



Thermoelectric rod temperature sensor with ceramic protective tube with thermocouple S, B or K without converter, type 113 36 with converter, type 113 36/P

PRODUCT MANUAL

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

APPLICATION

- for remote measurement of high temperatures, especially in incineration plants, furnaces, etc.
- for environment with a danger of explosion in areas Zone 2, Zone 1 and Zone 0 pursuant to EN 60079-10-1 with the use of the converter Ex ia or in case of connection to Ex ia of the circuit pursuant to EN 60079-25
- 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)

The sensors with converter are rated products pursuant to the Directive 2014/30/EU of the European Parliament and the Council and EU Declaration of Conformity **EU-11336P** is issued for them.

DESCRIPTION

The sensor consists of one or two wire-wound thermocouples located in a ceramic four-capillary and protective armature consisting of a support steel tube carrying external and inner ceramic tube with four-capillary and thermocouple on one side and connection head with connecting terminal board or installed two-wire converter (insulated or non-insulated, also in design Ex ia) on the other side. The connection head is provided with a cable gland for the connection wiring. The external protective ceramic tube is porous (for material LUNIT 20), for material LUXAL 203 is gas-tight. Inner ceramic tube always is gas-tight. A connecting flange is delivered as accessories sensor, which enables a connection of the sensor and, within a certain range, also an adjustment of the required depth of immersion of the sensor into the measured environment.

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 is uses a defined change of a thermoelectric voltage of the thermocouple in dependence on the change of temperature of the measured environment.

FIGURE 1 – DIMENSIONAL DRAWING

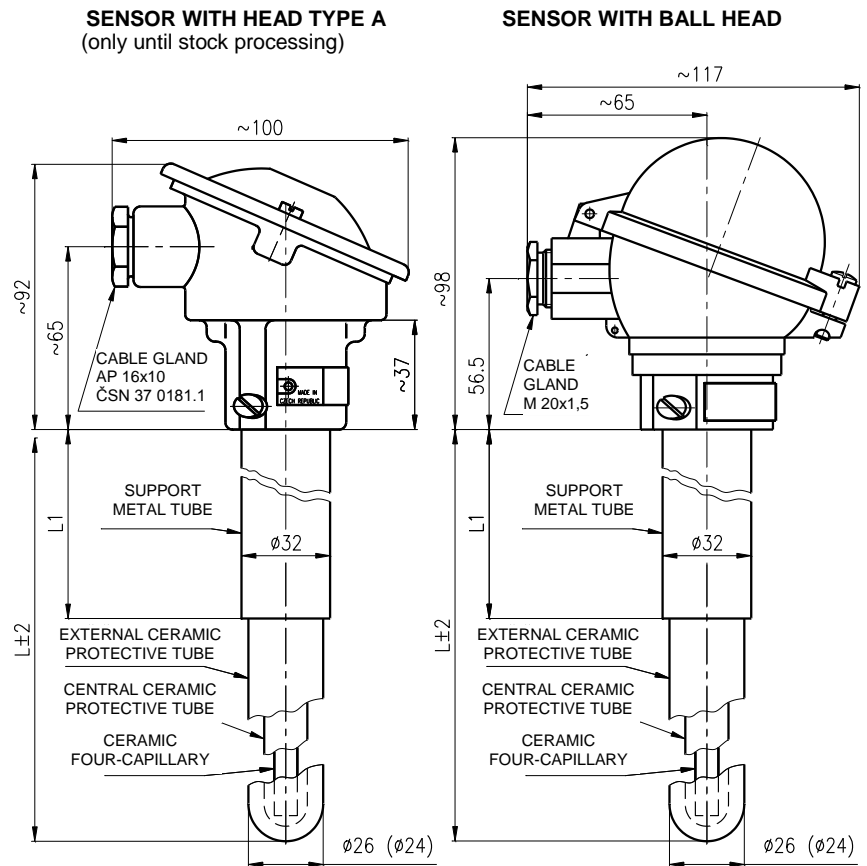
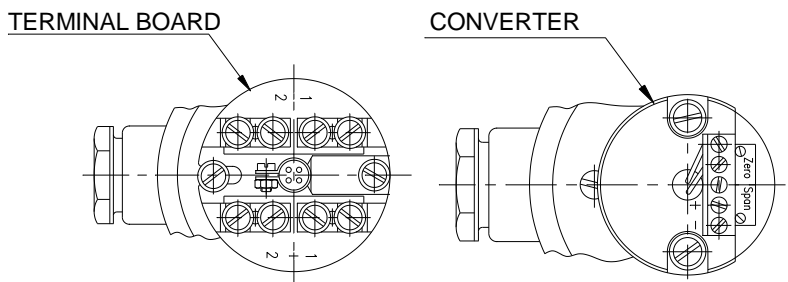


FIGURE 2 – VIEW TO HEAD



Weight:

L 500 mm	L ₁ = 200 mm	0.850 kg
L 800 mm	L ₁ = 200 mm	1.500 kg
L 1000 mm	L ₁ = 400 mm	1.600 kg
L 1600	L ₁ = 400 mm	2.470 kg

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:

Measuring range [°C]		Thermocouple	Material of protective tube
permanently	short-term		
0 to 1000	to 1200	K	LUNIT 20
			LUXAL 203
0 to 1300	to 1500	S	LUNIT 20
0 to 1300	to 1600		LUXAL 203
600 to 1300	to 1500	B	LUNIT 20
600 to 1600	to 1800		LUXAL 203

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

Electrical strength pursuant to EN 61010-1, Article 6.8.3: 500 V eff (only thermocouple without converter or design with insulated converter)

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

Power supply of converter: DC 24V, from source SELV, e.g. INAP 16, INAP 901

Other data of converter: refer to the enclosed manual

Ingress protection pursuant to EN 60529: IP 54

Operation position: discretionary, the cable gland not be situated upwards

Type of operation: continuous

Applied materials:

support metal tube	steel class 11, lacquered with synthetic lacquer
inner protective tube	
∅ 15×2 mm	ceramic LUNIT 73 with content of approx. 60 % Al ₂ O ₃ (it corresponds to sub-group C 610 pursuant to EN 60672-3) or ceramic LUXAL 203 with content min. 99.5 % Al ₂ O ₃ (it corresponds to sub-group C 799 pursuant to EN 60672-3)
external protective tube	
∅ 26×4 mm	ceramic LUNIT 20 with content of approx. 80 % Al ₂ O ₃ (it corresponds to sub-group C 530 pursuant to EN 60672-3)
or ∅ 24×3 mm	ceramic LUXAL 203 with content min. 99.5 % Al ₂ O ₃ (it corresponds to sub-group C 799 pursuant to EN 60672-3)
Connection head	chromated aluminium alloy lacquered with aluminium lacquer
terminals	brass with Ni surface

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 for sensor connection head:

for design without converter	max. 150 °C
for design with converter	pursuant to the type of converter (refer to the 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**Vibrations:**

The sensor is designed for environment with insignificant level of vibrations; therefore the parameters are not specified.

METROLOGICAL DATA**Sensor:** wire measuring thermocouple pursuant to

EN 60584-1, tolerance class 2

- "S" (PtRh10 - Pt) ∅ 0.5 mm
- "B" (PtRh30 - PtRh6) ∅ 0.5 mm
- "K" (NiCr-NiAl) ∅ 1 mm

single or double with insulated measuring connection for design without converter

single with insulated measuring connection for design with converter

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: 300 mm**Time of temperature response** pursuant to EN 60751 in

whirling water (characteristic value):	$\tau_{0.5}$	250
	$\tau_{0.9}$	350

DESIGNATION**Data on connection head label**

- Trademark of the manufacturer
- Made in Czech Republic
- Type of sensor/ tolerance class (only in case of delivery with built-in thermocouple)
- Measuring range or set up range of converter
- Ordering number of the product
- Ingress protection
- Time code (serial number for calibrated design and design with converter)
- Output signal 4 to 20 mA (design with converter)
- Designation of non-explosiveness and EU-Type Examination Certificate number (for design with converter EX ia)

Data on connection head of sensor with converter

- CE mark

Data on converter label

- Type of sensor
- Adjusted temperature range
- Designation of non-explosiveness and EU-Type Examination Certificate number for converter EX ia
- CE mark (for converter Ex ia with identification number notified person)

DELIVERY

Sensors with type A head will only be delivered until stock processing of these heads, then only ball head sensors can be supplied.

Unless agreed otherwise with the customer, each delivery includes

- delivery note
- sensor pursuant to purchase order
- connecting flange and thermocouple as accessories, which is ordered separately pursuant to purchase order
- optional accessories to the sensor with programmable converter
 - configuration (parameterization) programme pursuant to the required converter
 - communication modem (for serial port RS 232C) pursuant to the required converter
- accompanying technical documentation in Czech
 - product manual
 - certificate of product quality and completeness, which also serves as a warranty certificate
 - EU Declaration of Conformity (for converter Ex ia)
 - 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

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

CERTIFICATION**113 36/P**

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

REALIBILITY

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

CALIBRATION

The calibration is realized pursuant to TPM 3322-94 and in compliance with EN 60584-1, 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.

PACKING

Sensors and accessories are delivered in a package 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 OF TEMPERATURE SENSORS

The purchase order shall specify

- name
- ordering number of the product
- measuring range (only for design with converter)
- if is required calibration and in what temperature points
- if is required delivery connecting flange, type 991, as accessories and a separately ordered wire thermocouple
- if is required optional accessories to the sensor with programmable converter
- other (special) requirements
- number of pieces

EXAMPLE OF PURCHASE ORDER

Standard design:

Thermoelectric rod temperature sensor
with ceramic protective tube, with converter
113 369 K12 / HCF
0 - 1000 °C
5 pcs

Special request:

Thermoelectric rod temperature sensor
with ceramic protective tube, without converter
113 365 719
nominal length L = 1400 mm
5 pcs

TABLE 1 - DESIGN AND ORDERING OF TEMPERATURE SENSORS, TYPE 113 36

SPECIFICATIONS						ORDERING NUMBER			
						113 36	5	x	xx
Without thermocouple								7	
Wire-wound thermoelectric couple single **) pursuant to EN 60584-1 tolerance class 2		"S" (PtRh10 - Pt) Ø 0.5 mm						S	
		"B" (PtRh30 - PtRh6) Ø 0.5 mm						B	
		"K" (NiCr-NiAl) Ø 1 mm						K	
External ceramic protective tube	LUNIT 20 (C530) ***) temperature resistance of armature to 1300 °C (short-term up to 1500 °C) Ø 26×4 mm	nominal length L [mm]	L1 [mm]	500	200			12	
				800	200			13	
				1000	400			14	
				1600	400			15	
				other *) max. 1600				19	
				500	200			22	
	LUXAL 203 (C799) ****) temperature resistance of armature to 1600 °C (short-term up to 1800 °C) Ø 24×3 mm	nominal length L [mm]	L1 [mm]	800	200			23	
				970	400			26	
				1600 *)	400			25	
				other *) max. 1600				29	

- *) only as a special requirement after an agreement with the manufacturer
- **) or double as a special requirement after an agreement with the manufacturer, must be specified in the order
- ***) inner protective tube (ceramic LUNIT 73)
- ****) inner protective tube (ceramic LUXAL 203)

TABLE 2 - DESIGN OF TEMPERATURE SENSORS WITH CONVERTER, TYPE 113 36/P

SPECIFICATIONS						ORDERING NUMBER				
						113 36	9	x	xx	/xxx
Wire-wound thermoelectric couple single pursuant to EN 60584-1 tolerance class 2		"S" (PtRh10 - Pt) Ø 0.5 mm						S		
		"B" (PtRh30 - PtRh6) Ø 0.5 mm						B		
		"K" (NiCr-NiAl) Ø 1 mm						K		
External ceramic protective tube	LUNIT 20 (C530) **) temperature resistance of armature to 1300 °C (short-term up to 1500 °C) Ø 26×4 mm	nominal length L [mm]	L1 [mm]	500	200			12		
				800	200			13		
				1000	400			14		
				1600	400			15		
				other *) max. 1600				19		
				500	200			22		
	LUXAL 203 (C799) ***) temperature resistance of armature to 1600 °C (short-term up to 1800 °C) Ø 24×3 mm	nominal length L [mm]	L1 [mm]	800	200			23		
				970	400			26		
				1600 *)	400			25		
				other *) max. 1600				29		

Type of converter	Galvanic separation	Ex ia	Range [°C]			
Analogue linear output signal with thermoelectric voltage	APAQ-HCF		adjustable range		K	/HCF
	APAQ-HCFX	•		/HCFX		
Programmable linear output signal with temperature	TH 200	•	programmable range			/TH200
	TH 200-ex	•		/TH200X		
	IPAQ-H	•		/IPAQH		
	IPAQ-HX	•		/IPAQHx		
MINIPAQ-HLP		/MINIPAQ				
HART protocol linear output signal with temperature	TH 300	•		/TH300		
	TH 300-ex	•		/TH300X		
	MESO-H	•		/MESOH		
	MESO-HX	•	/MESOHx			
	248 HA NA	•	/248HANA			
Other *)						/99
Without converter (for mounting converter by customer)						/00

- *) only as a special requirement after an agreement with the manufacturer
 - **) inner protective tube (ceramic LUNIT 73)
 - ***) inner protective tube (ceramic LUXAL 203)
- Note: The sensors are delivered by standard with converter APAQ-HCF and thermocouple "K". The required measuring range is specified in the purchase order in word. Minimum range of measured temperature shall be entered pursuant to the parameters of the converter. Temperature range is established by the material of the protective tube.

ORDERING ACCESSORIES

- The purchase order shall specify:
- name
 - ordering number of the product
 - other (special) requirements
 - number of pieces

PURCHASE ORDER EXAMPLE

- Standard design:**
1. Connecting flange
991 UP 32
5 pcs
 2. Thermocouple
126764
5 pcs
- Special request:**
- Thermocouple
126720
5 pcs
L = 1200 mm

TABLE 3 - ACCESSORIES - to be ordered separately

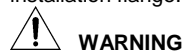
SPECIFICATIONS				ORDERING NUMBER
Connecting flange				991 UP 32
Wire-wound thermocouple	"S" (Ø 0.5 mm)	Nominal length L [mm]	500	126731
			800	126742
			970	126841
			1000	126753
			1600	126764
			other *)	126720
	"B" (Ø 0.5 mm)	Nominal length L [mm]	500	126940
			800	126951
			970	126962
			1000	126973
			1600	126984
			other *)	126995
	"K" (Ø 1 mm)	Nominal length L [mm]	500	127006
			800	127017
			970	127028
			1000	127039
			1600	127050
			other *)	127061

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

INSTALLATION AND CONNECTION

If you have an independent armature without a converter, first perform assembly the independently delivered wire-wound thermocouple into the armature of the sensor. Remove the ceramic capillary, insert the thermocouple into the holes and return the capillary back into the sensor (it is appropriate to leave the ceramic cord wound up around the capillary) and connect the thermocouple to the terminal board.

The sensor installation is performed by means of the installation flange.



WARNING
Attach the sensor by the support metal tube!
If you install or replace the sensor during operation, slide into the environment or out the environment with high temperature gradually (speed of approx. 200 mm per 1 minute), so that the ceramic protective tubes do not break due to temperature expansion caused by a fast change of temperature.
If a slow movement of the sensor is not possible, ensure at least slow and uniformly pre-heating of the sensor.

INSTALLATION OF FLANGE

Weld the bottom flange into the wall of the technological equipment. Connect the upper flange by using stirrup and two screws M6×14 on end support metal tube pursuant to figure 2. Connect both of part flange by using screws M8x30, washers and nuts. Their tightening is sealed of seal.

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 connection head, which is connected with two screws.

Connect the evaluation devices to the sensor with a cable with a double insulation with outer diameter from 5 to 12 mm, internal wires with Cu core (sensor with converter and sensor without converter with thermocouple type B) or compensating wiring (sensor without converter with thermocouple type S) with the cross section 0.5 to 2.5 mm². Seal the cable gland of the sensor properly. In the environment with interfering signals, use shielded cables in the power supply circuit. If it is not

possible to exclude influencing the measurement, ground the wiring. Shielding must be grounded in one point only.

The cable should not be led together with power cables. It is recommended supporting the cable along its length between the sensor and the follow-up device.

For the sensors with converter with HART protocol, the maximum length of wiring is given by the layout of the wires of the connecting cable. The overall length of wiring may be up to 1500 m. A twisted two-wire with shared shielding with the cross-section of the core min. 0.5 mm² is required. The HART communicator is connected to the supply loop of the sensor with the converter pursuant to Figure 1. To ensure communication, there shall be total load resistance of min. 250 Ω in the circuit of the output loop.

INSTALLATION OF SENSOR IN THE ENVIRONMENT WITH EXPLOSIVE GASEOUS ATMOSPHERE


In environment with explosive gaseous atmosphere a sensor without converter or sensor with Ex ia converter can be installed.

Installation of sensor in the environment with explosive gaseous atmosphere shall be in compliance 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.

WARNING  Programmable converter may not be connected to a computer or a HART communicator, if the converter is located in explosive environment.

In intrinsically safe circuits, the connection cable must have insulation resistance between conductors, conductors and shielding and shielding against ground at least AC 500V or DC 750. 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. If the intrinsically safe circuit is isolated from the ground, the shield must be connected in one place to the protective bonding system. 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 connection of the follow-up (evaluation) device to the supply voltage (and after period stabilizing of the converter), the equipment is prepared for operation.

WARNING  After the installation of sensor with converter Ex ia in the environment with explosive gaseous atmosphere 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 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.

SPARE PARTS
Spare parts shall be delivered by the manufacturer.

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. The 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 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.

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
Both 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 - EXAMPLE OF OPERATIONAL CONNECTION OF TEMPERATURE SENSOR WITH CONVERTER IN LOOP 4 - 20 mA

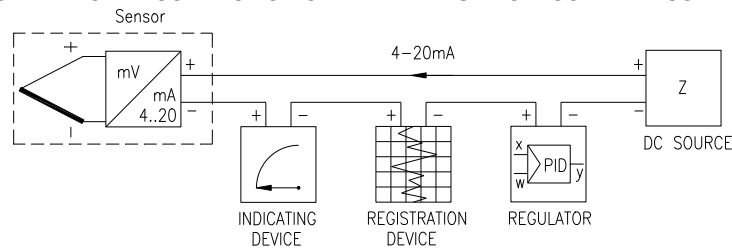
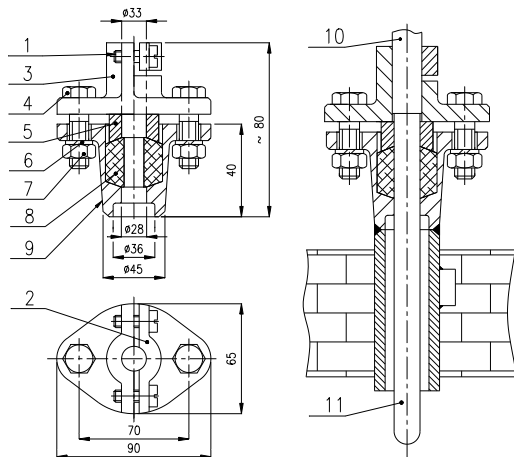
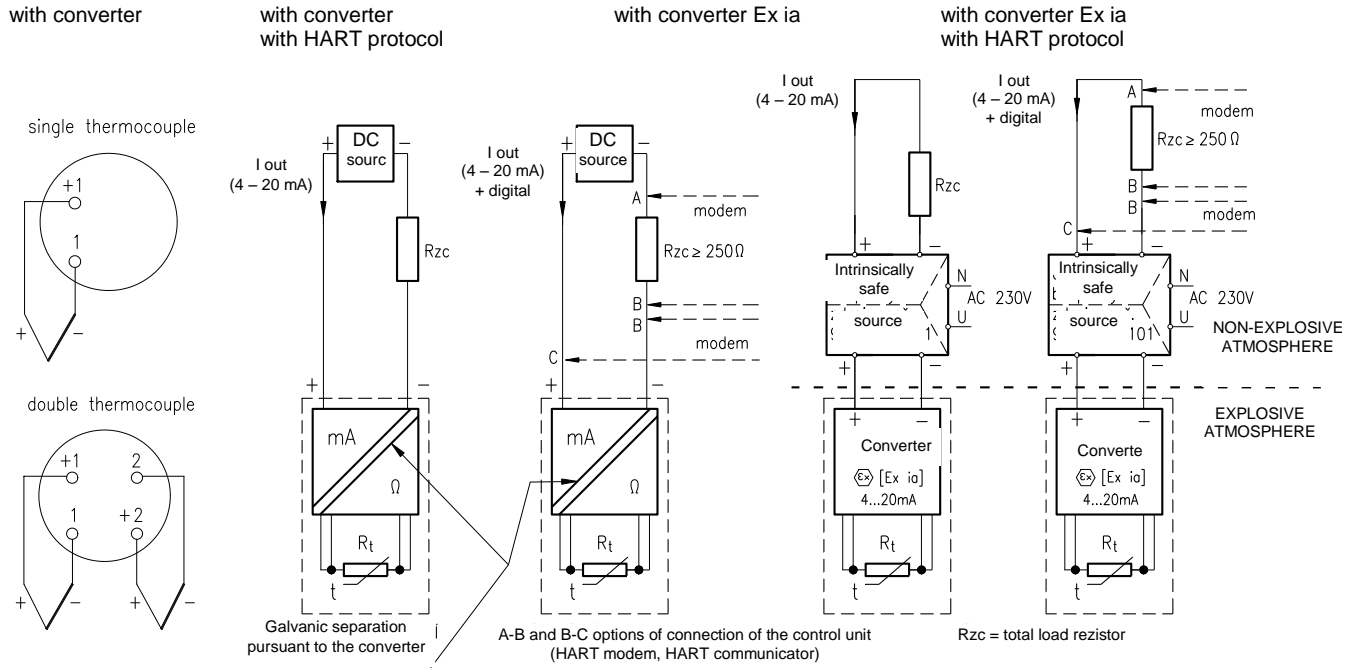


FIGURE 4 - CONNECTING FLANGE (example of installation)



- 1 screw ISO 1207-M6×14-5.8-A2K (2pcs)
- 2 stirrup
- 3 upper flange
- 4 screw ISO 4017-M8×30-5.8-A3K (2pcs)
- 5 insert
- 6 washer 8 ČSN 02 1740.05 (2pcs)
- 7 nut ISO 4034-M8-5-A2K (2pcs)
- 8 seal
- 9 bottom flange
- 10 support metal tube
- 11 external protective ceramic tube

FIGURE 5 - CONNECTION SCHEME OF TEMPERATURE SENSORS



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