN ISO/IEC 17050-1 (for orders according to the Decree 132/2008 Coll.)
  - o Product manual

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)
- Copy of EC Type Examination Certificate according to the Decree of the Government 23/2003 Coll. (ATEX) 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.

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.
Products that are withdrawn from operation, including their packages (with the exception of products marked as electrical equipment for the purposes of return withdrawal and separate salvage of electrical waste), may be disposed of to sorted or unsorted waste pursuant to the type of waste.
The manufacturer realizes free return withdrawal of marked electrical equipment (from 13.8.2005) from the consumer and points out the danger connected with their illegal disposal. The package of the sensor can be recycled completely. Metal parts of the products are recycled, non-recyclable plastic materials and electrical waste shall be disposed of in accordance with applicable legislation.

FIGURE 1 – EXAMPLE OF OPERATION CONNECTION OF TEMPERATURE SENSOR WITH CONVERTER IN LOOP 4 - 20 mA

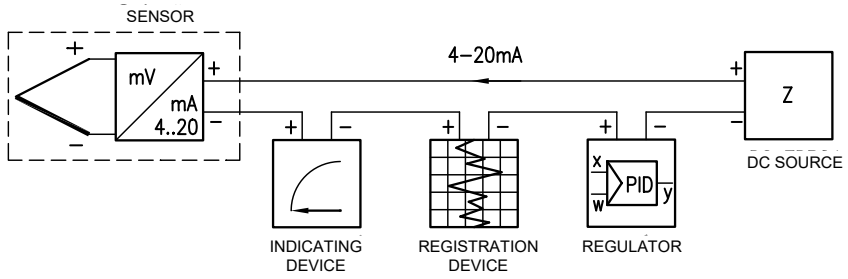
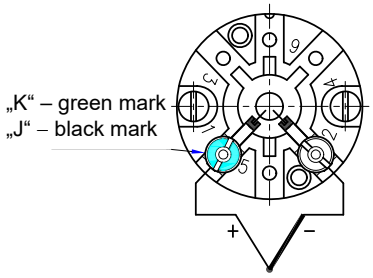


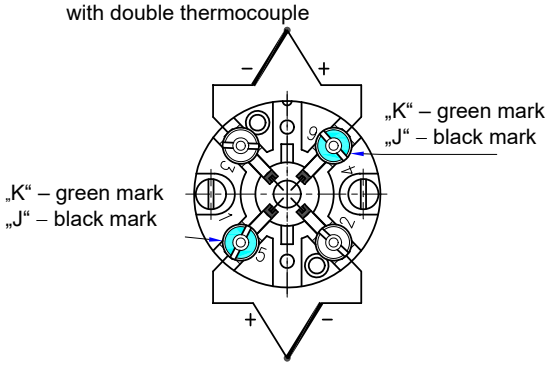
FIGURE 2 - SCHEME OF CONNECTION OF TEMPERATURE SENSORS

SCHEME OF CONNECTION WITHOUT CONVERTER

with single thermocouple



with double thermocouple



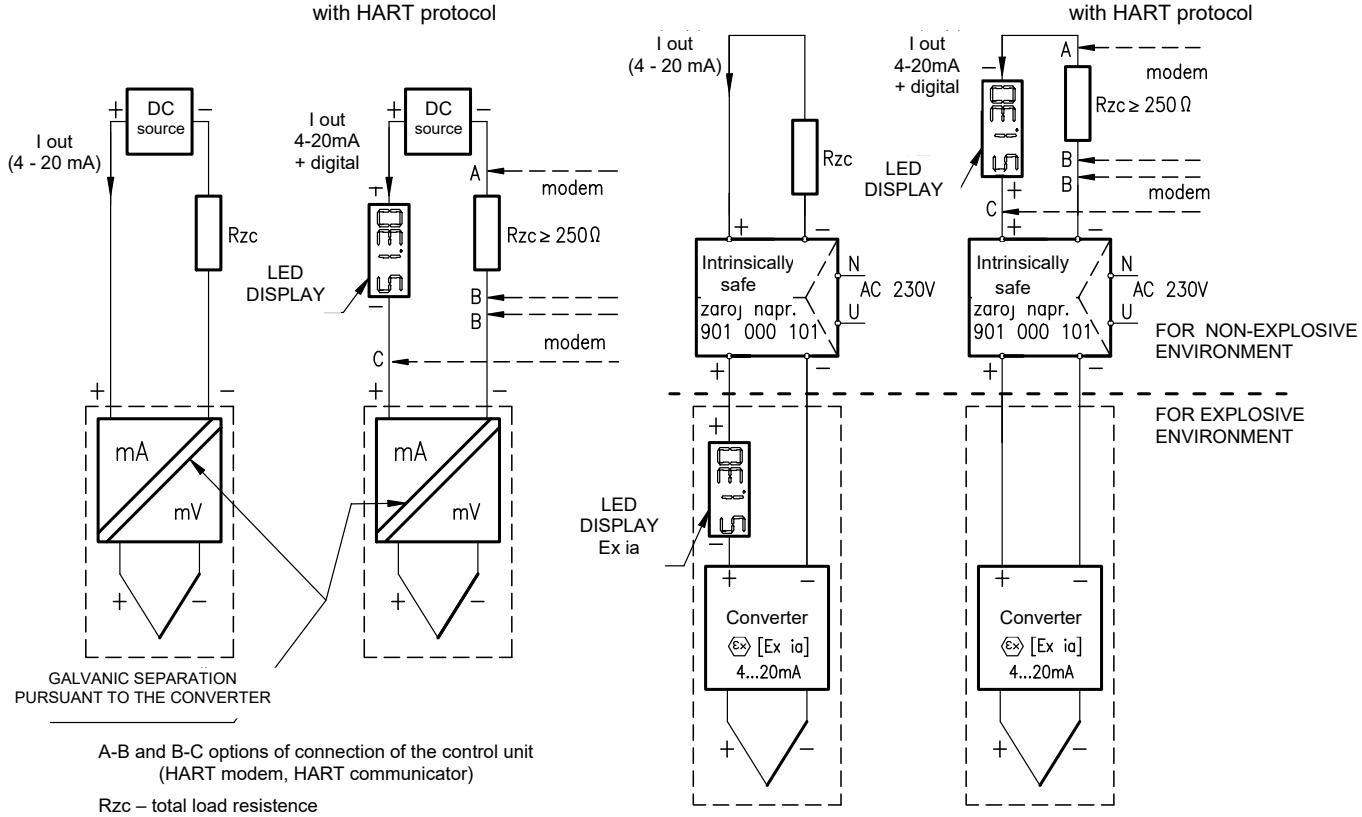
SCHEME OF CONNECTION WITH CONVERTER AND DISPLAY

without converter

with converter with HART protocol

with converter Ex ia

with converter Ex ia with HART protocol

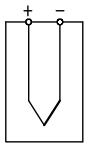


A-B and B-C options of connection of the control unit (HART modem, HART communicator)

Rzc – total load resistence

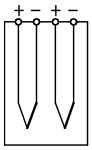
FIGURE 3 - DESIGN OF MEASURING ENDS OF JACKETED THERMOCOUPLES (SCHEMATIC ILLUSTRATION)

INSULATED END
design I
(standard for single design)



JI

INDEPENDENT END
design U
(standard for double design)



DU

November 2017

Notified Person No
by Type of Converter

ZPA Nová Paka, a.s.
Pražská 470
509 39 Nová Paka

tel.: spojovatel: 493 761 111
fax: 493 721 194
e-mail: obchod@zpanp.cz

www.zpanp.cz
bankovní spojení: ČSOB HK
číslo účtu: 271 992 523/300

IČO: 46 50 48 26
DIČ: CZ46504826