Chapter IX

Temperature transmitters

Smart temperature transmitter
APT-2000ALW

HART COMMUNICATION PROTOCOL

- ✓ **4…20 mA output signal + HART protocol**
- ✓ **Programmable range, zero shift, characteristic and damping ratio with local panel keys**
- ✓ **ATEX Intrinsic safety , ATEX Explosion proof**
- ✓ **Resistant or thermocouple measuring element**
- ✓ **MID (Measuring Instruments Directive) – certificate acc. to 2004/22/WE directive and OIML R140:2007 recommendations.**
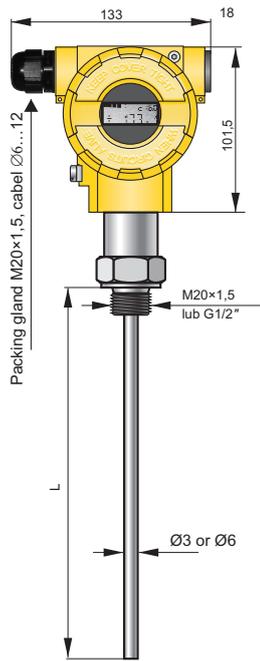
APT-2000ALW/GB
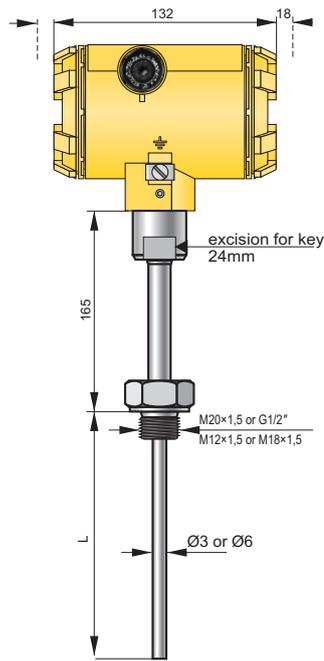
APT-2000ALW/GN

Thermowell

OG2.9 / OG2.11

T1

SW1 / SW2

SW1T / SW2T

Technical data
Metrological parameters
Error (digital value)

± (0,2 + 0,002·|t|)°C for Pt100 sensor
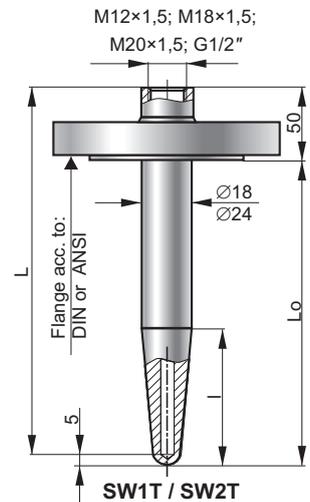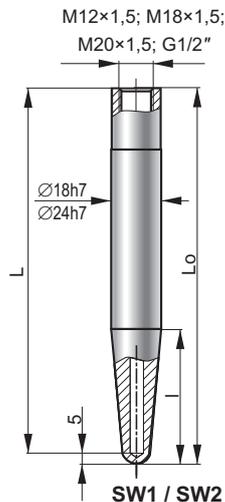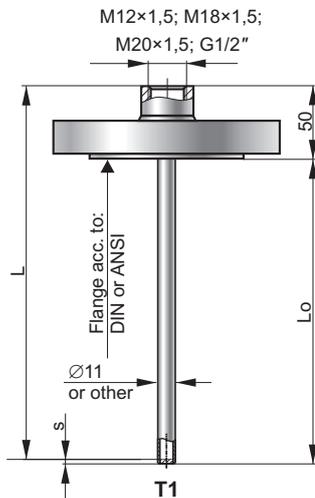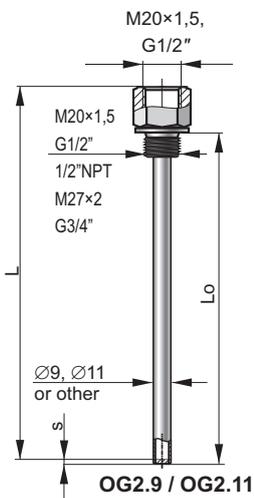
± 1,5°C for TC type K sensor and t ≤ 375°C

± (0,004·t)°C for TC type K sensor and t > 375°C

Additional error for analog output ±0,04%·z

where:

|t| – absolute value of the measured temperature °C

t - value of the measured temperature °C

z – transmitter setting range °C

Measuring range

Sensor type	Min set range	Nominal range
Pt100	10°C	-200…550°C*
K	10°C	-40…550°C

* for GB version -50…150°C

Electrical parameters

Powerr supply   12...55 V DC (Ex 13,5...28 V)

Additional voltage drop

when display illumination switched on   3 V

Output signal   4...20 mA + Hart protocol

Resistance required for

communication (HART)   min. 240Ω

Load resistance

$$R[\Omega] = \frac{U_{ZAS}[V] - 12V\ *}{0,0225A}$$

* – 15 V when display illumination switched on

Operating conditions

Ambient temperature   -40...85°C

            for version with Ex ia   -40...80°C

            for version with Ex d   -40…75°C

Min. immersion length   **L=100mm**

Materials

Casing   Aluminium,

                        316Lss- special version

Sensor material   321ss

Thermowell   according to table page.

Communication and configuration

The communication standard for data interchange with the transmitter is the Hart protocol.

Communication with the transmitter is carried out with:

– a KAP-03, KAP-03Ex communicator,

– some other Hart type communicators,

– a PC using an HART/USB converter and Raport 2 configuration software.

The data interchange with the transmitter   enables the users to:

- identify the transmitter;
- configure the output parameters:
- read the currently measured temperature value of the output current and the percentage output control level;
- force an output current with a set value;
- calibrate the transmitter in relation to a model temperature.

Standard thermowell data

Thermowell type		Standard dimensions of thermowell						Thermowell material	Available process connection	
		Ø[mm]		L[mm]		l[mm]				
OG2.9		9x1		100, 160, 250, 400		-		316Lss	M20x1,5 , M27x1 G½'', G¾'', ½''NPT	
OG2.11		11x2		100, 160, 250, 400		-		316Lss	M20x1,5 , M27x1 G½'', G¾'', ½''NPT	
T1		11x2		100, 160, 250, 400		-		316Lss	Flange according to DIN and ANSI	
SW1	SW2	18h7	24h7	100 140 200	140 200	35 65 65	65 65	15HM, 10H2M 316Lss	-	
SW1T	SW2T	18h7	24h7	100 140 200	140 200	35 65 65	65 65	15HM, 10H2M 316Lss	Flange according to DIN and ANSI	
SW1G	SW2G	18h7	24h7	100 140 200	140 200	35 65 65	65 65	15HM, 10H2M 316Lss	M20x1,5, G1/2"	M27x1,5, G3/4"

Ordering procedure

APT-2000ALW/___/___/___/___/ L = ... mm /___/___÷___°C/___/___

Special version:

Exia - ATEX certificate
⟨Ex⟩ II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb

Exia(Da) - ATEX certificate
II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb
⟨Ex⟩ II 1D Ex ia IIC T105cC Da
I M1 Ex ia I Ma (version with SS housing)

Exd - ATEX certificate
II 1/2G Ex ia/d IIC T* Ga/Gb
⟨Ex⟩ II 1/2D Ex ia/t IIIC T* Da/Db
I M2 Exd ia I Mb (version with SS housing)
T* - temperature class transmitter (for gas)
or maximum surface teperature (for dust)

SS - Housing material 316SS
IP67, IP66/67

Version: **GB, GN**

Thermowell type: according to table

Type of thread of flange connection:
M20×1,5; G1/2″; M27×2; G1" or flange

Immersion length

Type of measuring element: **Pt100, K**

Set measuring range

Alarm signal: 3,8 or 23 mA

Elcetrical connection: **without marking** (M20x1,5) or **US** (1/2"NPTF)

SMART TEMPERATURE TRANSMITTER APT-2000ALW with MID

Application

Smart temperature transmitters APT-2000ALW MID is applicable to the measurement of the temperature in application designed according to directive 2004/22/WE (MID), harmonized standard PN-EN12405-1:2005 + A2:2010 and recommendation OIML R140:2007. Device subcomponent suitable for custody transfer measurement of gas with MID approval. Mechanical construction and installation of the transmitter enclosure shall comply with the transmitter APT-2000ALW are described on page IX/ 2, IX/ 3 of catalogue. Transmitter due to factory blockade of transmitter's configuration cannot be configurable by user. Electrical connection of the transmitter is according to drawing on page IX/ 3. Available are only terminals SIGNAL + and SIGNAL -. Temperature transmitter APT-2000ALW MID are produce with GB type of sensor and with resistant sensor Pt100.

Note! For custody transfer applications, the cover clamp screws have to be locked with seal wire.

Metrological parameters

Max. permissible error according to EN12405-1 (calculated in relation to the measured value)

- in reference conditions	
20±3°C(±1 during the measurement)	≤ 0,1%
- nominal operating conditions	< 0,2%
special version	< 0,1%
Long-term stability	< 0,2% / 5 years
Operating temperature range	-25...55°C
Immersion length	150...290mm
Power supply	Exia: 13,5...28VDC
	Exd: 13,5...45VDC

MID Parts Cerfificate No. 28/12
Exia: ⟨Ex⟩ II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb
Exd: ⟨Ex⟩ II 1/2G Ex ia/d IIC T* Ga

Measuring range

Measuring range: -20...60°C

Ordering procedure

APT-2000ALW/MID/___/___/ L = ... mm

Special version:
Exia - Intrinsic safety version (ATEX)
**Exd** - Explodion proof version (ATEX)
SS - Housing material 316SS

Process connection type: **M20x1,5 , G1/2"**

Immersion length

Smart temperature transmitter
LI-24ALW

HART
COMMUNICATION PROTOCOL

- ✓ **Output signal 4…20mA with Hart protocol**
- ✓ **Galvanic insulation (In, Out)**
- ✓ **Programmable sensor type**
- ✓ **Programmable measuring range**
- ✓ **Thermoresistance line compensation**
- ✓ **Compensation of thermocouple cold junction**
- ✓ **Autodiagnostic system**
- ✓ **Intrinsic safety certificate (ATEX, IECEx)**
- ✓ **Explosion proof certificate (ATEX, IECEx)**
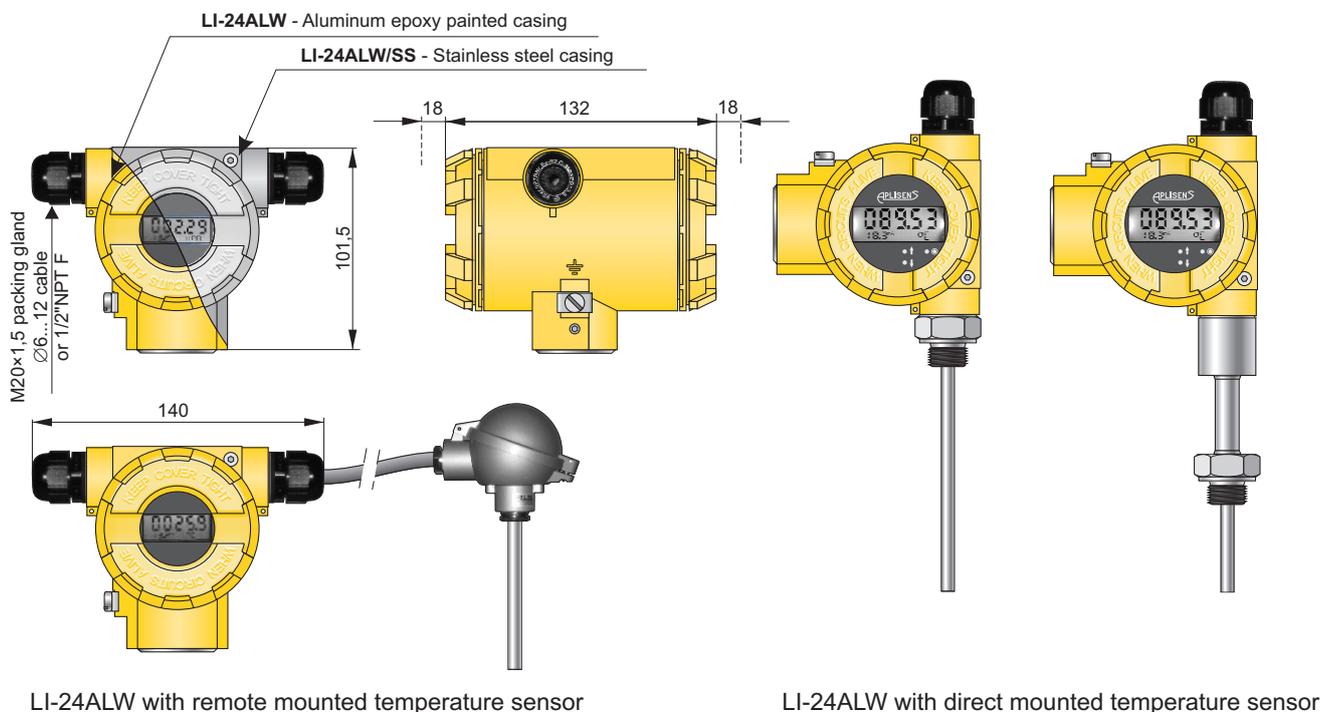
LI-24ALW with remote mounted temperature sensor

LI-24ALW with direct mounted temperature sensor

Application and function

The temperature transmitter LI-24ALW is applicable to converting resistance of temperature or voltage of thermocouple sensor to standard current signal 4-20mA. The transmitter has two separate channels enabling measurement of temperature difference, averange, averange with redundancy, max. or min. temperature. Transmitter has compensation of ambient temparature influence and compensation of thermocouple cold junction using internal/external (Pt100) sensor or constant temperature. Most of parameters such as: sensor type, measuring range, current alarm signal when electric circuit is broken, output characteristic correction, user characteristic (60 points) are programmed using PC with HART/USB converter and Aplisens RAPORT 2 configuration software. For request Aplisens can set temperature transmitter parameters like measuring range, type of sensor. Their values are printed on label. Transmitter LI-24/ALW is designed for field use. LI-24ALW can be used with temprature sensors mounted directly in transmitter's casing or with external sensors connected with cable.

Technical data

Input signal	K, J,S,B,N,T, R, E, voltage Pt100,Ni100 resistance
Limit process	-10mV< E<100mV or -100mV< E<1000mV 0Ω<R<400Ω or 0Ω<R<2000Ω
Min. measuring range	10mV or 10Ω or 10K
Output signal	4 - 20 mA + Hart
Power supply	13,5…55 VDC (Ex 13,5..30 VDC) when display illumination switched on 16,5…55 VDC (Ex 16,5..30 VDC)
Max. wires resistance	500Ω
Alarm signal	3,75mA / 21,5mA (NORMAL) or 3,6 mA / 21 mA (NAMUR NE89)or setting by user
Sensor current	0,42mA
Galvanic insulation	Optoelectrical
Accuracy	acc. to below table
Time constant	0,3s
Additional electronic damping	0..30s
Ambient temperature	-40…+80°C (Ex -40…+75°C)

Electrical diagrams

$R \geq 240 \ \Omega$

$4 \div 20$ mA

Power supply − +

KAP-03 comunicator or Hart/USB converter

Load resistance $R[\Omega] = \dfrac{U_{SUP}[V] - 13,5V \ *}{0,0235A}$

* - 16,5 V when display illumination switched on

Electrical diagrams

RTD 2-wires connection

RTD 3-wires connection

RTD 4-wires connection

2 × RTD 2-wires connection

2 × RTD 3-wires connection

Thermocouple

2 x Thermocouple

Thermocouple with external CJC

2 x Thermocouple with external CJC

Potentiometer 2-wires connection

Potentiometer 3-wires connection

Potentiometer 4-wires connection

2 × Potentiometer 2-wires connection

2 × Potentiometer 3-wires connection

Voltage source

2 x Voltage source

Type of input signals and metrological parameters

RTD sensor connected with 2, 3 or 4 wires						
Input – RTD Thermal resistance sensors Sensor current Maximum wires resistance Minimum range				2, 3 or 4 wires connection ~420uA 25Ω 10 ºC		
Sensor type	Standard	Basic range	Min. range span	Processing error Δp	Temperature processing error Δtp	Analogue output error
		ºC	ºC	K	K/K	%
1	2	3	4	5	6	7
Pt10 (α=0.003850)	EN 60751+A2, IEC751, DIN43760, JISC 1604-97, BS 1904	-200÷850	10	±0.8	±0.035	Analogue output error is 0.05% FSO (Full Scale Output) over the operating temperature range.
Pt50 (α=0.003850)		-200÷850	10	±0.2	±0.0070	
Pt100 (α=0.003850)		-200÷850	10	±0.07	±0.0035	
Pt200 (α=0.003850)		-200÷850	10	±0.2	±0.0020	
Pt500 (α=0.003850)		-200÷850	10	±0.05	±0.0007	
Pt1000 (α=0.003850)		-200÷266	10	±0.03	±0.0003	
Pt 98 (α=0.003923)	SAMA RC-4-1966	-200÷650	10	±0.07	±0.0035	
Ni100 (W100=1.617)	PN-83/M-53952	-60 ÷ 180	10	±0.07	±0.0030	
Cu100 (W100=1.426)		-50 ÷ 180	10	±0.07	±0.0030	
Pt10 (α=0.003916)	JIS C1604-81	-200÷630	10	±0.8	±0.035	
Pt50 (α=0.003916)		-200÷630	10	±0.2	±0.0070	
Pt100 (α=0.003916)		-200÷630	10	±0.07	±0.0035	
Pt10 (W100=1.3910)	GOST 6651-94	-200÷1100	10	±0.8	±0.035	
Pt50 (W100=1.3910)		-200÷1100	10	±0.2	±0.0070	
Pt100 (W100=1.3910)		-200÷1100	10	±0.07	±0.0035	
Pt500 (W100=1.3910)		-200÷1100	10	±0.05	±0.00070	
Cu50 (W100=1.426)		-50 ÷ 200	10	±0.2	±0.0070	
Cu100 (W100=1.426)		-50 ÷ 200	10	±0.07	±0.0030	
Cu50 (W100=1.428)		-185 ÷ 200	10	±0.2	±0.0070	
Cu100 (W100=1.428)		-185 ÷ 200	10	±0.07	±0.0030	
Ni100 (W100=1.617)		-60 ÷ 180	10	±0.07	±0.0030	
Resistance (resistor, potentiometer)						
		Ω	Ω	mΩ	mΩ/K	As above
Measuring range No.1		0…400	10	±30	±2	
Measuring range No.2		0…2000	10	±120	±2	
1	2	3	4	5	6	7

Thermocouples						
Input – Thermocouples Input impedance Maximum wires resistance Cold junctions compensation Minimum range				>10MΩ 500Ω (wires + thermocouple) internal sensor, external sensor Pt100 temperature constant of the cold junctions 50 ºC		
Sensor type	Standard	Basic range	Min. range span	Processing error Δp	Temperature processing error Δtp	Analogue output error
		ºC	ºC	K	K/K	%
1	2	3	4	5	6	7
B (Pt30Rh-Pt6Rh)	EN 60751+A2, IEC584, NIST MN175, DIN43710, BS4937, ANSI MC96.1, JIS C1602, NF C42-321	250 ÷ 1820	10	±0.55	<±0.001	Analogue output error is 0.05% FSO (Full Scale Output) over the operating temperature range.
E (Ni10Cr-Cu45Ni)		-200 ÷ 1000	10	±0.15	<±0.001	
J (Fe-Cu45Ni)		-210 ÷ 1200	10	±0.20	<±0.001	
K (Ni10Cr-Ni5)		-200 ÷ 1372	10	±0.30	<±0.001	
N(Ni14CrSi-NISi)		-200 ÷ 1300	10	±0.25	<±0.001	
R(Pt13Rh-Pt)		-20 ÷ 1768.1	10	±0.35	<±0.001	
S(Pt10Rh-Pt)		-30 ÷ 1768.1	10	±0.40	<±0.001	
T(Cu-Cu45Ni)		-200 ÷ 400	10	±0.15	<±0.001	
TC Type L	EN 60751+A2, GOST P 8.585-2001	-200 ÷ 800	10	±0.20	<±0.001	

Voltage						
		mV	mV	µV	µV/K	
Measuring range No.1		-10…100	10	±6	<±0.06	As above
Measuring range No.2		-100…1000	10	±50	<±0.5	
1	2	3	4	5	6	7

Direct mounted sensors

WOGN	WOGB	WRGN	WRGB
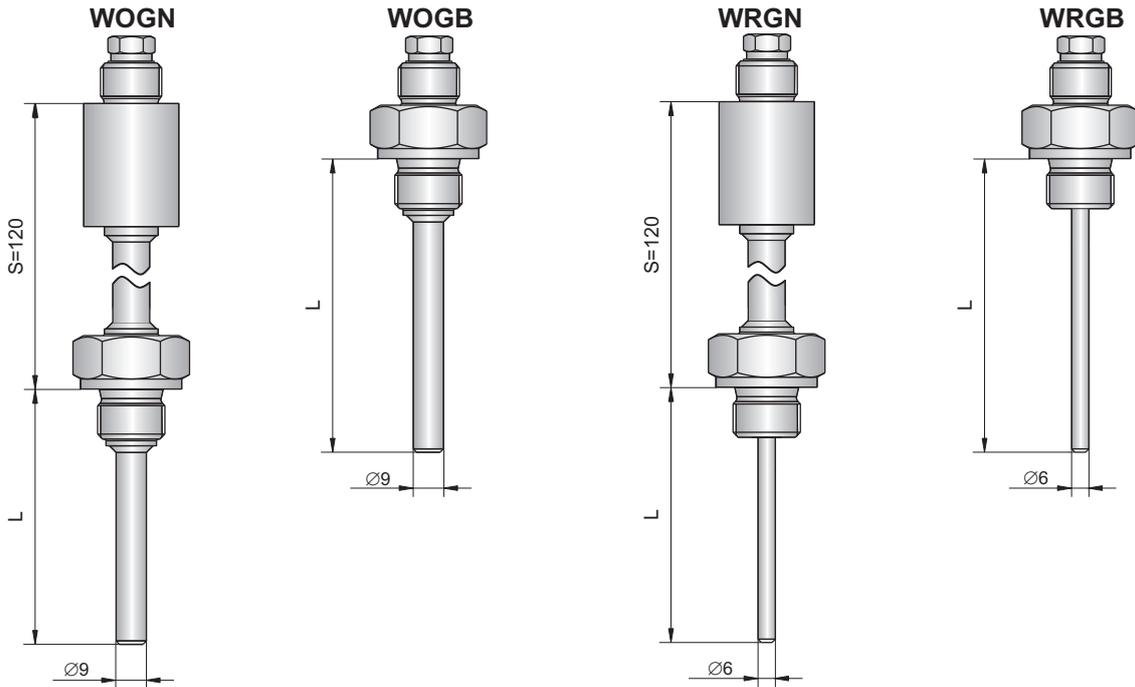
Sensor type	Standard dimensions of sensor			Sensor material	Available process connection
	Ø[mm]	L[mm]	S[mm]		
WOGN	9	100, 160, 250, 400	120	304ss, 316Lss	M20x1,5 , G½'', G¾'', ½''NPT
WOGB	9	100, 160, 250, 400	-	304ss, 316Lss	M20x1,5 , G½'', G¾'', ½''NPT
WRGN	6	100, 160, 250, 400	120	304ss, 316Lss	M20x1,5 , G½'', G¾'', ½''NPT
WRGB	6	100, 160, 250, 400	-	304ss, 316Lss	M20x1,5 , G½'', G¾'', ½''NPT

WOGN, WOGB - welded sensors; WRGN, WRGB - spring-loaded sensors (to use with additional thermowell)

Ordering code

LI-24ALW /___/ ___/ ___ ÷ ___°C/ ___/ ___

Sensor type (optionally):
Direct: **WOGN, WOGB, WRGN, WRGB**
(According to below ordering code)
Remote: According to **Chapter X**

Settings (optionally):
Type of measuring element,
measuring range, alarm signal

Version:
Exia – Intrinsic safety certificate (ATEX, IECEx)

(Ex) II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb	(Ex) II 2(1)G Ex ia [ia Ga] IIC T4/T5/T6 Ga/Gb
IECEx Ex ia IIC T4/T5/T6 Ga/Gb 1)	**IECEx** Ex ia [ia Ga] IIC T4/T5/T6 Ga/Gb 2)

Exia(Da) – Intrinsic safety certificate (ATEX, IECEx)

(Ex) II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb II 1D Ex ia IIIC T105°C Da I M1 Ex ia I Ma (with SS enclosure)	(Ex) II 2(1)G Ex ia [ia Ga] IIC T4/T5/T6 Ga/Gb II 1D Ex ia IIIC T105°C Da I M1 Ex ia I Ma (with SS enclosure)
IECEx Ex ia IIC T4/T5/T6 Ga/Gb Ex ia IIIC T105°C Da Ex ia I Ma (with SS enclosure) 1)	**IECEx** Ex ia [ia Ga] IIC T4/T5/T6 Ga/Gb Ex ia IIIC T105°C Da Ex ia I Ma (with SS enclosure) 2)

Exd – Explosion proof certificate (ATEX, IECEx)

(Ex) II 2G Ex d IIC T* Gb II 2D Ex t IIIC T* Db I M2 Ex d I Mb (with SS enclosure)	(Ex) II 2(1)G Ex d [ia Ga] IIC T4/T5/T6 Gb II 2(1)D Ex t [ia Da] IIIC T105°C Db I M2 Ex d [ia Ma] I Mb (with SS enclosure)
IECEx Ex d IIC T* Gb Ex t IIIC T* Db Ex d I Mb (with SS enclosure) 1)	**IECEx** Ex d[ia Ga] IIC T4/T5/T6 Gb Ex d[ia Da] IIIC T105°C Db Ex t[ia Ma] I Mb (with SS enclosure) 2)

1) transmitter with sensor mounted in casing   2) transmitter without sensor or with cable senor

IP67 – protection class IP67
SS – housing material SS316
US – electrical and sensor connection 1/2''NPT F

WOGN/Exia/L=400mm/S=120mm/G1/2"/Pt100-A-2/316Lss/1/2"NPT

Type of sensor

Version: Standard, Exia, Exd

Dimmensions L and S [mm]

Process connection

Connection thread between sensor and transmitter

Sensor material

Type of measuring element

Smart temperature transmitter type APT-28

NEW

- ✓ **Programmable measuring range**
- ✓ **Output signal 4 ÷ 20 mA**
- ✓ **Stainless steel casing**

Application and construction

Smart temperature transmitter type APT-28 is designed for temperature measurement in range from -50 to +80°C (up to +140°C in special version). Resistance signal from RTD element is converted to standard 4…20mA output signal. Casing of transmitter is made in stainless steel. Standard electrical connection is DIN EN 175301-803 connector with ingress protection class IP 65.

Configuration

Transmitter is delivered with measuring range according to customer's order, however it can be change by user. For configuration user will need: PC computer, RS converter, APT-28 converter and AT software. Beside changes of measuring range customer will be able to proceed calibration of the transmitter and make correction of output characteristic. Configuration is available only in transmitters with PD and ALW electrical connection.

Electrical connections

PD type
IP65

PM12 type
IP67
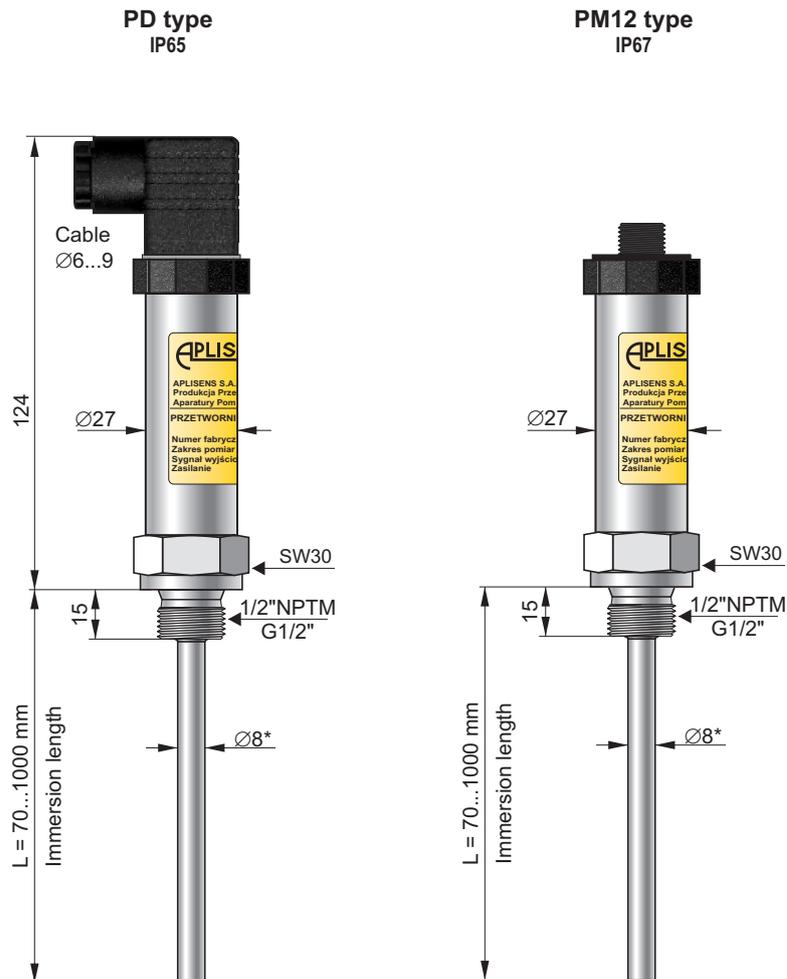
* - other diameters on request

Electrical connection type ALW

Aluminum casing with programable local display. The design of the casing enables the use of a local display, rotation of the display, rotation of the casing by 0–340° relative to the sensor.
Electrical connection DIN EN 175301-803, IP65.

Display with backlight allows to read:
- measured temperature in user units or % of measuring range
- current in output loop in mA
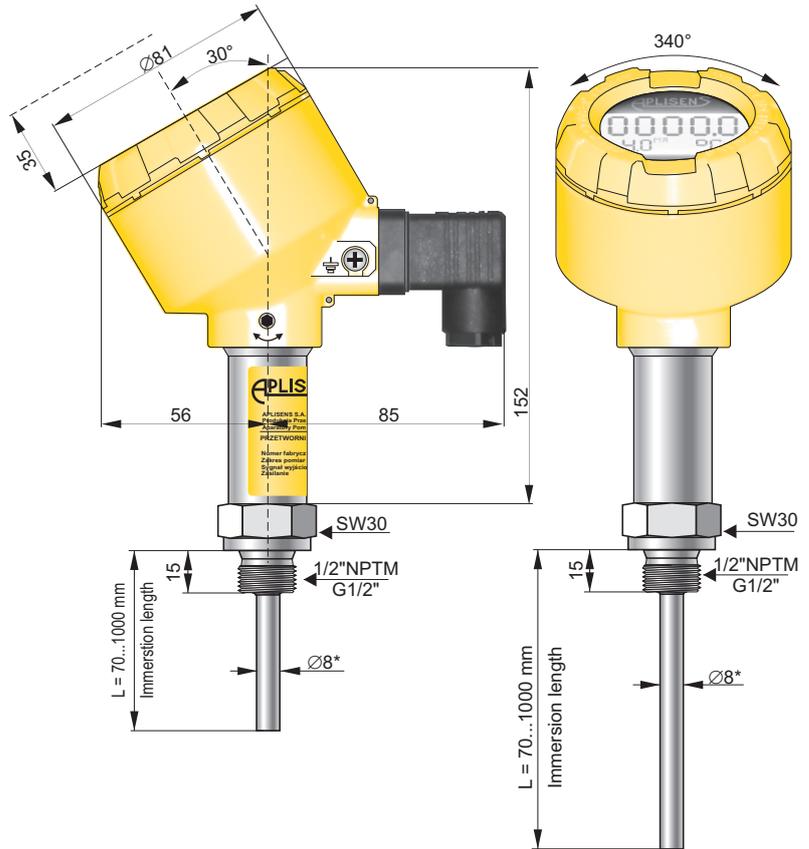
Technical data

Measuring range	-50...+80°C
Minimal width of measuring range	30°C
Transmitter accuracy	±0,16%
Sensor accuracy	±(0,15 + 0,002·|t|)°C
|t| – absolute value of the measured temperature °C	
Error due to ambient temp. changes	0,1% / 10°C
Error due to supply voltage changes	0,1%
Output signal	4 ÷ 20 mA, 2-wires
Power supply U$_{zas}$	7...29 V DC
APT-28/ALW	10…29 V DC
Additional voltage drop when backlight is on	3V

Load resistance $\qquad R[\Omega] \leq \dfrac{U_{zas}[V] - 7\,V}{0,023\,A}$

Alarm signal	3,8 mA or 23 mA
	factory setting: 23 mA
Ambient temperature	-25...+80°C
Materials: sensor shield and process connection	ss321
casing	ss304
Ingres protection class	PD – IP65, PM12 – IP67

Electrical diagrams
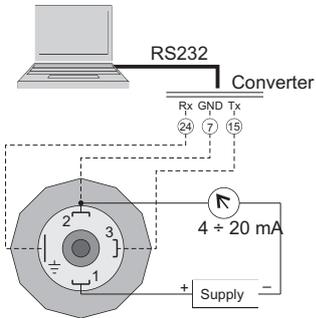
Ordering procedure

APT-28/___/L = ... mm/___/___/__÷__°C/___

Electrical connection: **PD** (connector DIN EN 175301-803)
PM12 (connector M12x1)
ALW (with display)
Immersion length: **L=...mm**
Diameter of sensor: **8 mm** (other on request)
Connection thread: **G1/2", 1/2"NPT, M20x1,5**
Measuring range
Alarm signal: **3,8** or **23 mA**

Temperature transmitter type PT-25

NEW

✓ **Output signal 4 ÷ 20mA**
✓ **Stainless steel casing and wetted parts**
✓ **Factory configured**

Application and construction

Temperature transmitter type PT-25 is designed for temperature measurement of liquid and gaseous media in range from -40 to +200°C. Resistance signal from RTD element is converted to standard 4…20mA output signal. Casing of transmitter and wetted parts are made in stainless steel. Transmitter is manufactured in two versions: with removable measuring insert and not removable measuring insert which has additional protection against vibrations. Available electrical connections are angular connector DIN EN 175301-803 or connector M12x1.

PD type
IP65

PM12 type
IP67
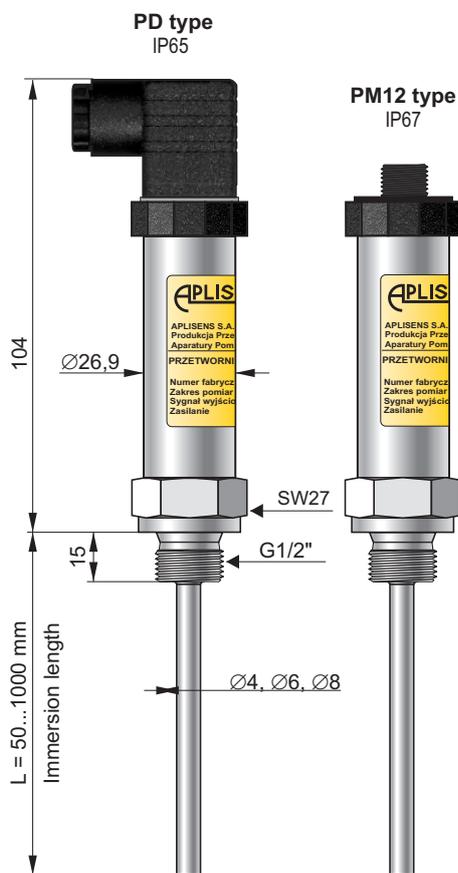
Technical data

Output signal	4...20mA
Measuring range	acc. to request from range -40...200°C
Minimum span	25K
Accuracy	± 1%
Power supply	8...35 V DC
Alarm signal	<3,1mA or >26,1mA
Wetted parts material	316L
Sensor diameter	⌀4, ⌀6, ⌀8mm
Process connection	G1/2", other on request
Immersion length	50...1000mm
Extension neck	on request
Ingress protection	PD - IP65, PM12 - IP67

Ordering procedure

PT-25/___/L = ... mm/___/___/___/__÷__°C/___

Electrical connection: **PD** (connector DIN EN 175301-803)
                                   PM12 (connector M12x1)
Immersion length: **L=...mm** (standard: 50, 100, 150, 200, 250 mm
                                      other length on request)
Diameter of sensor: 4, **6**, **8 mm**
Connection thread: **G1/2"**, other on request
Measuring range
Alarm signal: **3,1** or **26,1 mA**
Measuring insert: **R** - removable, **NR** - not removable

APLISENS®

Rail-mounted smart temperature transmitters type LI-24L and LI-24/Ex

LI-24L **LI-24/Ex**

✓ Galvanic insulation (In, out)
✓ Programmable sensor type
✓ Programmable measuring range
✓ Thermoresistance line compensation
✓ Compensation of thermocouple cold junction
✓ Output signal 4…20mA + Hart protocol
✓ Ambient temperature from -25 to +75 °C
✓ Rail mounting system
✓ Autodiagnostic system
✓ Hart protocol
✓ ATEX certificate (LI-24/Ex) ⟨Ex⟩ II 1G Ex ia IIC T4/T5 Ga
　　　　　　　　　　　　　　　　　I M1 Ex ia I Ma

HART COMMUNICATION PROTOCOL

SIL2 Manufacturer's declaration

Technical data

Input signal	K, J, S, B, N, T, R, E voltage Pt10, Pt50, Pt100, Pt200, Pt500, Pt1000, Ni100, Cu100, resistance
Limit process	- 10mV< E<100mV or -100mV< E<1000mV 0Ω<R<400Ω or 0Ω<R<2000Ω
Min. measuring range	10mV or 10Ω
Output signal	4...20mA + HART
Power supply	LI-24L: 8,5…50V DC LI-24/Ex 14...30V DC
Max. Wires resistance	500Ω
Alarm signal	21,5mA or 3,75 mA or setting by user
Sensor current	0,42mA
Accuracy	± 0,1%
Time constant	0,3s - 1,2s
Additional electronic damping	0..30s
Ambient temperature	-25…+75°C
Dimensions (WxHD)	LI-24L: 12,5mmx99mmx114,5mm LI-24/Ex: 27,5mmx80mmx106,7mm

Application and function

The temperature transmitter LI-24L and LI-24/Ex are applicable to converting resistance of temperature or voltage of thermocouple sensor to standard current signal 4-20mA. The transmitters have two separate measuring channels enabling measurement of temperature difference, averange, averange with redundancy, max or min temperature. Transmitter has compensation of ambient temparature influence and compensation of thermocouple cold junction using internal/external (Pt100) sensor or constant temperature.

Most of parameters such as: sensor type, measuring range, current alarm signal when electric circuit is broken, output characteristic correction, user characteristic (60 points) are programmed using PC with HART/USB converter and Raport 2 configuration software.

For request Aplisens can set temperature transmitter parameters like measuring range, type of sensor. Their values are printed on label. Transmitter for rail mounting (TS-35).

Electrical diagrams

RTD 2-wires connection

RTD 3-wires connection

RTD 4-wires connection

2 × RTD 2-wires connection

2 × RTD 3-wires connection

Potentiometer 2-wires connection

Potentiometer 3-wires connection

Potentiometer 4-wires connection

2 × Potentiometer 2-wires connection

2 × Potentiometer 3-wires connection

Thermocouple with external CJC

Thermocouple

2 x Thermocouple

Voltage source

2 x Voltage source

LI-24L/___/___/___/___

Version: SIL2 or none

Sensor type

Alarm signal

Measuring range

LI-24/ Ex /___/___/___

Sensor type

Alarm signal

Measuring range

Rail-mounted temperature transmitter type ATL

APLISENS®

✓ **Programmable sensor type PT100 i Ni100**
✓ **Programmable measuring range.**
✓ **Thermoresistance line compensation (3 wires line)**
✓ **Output signal 4…20mA**
✓ **Rail- mounting system.**

Application and function

The temperature economical transmitter ATL is applicable to converting resistance of temperature sensor to standard current signal 4…20mA.
Most of parameters such as: sensor type, input signal, measuring range may be adapted by user for specific requirements of his measuring system.
The transmitter is programmed using PC with RS converter and Aplisens AT configuration software.
If you define type of sensor, measuring range in the order, then the transmitter is programmed with required parameters and their values are printed on serial number label.
Transmitter for rail mounting.

Technical data

Input signal	Pt 100, Ni 100
Limit process	$20\Omega <R<380\Omega$
Min. measuring range	$10\ \Omega$
Output signal	4 – 20 mA
Power supply	6…29V DC
Load resistance	$R_o[k\Omega]<(U_z – 7V)/25mA$
Alarm signal	23mA or 3,8mA
Accuracy for $\Delta R>20\Omega$	± 0,2%
Thermal error	± 0,1% / 10°C
Ambient temperature	-25…+80°C
Error due to supply voltage changes	±0,1%

Ordering procedure.

ATL /___/__÷__°C/___

Sensor type:Pt100,Ni100
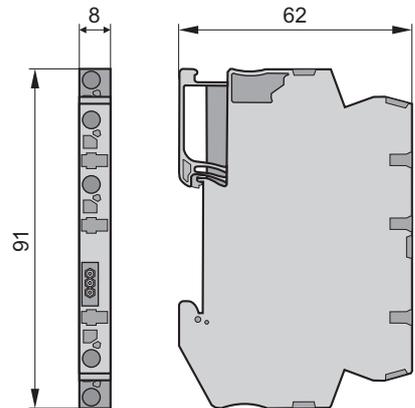
Measuring range
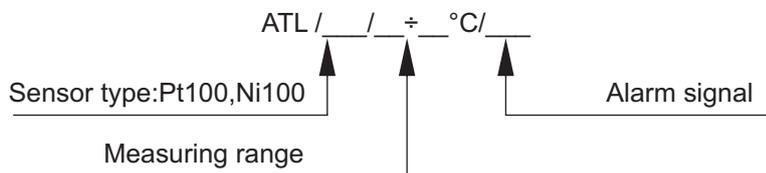
Alarm signal

Example: temperature transmitter ATL, sensor type Pt100, measuring range 0…100°C, alarm signal 23mA.

ATL/Pt100/ 0…100°C/23mA

Electrical diagrams
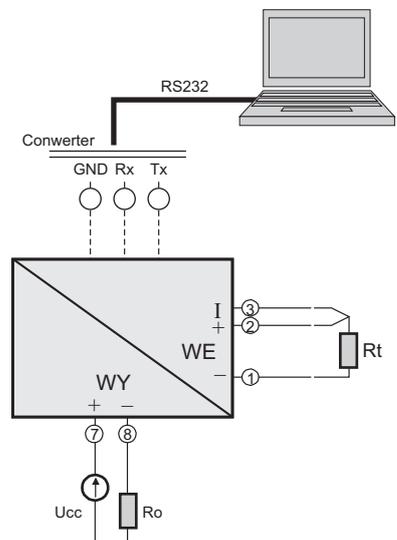
Head-mounted smart temperature transmitter type LI-24G

HART COMMUNICATION PROTOCOL

SIL2 Manufacturer's declaration

- ✓ Galvanic insulation (In, out)
- ✓ Programmable sensor type
- ✓ Programmable measuring range
- ✓ Resistant thermoresistance line compensation
- ✓ Compensation of thermocouple cold junction
- ✓ Output signal 4…20mA + Hart protocol
- ✓ Ambient temperature from -25 to +75 °C
- ✓ Autodiagnostic system
- ✓ Hart protocol
- ✓ Intrinsic Safety version
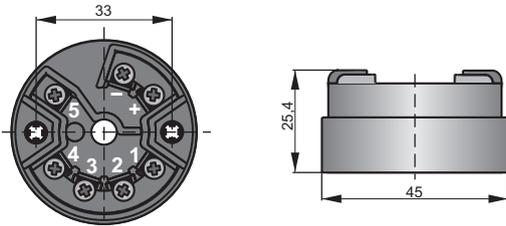
I M1 Ex ia I Ma
II 1G Ex ia IIC T5/T6 Ga
II 1D Ex ia IIIC T105°C Da

33

25,4

45

Technical data

Input signal	L, K, J, S, B, N, T, R, E voltage Pt10, Pt50, Pt98, Pt100, Pt200, Pt500, Pt1000, Ni100, Cu50, Cu100, resistance
Limit process	- 10mV< E<100mV or -100mV< E<1000mV $0Ω<R<400Ω$ or $0Ω<R<2000Ω$
Min. measuring range	10mV or 10Ω
Output signal	4...20mA + HART
Power supply	8,5...36V DC
Max. sensor resistance	150Ω/200Ω
Alarm signal	21,5mA or 3,75 mA or setting by user
Sensor current	0,42mA
Accuracy	± 0,1%
Time constant	0,55s - 1,5s
Additional electronic damping	0..30s
Ambient temperature	-25…+75°C

Application and function

The temperature transmitter LI-24G is applicable to converting resistance of temperature or voltage of thermocouple sensor to standard current signal 4-20mA. The transmitter has two separate measuring channels enabling measurement of temperature difference, averange, averange with redundancy, max or min temperature. Transmitter has compensation of ambient temparature influence and compensation of thermocouple cold junction using internal/external (Pt100) sensor or constant temperature.

Most of parameters such as: sensor type, measuring range, current alarm signal when electric circuit is broken, output characteristic correction, user characteristic (60 points) are programmed using PC with HART/USB converter and Raport 2 configuration software.

For request Aplisens can set temperature transmitter parameters like measuring range, type of sensor. Their values are printed on label.

Electrical diagrams.

1 2 3 4 5 RTD 2-wires connection

1 2 3 4 5 RTD 3-wires connection

1 2 3 4 5 RTD 4-wires connection

1 2 3 4 5 2 × RTD 2-wires connection

1 2 3 4 5 2 × RTD 3-wires connection

1 2 3 4 5 Potentiometer 2-wires connection

1 2 3 4 5 Potentiometer 3-wires connection

1 2 3 4 5 Potentiometer 4-wires connection

1 2 3 4 5 2 × Potentiometer 2-wires connection

1 2 3 4 5 2 × Potentiometer 3-wires connection

1 2 3 4 5 Thermocouple with external CJC

1 2 3 4 5 Thermocouple

1 2 3 4 5 2 x Thermocouple

1 2 3 4 5 Voltage source

1 2 3 4 5 2 x Voltage source

LI-24G /___/___/___/___

Version: Exia, SIL2, none

Sensor type

Alarm signal

Measuring range

Head-mounted temperature transmitter type AT-2

✓ **Sensor type PT100 or Ni100**
✓ **Thermoresistance line compensation (3 wires line)**
✓ **Output signal 4…20mA**
✓ **Head- mounting system.**

Application and function

The temperature economical transmitter AT-2 is applicable to converting resistance of temperature sensor to standard current signal 4…20mA.
Most of parameters such as: sensor type, input signal, measuring range may be adapted by user for specific requirements of his measuring system.

User define type of sensor, measuring range in the order, the transmitter are programmed with required parameters and their values are printed on serial number label.
Transmitter for head mounting.
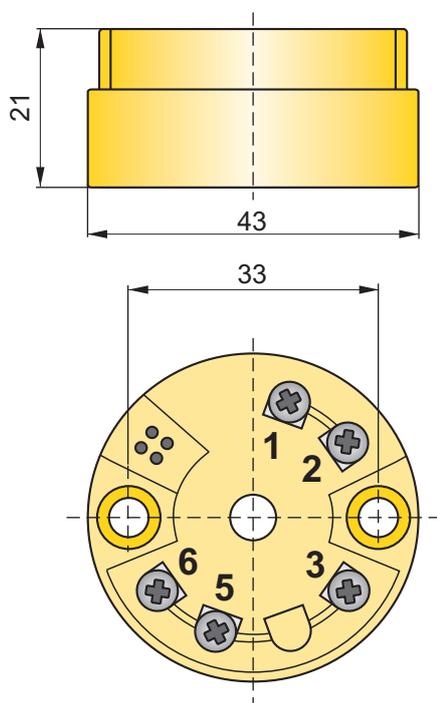
Technical data

Input signal	Pt 100
Limit process	$20\Omega < R < 380\Omega$
Min. measuring range	25C°
Output signal	4 – 20 mA
Power supply	7,5…30V DC
Load resistance	$R_d[k\Omega] < (U_z - 7,5V)/22mA$
Alarm signal	22mA or 3,6mA
Accuracy for $\Delta R > 20\Omega$	± 0,1%
Thermal error	± 0,1% / 10°C
Ambient temperature	-40…+85°C
Error due to supply voltage changes	±0,01%/V

Note: for spans smaller than 75°C, the only permissible start values are: -40°C, -20°C, 0°C, +20°C and +40°C.

Electrical diagrams

Ordering procedure.

AT-2 /___/__ ÷ __°C/___

Sensor type:Pt100,Ni100   Alarm signal

Measuring range

Example: temperature transmitter AT-2, sensor type Pt100, measuring range 0…100°C, alarm signal 22mA.

AT-2/Pt100/ 0…100°C/22mA

Head-mounted temperature transmitter type ATX-2

✓ **Sensor type: Pt100, Pt500, Pt1000, Ni100**
✓ **Thermoresistance line compensation**
✓ **Output signal 4…20mA**
✓ **ATEX certificate ⟨Ex⟩ II 1G Ex ia IIC T6**
✓ **Head-mounting system.**

Application and function

The temperature transmitters are applicable to converting resistance of temperature sensor to standard current signal 4…20mA.

Most of parameters such as: sensor type, input signal, measuring range, may be adapted by user for specific requirements of his measuring system.

User define type of sensor, measuring range in the order, the transmitter are programmed with required parameters and their values are printed on serial number label.
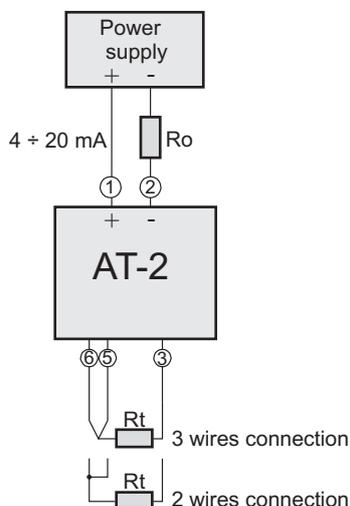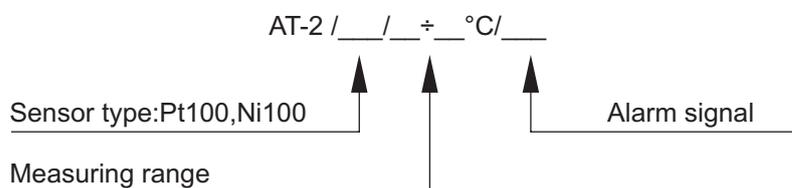
Transmitter for head mounting.
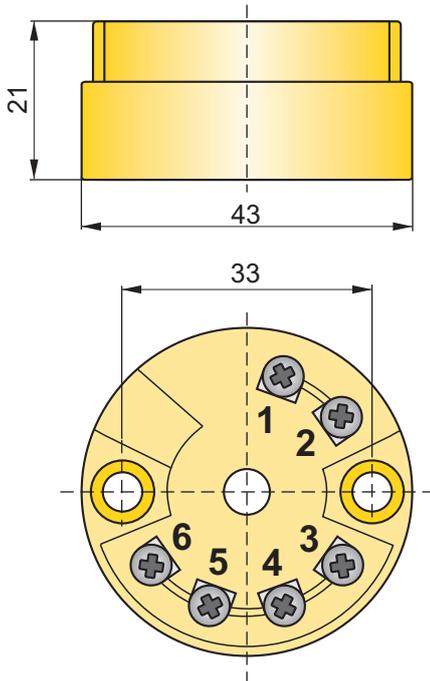
Technical data

Input signal	Pt,Ni
Min.measuring range	10°C
Output signal	4–20mA
Power supply	8…30VDC
Load resistance	$R_d[k\Omega] < (U_z - 8V)/22mA$
Alarm signal	21mAor3,5mA
Accuracy for ΔR>20Ώ	±0,2%
Thermal error	±0,05%/10°C
Ambient temperature	-40…+85°C

Accuracy:

PT100: -100÷200°C	±0,2°C	PT1000: -100÷200°C	±0,2°C
PT100: -200÷850°C	±0,4°C	PT1000: -100÷250°C	±0,4°C
PT500: -100÷200°C	±0,2°C	Ni100: -60÷250°C	±0,2°C

Electrical diagrams
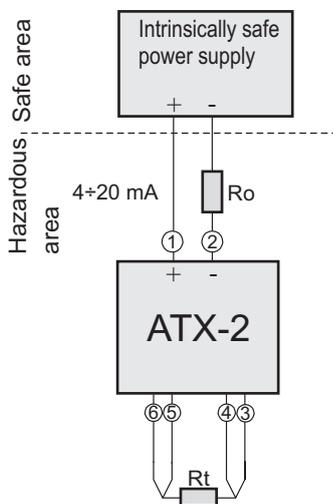
Input parameters

Input terminals 3, 4, 5, 6:
  U_o = 9,6V, I_o = 4,5mA, P_o = 11mW,
  L_o = 4,5mH dla IIC; 8,5mH dla IIB
  C_o = 709nF dla IIC; 1300nF dla IIB
Supply terminals 1(+) 2(-):
  U_i = 30V, I_i = 100mA, P_i = 750mW, L_i ~ 0, C_i ~ 0

Ordering procedure

ATX-2 /___/__÷__°C/___

Sensor type:Pt100,Ni100

Measuring range
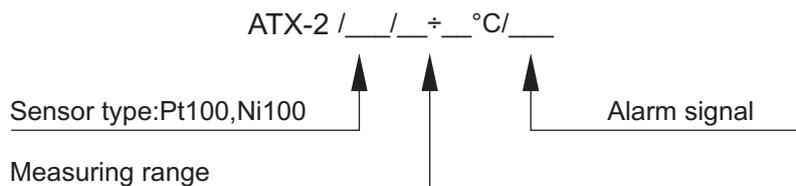
Alarm signal

Example: temperature transmitter ATX-2, sensor type Pt100, measuring range 0…100°C, alarm signal 23mA.

ATX-2/Pt100/0…100°C/23mA

Head-mounted temperature transmitter type GI-22-2, GIX-22-2

✓ **Galvanic insulation (In, out)e**
✓ **Thermoresistance line compensation (3 and 4 wires line)**
✓ **Compensation of thermocouple cold junction**
✓ **Output signal 4…20mA**
✓ **Head-mounting system**
✓ **Certificate ATEX ⟨Ex⟩II 1G Ex ia IIC T6 (GIX-22-2 version).**

Application and function

The temperature transmitters are applicable to converting resistance of temperature or voltage of thermocouple sensor to standard current signal 4…20mA.

Most of parameters such as: sensor type, input signal, measuring range, may be adapted by user for specific requirements of his measuring system.

User define type of sensor, measuring range in the order, the transmitter are programmed with required parameters and their values are printed on serial number label.

Transmitter for head mounting.
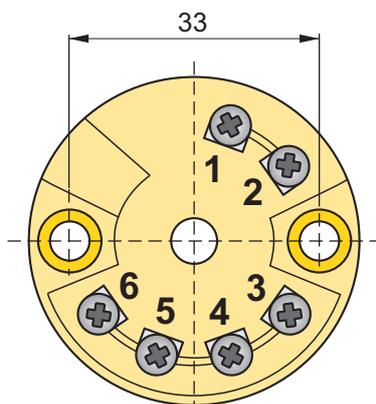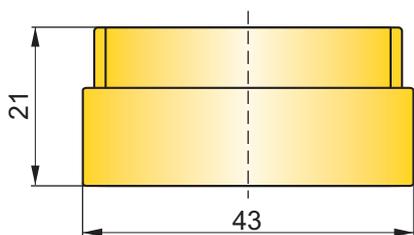
Technical data

Input signal	J, L, U, T, E, K, N, S, R, B, Pt, Ni
Min. measuring range	10°C for Pt, Ni
	50°C for J, L, U, T, E, K, N
	500°C for S, R, B
Output signal	4 – 20mA
Power supply	8…35V DC
	8-30V DC for GIX-22-2
Load resistance	$R_0[k\Omega] < (U_z - 11V)/25mA$
Alarm signal	22mA or 3,6 mA
Galvanic insulation	Optoelectrical

Accuracy

PT100: -100÷200°C	±0,2°C	J: -210÷1200°C	±0,5°C over -150°C
PT100: -200÷850°C	±0,4°C	L: -200÷900°C	±0,5°C
PT500: -100÷200°C	±0,2°C	U: -200÷600°C	±0,5°C
PT100: -200÷250°C	±0,4°C	T: -270÷400°C	±0,5°C over -200°C
PT1000: -100÷200°C	±0,2°C	E: -270÷1000°C	±0,5°C over -150°C
PT1000: -100÷250°C	±0,4°C	K:-270÷1372°C	±0,5°C over -140°C
Ni100: -60÷250°C	±0,2°C	N: -270÷1300°C	±1°C over -100°C
		S: -50÷1768°C	±2°C over +20°C
		R: -50÷1768°C	±2°C over +50°C
		B: 0÷1820°C	±2°C over +400°C
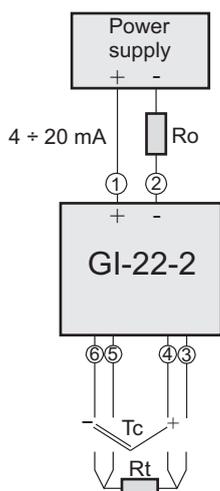
Thermal error	±0,05 %/10°C
Voltage error	±0,01%/V
Ambient temperature	-40…+85°C

Electrical diagrams

Ordering procedure

GIX-22-2 /___/__÷__°C/___

GI-22-2 /___/__÷__°C/___

Sensor type

Measuring range

alarm signal: 22mA or 3,6mA

Chapter X

Temperature sensors

NEW

Temperature sensor type CT-25

✓ **RTD output signal**
✓ **Stainless steel casing and wetted parts**

Application and construction

Temperature sensor type CT-25 is designed for temperature measurement of liquid and gaseous media in range from -40 to +200°C. Casing of sensor and wetted parts are made in stainless steel. Available electrical connections are angular connector DIN EN 175301-803 or connector M12x1.

PD type
IP65

64

15

SW27

G1/2"

L = 50...1000 mm
Immersion length

∅4, ∅6, ∅8

PM12 type
IP67
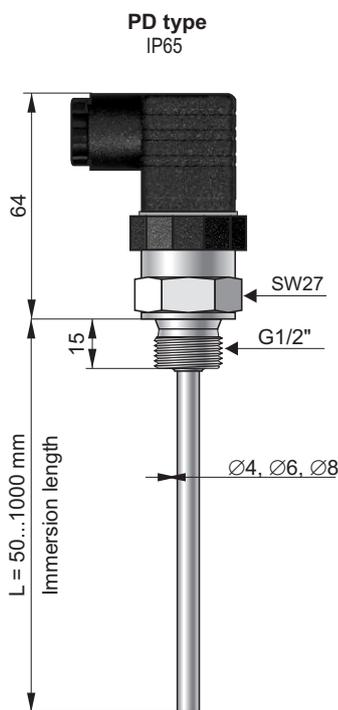
Technical data

Measuring range	-40...200°C
Accuracy	±(0,3+0,005|t|)°C (class B per IEC 60751)
Wetted parts material	316L
Sensor diameter	∅4, ∅6, ∅8mm
Process connection	G1/2", other on request
Immersion length	50...1000mm
Extension neck	on request
Ingress protection	PD - IP65, PM12 - IP67

Ordering procedure

CT-25/___/L = ... mm/___/___/___/___

Electrical connection: **PD** (connector DIN EN 175301-803)
PM12 (connector M12x1)
Immersion length: **L=...mm** (standard: 50, 100, 150, 200, 250 mm
other length on request)
Diameter of sensor: **4, 6, 8 mm**
Connection thread: **G1/2"**, other on request
Measuring element: **Pt100**
Number of wires: **2, 3, 2x2** (only in PM12 version)

Temperature sensor type CT AL
Temperature transmitter type APT AL
with Explosion Proof certificate

now available with
BV marine certificate
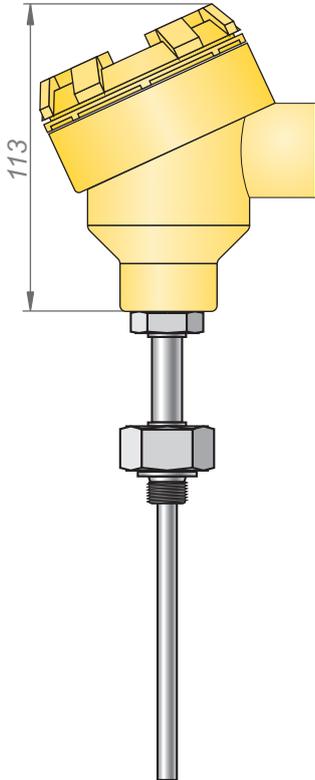
TECHNICAL DATA:

1. Measuring range:
   Pt: -196...550°C
   J/K: -200...550°C

2. Material of wetted parts:
   304ss or 316Lss (other materials on request)

3. Process connection:
   M20x1.5, G1/2", 1/2"NPT, flagnes according to DIN or ANSI (other process connection on request)

4. Diameter of measuring insert:
   $\varnothing$ 6mm, $\varnothing$ 8mm

5. Minimal immersion depth:
   90mm

6. Electrical entry:
   Thread M20x1,5 or 1/2"NPT

6. Certificate ATEX:

Location of complete equipment in zone 1 or 21

⟨Ex⟩ II 2G Ex d IIB+H_2T** Gb
II 2D Ex tb IIIC T* Db

Measuring stem with screwed to the opening D2 of housing thermowell, with proper wall thickness (zone 0 or 20):
a) minimum 1,5mm, made of corrosion resistant steel or
b) minimum 1mm and ficed in protective thermowell (wall thickness minimum 1mm) made of corrision resistant steel

⟨Ex⟩ II 1/2G Ex d IIB+H_2 T** Ga/Gb
II 1/2D Ex tb IIIC T* Da/Db

Ordering procedure
with example of ordering code

| CT-AL-Exd | GN | MR | ... | 250 | 100 | G1/2" | Pt100 | A | 3 | | |
| APT-AL-Exd | GN | MR | ... | 250 | 100 | G1/2" | Pt100 | A | 3 | AT-2 | 0÷100°C |

— Set range

— Transmitter type: AT-2, ATX-2, GI22-2, GIX-22-2 (detailed specification: Chapter IX)

— Wires number: 2, 3, 4- wires

— Class of measuring range: AA, A, B

— Type of the measuring element: Pt, 2xPt or J, 2xJ, K, 2xK

— Connection: Thread (M20x1,5; G1/2, 1/2"NPT) or flange (acorrdind to DIN or ANSI)

— Extension length: S [mm]

— Mounting length: L, Lo [mm]

— Thermowell: OG2.9, OG2.11, OG2.15, T1, SW2, SW2T (only for version GB3 and GN3)

— BV marine certificate: MR or none

— Sensor version: GB, GN, GB3, GN3, T, PG, SW, SWT; Version GB3 and GN3 only with additional thermowell

— Temperature sensor: CT-AL
  Temperature transmitter: APT-AL

Type	D [mm]	L, Lo [mm]	Material	Available process connection
PG	Ø9, Ø12, Ø11	as required	1.4301 (304)	–
GB	Ø9	100, 160, 250, 400	1.4301 (304)	M20x1.5, G1/2"
GN	Ø9, Ø12	100, 160, 250, 400	1.4301 (304)	M20x1.5, G1/2"
SW	Ø24h7	100, 140, 200	1.7335 (15HM), 1.7380 (10H2M), 1.4404 (316L)	–
SW2		140, 200		
SWT; SW2T	Ø24h7	100, 140, 200 / 140, 200	1.7335 (15HM), 1.7380 (10H2M), 1.4404 (316L)	Flange according to DIN and ANSI
OG2.9	Ø9	as required	1.4404 (316L)	G1/2", G3/4", G1" 1/2"NPT,3/4"NPT M18x1.5,M20x1.5 M24x1.5,M27x2
OG2.11	Ø11			
OG2.15	Ø15			
T	Ø11	as required	1.7335 (15HM), 1.7380 (10H2M), 1.4404 (316L)	Flange according to DIN and ANSI"
T1	Ø9, Ø 11			

Temperature sensor type CT GB1

now available with
BV marine certificate
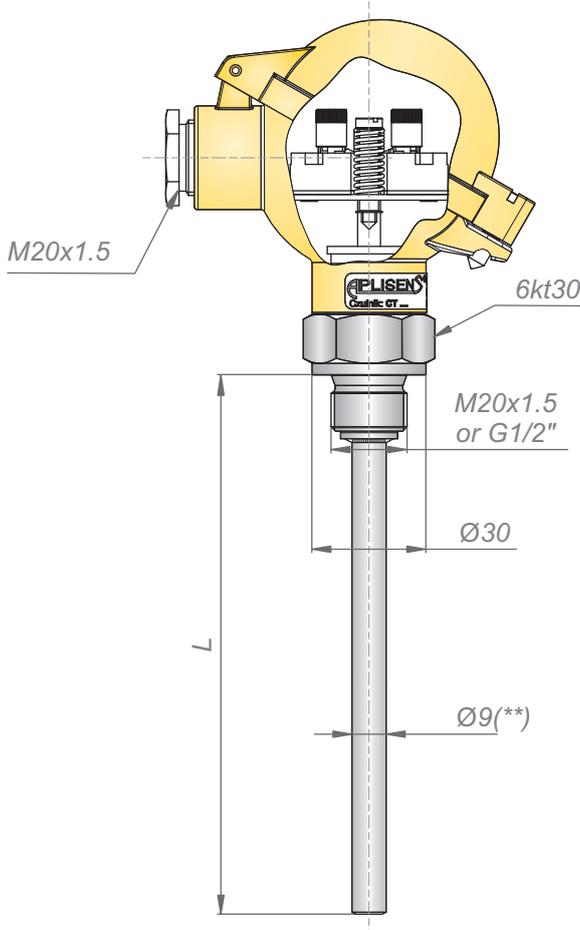
TECHNICAL DATA:

1. Measuring range:
   Pt: -70...150°C / -196...150°C (*)
2. Admissible load:
   see **Graph 2** (page X/ 17)
3. Material of wetted parts:
   304ss or 316Lss (**)
4. Standard immersion length
   L=100, 160, 250, 400 mm (**)
5. Process connection:
   M20x1,5 or G1/2"(**)
6. Time constant:

Type of sensor	$T_{0.5}$[s]	$T_{0.9}$[s]
CT GB1	≤ 33	≤ 95

7. Diameter of the measuring insert:
   Ø 6 mm
8. Minimal immersion depth:
   90 mm
9. Admissible vibrations at mounting site:
   5 ... 80 [Hz] (up to 5 [g])

Ex I M1 Ex ia I Ma

Ex II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

Left diagram labels:
M20x1.5
6kt30
M20x1.5 or G1/2"
Ø30
L
Ø9(**)

Ordering procedure with example of ordering code:

CT	GB1	Exia	II	MR	100	Ø9	304ss	M20x1.5	Pt100	B	2	ATX-2	0÷100°C	Other*****

- Set range
- Transmitter type (***) or:
  KZ - terminal block
  TR - sensor prepared for installation of another transmitter
- Wires number: 2, 3, 4- wires
- Class of measuring element: AA, A, B
- Type of the measuring element: Pt, 2xPt
- Connection thread: M20x1.5 , G1/2"(**)
- Material of wetted parts: 304ss, 316Lss(**)
- Diameter of sensor: 9mm(**)
- Mounting length: L=100, 160, 250, 400 mm(**)
- BV marine certificate: MR or none
- I-group I (IM1)(****)
  II-group II (1/2G and 1D)
- ATEX certificate: Exia or without
- Type of shield: GB1

ADDITIONAL INFORMATION:

1.(*) Low temperature version: -196...150°C.
2.(**) Non-standard version of temperature sensors on request.
3.(***) Type of temp. transmitters: LI24-G, AT-2, GI-22-2, ATX-2, GIX-22-2 or other.
4.(****) Temperature sensor for group I is produced with stainless steel housing.
5.(*****) Additional required parameters acc. to transmitter data sheet.

Temperature sensor type CT GN1

now avaliable with
BV marine certificate

M20x1.5

145

Ø12

6kt30

15

Ø30

M20x1.5
G1/2"(**)

L

Ø9 (**)
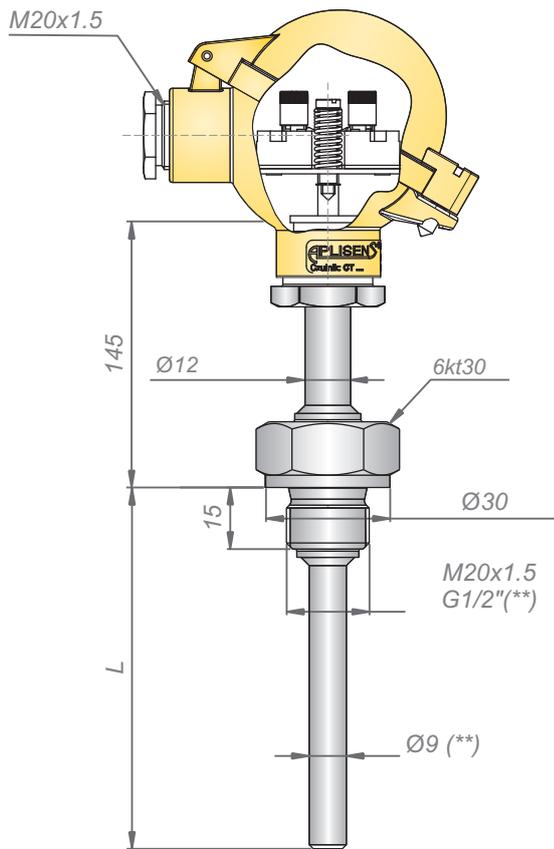
TECHNICAL DATA:

1. Measuring range:
   Pt: -70...500°C / -196...150°C (*)
   J/K: -40...550°C / -200...550°C
2. Admissible load:
   see **Graph 2** (page X/ 17)
3. Material of wetted parts:
   304ss or 316Lss (**)
4. Standard immersion length
   L=100, 160, 250, 400 mm (**)
5. Process connection:
   M20x1.5 or G1/2"(**)
6. Time constant:

Pt	$T_{0.5}$[s]	$T_{0.9}$[s]
	≤ 33	≤ 95

J/K	Isolated junction		Grounded junction	
	$T_{0.5}$[s]	$T_{0.9}$[s]	$T_{0.5}$[s]	$T_{0.9}$[s]
	≤ 22	≤ 62	≤ 3	≤ 8

7. Diameter of the measuring insert:
   Ø 6 mm
8. Minimal immersion depth:
   Pt: 90 mm

⟨Ex⟩ I M1 Ex ia I Ma

⟨Ex⟩ II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

Ordering procedure with example of ordering code:

| CT | GN1 | Exia | II | MR | 100 | Ø9 | 304ss | M20x1.5 | Pt100 | B | 2 | ATX-2 | 0÷100°C | Øther***** |

Set range

Transmitter type (***) or:
KZ - terminal block
TR - sensor prepared for installation
of another transmitter

Wires number: 2, 3, 4- wires (only for Pt100)

Class of measuring element: AA, A, B or 1, 2

Type of the measuring element: Pt, 2xPt or J, 2xJ, K, 2xK

Connection thread: M20x1.5 , G1/2"(**)

Material of wetted parts: 304ss, 316Lss(**)

Diameter of sensor: 9mm(**)

Mounting length: L=100, 160, 250, 400 mm(**)

BV marine certificate: MR or none

I-group I (IM1)(****)
II-group II (1/2G and 1D)

ATEX certificate: Exia or without

Type of shield: GN1
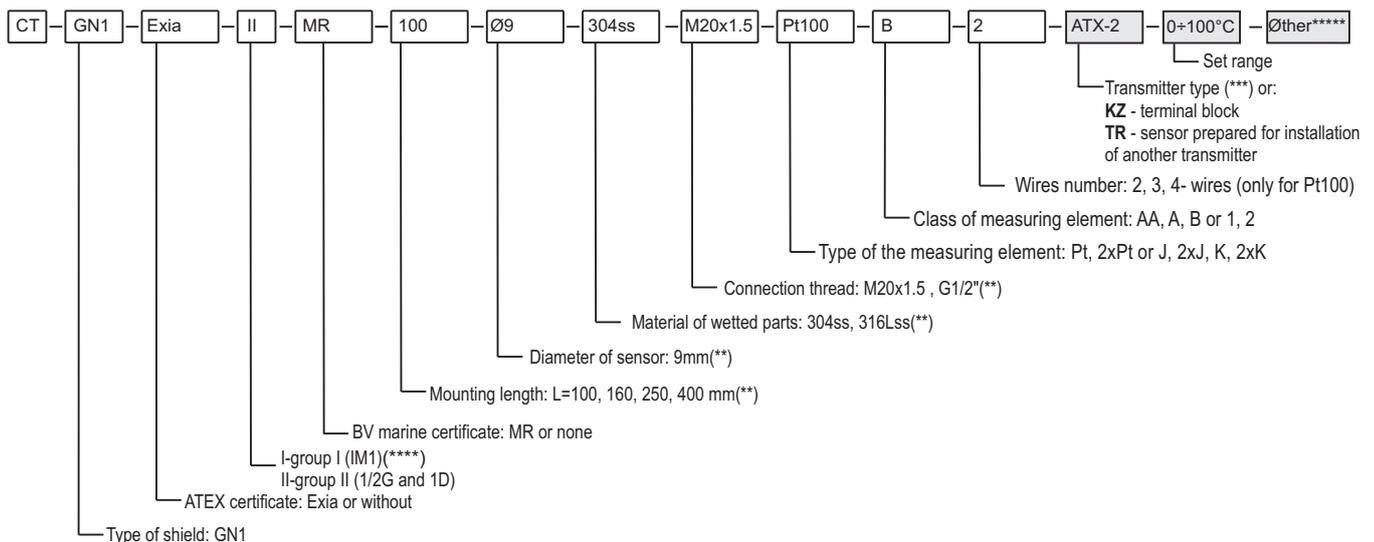
ADDITIONAL INFORMATION:

1.(*) Low temperature version: -196...150°C.
2.(**) Non-standard version of temperature sensors on request.
3.(***) Type of temp. transmitters: LI24-G, AT-2, GI-22-2, ATX-2, GIX-22-2 or other.
4.(****) Temperature sensor for group I is produced with stainless steel housing.
5.(*****) Additional required parameters acc. to transmitter data sheet.

Temperature sensor type CT T1

now avaliable with BV marine certificate

M20x1.5

145

L

Ø11(**)
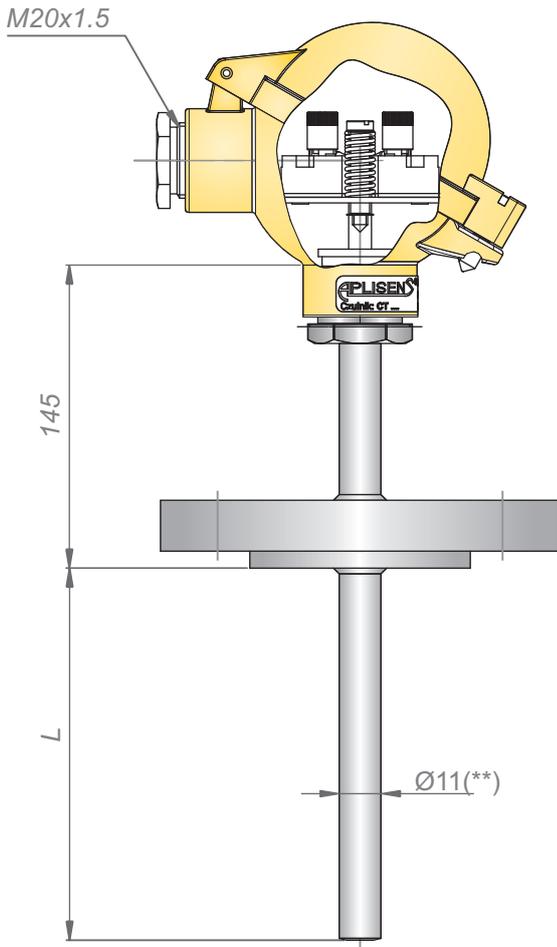
TECHNICAL DATA:

1. Measuring range:
   Pt: -70...500°C / -196...150°C (*)
   J/K: -40...550°C
2. Admissible load:
   see **Graph 1** (page X/ 17)
3. Material of wetted parts:
   304ss or 316Lss (**)
4. Standard immersion length
   L=100, 160, 250, 400 mm (**)
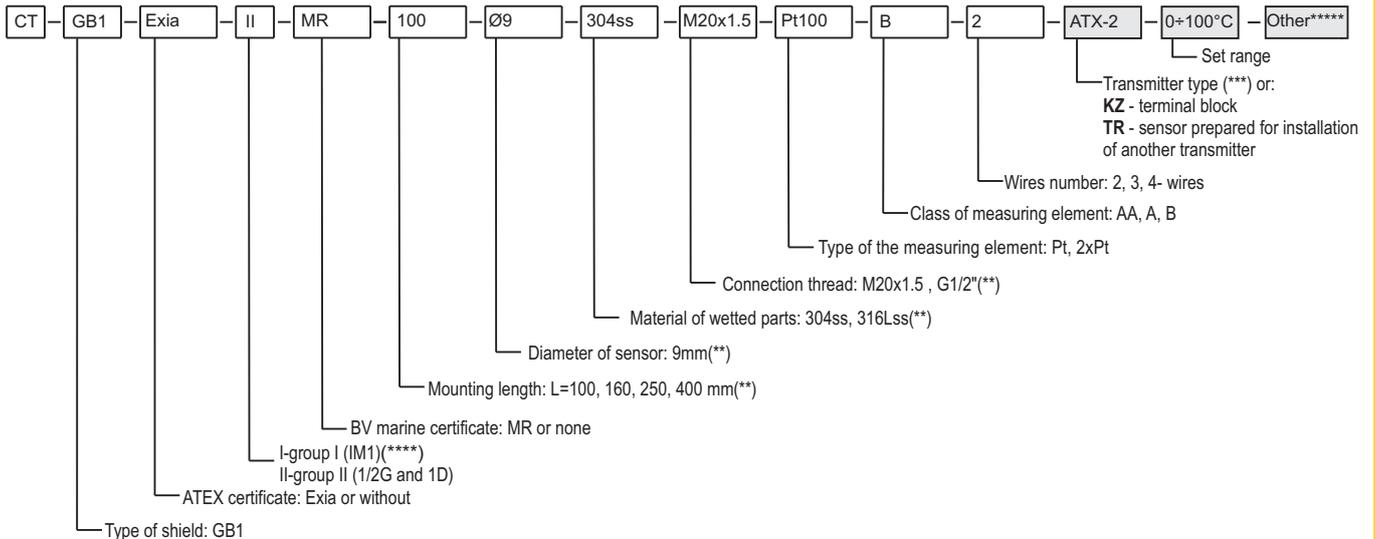5. Flange process connection
6. Time constant:

Pt	$T_{0.5}$[s]	$T_{0.9}$[s]
	≤ 40	≤ 120

J/K	Isolated junction		Grounded junction	
	$T_{0.5}$[s]	$T_{0.9}$[s]	$T_{0.5}$[s]	$T_{0.9}$[s]
	≤ 27	≤ 90	≤ 6	≤ 15

7. Diameter of the measuring insert:
   Ø 6 mm
8. Minimal immersion depth:
   Pt: 100 mm

⟨Ex⟩ I M1 Ex ia I Ma

⟨Ex⟩ II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

Ordering procedure with example of ordering code:

| CT | T1 | Exia | II | MR | 100 | Ø11 | 304ss | DN50PN16 | Pt100 | B | 2 | ATX-2 | 0÷100°C | Other****** |

- Set range
- Transmitter type (***) or:
  KZ - terminal block
  TR - sensor prepared for installation of another transmitter
- Wires number: 2, 3, 4- wires (only for Pt100)
- Class of measuring element: AA, A, B or 1, 2
- Type of the measuring element: Pt, 2xPt or J, 2xJ, K, 2xK
- Type of flange (*****)
- Material of wetted parts: 304ss, 316Lss(**)
- Diameter of sensor: 11mm(**)
- Mounting length: L=100, 160, 250, 400 mm(**)
- BV marine certificate: MR or none
- I-group I (IM1)(****)
  II-group II (1/2G and 1D)
- ATEX certificate: Exia or without
- Type of shield: T1
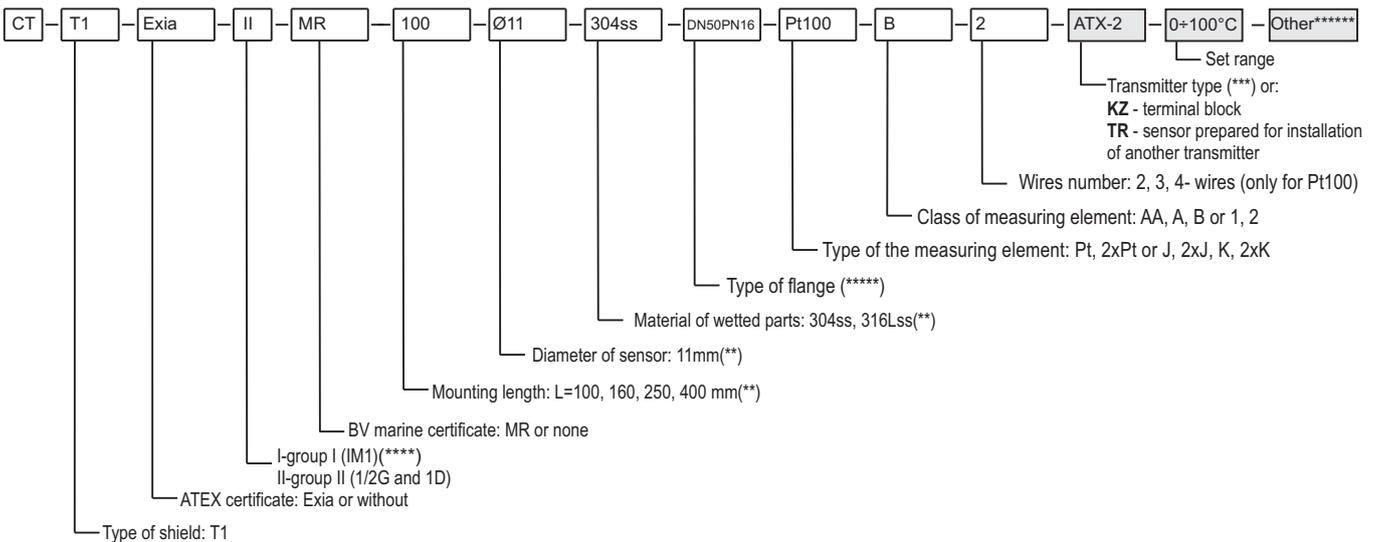
## ADDITIONAL INFORMATION:

1.(*) Low temperature version: -196...150°C
2.(**) Non-standard version of temperature sensors on request.
3.(***) Type of temp. transmitters: LI-24G, AT-2, GI-22-2, ATX-2, GIX-22-2 or other.
4.(****) Temperature sensor for group I is produced with stainless steel housing.
5.(*****) The flange standard are available acc. to norm PN, ANSI or DIN.
6.(******) Additional required parameters acc. to transmitter data sheet.

Temperature sensor type CT SW1, CT SW2

now avaliable with
BV marine certificate

M20x1.5

Thermowell SW1 or SW2

Internal thread
M12x1.5 for SW1
M18x1.5 for SW2

Ø 12

145

25

L

L

Ø18h7 for SW1
Ø24h7 for SW2

l

TECHNICAL DATA:

1. Measuring range:
   Pt: -70...500°C for 10H2M, 15HM
   J/K: 0...570°C for 10H2M; -40...540°C for 15HM
2. Admissible load:
   see **Graph 3** (page X/ 17)
3. Material of wetted parts:
   15HM, 10H2M (*)
4. Standard immersion length
   L=100, 140, 200 mm (*)
5. Fastening (welding) diameter:

CT SW1	CT SW2
Ø=18h7	Ø=24h7
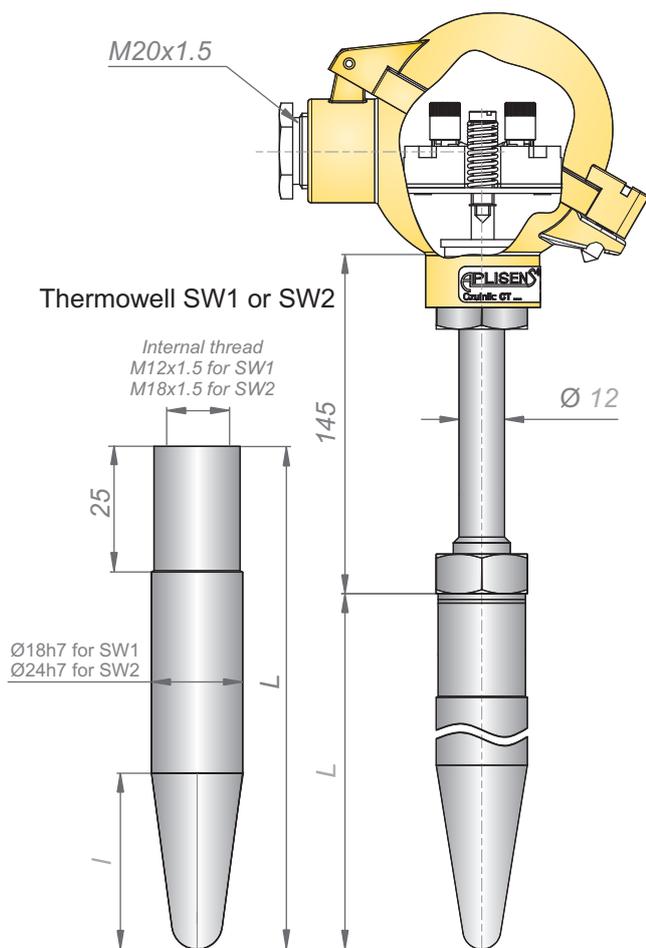
Type of sensor	Shield			Measuring insert Ø [mm]
	Ø [mm]	L [mm]	l [mm]	
CT SW1	18h7	100	35	3
		140	65	3
		200	65	3
CT SW2	24h7	140	65	6
		200	65	6

⟨Ex⟩ I M1 Ex ia I Ma

⟨Ex⟩ II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

Ordering procedure with example of ordering code:

| CT | SW1 | Exia | II | MR | 100 | Ø18 | 15HM | M20x1.5 | Pt100 | B | 2 | ATX-2 | 0÷100°C | Other**** |

Set range

Transmitter type (**) or:
KZ - terminal block
TR - sensor prepared for installation of another transmitter

Wires number: 2, 3, 4- wires (only for Pt100)

Class of measuring element: AA, A, B or 1, 2

Type of the measuring element: Pt, 2xPt or J, 2xJ, K, 2xK

Connection thread: M20x1.5 , G1/2"(*)

Material of wetted parts: 15HM, 10H2M(*)

Diameter of sensor: 9mm(*)

Mounting length: L=100, 140, 200mm (*)

BV marine certificate: MR or none

I-group I (IM1)(****)
II-group II (1/2G and 1D)

ATEX certificate: Exia or without

Type of shield: SW1, SW2

ADDITIONAL INFORMATION:

1.(*) Non-standard version of temperature sensors on request.
2.(**) Type of temp. transmitters: LI-24G, AT-2, GI-22-2, ATX-2, GIX-22-2 or other.
3.(***) Temperature sensor for group I is produced with stainless steel housing.
4.(****) Additional required parameters acc. to transmitter data sheet.

Temperature sensor type CT I4, CT I5

CT I4+OG4

M16x1.5

M20x1.5 or G1/2"

L

L+20

Ø8

Ø4
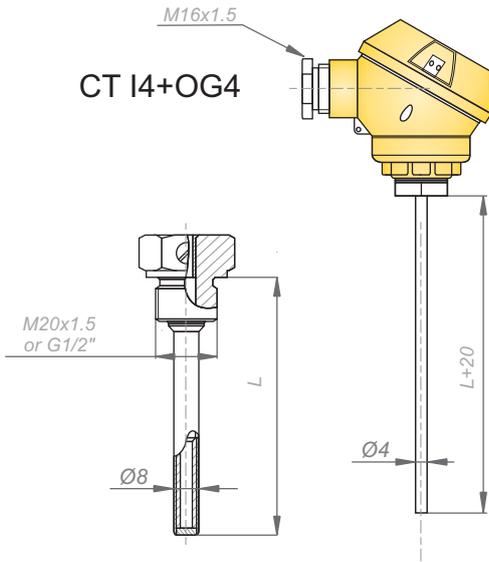
TECHNICAL DATA:

1. Measuring range:
   Pt: -70...150°C
2. Admissible load:
   OG4 and OG5: 1,6MPa
3. Material of wetted parts:
   304ss or 316Lss (*)
4. Standard immersion length
   Shield of sensor: L=85 or 120 mm (*)
5. Process connection:
   M20x1,5 or G1/2" (*)
6. Time constant:

Type of sensor	$T_{0.9}$[s]
CT I4+OG4	≤ 15
CT I5+OG5	≤ 15
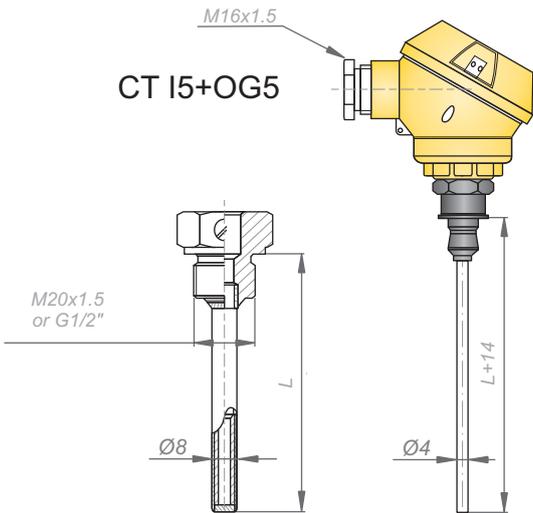
II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

CT I5+OG5

M16x1.5

M20x1.5 or G1/2"

L

L+14

Ø8

Ø4

Ordering procedure with example of ordering code:

| CT | I5+OG5 | Exia | II | 120 | Ø8 | 304ss | M20x1.5 | Pt100 | B | 2 |

- Wires number: 2, 3, 4- wires
- Class of measuring element: AA, A, B
- Type of the measuring element: Pt, 2xPt
- Connection thread: M20x1.5 , G1/2"(*)
- Material of wetted parts: 304ss, 316Lss(*)
- Diameter of sensor: 8mm(*)
- Mounting length: L=85, 120 mm(*)
- II-group II (1/2G and 1D)
- ATEX certificate: Exia or without
- Type of shield: I4+OG4, I5+OG5
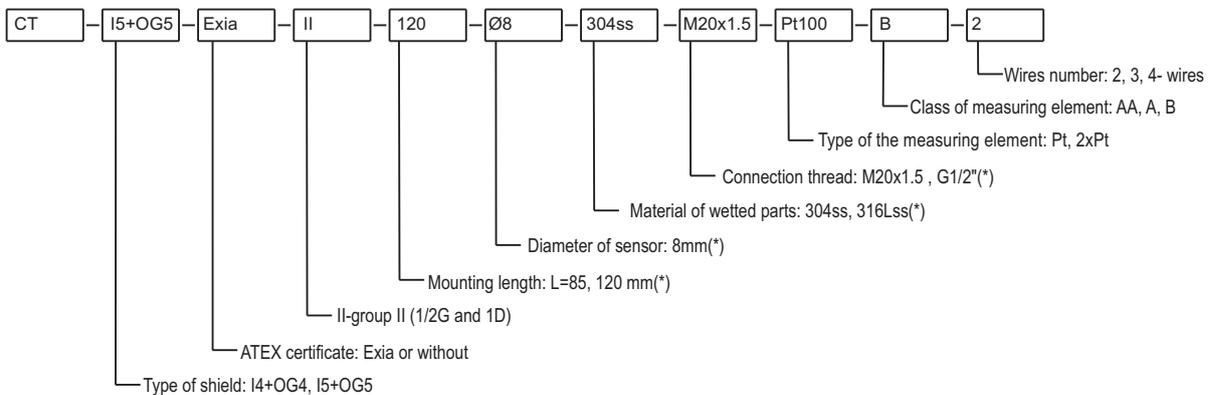
ADDITIONAL INFORMATION:

1.(*) Non-standard version of temperature sensors on request.

Temperature sensor type CT I6, CT I8, CT P1

now avaliable with
BV marine certificate
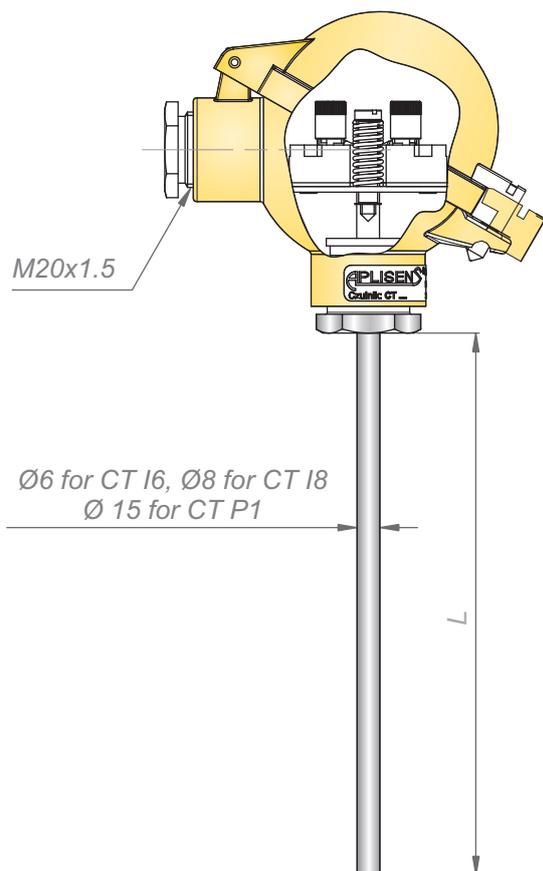
TECHNICAL DATA:

1. Measuring range:
   Pt: -70...500°C / -196...150°C (*)
   J/K: -40...550°C
2. Admissible load:
   max. up to 0.1MPa(*****)
3. Material of wetted parts:
   CT I6, CT I8 - 304ss or 316Lss (**)
   CT P1   - 15HM steel
4. Standard immersion length
   CT I6, CT I8: L=100, 160, 250, 400 mm (**)
   CT P1: L=500, 700, 1000, 1400, 2000 mm(**)
5. Process connection
   CT I6, CT I8: movable fastener UG6, UG8
   CT P1: movable fastener UG15, UC1-15
6. Time constant:

Type of sensor	0.5/0.9 [s]		
	Pt	Isolated junction	Grounded junction
CT I6	4/ 13	7/ 18	1/ 5
CT I8	9.5/ 28	10/ 25	1.5/ 7

7. Minimal immersion depth:
   CT I6-60 mm; CT I8-90 mm; CT P1-150 mm
8. Admisible vibrations at mounting site:
   5...80 [Hz] (up to 2 [g])

⟨Ex⟩ I M1 Ex ia I Ma

⟨Ex⟩ II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

M20x1.5

Ø6 for CT I6, Ø8 for CT I8
Ø 15 for CT P1

L

Ordering procedure with example of ordering code:

CT – I8 – Exia – II – MR – 100 – Ø8 – 304ss – UG8-G1/2 – Pt100 – B – 2 – ATX-2 – 0÷100°C – Other******

— Set range

— Transmitter type (***) or:
KZ - terminal block
TR - sensor prepared for installation of another transmitter

— Wires number: 2, 3, 4- wires (only for Pt100)

— Class of measuring element: AA, A, B or 1, 2

— Type of the measuring element: Pt, 2xPt or J, 2xJ, K, 2xK

— Process connection: UG6, UG8, UG15, UC1-15, none (**)

— Material of wetted parts: 304ss, 316Lss, 15HM(**)

— Diameter of sensor: 6mm, 8mm, 15mm(**)

— Mounting length: L=100, 160, 250, 400 mm for CT I6 and CT I8; L=500, 700, 1000, 1400, 2000 for CT P1(**)

— BV marine certificate: MR or none

— I-group I (IM1)(****)
II-group II (1/2G and 1D)

— ATEX certificate: Exia or without

— Type of shield: I6, I8, P1
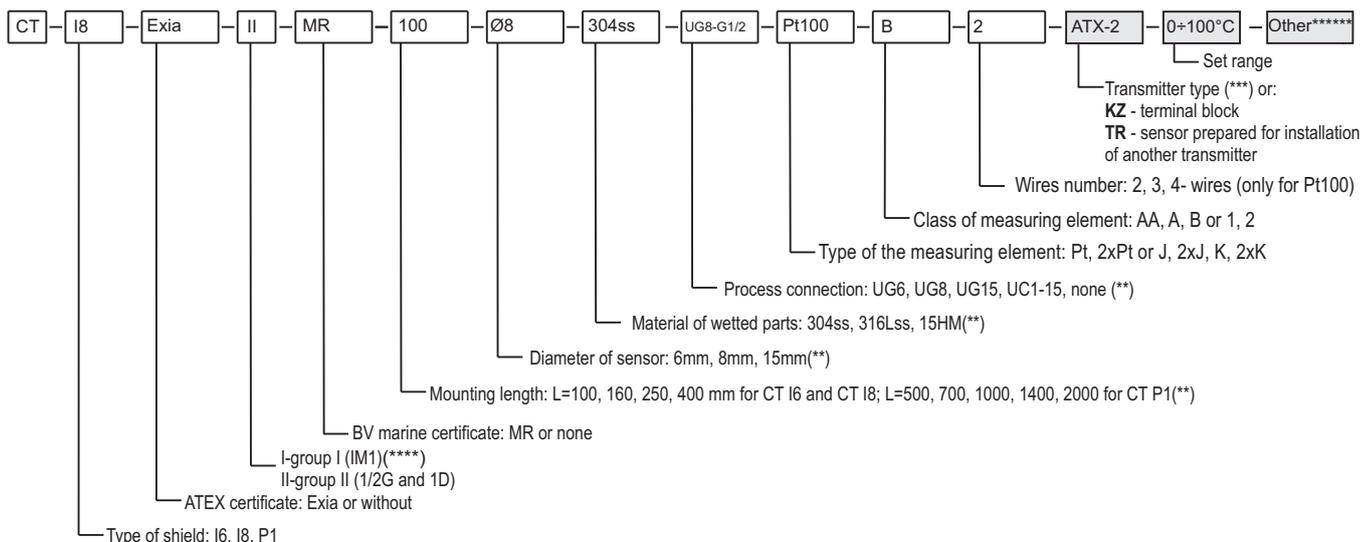
ADDITIONAL INFORMATION:

1.(*) Low temperature version: -196...150°C.
2.(**) Non-standard version of temperature sensors on request.
3.(***) Type of temp. transmitters: LI24-G, AT-2, GI-22-2, ATX-2, GIX-22-2 or other.
4.(****) Temperature sensor for group I is produced with stainless steel housing.
5.(*****) On request, we offer ERMETO sealing for higher pressures.
6.(******) Additional required parameters acc. to transmitter data sheet.

Temperature sensor
type CT U1, CT U2, CT U3, CT U4

TECHNICAL DATA:

1. Measuring range (constant/momentary)
   J: -40...750°C
   K: -40...1000°C / -40...1100°C
2. Admissible load:
   0.1 MPa
3. Material of wetted parts:
   Heat-resisting steel 1.4841(*).
4. Standard immersion length
   L=500, 700, 1000,1400, 2000 mm (*)
5. Process connection:
   UC1-22, UC2-22
6. Type of measuring junction :
   isolated
7. Admisible vibrations at mounting site:
   5 ... 80 [Hz] (up to 2 [g])

⟨Ex⟩ I M1 Ex ia I Ma

⟨Ex⟩ II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

M20x1.5

L

*200
SiC or CrC*

Thermowell Ø22x2 for CT U1
Thermowell Ø22x2+ SiC or CrC for CT U2
Thermowell Ø22x4 for CT U3
Thermowell Ø26x3 for CT U4

Ordering procedure with example of ordering code:

| CT | – | U1 | – | Exia | – | II | – | 1000 | – | Ø22 | – | 1.4841 | – | UC1-22 | – | K | – | 1 | – | O | – | GIX-22-2 | – | 0÷900°C | – | Other**** |

Set range

Transmitter type (**) or:
KZ - terminal block
TR - sensor prepared for installation of another transmitter

Type of junction: O, P, Z

Class of measuring element: 1, 2

Type of the measuring element: J, 2xJ, K, 2xK

Process connection: UC1-22, UC2-22, none(**)

Material of wetted parts: 1.4841(*)

Diameter of sensor: 22, 26 mm(*)

Mounting length: L=500, 700, 1000, 1400, 2000 mm(*)

I-group I (IM1)(***)
II-group II (1/2G and 1D)

ATEX certificate: Exia or without

Type of shield: U1, U2, U3, U4

ADDITIONAL INFORMATION

1. Type of exchangeable insert: W5.
2. (*) Non-standard version of temperature sensors on request.
3. (**) Type of temp. transmitters: LI-24G, GI-22-2, GIX-22-2 or other.
4. (***) Temperature sensor for group I is produced with stainless steel housing.
5. (****) Additional required parameters acc. to transmitter data sheet.

Temperature sensor type CT UC

TECHNICAL DATA:

1. Measuring range (constant/momentary)
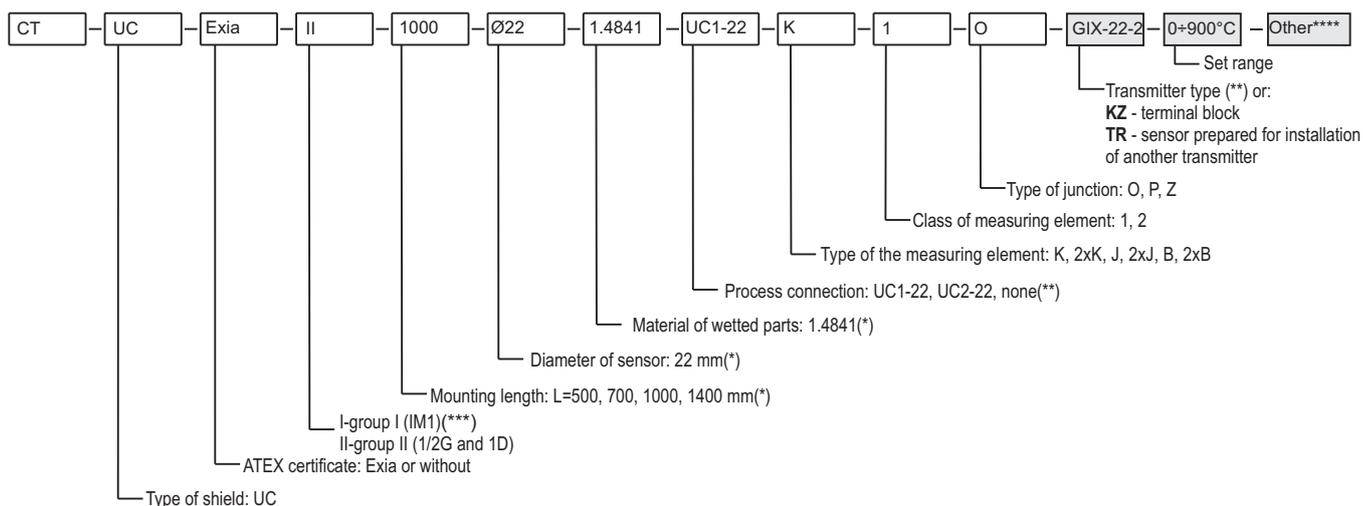   K: -40...1000°C / -40...1100°C
   S: 0...1000°C / 0...1100°C
   B: 600...1000°C / 600...1100°C
2. Material of wetted parts:
   outside: heat resisting steel 1.4841(*)
   inside: mullite ceramic material 610
           high aluminium ceramic material 799
3. Standard immersion length
   L=500, 700, 1000, 1400 mm (*)
4. Standard connection thread:
   UC1-22, UC2-22
5. Admissible vibrations at mounting site:
   5 ... 80 [Hz] up to 2 [g]
6. Diameters of thermoelectric wires:

Type	Ø [mm]
K	1.6
S	0.35 or 0.5
B	0.35 or 0.5

⟨Ex⟩ I M1 Ex ia I Ma

⟨Ex⟩ II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

M20x1.5

Heat-resistant thermowell Ø22X2

Ceramic thermowell Ø15

L

Ordering procedure with example of ordering code:

| CT | UC | Exia | II | 1000 | Ø22 | 1.4841 | UC1-22 | K | 1 | O | GIX-22-2 | 0÷900°C | Other**** |

- Set range
- Transmitter type (**) or:
  KZ - terminal block
  TR - sensor prepared for installation of another transmitter
- Type of junction: O, P, Z
- Class of measuring element: 1, 2
- Type of the measuring element: K, 2xK, J, 2xJ, B, 2xB
- Process connection: UC1-22, UC2-22, none(**)
- Material of wetted parts: 1.4841(*)
- Diameter of sensor: 22 mm(*)
- Mounting length: L=500, 700, 1000, 1400 mm(*)
- I-group I (IM1)(***)
  II-group II (1/2G and 1D)
- ATEX certificate: Exia or without
- Type of shield: UC

ADDITIONAL INFORMATION

1. Type of exchangeable insert: W4.
2. (*) Non-standard version of temperature sensors on request.
3. (**) Type of temp. transmitters: LI-24G, GI-22-2, GIX-22-2 or other.
4. (***) Temperature sensor for group I is produced with stainless steel housing.
5. (****) Additional required parameters acc. to transmitter data shee

Temperature sensor
type CT C, CT C1, CT C2, CT C3

M20x1.5

150

L

Ø15 for C i C1
Ø22 for C2
Ø32 for C3

Ø6 for C mat.799
Ø10 for C1 mat.799
Ø15 for C2 mat.610 or 799
Ø24 for C3 mat 799
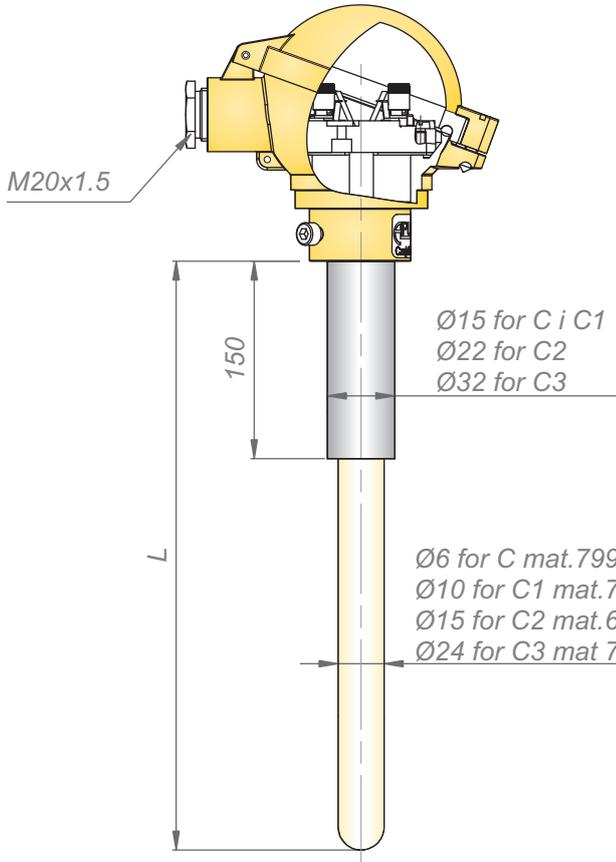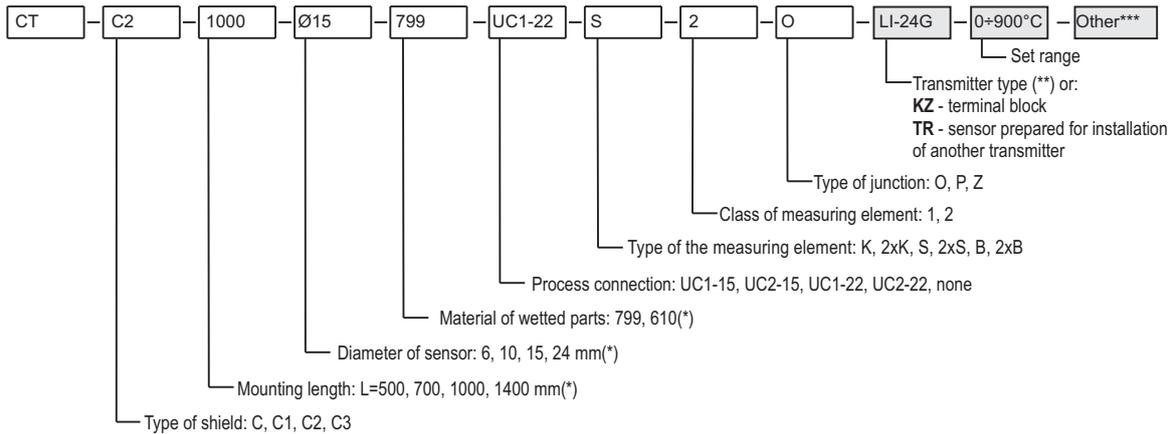
TECHNICAL DATA:

1. Measuring range (constant/momentary)
   K: -40...1000°C / 0...1100°C
   S: 0...1300°C / 0...1600°C
   B: 600...1600°C / 660...1700°C
2. Material of wetted parts:
   mullite ceramic material 610
   high aluminium ceramic material 799
3. Standard immersion length
   L=500, 700, 1000, 1400 mm (*)
4. Process connection:
   UC1-15, UC2-15, UC1-22, UC2-22
5. Admissible vibrations at mounting site:
   5 ... 80 [Hz] up to 2 [g]
6. Diameters of thermoelectric wires:

Type	Ø [mm]
K	1 for C and C1 1.6for C2 and C3
S	0.35 or 0.5
B	0.35 or 0.5

⟨Ex⟩ I M1 Ex ia I Ma

⟨Ex⟩ II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

Ordering procedure with example of ordering code:

CT – C2 – 1000 – Ø15 – 799 – UC1-22 – S – 2 – O – LI-24G – 0÷900°C – Other***

└─ Set range

└─ Transmitter type (**) or:
  KZ - terminal block
  TR - sensor prepared for installation of another transmitter

└─ Type of junction: O, P, Z

└─ Class of measuring element: 1, 2

└─ Type of the measuring element: K, 2xK, S, 2xS, B, 2xB

└─ Process connection: UC1-15, UC2-15, UC1-22, UC2-22, none

└─ Material of wetted parts: 799, 610(*)

└─ Diameter of sensor: 6, 10, 15, 24 mm(*)

└─ Mounting length: L=500, 700, 1000, 1400 mm(*)

└─ Type of shield: C, C1, C2, C3

ADDITIONAL INFORMATION

1. Type of exchangeable insert: W4.
2. (*) Non-standard version of temperature sensors on request.
3. (**) Type of temp. transmitters: LI-24G, GI-22-2 or other.
4. (***) Additional required parameters acc. to transmitter data sheet.

Temperature sensor type CT F

M20x1.5

S

Ø20
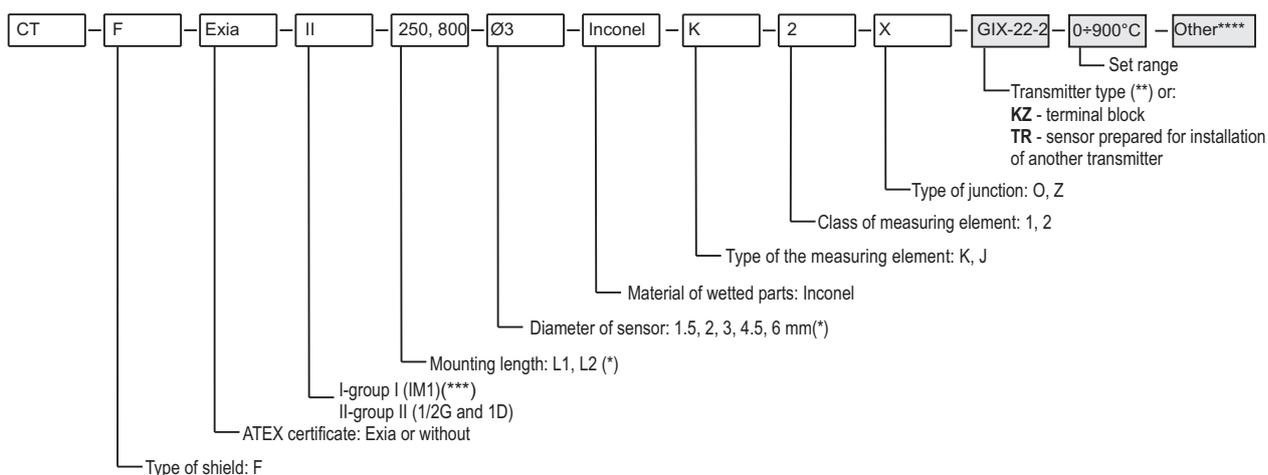
L1

L2
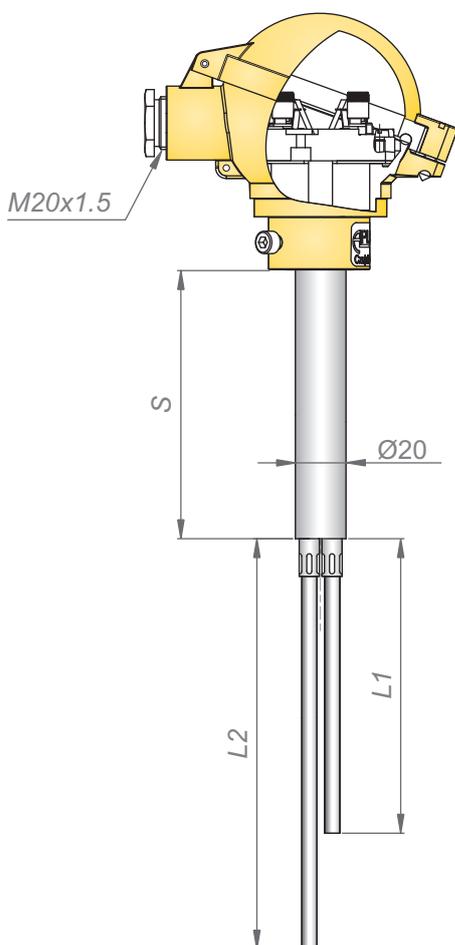
TECHNICAL DATA:

1. Measuring range
   J: -40...750°C
   K: -40...1000°C

2. Material of wetted parts:
   holding element: heat resisting steel 1.4841(*)
   measuring element: INCONEL

3. Standard immersion length:
   L1, L2 - according to specification (**)

4. Assembly length for handle
   S=100 mm or according to specification

5. Diameters of measuring elements:
   Ø: 1.5, 2, 3, 4.5, 6 mm

⟨Ex⟩ I M1 Ex ia I Ma

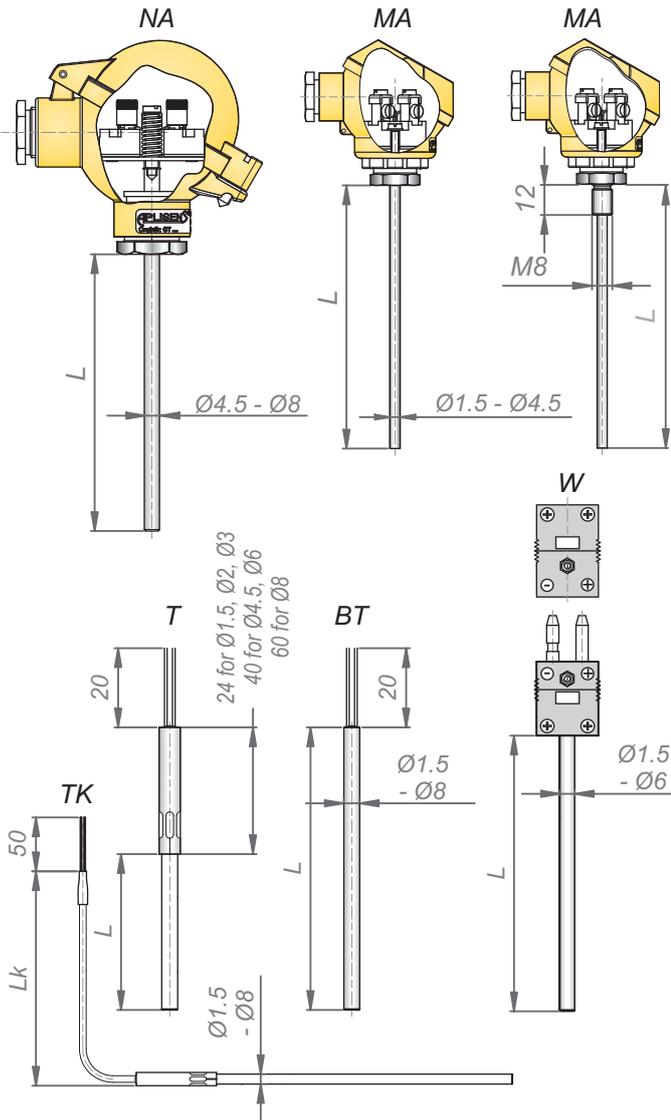⟨Ex⟩ II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

Ordering procedure with example of ordering code:

| CT | – | F | – | Exia | – | II | – | 250, 800 | – | Ø3 | – | Inconel | – | K | – | 2 | – | X | – | GIX-22-2 | – | 0÷900°C | – | Other**** |

- Set range
- Transmitter type (**) or:
  KZ - terminal block
  TR - sensor prepared for installation of another transmitter
- Type of junction: O, Z
- Class of measuring element: 1, 2
- Type of the measuring element: K, J
- Material of wetted parts: Inconel
- Diameter of sensor: 1.5, 2, 3, 4.5, 6 mm(*)
- Mounting length: L1, L2 (*)
- I-group I (IM1)(***)
  II-group II (1/2G and 1D)
- ATEX certificate: Exia or without
- Type of shield: F

ADDITIONAL INFORMATION

1.(*) Non-standard version of temperature sensors on request.
2.(**) Type of temp. transmitters: LI-24G, GI-22-2, GIX-22-2 or other.
3.(***) Temperature sensor for group I is produced with stainless steel housing.
4.(****) Additional required parameters acc. to transmitter data shee
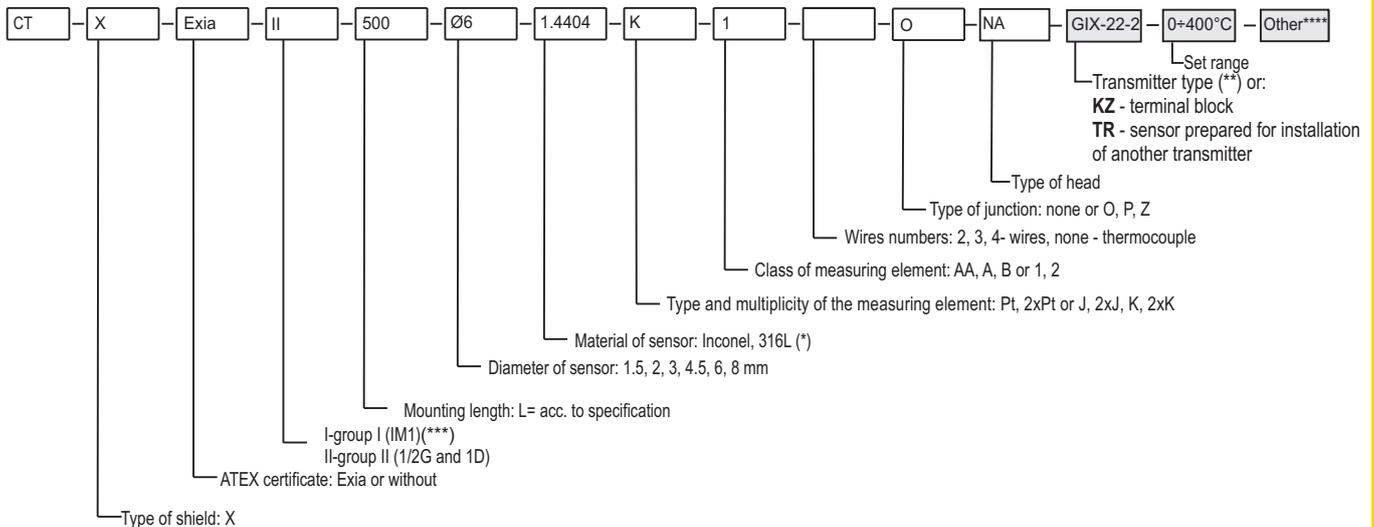
Temperature sensor type CT X

NA   **MA**   **MA**

12

M8

L   *L*

Ø4.5 - Ø8   *Ø1.5 - Ø4.5*

W

T   **BT**

20   *20*

24 for Ø1.5, Ø2, Ø3
40 for Ø4.5, Ø6
60 for Ø8

Ø1.5 - Ø8   *Ø1.5 - Ø6*

TK

50

Lk   *L*   *L*

Ø1.5 - Ø8

TECHNICAL DATA:

1. Measuring range:
   Pt: -50...500°C / -196...150°C
   J: -40...750°C
   K: -40...1000°C
2. Material of wetted parts:
   316L - for Pt
   Inconel 600 - for thermocouple
3. Standard immersion length:
   L- according to specification
4. Standard lenght of cable:
   Lk- according to specification
5. External mantle diameter:
   Ø=1.5, 2, 3, 4.5, 6, 8 mm
6. Minimal bending radius:
   2 x Ø
7. Time constant:

Diameter	Isolated junction		Grounded junction	
	$T_{0.5}$[s]	$T_{0.9}$[s]	$T_{0.5}$[s]	$T_{0.9}$[s]
Ø=3	≤ 0.5	≤ 1.5	≤ 0.35	≤ 1.2
Ø=6	≤ 2.5	≤ 6.0	≤ 0.8	≤ 2.5

⟨Ex⟩ I M1 Ex ia I Ma

⟨Ex⟩ II 1/2 G Ex ia IIC T6..T1 Ga/Gb
II 1D Ex iaD 20 T75°C Da

Ordering procedure with example of ordering code:

CT – X – Exia – II – 500 – Ø6 – 1.4404 – K – 1 – – O – NA – GIX-22-2 – 0÷400°C – Other****

- Set range
- Transmitter type (**) or:
  KZ - terminal block
  TR - sensor prepared for installation of another transmitter
- Type of head
- Type of junction: none or O, P, Z
- Wires numbers: 2, 3, 4- wires, none - thermocouple
- Class of measuring element: AA, A, B or 1, 2
- Type and multiplicity of the measuring element: Pt, 2xPt or J, 2xJ, K, 2xK
- Material of sensor: Inconel, 316L (*)
- Diameter of sensor: 1.5, 2, 3, 4.5, 6, 8 mm
- Mounting length: L= acc. to specification
- I-group I (IM1)(***)
  II-group II (1/2G and 1D)
- ATEX certificate: Exia or without
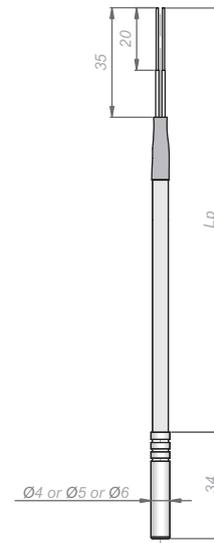- Type of shield: X

ADDITIONAL INFORMATION:

1.(*) Non-standard version of temperature sensors on request.
2.(**) Type of temp. transmitters: LI-24G, AT-2, GI-22-2, ATX-2, GIX-22-2 or other.
3.(***) In version NA head temperature sensor for group I is produced with stainless steel housing.
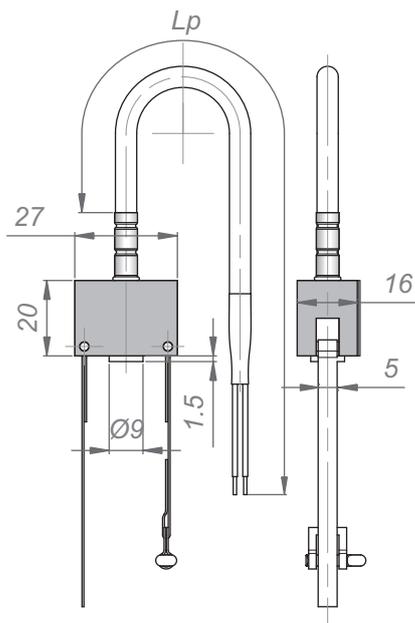4.(****) Additional required parameters acc. to transmitter data sheet.

Cable temperature sensors
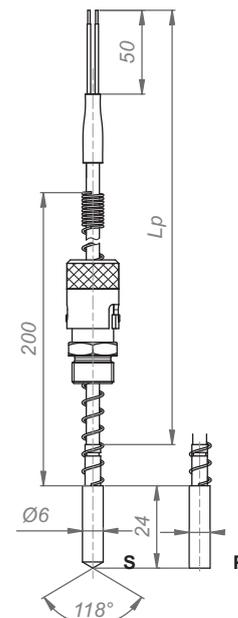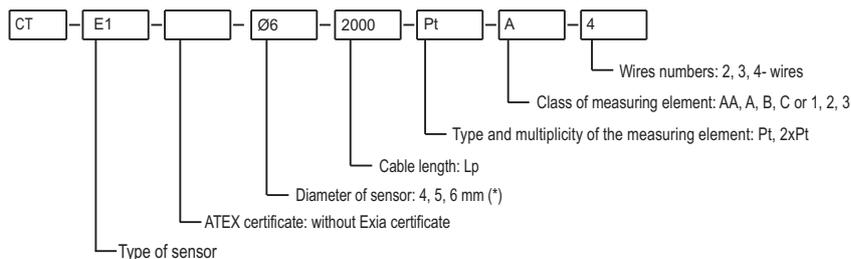# type CT GE1, CT E1, CT R6, CT E2
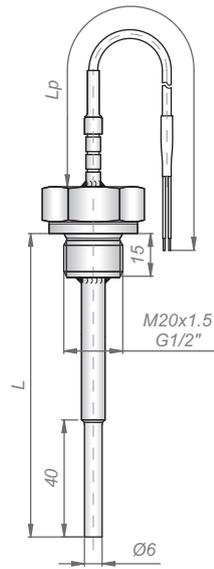
CT GE1

CT E1

CT R5

CT E2

Ordering procedure with example of ordering code:

| CT | – | E1 | – | | – | Ø6 | – | 2000 | – | Pt | – | A | – | 4 |

- Wires numbers: 2, 3, 4- wires
- Class of measuring element: AA, A, B, C or 1, 2, 3
- Type and multiplicity of the measuring element: Pt, 2xPt
- Cable length: Lp
- Diameter of sensor: 4, 5, 6 mm (*)
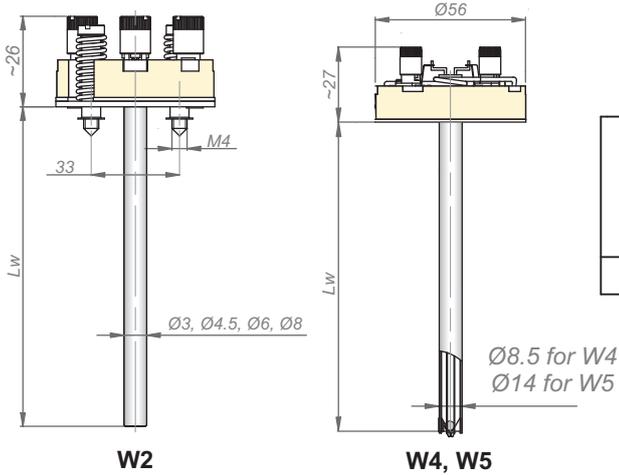- ATEX certificate: without Exia certificate
- Type of sensor

Certificate ATEX: ⟨Ex⟩ I M1 Ex ia I
II 1/2 G Ex ia IIC T6
II 1D Ex iaD 20 T75°C

ADDITIONAL INFORMATION:

1.(*) Non-standard lenght on demand.
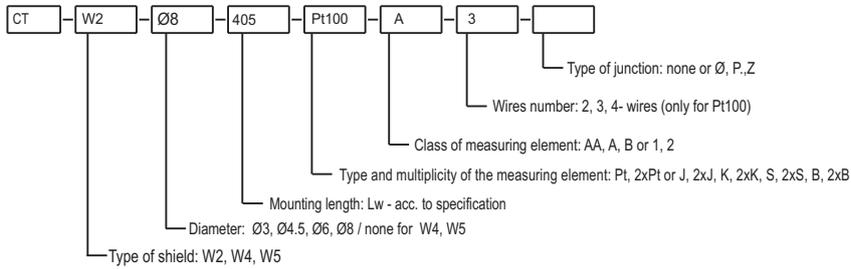
Measuring insert W2, W4, W5

W2

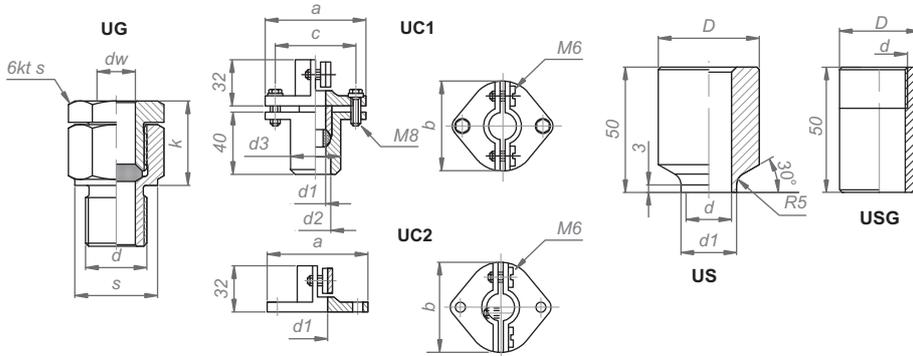Ø8.5 for W4
Ø14 for W5

W4, W5

Measuring range of insert

		Insert type		
		W2	W4	W5
	Pt	-70÷500°C / -196÷150°C**		
	J	-40÷550°C		-40÷750°C
	K	-40÷550°C / -40÷900°C	-40÷1000°C (1100°C)*	-40÷1000°C (1150°C)*
	S		0÷1300°C (1600°C)*	
	B		600÷1600°C (1800°C)*	
Shield material		316L/Inconel	Ceramic	Ceramic

* - value in the bracket is the maximum admissible momentary temperature
** - low temperature version

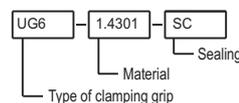## Ordering procedure with example of ordering code:

CT	–	W2	–	Ø8	–	405	–	Pt100	–	A	–	3	–	

Type of junction: none or Ø, P.,Z

Wires number: 2, 3, 4- wires (only for Pt100)

Class of measuring element: AA, A, B or 1, 2

Type and multiplicity of the measuring element: Pt, 2xPt or J, 2xJ, K, 2xK, S, 2xS, B, 2xB

Mounting length: Lw - acc. to specification

Diameter: Ø3, Ø4.5, Ø6, Ø8 / none for W4, W5

Type of shield: W2, W4, W5

CLAMPING GRIPS APPLIED FOR MOUNTING THE TEMPERATURE SENSORS

UG

UC1

UC2

US

USG

Type	Marking	Eksternal diameter of sensor's shield [mm]	Dimensions [mm]										Material
			dw	s	l	d	k	a	b	c	d1	d2	d3	D	
UG	UG6	6	6.5	22	16	M16x1.5	28								1.4301 or St
	UG8	8	8.5	22	16	M16x1.5	28								
	UG15	15	15.5	32	20	M24x2	32								
UC1	UC1-15	15						75	50	55	16	26	35		
	UC1-22	22						90	65	70	23	33	40		
UC2	UC2-15	22						75	50	55	16				
	UC2-22	22						90	65	70	23				
US	US18					Ø18H7					22			40	1.4301 15HM 10H2M
	US24					Ø24H7					30			50	
USG	USG-M20x1,5 USG-G1/2" USG-1/2"NPT					M20x1,5 G1/2" 1/2"NPT								30	1.4301

Admisible load:
UG with SC sealing - 0,1MPa
UG with PZ sealing - 8MPa
UC1 - 0,1MPa

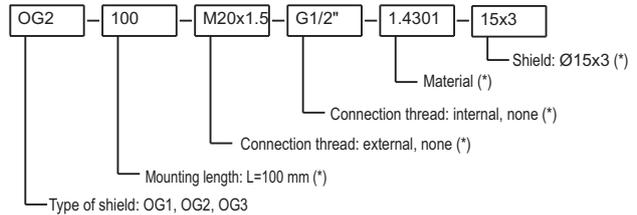## Ordering procedure with example of ordering code:

UG6	–	1.4301	–	SC

Sealing

Material

Type of clamping grip

Thermowells

OG1

Gz

Lo

L

Ø9x1
Ø10x1.5
Ø11x2
Ø12x2
Ø15x2

OG2

Gw

Gz

Lo

L

Ø9x1
Ø11x2
Ø15x2

OG3

Ø30

Gw

50

Lo

L

Ø9x1
Ø10x1.5
Ø11x2
Ø12x2
Ø15x2
Ø15x3 (15HM)

T1

Gw

40

Lo

L

Ø9x1
Ø10x1.5
Ø11x2
Ø12x2
Ø15x2
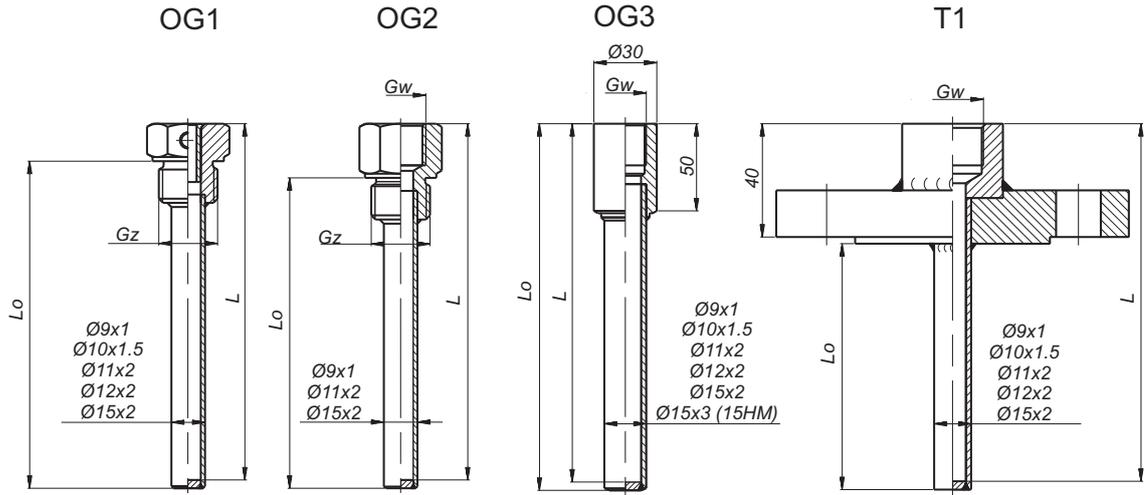
Material: ØG1, ØG2 - 1.4301, 1.4541, 1.4404; ØG3 - 1.7335 (13CrMo4-5, 15HM)

SW1G i SW2G

Gw

Gz

Lo

L

Ø18 for SW1G
Ø24 for SW2G

SW1 i SW2

Gw

Ø18h7 for SW1
Ø24h7 for SW2

Lo

L

35 for Lo=100
65 for Lo>100

SW1T i SW2T

Gw

40

Lo

L

Ø18 for SW1T
Ø24 for SW2T

35 for Lo=100
65 for Lo>100
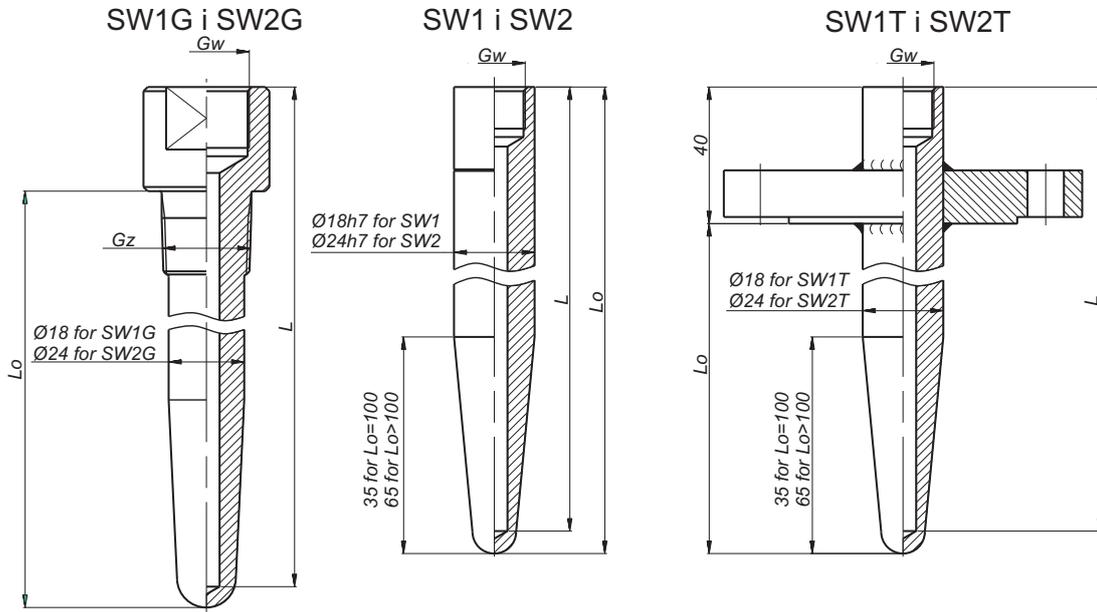
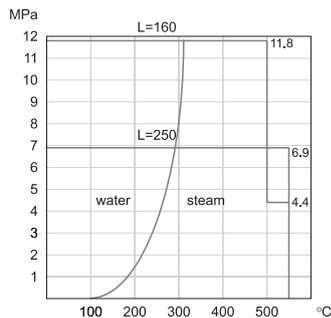Material: 1.4301, 1.4541, 1.4404, 1.7335 (13CrMo4-5,15HM), 1.7380 (10CrMo9-10, 10H2M)

Ordering procedure with exapmle of ordering code:

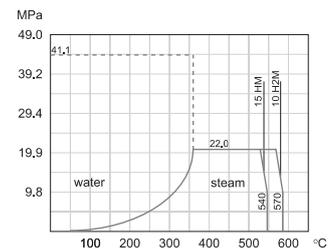| OG2 | – | 100 | – | M20x1.5 | – | G1/2" | – | 1.4301 | – | 15x3 |

Shield: Ø15x3 (*)

Material (*)

Connection thread: internal, none (*)

Connection thread: external, none (*)

Mounting length: L=100 mm (*)

Type of shield: OG1, OG2, OG3

ADMISSIBLE LOADS FOR PARTICULAR TYPES OF SHIELDS AT SPECIFIED WORKING CONDITIONS

MPa

L=160

12
11.8
11
10
9
8
7 — 6.9
6
5
L=250
4 — 4.4
3
2
1

water | steam

100 200 300 400 500 °C

Graph 1. Admissible load of the G1 and T1 shields at the conditions of work - 15HM, 1H18N9T, H17N13M2T

MPa

7
6 — 6.4
5
4 — 4.9
3
2
1

L=100, 160
L=230, 250

water | steam

L=360, 400, 510

100 200 300 400 500 °C
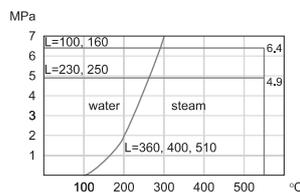
Graph 2. Admissible load of the GN1 and GB1 shields at the conditions of work - 15HM, 1H18N9T, H17N13M2T

MPa

49.0
41.1
39.2
29.4
22.0
19.9

15 HM
10 H2M

540 | 570

9.8

water | steam

100 200 300 400 500 600 °C

Graph 3. Admissible load of the SW1 and SW2 shields at the conditions of work

Notes