



Resistance temperature sensor with thermowell PN 16, with high mechanical resistance without converter type 112 80 with converter type 112 80/P

FOR DESIGN WITH CONVERTER A MANUAL IS ENCLOSED TO THE RELEVANT CONVERTER

APPLICATION

- For remote measurement of temperature of steady and flowing liquids (gases and fluids), for which properties of the thermowell of the sensor are suitable; measurement may be realized up to the temperature determined by thermowell resistance and nominal pressure PN 16.
- For environment requiring seismic resistance from 1 Hz to 33 Hz, acceleration 3g, (design without converter)
- For explosive atmosphere 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 pursuant to EN 60079-25

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 -112800** is issued for the sensors without converter and **EU -11280P** for the sensors with converter.

DESCRIPTION

The sensor consists of a thermowell with adapter and screw-joint for the connection of the sensor to the sleeve of the piping (technological equipment and is firmly connected with the heat with the terminal board or installed two-wire converter (insulated or non-insulated, even in design Ex ia). The head is provided with a lid and sealing outlet for the connection wiring. The stem tube, into which the measuring resistor with internal wiring is inserted, is welded with the tube of the adapter in the place of the connecting screw-joint and, as a unit, it forms the thermowell of the sensor. The sensor has no replaceable measuring insert; therefore, it is forbidden to turn the head and dismantle it.

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 sensor resistance in dependence on the change of temperature of the measured environment is used.

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: -70 to 400°C

In case of application without overpressure, the sensor with internal wiring from a special alloy may be used up to 600°C.

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 sensor without converter or design with insulated converter)

Electric insulation resistance pursuant to EN 60751:

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

Power supply of converter:

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

Other data of converter: refer to enclosed manual

Nominal pressure pursuant to ČSN 13 0010: PN 16

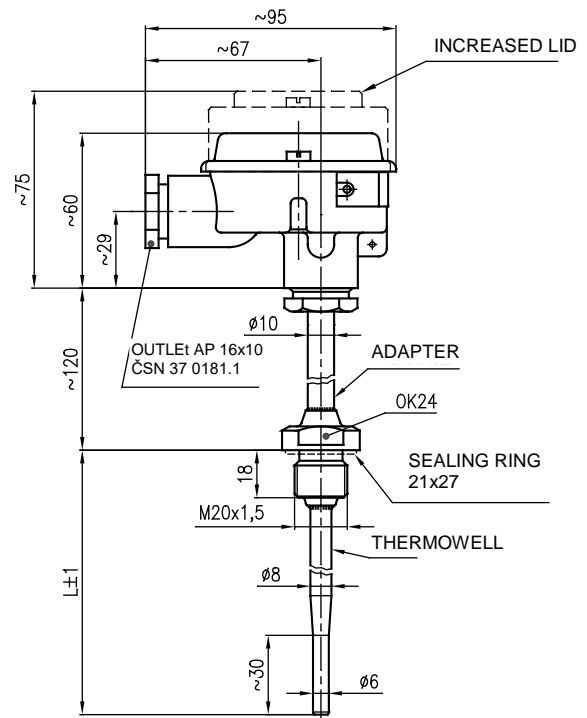
Ingress protection pursuant to EN 60529: IP 65

Sensor weight: L 160 approx. 0.42 kg
L 250 0.44 kg

Operation position:

discretionary; the outlet shall not be situated upwards

Type of operation: continuous



Applied materials:

Thermowell	steel 1.4541
Adapter	steel class 11 zinc plated
Head	chromated aluminium alloy and painted with aluminium paint
Head clamps of terminal board	brass with Ni surface
Internal wiring	Ag or special alloy (Ag only for design without converter)

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:

for design without converter	max. 150 °C
for design with converter	pursuant to the type of converter (refer to enclosed manual)

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:

Air and gas:	25 m/s
Water:	3 m/s

Vibrations:

For nominal length of thermowell L 160 mm	L 250 mm
Frequency range:	10 to 500 Hz 10 to 500 Hz
Drift amplitude	0.2 mm 0.15 mm
Acceleration amplitude	29.4 ms ⁻² 19.6 ms ⁻²

METROLOGICAL DATA

Sensing probe: measuring resistor Pt 100 single or double pursuant to the scheme of connection 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 at 20 °C:

Ag	0.053 Ω/m ± 10 %
special alloy	2.45 Ω/m ± 5%

The measured resistance value of internal wiring is specified on the label of the sensor for the design without converter.

Maximum current load of measuring resistor: 5 mA
Recommended measuring current: 1 mA
Output signal of the converter (linear with measured temperature): 4 to 20 mA (+ digital for HART protocol)
Calibration depth of immersion: 100 mm
Temperature response time pursuant to EN 60751 in whirling water (characteristic value): $\tau_{0,5}$ 4.5 s
 $\tau_{0,9}$ 12.7 s

DESIGNATION:

Data on head label

- Trademark of the manufacturer
 - Made in Czech Republic
 - Type of resistance sensor, nominal value R_0 / tolerance class / configuration of wires of internal wiring *)
 - Resistance value of internal wiring (for design without converter)
 - Measuring range or pre-set converter range
 - 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)
 - Mark of non-explosiveness and No. of EC-Type Examination Certificate for converter Ex ia
- *) Configuration of wires of internal wiring is not specified for the 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 ia)
- CE mark with identification number of the notified person (for design with converter)

Data on sensor head

- CE mark (for design with converter)

CERTIFICATION

112 80/P

- Non-explosiveness Ex ia, EU-Type Examination Certificate pursuant to the 2014/34/EU, (pursuant to the type of the converter)

DELIVERY

Unless agreed otherwise with the customer, each delivery includes

- Delivery note
- Sensor pursuant to the purchase order
- Sealing ring 21x27 TDP 62-014-91.21
- Suitable nipple ordered independently from the catalogue of accessories, type 991;
- Optional accessories to the sensor with programmable converter
 - o Configuration (parameterization) programme pursuant to the required converter
 - o Communication modem (for serial port RS 232C) pursuant to the required converter
- Accompanying technical documentation in Czech
 - o Product manual
 - o Product quality and completeness certificate, which also serves as the warranty certificate
 - o EU Declaration of Conformity (for converter Ex ia)
 - o Calibration sheet (for calibrated design)

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 the thermowell material with the heat number
- Supplier's declaration of conformity pursuant to EN ISO/IEC 17050-1
- EU Declaration of Conformity (for converter)
- Copy of EU-Type Examination Certificate pursuant to the Directive No 2014/34/EU (ATEX). for design with converter Ex ia
- Test report about the seismic and the vibration qualification

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

CALIBRATION

The calibration is realized pursuant to TPM 3342-94 and in compliance with EN 60751, 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 60721-3-2 (i.e. by airplanes and trucks, in premises that are ventilated and protected against atmospheric conditions).

STORAGE

The sensors may be stored on conditions corresponding to the set of combinations of classes IE 11/1K3 pursuant to EN 60721-3-1 (i.e. in places with temperature from -5 to 45 °C and humidity from 5 to 95%, without a special threat of an attack with biological agents, with vibrations of small significance and not situated close to sources of dust and sand).

ORDERING TEMPERATURE SENSORS

The purchase order shall specify

- Name
- Product ordering number
- Measuring range (for a different range)
- If calibration is required and in what temperature points
- If a delivery of a nipple pursuant to the type 991 is required for the sensor as accessories
- If optional accessories to the sensor with programmable converter are required
- Other (special) requirements
- Number of pieces

PURCHASE ORDER EXAMPLE

Standard design:

Resistance temperature sensor with thermowell PN 16, with high mechanical resistance
 112 805 712
 6 pcs

Special request:

Resistance temperature sensor with thermowell PN 16, with high mechanical resistance
 112 805 699
 L = 200 mm
 6 pcs

ORDERING ACCESSORIES

The purchase order shall specify:

- name
- ordering number
- number of pieces

PURCHASE ORDER EXAMPLE

Standard design:

Direct nipple
 991 NVP2 M20 13
 6 pcs

Special request:

Oblique nipple
 991 NVS2 M20 99
 Material 1.0577
 6 pcs

TABLE 1 - DESIGN OF TEMPERATURE SENSORS WITH THERMOWELL PN 16, TYPE 112 80

SPECIFICATIONS			ORDERING NUMBER					
			112 80	5	x	x	x	
Measuring range -70 to 400 °C internal wiring Ag	Measuring resistor pursuant to EN 60751, tolerance class B	Pt 100/B/2			7	1		
		2 x Pt 100/B/2			8	1		
Measuring range -70 to 400 °C internal wiring of special alloy (when using the sensor without overpressure to 600°C)		Measuring resistor pursuant to EN 60751, tolerance class A	Pt 100/B/4			6	2	
			Pt 100/B/4C			7	2	
2 x Pt 100/B/2					8	2		
Pt 100/A/4 *)					6	9		
Nominal length L [mm]		Pt 100/A/4C *)			7	9		
		100 *)					1	
		160					2	
		250					3	
		Other, max. 1000 mm *)					9	

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

TABLE 2 - DESIGN OF TEMPERATURE SENSORS WITH THERMOWELL PN 16 WITH CONVERTER, TYPE 112 80/P

SPECIFICATIONS				ORDERING NUMBER					
				112 80	9	x	0	x	/xxxx
Measuring resistor pursuant to EN 60751, tolerance class B or A		Pt 100/B			B				
		Pt 100/A *)			A				
Nominal length L [mm]		100 *)					1		
		160					2		
		250					3		
		Other, max. 1000mm*)					9		
Type of converter	Galvanic separation	Increased lid	Ex ia	Range [°C]					
Analogue	INPAL 420				-50 to 50				/07
					-30 to 70				/55
					0 to 50				/15
					0 to 100				/18
					0 to 150				/19
					0 to 200				/20
					0 to 250				/21
					0 to 400				/23
	APAQ-HRF				Adjustable range			/HRF	
	APAQ-HRFX		•					/HRFX	
Programmable	TK-L				Programmable range				/TKL
	TK-L-ex			•					/TKLX
	TK	•							/TK
	TK-ex	•		•					/TKX
	IPAQ-H	•							/IPAQH
	IPAQ-HX	•		•					/IPAQHX
	MINIPAQ-HLP								/MINIPAQ
	IPAQ C330	•		IPAQ C330					/C300X
IPAQ C330X	•	•	IPAQ C330X				/TH300		
HART protocol	TK-H	•						/TKH	
	TK-H-ex	•		•				/TKHX	
	MESO-H	•						/MESOH	
	MESO-HX	•		•				/MESOHX	
Other *)			•					/99	
Without converter (for installation of converter by customer)			•					/00	

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

Note: As a default, the sensors are delivered with converter INPAL 420 and specified default ranges. When another range is required, converter APAQ-HRF is used as a default. Specify the required temperature range for in the purchase order in wording. Minimum range of measured temperature shall be entered pursuant to the parameters of the converter. The lower limit of the temperature range is -40°C, the upper limit of the range is 600°C.

TABLE 3 - 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 4 - 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	Figure 1	PN	40			1		
	Figure 2					3		
	Other *)					9		
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 1 - DIMENSIONAL DRAWING OF NIPPLES

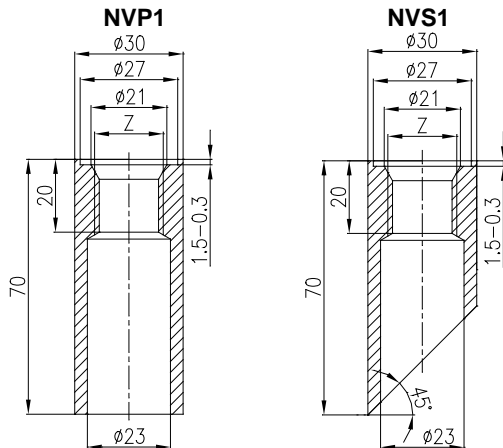
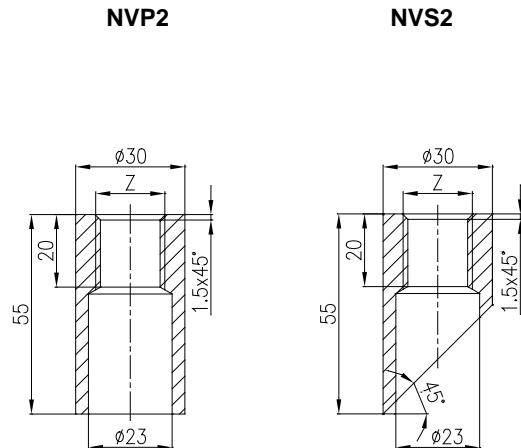


FIGURE 2 - DIMENSIONAL DRAWING OF NIPPLES



INSTALLATION AND CONNECTION

SENSOR INSTALLATION

Put the enclosed sealing ring on the thermowell of the sensor and install the sensor by screwing into the nipple on the piping (technological equipment). During the installation, torque of 70 Nm is recommended.

Recommended applications of nipples:

- Direct nipple
 - for piping DN 65 to DN 250 (vertical installation)
- Oblique nipple
 - for piping ≤ DN 50 (oblique installation or installation in bent)

Examples of nipple applications are provided in Figure 4.

! WARNING

The sensor has no replaceable measuring insert; therefore, during the installation and operation of the sensor the head and the thermowell of the sensor may not be turned towards each other – possibility of interruption of internal wiring!

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.

ELECTRICAL CONNECTION

The electrical connection may be only realized by qualified workers.

The terminal board of the sensor (converter) is accessible after the removal of the lid of the head, which is connected with two screws. During the installation, it is necessary to remove the metal label with internal wiring resistance value of sensors with internal wiring made of a special alloy; the label is connected on one of the terminals in the head of the sensor.

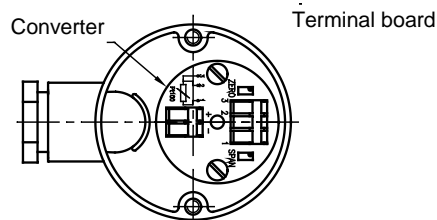
Connect the evaluation devices to the sensor with a cable with double insulation with outer diameter from 5 to 12 mm (internal wires with Cu core with cross section 0.5 to 2.5 mm²). Seal the cable outlet of the sensor properly.

In the environment with interfering signals, use shielded cables in the supply circuit. Unless influencing measurement can be excluded, ground the wiring.

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 mm². The HART communicator is connected to the supply loop of the sensor with converter pursuant to Figure 6.

To achieve reliable communication, the total load resistance of min. 250 Ω shall be in the circuit of the output loop.

FIGURE 3 – VIEW INTO THE SENSOR HEAD



INSTALLATION OF THE SENSOR 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 without converter 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 P₀ 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.

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.

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.

COMMISSIONING

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

OPERATION AND MAINTENANCE

The sensor does not require any operation and maintenance

SPARE PARTS

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

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.

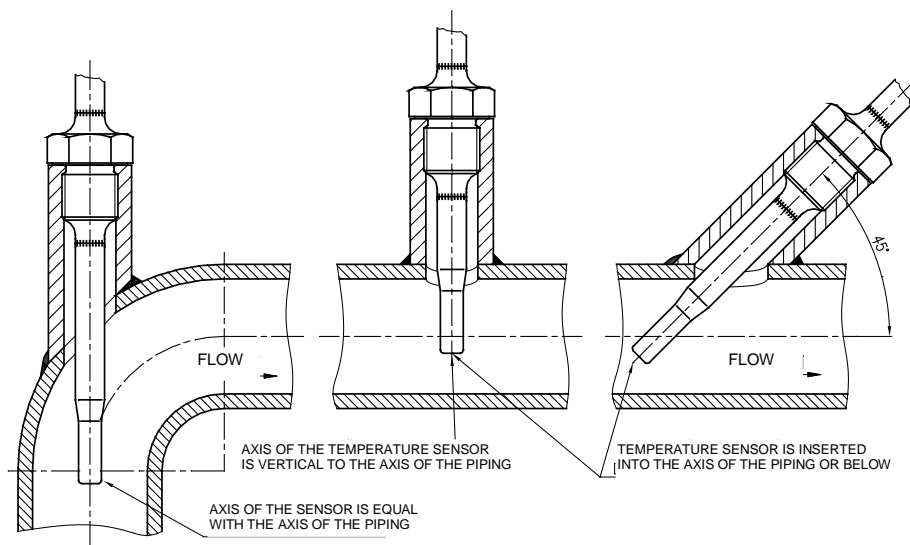
DISABLING AND LIQUIDATION

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 4 - EXAMPLES OF INSTALLATION OF DIRECT AND OBLIQUE NIPPLES PURSUANT TO ČSN EN 1434-2

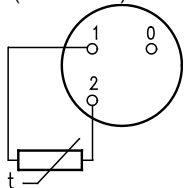


WARNING

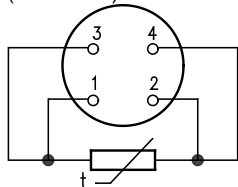
- When using the sensor with an Oblique nipple, locate the sensor with thermowell at an angle against the direction of flow.
- The sensor may not touch the opposite side of the piping.
- It is also advantageous to use the temperature sensors in the piping elbow. In such a case, locate the sensor with the thermowell against the direction of flow so that the measured medium flows around evenly.

FIGURE 5 - SCHEME OF CONNECTION OF TEMPERATURE SENSORS without converter with converter

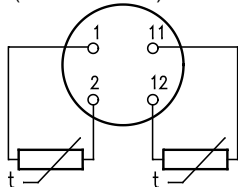
with single measuring resistor in two-wire connection (Pt 100/B/2)



with single measuring resistor in four-wire connection (Pt 100/ /4)



with double measuring resistor in two-wire connection (2 x Pt 100/B/2)



with single measuring resistor in connection with auxiliary loop (Pt 100/ /4C)

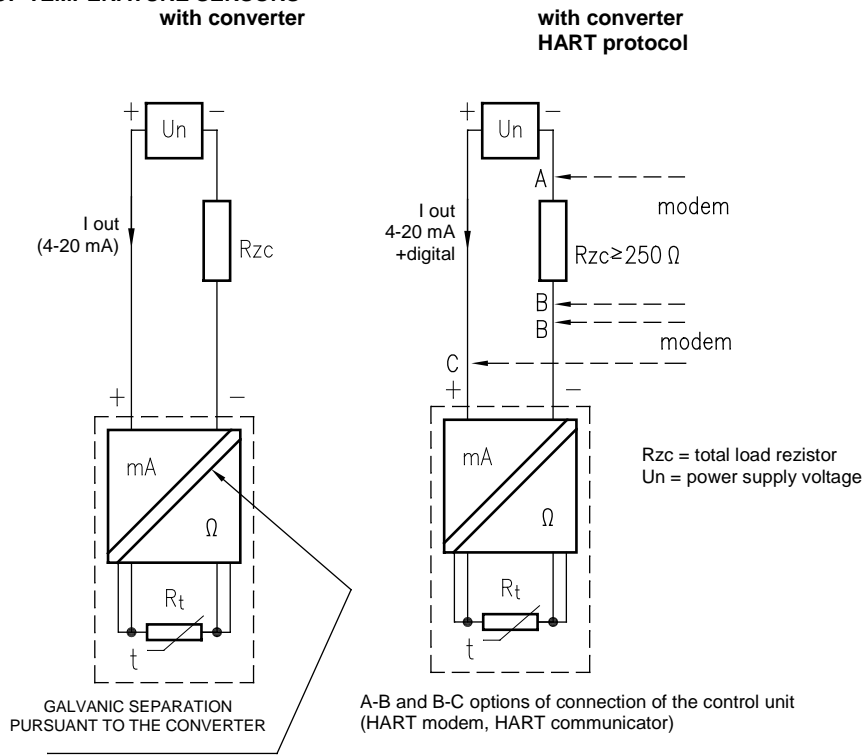
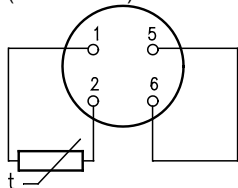
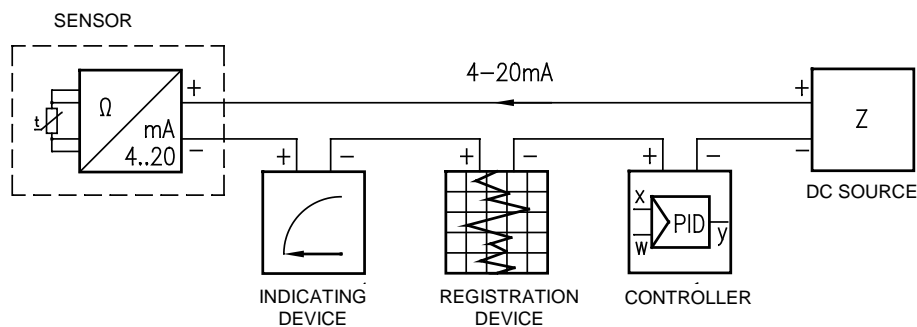


FIGURE 6 - EXAMPLE OF OPERATION CONNECTION OF TEMPERATURE SENSOR WITH CONVERTER IN LOOP 4 - 20 MA



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