PJSC TERA   Vsikhsviatska str., 7, Chernihiv city   +38 (067) 505-35-42   +38 (067) 657-27-99   info@ao-tera.com.ua   www.ao-tera.com

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PJSC TERA, based in Ukraine, stands as a leading manufacturer in the field of humidity and temperature sensors, control and measurement devices, and other automation solutions. The company operates from extensive industrial, office, and storage facilities spanning over 2000 square meters in Chernihiv.

CEO Yevhen Yakimets

Design bureau

Laser welding

The hardware produced by PJSC TERA finds application in automating heating and gas supply systems, ventilation and air conditioning, industrial processes in the chemical, pharmaceutical, and food industries, engineering and agriculture.

The company comprises various divisions, including probe manufacturing (involving metal mechanical processing, pressing, casting, welding, assembly, and technical quality control stations), device manufacturing (involving PCB assembly, assembly, configuration, and technical quality control stations), a design bureau, a metrology and testing laboratory, a supply and logistics division, and administration.

Welding

Assembly

CNC turning center

Common types of products that are manufactured or designed according to technical projects include:

- Temperature, humidity, gas, presence, and inductance sensors
- Transducers for both analog and digital signals
- Transducers equipped with interfaces such as RS232, RS485, CAN, Ethernet, WiFi, and USB
- Meters, regulators, controllers, and transducer boards
- Pulse counters and tachometers
- Paperless recorders for capturing data from probes

- Power supplies and relays
- Control panel boards
- Monitoring and alarm systems
- Wireless data transfer systems using ZigBee 865/2400 MHz, GSM 4G LTE, and WiFi
- Software for use on PCs with Windows OS or smartphones with Android OS

*Wire Electrical Discharge Machine*

PCB assembly

Device configuration

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Advantages:

High-Quality Products: PJSC TERA has been designing and manufacturing probes since 1989 and control measuring devices since 2000. Our products are assembled using components from world-renowned manufacturers. Rigorous quality control is ensured through our in-house technical control station. The company's quality control system is certified according to the ISO 9001:2021 standard.
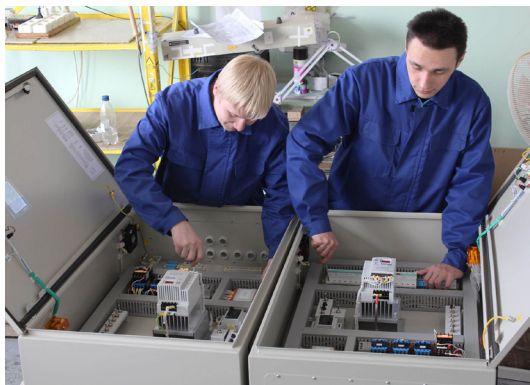
Assembly of control panel boards

Technical control station

Laboratory

Personalized Customer Approach: PJSC TERA prides itself on offering a tailored experience for every client. Its customers have the flexibility to choose from our catalog of standard models, provide samples (even if they are non-functional), specify models from other manufacturers, or send technical drawings of probes via SNS with their desired features.

Cutting-Edge Technologies and Ongoing Development: PJSC TERA remains at the forefront of technology through continuous production enhancements and an ever-expanding product range, thanks to our robust design bureau. Additionally, its design bureau excels in successfully developing projects based on client-provided specifications.

Headquarters

CNC machining center

CNC machining center

PJSC TERA serves a diverse clientele in Ukraine, catering to companies that require precise control and regulation of temperature, humidity, and various other technological parameters. In addition to serving the domestic market, the company exports its products to a wide range of countries, including but not limited to the United Kingdom, Poland, Latvia, Georgia, Kazakhstan, Moldova, China, India, Egypt, Iraq, Azerbaijan, Turkmenistan, Argentina, Uruguay, Venezuela, Colombia, and more. Its international exports are facilitated through official distributors located overseas.

Vibratory Polishing Machine

CNC Electrical Discharge Machine

Injection Molding Machine

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This section showcases the extensive variety of temperature probes, which constitute the core product line manufactured by PJSC TERA. The company has been producing temperature probes since its establishment in 1989, accumulating significant expertise in manufacturing these products. Its core principles include offering competitive prices, providing a personalized approach to addressing each client's unique needs, and incorporating the latest advancements in thermometry technology.

Ordering options for probes:

- Select a standard model from the catalog using the order code provided below.
- Submit a sample (even if non-functional).
- Share a technical drawing through SNS with the required specifications.
- Specify the name or serial number of a probe from another company.

Order code

Example:	TSP	-	1-5	-	Pt100	-	B	-	3	-	250	-		-	6	-	M20x1,5	-	40	-			-	2000	-	RE	-	/-50...250/	-	Exi
Example:	TXA	-	U	-	1-23	-	K	-	1%	-	U	-	800	-	310S	-	10	-	INC	-	G1/2"	-	70	-	A		-					/0...1000/		
Example:	TNN	-			1-29k	-	N	-	1	-	U	-	1250	-	600	-	C530	-	26	-	3,0	-			A1		-					/0...1200/		
Example:	TSP	-			1-43	-	Pt100	-	B	-	3	-	100	-		-	8	-		-	M20x1,5	-	80	-	AX	A12	-					/-50...500/	-	Exd
Example:	TΠP	-			1-29	-	S	-	1	-	U	-	1000	-	400	-	C799	-	12	-	0,35	-		-		-	A		-					/0...1400/		

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

1. Type

TSM, TSP, TST, TR, TXK, TJK, TMKn, TXA, TNN, TPP, TΠR

2. Transducer

U (built-in 4-20 mA transducer), **RST** (built-in RS485 transducer, T-bus protocol), **RSM** (built-in RS485 transducer, Modbus RTU protocol), **HART** (built-in HART transducer, HART5 and HART7 protocol)

3. Model name

4. Type and Nominal Resistance

Cu50, Cu100, Pt50, Pt100, Pt1000, 10kNTC, DS18B20, K, L, J, T, N, S, R, B

5. Accuracy (for RTD without 4-20mA / RS485 transducer)   (for RTD with 4-20mA / RS485 transducer)

B (Cu50, Cu100), **B** (Pt50, Pt100), **AA, A, B** (Pt100, Pt1000), **1%** (10kNTC), **0,5** (DS18B20), **1, 2** (K, L, J, T, N, S, R, B)

0,5% (Cu50, Pt50), **0,2%, 0,5%** (Cu100, Pt100, Pt1000), **1%** (K, N, S, R, B)

6. RTD wire connection   TC junction type

2, 3, 4, 2x2, 2x3 (TSM, TSP), **2** (TST), **3** (TP)   **U** (ungrounded), **2U** (dual ungrounded), **G** (grounded), **2G** (dual grounded)

7. Length of the immersion part L, mm*

8. Length of the immersion (ceramic) part l, mm (only 1-29 and 1-29k)

9. Sheath material (high temperature probes up to 900°C only)

321S - AISI321 stainless steel, **310S** - AISI310 stainless steel, **INC** - Inconel 600 alloy, **INC601** - Inconel 601 alloy, **NIC** - Nicrobel alloy, **C799** - C799 gas proof ceramic, **C530** - C530 porous ceramic, **15Cr25Ti** - Steel 15Cr25Ti

10. Diameter of the immersion part, mm (defines by the ring of the probe)

11. Inner sheath material (1-23, 1-23m, 1-23n, 1-23l, 1-23p, 1-24, 1-24m, 1-29 and 1-29k only)

321S - AISI321 Ø6 mm MI cable, **310S** - AISI310 Ø6 mm MI cable, **INC** - Inconel 600 Ø6 mm MI cable, **1,2** - Ø1,2 mm thermocouple wire type K in ceramic, **3,0** - Ø3 mm thermocouple wire type K / N in ceramic, **0,5** - Ø0,5 mm thermocouple wire type S, R / B in ceramic, **0,35** - Ø0,35 thermocouple wire type S, R mm in ceramic

12. Process connection size

M6 x 1, M8 x 1, M10 x 1, M12 x 1,5, M16 x 1,5, M20 x 1,5, M27 x 2, M33 x 2, G1/4, G3/4, G1/2, R1/2, Rc1/2, NPT 1/2

13. Length of the remote part, mm (the distance between the bearing surface and the RTD / thermocouple head or wires)

14. RTD/TC head (transducer's case) or connector

B (polyamide), **BX** (polyamide antistatic), **A** (aluminium), **A1** (aluminium), **Z** (polyamide), **AX** (proof-explosive aluminium), **AIX** (proof-explosive aluminium), **M12FA** (M12 connector, angled), **M12FD** (M12 connector, straight), **M8MD** (M8 connector, straight)

15. Cable glande (AX and AIX only)

H8, H14, A12, A20, HM8, HM14

16. Length of the output cable Lw, mm

17. Cable type

PR, RS, RE, ME, TE, TT, VV, VE, OLF

18. Process temperature range, °C

19. Explosion-proof labelling (explosion-proof temperature probes only)

Exi - low current/voltage supply, **Exd** - prevents transmission of the explosion outside

* - For thermocouples with a fixed flange or a construction component, the distance between the thermowell tip and the bearing surface of the flange or the construction. For thermocouples without a flange, the distance between the thermowell tip and either the RTD/TC head or, in the absence of a head, the wire leads.

RTD TECHNICAL SPECIFICATIONS

Type*	R_o, Om	$\alpha = R_{100} - R_0/R_0 \cdot 100$, °C^{-1}	$I_{mes.}$, max, mA	Process temperature range, °C	Description
Cu50	50	0,00428	1	-50...180	Linear characteristics. Low thermal stability. Standard for former USSR countries.
Cu100	100				
Pt100	100	0,00385	1	-196...750	International standard. Non-linear characteristics. Highest reliability and thermal stability. Compact dimensions. Using sputtering technology. High-resistance models have current limitations.
Pt1000	1000		0,3		
Pt50	50	0,00391	3	-196...600	Non-linear characteristics. Excellent thermal stability. Elevated price. Standard for former USSR countries.
Pt100	100				

RTD NOMINAL RESISTANCE

Type	Accuracy	Process temperature range, °C	The range of the error, °C
Cu50, Cu100	B	-50...150	± (0,30 + 0,0050t)
Pt50, Pt100		-196...600	
Pt100, Pt1000		-70...500	
Pt100, Pt1000	AA	-50...200	± (0,10 + 0,0017t)
Pt100, Pt1000	A	-70...300	± (0,15 + 0,0020t)

THERMISTOR TECHNICAL SPECIFICATIONS

Type	R_o, Om	B_{25}/B_{85}	The range of the error of B25 / B85, %	Process temperature range, °C	The range of the error R_{25}, %
10kNTC 003	10 000	3970 K	± 1,3	-40...150, -20...200	± 1

RTD WIRE CONNECTION AND TC JUNCTION TYPES

2 - 2-wired
3 - 3-wired
4 - 4-wired
2x2 - dual 2-wired
2x3 - dual 3-wired
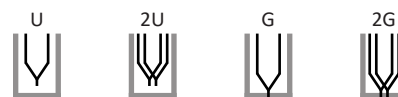
U - ungrounded*
2U - dual ungrounded
G - grounded
2G - dual grounded

* - thermocouples of type J are made with ungrounded junction only.

THERMOCOUPLE TECHNICAL SPECIFICATIONS

| Type	Description	Name	Process temperature range, °C	Description
T	Cu-CuNi	Copper-constantan	-200...350	International standard. Specialization in low temperature, vacuum, inert and reactive atmospheres, and partially in oxidative atmospheres.
L	CrNi-CuNi	Chromel-coppel	-40...600	High thermal sensitivity. Sensitivity to deformations. Popular in former USSR countries.
J	Fe-CuNi	Iron-constantan	-40...750	International standard. Excellent thermal stability. Capable of operating in renewable environments. Grounded junction not available for use.
K	NiCr-NiAl	Chromel-alumel	0...1200	International standard. Moderate thermal stability. Highly popular. Affordable price.
N	NiCrSi-NiSi	Nicrosil-nisil	0...1250	International standard. Offers superior thermal stability compared to TXA. Ideal for temperature range of 1000 to 1250 °C.
S	Pt10Rh-Pt	Platinum/rhodium-platinum	0...1600	International standard. Exceptional thermal stability and oxidative resistance. Susceptible to fouling. High cost.
R	Pt13Rh-Pt	Platinum/rhodium-platinum	0...1600	International standard. Similar to type S with slight differences in characteristics. Previously popular overseas.
B	Pt30Rh-Pt6Rh	Platinum/rhodium-platinum/rhodium	600...1600	International standard. Higher resistance to fouling and lower thermal sensitivity compared to TPP. Plain copper wire easily compensates for It.

ACCURACY FOR THERMOCOUPLE

Type	Accuracy	Process temperature range, °C	The range of the error, °C
T*	1	-40...250	± 0,5
	1	125...350	± 0,004|T|**
J	1	-40...375	± 1,5
	1	375...600 (750)	± 0,004|T|**
L	2	-40...375	± 2,5
	2	375...600 (750)	± 0,0075|T|**
K	1	-40...375	± 1,5
	1	375...1000	± 0,004|T|**
	2	-40...375	± 2,5
	2	375...1200	± 0,0075|T|**
N	1	-40...375	± 1,5
	1	375...1000	± 0,004|T|**
S, R, B	2	0...600	± 1,5
	2	600...1600	± 0,0025|T|**

* - The mobile using type T thermocouples for temperatures over 250°C is not recommended.
** - T represents the process temperature value used for error calculation.
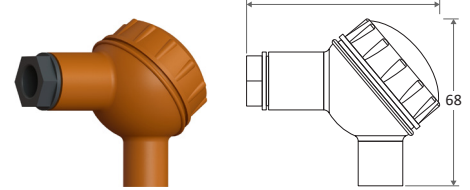
B Head
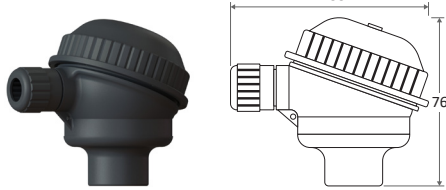
88
76

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Material
-50...200 (230)	IP67	Polyamide

Standard	Outer diameter of the cable, mm	Process connection
DIN B (33 mm*)	3...7	M10 x 1, M20 x 1,5, G1/2

M Head (under development)
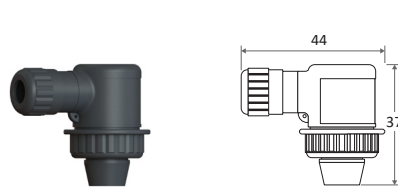
44
37

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Material
-50...200 (230)	IP66	Polyamide

Outer diameter of the cable, mm	Process connection
3...7	M6 x 1

D Head (discontinued)

80
68

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Material
-50...200 (230)	IP54	Fiberglass

Outer diameter of the cable, mm	Process connection
3...9	M10 x 1

A Head
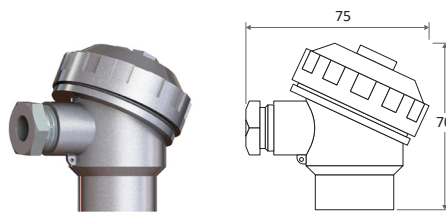
75
70

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Material
-50...300	IP54	Aluminium alloy

Outer diameter of the cable, mm	Process connection
8	M10 x 1, M16 x 1,5

A1 Head
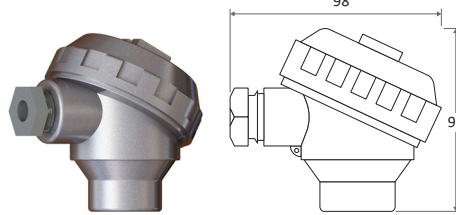
98
90

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Material
-50...300	IP54	Aluminium alloy

Стандарт	Outer diameter of the cable, mm	Process connection
DIN B (33 mm*)	12	M20 x 1,5

Z Head

63
30
Cable gland PG7
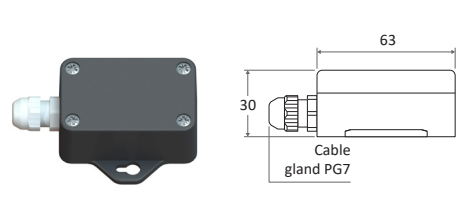
TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection
-50...100	IP66

Material	Outer diameter of the cable, mm
Polyamide	3...7

BX Head
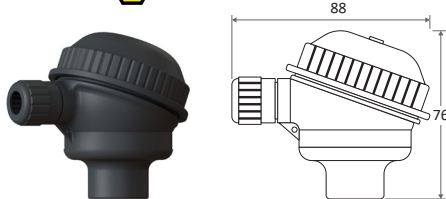
88
76

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Material
-50...200 (230)	IP67	Polyamide AS

Standard	Outer diameter of the cable, mm	Process connection
DIN B (33 mm*)	3...7	M10 x 1, M20 x 1,5, G1/2

Explosion-proof labelling		
Exi		

AX Head
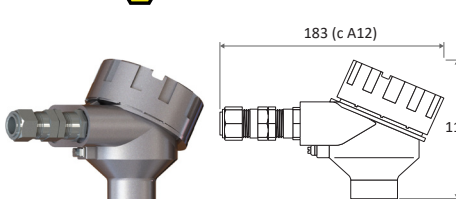
183 (с A12)
115

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Material
-40...100	IP66	Aluminium alloy

Standard	Outer diameter of the cable	Process connection
DIN A (33 mm*), DIN B (33 mm*)	Defines by the cable gland	M20 x 1,5

Explosion-proof labelling		
Exi, Exd		

AIX Head
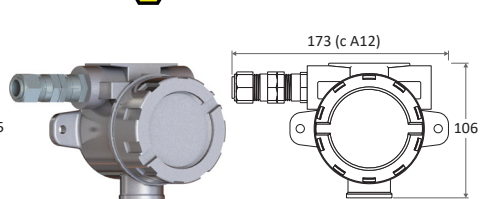
173 (с A12)
106

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Material
-40...100	IP66	Aluminium alloy

Standard	Outer diameter of the cable	Process connection
DIN A (33 mm*), DIN B (33 mm*)	Defines by the cable gland	M20 x 1,5

Explosion-proof labelling		
Exi, Exd		

M12FA Connector
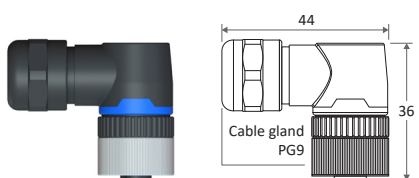
44
36
Cable gland PG9

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Type	Process connection
-50...120	IP67	Angled	M12 female

Connectors	Cable connection	Max wire diameter, mm
5-pin A-code	Screw terminals	8

M12FD Connector
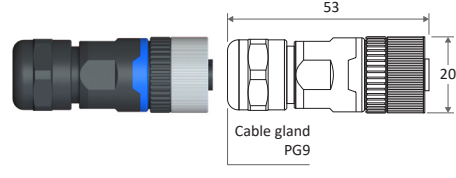
53
20
Cable gland PG9

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Type	Process connection
-50...120	IP67	Straight	M12 female

Connectors	Cable connection	Max wire diameter, mm
5-pin A-code	Screw terminals	8

M8MD Connector
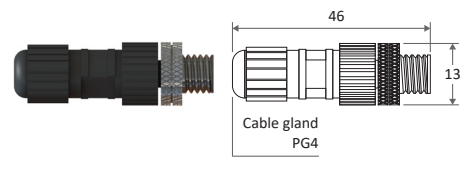
46
13
Cable gland PG4

TECHNICAL SPECIFICATIONS

Operating temperature, °C	Ingress protection	Type	Process connection
-50...120	IP67	Straight	M8 male

Connectors	Cable connection	Max wire diameter, mm
5-pin A-code	Screw terminals	5,5

* - The distance between the mounting screws' centers on the probe.

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Cables are used in the production and connection of temperature probes (RTDs, TCs, and thermistors). These cables are designed with various insulations to operate in extreme conditions, including high and low temperatures, exposure to aggressive environments, flexibility, and mobility requirements. The insulations include single- and multilayer options made from materials such as polyvinyl chloride, silicone, PFA, and MFA Teflon, as well as fiberglass, ceramic fiber, stainless steel, and high-temperature alloys. These cables can be both unshielded and shielded with options like foil, tinned copper, and stainless steel braid. They come in both mono- and multicore configurations, available in a wide range of cross-sections and diameters. Custom cables can also be manufactured upon request, tailored to specific cross-sections, insulations, and shielding requirements.
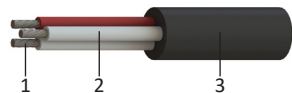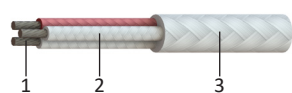
Cables for RTD temperature probes

TE cable
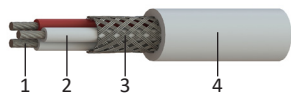
Conductor: multicore silver-plated copper (1)
Insulation: PFA teflon (2)
Shield: tinned copper braid (3)
Sheath: PFA teflon (4)
Number of conductors: 2, 3
Conductor cross-section: 0,22 mm²
Operation temperature: -196...250°C
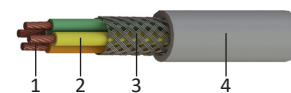**Outer diameter:** 3,9 / 4,2 mm

RS cable

Conductor: multicore silver-plated copper (1)
Insulation: PFA teflon (2)
Sheath: high temp. silicone (3)
Number of conductors: 2, 3, 4
Conductor cross-section: 0,15 / 0,22 mm²
Operation temperature: -70...250°C
Outer diameter: 3,0 / 3,2 / 3,8 mm

WW cable

Conductor: multicore nickel (1)
Insulation: high temp. fiberglass (2)
Sheath: high temp. fiberglass (3)
Number of conductors: 3
Conductor cross-section: 0,50 mm²
Operation temperature: -50...400°C
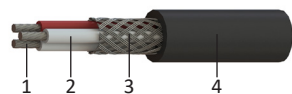**Outer diameter:** 3,2 mm

PR cable

Conductor: multicore tinned copper (1)
Insulation: polyvinyl chloride (PVC) (2)
Shield: tinned copper braid (3)
Sheath: polyvinyl chloride (4)
Number of conductors: 4
Conductor cross-section: 0,25 mm²
Operation temperature: -40...100°C
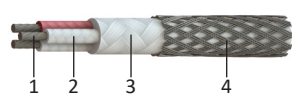**Outer diameter:** 4,3 / 4,5 / 4,9 mm

ME cable

Conductor: multicore silver-plated copper (1)
Insulation: PFA teflon (2)
Shield: tinned copper braid (3)
Number of conductors: 2, 3, 4
Conductor cross-section: 0,15 / 0,22 mm²
Operation temperature: -100...250°C
Outer diameter: 2,4 / 2,6 / 2,8 mm
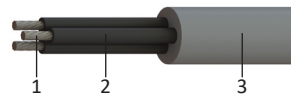
RE cable

Conductor: multicore silver-plated copper (1)
Insulation: PFA teflon (2)
Shield: tinned copper braid (3)
Sheath: high temp. silicone (4)
Number of conductors: 2, 3, 4
Conductor cross-section: 0,15 / 0,22 mm²
Operation temperature: -70...250°C
Outer diameter: 3,9 / 4,2 / 4,5 mm

WE cable

Conductor: multicore nickel (1)
Insulation: high temp. fiberglass (2)
Sheath: high temp. fiberglass (3)
Shield: tinned copper braid (4)
Number of conductors: 3
Conductor cross-section: 0,50 mm²
Operation temperature: -50...400°C
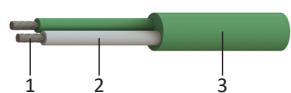**Outer diameter:** 4,0 mm

OLF cable

Conductor: multicore tinned copper (1)
Insulation: polyvinyl chloride (PVC) (2)
Sheath: polyurethane (PUR) (3)
Number of conductors: 2, 3, 4
Conductor cross-section: 0,50 / 0,75 mm²
Operation temperature: -40...85°C
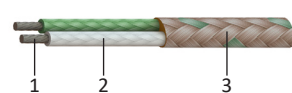**Outer diameter:** 4,8 / 5,1 / 5,4 / 5,7 mm

Cables for TC temperature probes

RS cable

Conductor: multicore thermocouple (1)
Insulation: PFA teflon (2)
Sheath: high temp. silicone (3)
Type: K, L, J
Conductor cross-section: 0,15 / 0,22 mm²
Operation temperature: -70...250°C
Outer diameter: 2,9 / 3,5 mm

WW cable

Conductor: multicore thermocouple (1)
Insulation: high temp. fiberglass (2)
Sheath: high temp. fiberglass (3)
Type: K, L, J
Conductor cross-section: 0,22 mm²
Operation temperature: -50...400°C
Outer diameter (dimensions): 1,5x2,6 mm

RE cable
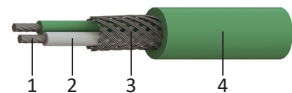
Conductor: multicore thermocouple (1)
Shield: tinned copper braid (2)
Sheath: high temp. silicone (3)
Type: K, L, J, N
Conductor cross-section: 0,22 mm²
Operation temperature: -70...250°C
Outer diameter: 3,9 mm

MI cables

TS MI cable
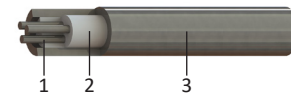
Conductor: copper or nickel (1)
Insulation: periclase (MgO) (2)
Sheath: stainless steel 316S / 321S (3)
Number of conductors: 3, 4
Conductor diameter / cable:
0,6 / 3,0 mm, 0,8 / 4,5 mm, 1,0 / 6,0 mm
Operation temperature: -196...800°C

TT cable
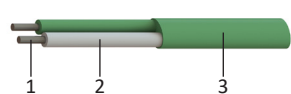
Conductor: multicore thermocouple (1)
Insulation: PFA teflon (2)
Sheath: PFA teflon (3)
Type: K, T
Conductor diameter: 0,50 mm
Operation temperature: -196...250°C
Outer diameter (dimensions): 1,5x2,5 mm

WE cable
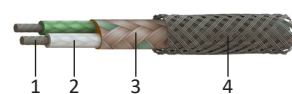
Conductor: multicore thermocouple (1)
Insulation: high temp. fiberglass (2)
Sheath: high temp. fiberglass (3)
Shield: stainless steel braid (4)
Type: K, L, J
Conductor cross-section: 0,22 mm²
Operation temperature: -50...400°C
Outer diameter (dimensions): 2,4x3,3 mm

XA, NN MI cable

Conductor: thermocouple
Insulation: periclase (MgO)
Sheath: stainless steel 310S / 316S / 321S / INC / NIC
Type: K, N
Number of thermocouple: 1, 2
Operation temperature:
-40...800°C (316S / 321S), -40...1050°C (310S), -40...1150°C (INC), -40...1200°C (NIC)
Conductor diameter / cable:
0,6 / 3,0 mm, 0,8 / 4,5 mm, 1,0 / 6,0 mm

Cable order code for delivery

<Number of conductors> X <cross-section of conductor> - <type of conductor> - <insulation of conductor> - <presence of common shield and its type> - <presence of common insulation and its type> - <meterage>

Example: 2x1,50 sq. mm thermocompensated chromel-alumel - PVC - shield (foil) - PVC - 200 m

Cable inventory order code

<Code> - <RTD type> <number of conductors> X <cross-section of conductor> - <meterage>

Example: RE TSP 3x0,22 sq. mm - 15 m

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1-3   1-3a   1-3w   1-3h   1-3n   1-3r   1-3f   1-4   1-4z

Immersion temperature probes from the 1-3 and 1-4 series are designed for temperature measurement in liquid, gas-like, and air environments. These probes come with a variety of hex fittings for installation, including a thermowell and a threaded boss included in the kit. Additionally, the transmitter with 4-20 mA/RS485 output can be easily mounted into an RTD/TC head.

Models 1-3, 1-3a, 1-3h, and 1-3p feature a free hex fitting, with the option of galvanized steel 20 (or steel 304 on order) for the hex fitting material. Models 1-3n and 1-3na come with a welded hex fitting, securely attached to the sheath of the probe, using steel 304 for the hex fitting material. The 1-3p model is equipped with a spring-loaded hex fitting, ensuring a tight contact between the probe and the bottom of a thermowell or measuring surface. Models 1-3w and 1-3f are designed with a flange joint for easy mounting on various objects.

There are two types of RTD/TC heads available for the temperature probe: Type B (high-temperature polyamide) and Type A (aluminum). It is recommended to use Type B, which is the latest design equipped with a cable gland providing IP67 protection.

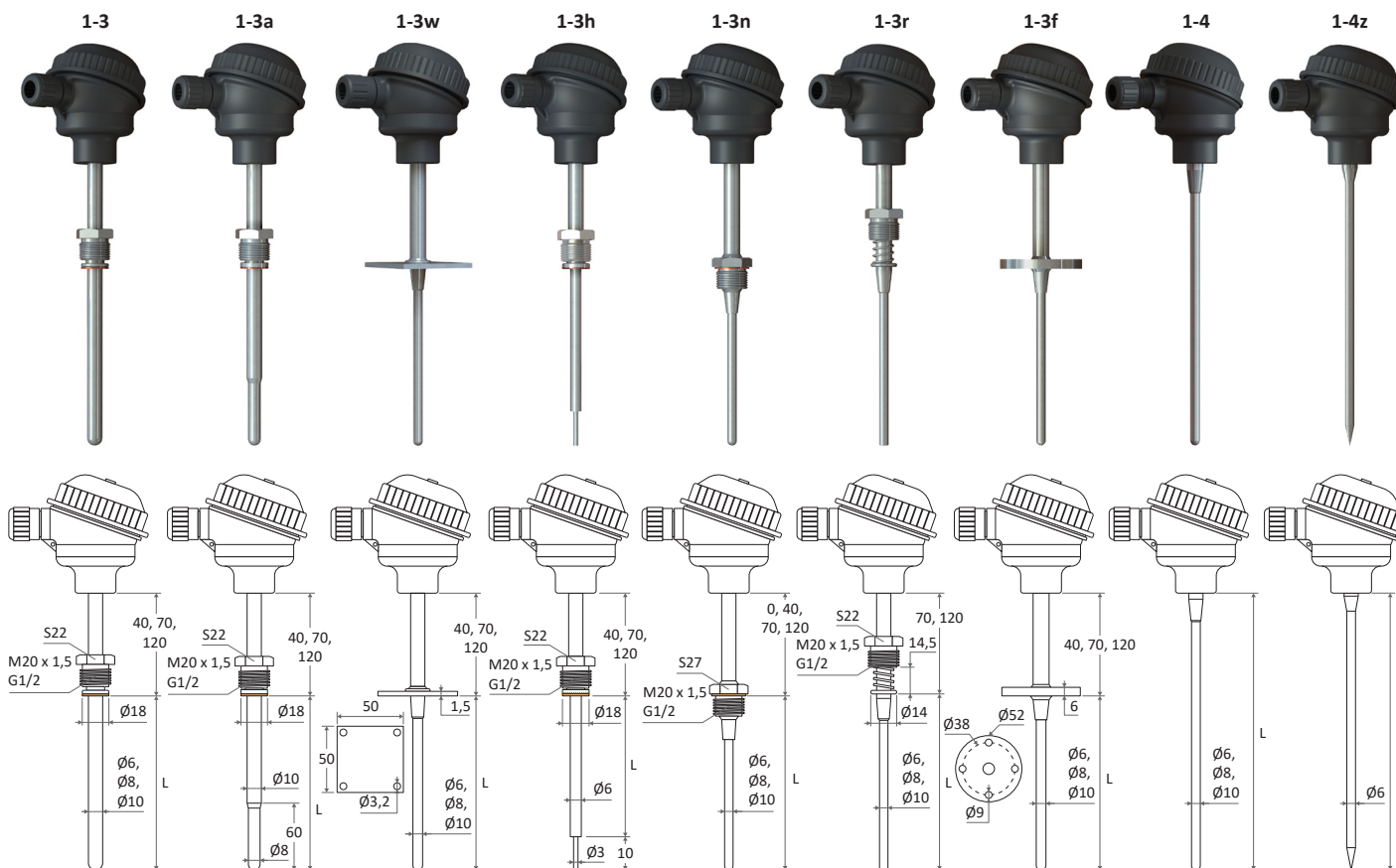| TECHNICAL SPECIFICATIONS							
Model	Process temperature range, °C						Thermal inertia, sec
	TSM (Cu50, Cu100)	TSP (Pt50, Pt100, Pt1000)	TST (10kNTC)	TP (DS18B20)	TXK (L), TJK (J)	TXA (K)	
1-3, 1-3a, 1-3w, 1-3n, 1-3p, 1-3f, 1-4	-50...150	-100...250, -50...250, -50...500, -50...600	-40...120, -20...200	-40...125	-40...250, -40...600	-40...250, -40...500, -40...800	20...30
1-3h	-	-100...250, -50...250	-	-	-40...250	-40...250	12...15
1-4z	-50...150	-50...250	-40...120	-40...125	-	-	20

DIMENSIONS	
Model	Length of the immersion part L, mm
1-3, 1-3w, 1-3n, 1-3p, 1-3h, 1-3f	40, 60, 80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000
1-3a, 1-3na, 1-4	80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000
1-4z	160, 200, 250, 320, 400, 500, 600

Note: The table displays the maximum process temperature range within which only the immersion part of the temperature probe can operate safely. The connection between the operating part and the head must be maintained at a temperature not exceeding the permissible limits: B, BX, and A types - up to 250°C.

All types of RTD/TC heads provide IP54 protection (Type A) and IP67 protection (Type B) at temperatures up to 120°C. To comply with these requirements, it is advisable to order a longer immersion or remote part to distance the unprotected segments of the temperature probe from the high-temperature areas.

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1-5   1-5r   1-5n   1-5l   1-5p   1-11   1-11a   1-11n   1-11p
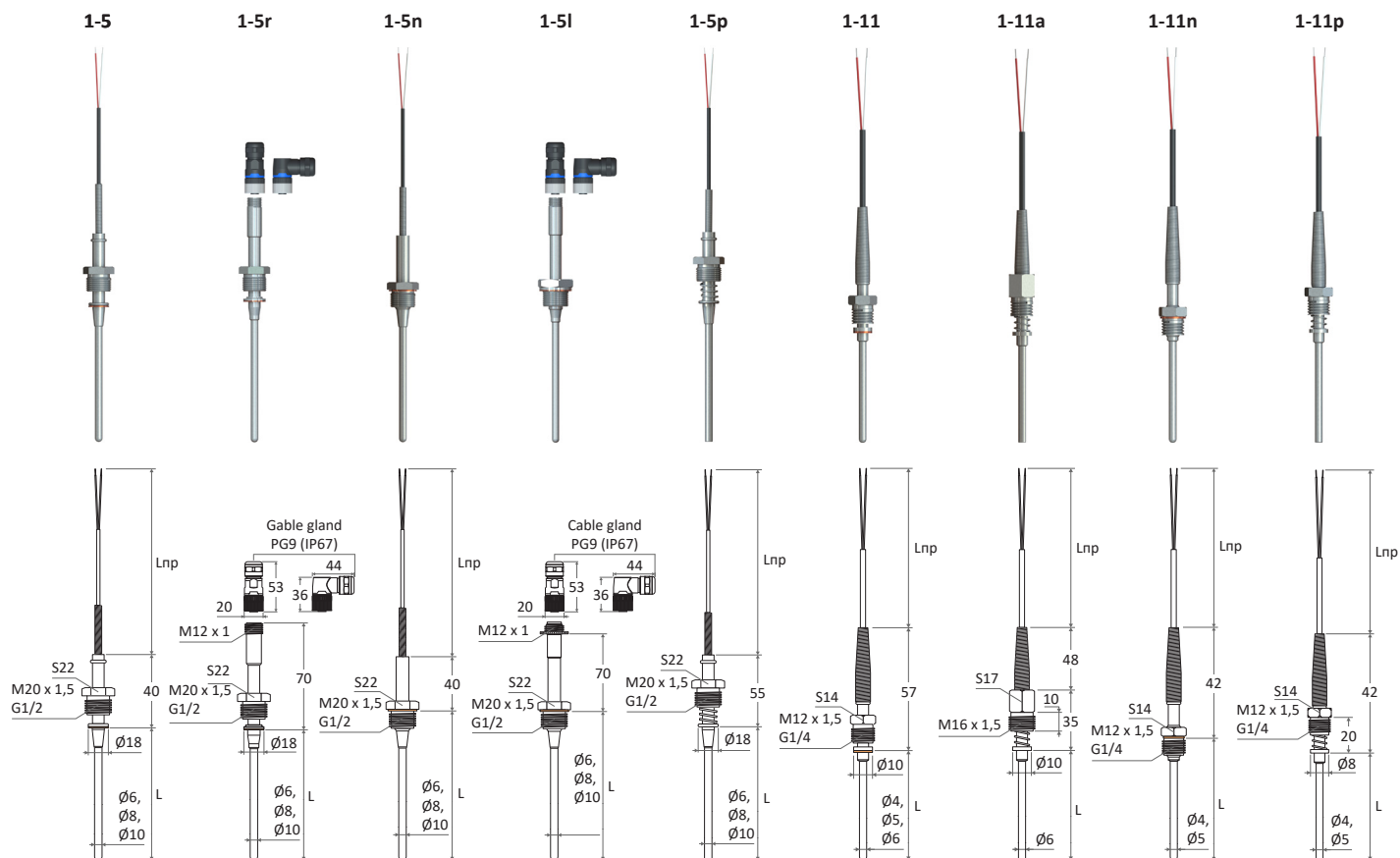
Immersion temperature probes in the 1-5 and 1-11 models are the most widely used variants featuring an output cable and a hex fitting. These temperature probes are specifically designed for temperature measurements in various industrial processes. The sheath material of these temperature probes is stainless steel 321. Additionally, 1-5 and 1-11 models equipped with an output cable RE can possess the intrinsic safety Exia certification.

Models 1-5 and 1-11 come with a free hex fitting. The standard material for models 1-5, 1-5r, 1-5p, 1-11, 1-11a, and 1-11p is galvanized steel 20 (AISI 304 available upon request). Models 1-5n and 1-11n feature a welded hex fitting, securely attached to the sheath of the probe, with the material being AISI 304. Additionally, models 1-5p, 1-11a, and 1-11p are equipped with a spring-loaded hex fitting, ensuring tight contact between the probe and the bottom of the thermowell or the measuring surface.

Models 1-5r and 1-5l feature a sealed M12 threaded connector (IP67) for connecting an output cable to the probe. The connector is included with the probe and has a collapsible design. The cable is connected using screw terminals. Two connector types are available: straight along the sheath axis (M12FD) and angled (M12FA), with the output cable at a 90° angle.

If the user needs to ensure that the temperature probe's features remain within the operating range, it's important to select the appropriate output cable type, process temperature range, the number of conductors, and the type that matches the chosen temperature probe. To do this, please visit the 'Cables for Temperature Probes' page and select the corresponding cable type.

TECHNICAL SPECIFICATIONS

Model	Process temperature range, °C					Thermal inertia, sec
	TST (10kNTC)	TP (DS18B20)	TSM (Cu50, Cu100)	TSP (Pt50, Pt100, Pt1000)	TJK (J), TXK (L), TXA (K)	
1-5, 1-5r, 1-5n, 1-5l, 1-5p	-40...120, -20...200	-40...125	-50...150	-100...250, -50...250, -50...350, -50...500	-40...250, -40...400	20...30
1-11, 1-11a, 1-11n, 1-11p	-40...120, -20...200	-40...125	-50...150	-100...250, -50...250, -50...350	-40...250, -40...400	15...20

DIMENSIONS

Model	Length of the immersion part L, mm
1-5, 1-5r, 1-5n, 1-5l, 1-5p	60, 80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000
1-11, 1-11a, 1-11n, 1-11p	32, 40, 60, 80 , 100, 120, 160, 200, 250, 320, 400, 500

Note: The table displays the maximum process temperature range, within which only the immersion part of the temperature probe can safely operate. The connection between the immersion part and the output cable should be maintained at temperatures up to 250°C. For 1-5r and 1-5l models, the connector should be kept at temperatures up to 120°C. To comply with these requirements, it is advisable to order a longer immersion or remote part to distance the unprotected segments of the temperature probe from the high-temperature areas.

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1-6 1-7 1-8 1-8n 1-8t 1-13 1-14 1-14a 1-15 1-15a 1-15b
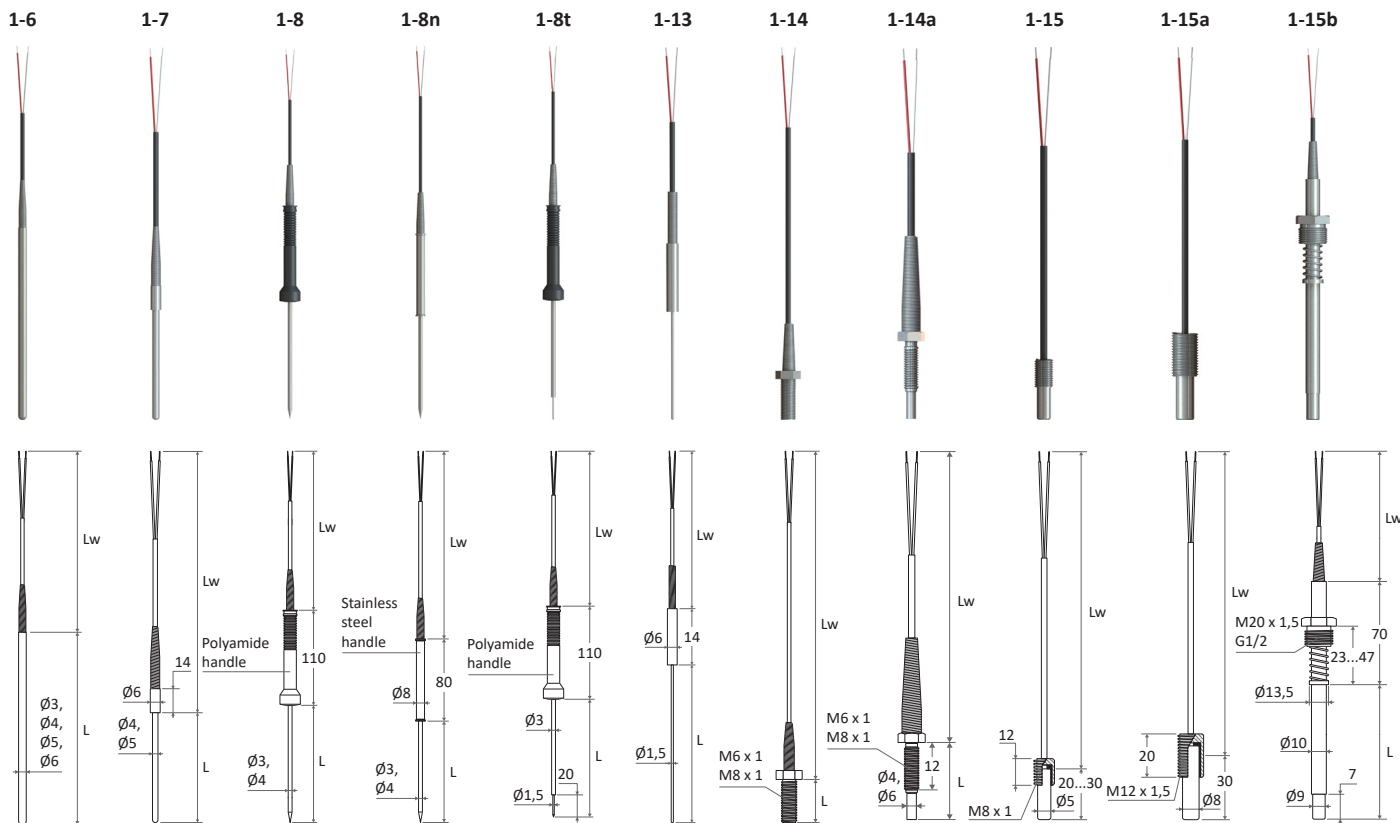
Immersion temperature probes in the 1-6 and 1-7 series are among the most commonly used models. They come equipped with an output cable and are designed for temperature measurements in various industrial processes. Models within the 1-6 and 1-7 series, featuring the RE output cable, can carry an intrinsic safety marking of Exia.

Models 1-8, 1-8n, and 1-8t feature a pointed end. Models 1-8 and 1-8t come with a polyamide handle (suitable for temperatures up to 120°C), while 1-8n is equipped with a stainless steel 321 handle (suitable for temperatures up to 250°C). Model 1-13 is a cable with mineral insulation and a stainless steel sheath (MI cable) with a diameter of 1.5 mm, along with an output cable. This design allows for flexibility and virtually unlimited probe length. Models 1-14 and 1-14a are designed with M6 or M8 screws for convenient fastening. The models in the 1-15 series are specifically designed for measuring bearing temperatures.

If the user needs to ensure that the temperature probe operates within its specified range, it's essential to select the appropriate output cable type, process temperature range, the number of conductors, and the type that matches your chosen temperature probe. To make these selections, please visit the 'Cables for Temperature Probes' page and choose the cable type that best fits your needs.

TECHNICAL SPECIFICATIONS

Model	Process temperature range, °C						Thermal inertia, sec
	TST (10kNTC)	TP (DS18B20)	TSM (Cu50, Cu100)	TSP (Pt50, Pt100, Pt1000)	TJK (J), TXK (L)	TXA (K)	
1-6, 1-7, 1-14, 1-14a	-40...120, -20...200	-40...125	-50...150	-100...250, -40...100, -50...250, -50...350	-40...250, -40...400	-40...250, -40...400	10...20
1-8, 1-8n	-40...120, -20...200	-	-50...150	-100...200, -50...100, -50...200, 50...250	-	-40...250	10...12
1-15, 1-15a, 1-15b	-	-	-50...150	-50...250	-50...250	-50...250	7...9
1-8t	-	-	-	-	-	-40...250	5...7
1-13	-	-	-	-	-	-40...250, -40...400	4...6

DIMENSIONS

Model	Length of the immersion part L, mm
1-6, 1-7	20, 32, 40, 60, 80, 100, 120, 160, 200, 250, 320, 400, 500
1-8, 1-8n	80, 100, 120, 160, 200, 250, 320, 400, 500
1-8t	60, 80, 100, 120, 160, 200, 250, 320, 400, 500
1-13	60, 80, 100, 120, 160, 200, 250, 320, 400, 500, up to 10000
1-14	10, 15, 25
1-14a	35, 60, 80
1-15	25 (TSM), 30 (Pt50, Pt100), 20 (Pt100, Pt1000, TXA, TXK, TJK)
1-15a	30
1-15b	60, 80, 100, 120, 160, 200, 250, 320, 400, 500

* - the length L of 1-13 can reach 10 meters.

Note: The table displays the maximum process temperature range, within which only the immersion part of the probe can safely operate. The connection between the immersion part and the output cable should be kept at a temperature of up to 250°C, except for 1-8 and 1-8t models, which should be kept at temperatures up to 120°C. To comply with these requirements, it is advisable to order a longer immersion or remote part to distance the unprotected segments of the temperature probe from the high-temperature areas.

Probe models: 2-2, 2-2k, 2-4, 2-4a, 2-8, 2-8a, 2-8w, 2-8m, 2-8c, 2-10, 2-10d, 2-10m, 2-10h, 2-12
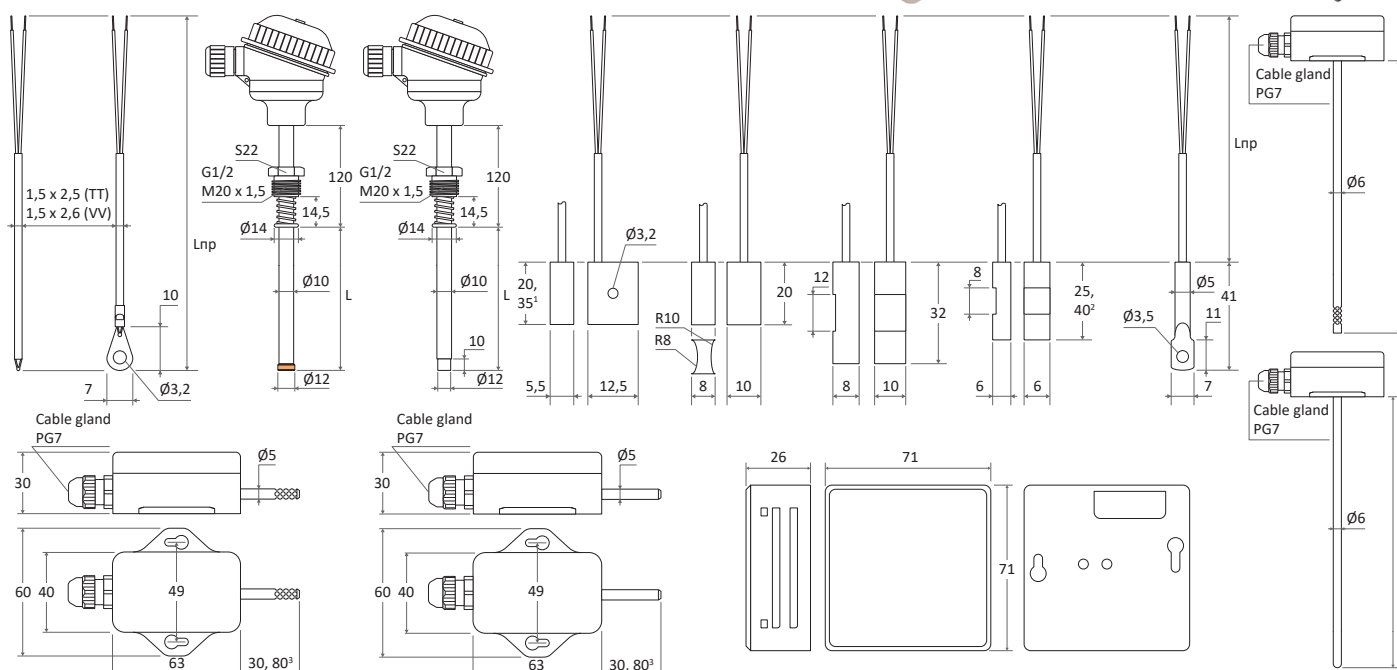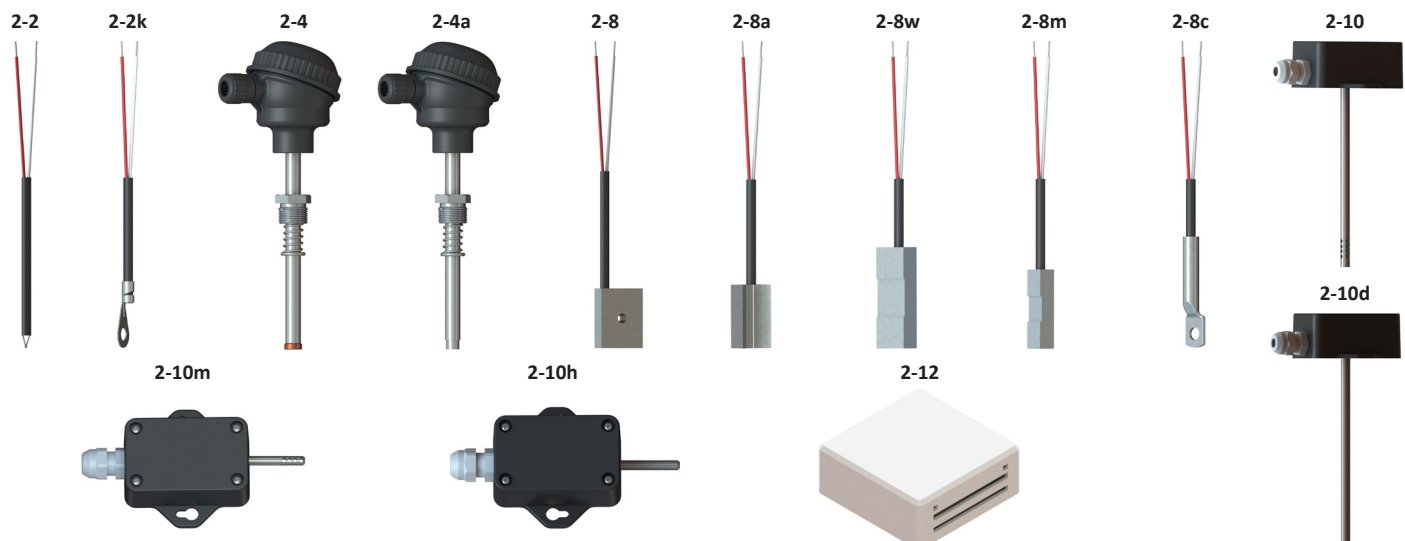
1 - 35 mm - Cu50, Cu100, 20 mm - the rest; 2 - 40 mm - Cu50, Cu100, 25 mm - the rest; 3 - 30 mm - для ТЗ без нормуючого перетворювача, 80 мм - для ТЗ з нормуючим перетворювачем

Surface temperature probes are designed for measuring the surface temperature of solid objects. The 2-2 model consists of a thermocouple cable available in types K, L, and T, with either teflon or glass fiber insulation and a grounded junction. The 2-2k model features a grounded junction soldered to a terminal for easy installation on the measuring surface. The 2-4 and 2-4a models are used to measure surface temperature by applying compression to the surface using a spring-loaded hex fitting. The 2-8 model is installed on the surface using an M3 screw, while the 2-8a, 2-8w, and 2-8m models are designed to be mounted on pipes using a clamp. The 2-8c model, made of nickel-plated brass, is installed on the surface using M4 screws. The 2-8v model boasts a special vibration-proof design.

Air temperature probes are available in the 2-10 and 2-12 series. Installation is accomplished by tightening self-tapping screws through holes in the plastic casing into the surface. The 2-10m and 2-10h models are designed for measuring indoor and outdoor air temperatures. The 2-10m model features a non-isolated tip within the pipe to reduce thermal inertia, while the 2-10h model has an isolated tip. The 2-12 model comes in an ABS plastic casing, designed to cover cables on the walls of a facility.

TECHNICAL SPECIFICATIONS

Model	Process temperature range, °C						Thermal inertia, sec
	TST (10kNTC)	TP (DS18B20)	TSM (Cu50, Cu100)	TSP (Pt50, Pt100, Pt1000)	TMKn (T)	TXK (L), TXA (K)	
2-2, 2-2k	-	-	-	-	-100...250	-40...250, -40...400	5
2-4	-40...120, -20...200	-	-50...150	-50...250, -50...350	-	-40...350	18...25
2-8, 2-8a, 2-8m, 2-8c	-40...120, -20...200	-	-50...150	-50...250	-	-40...250	12
2-8v	-	-	-	-50...250	-	-	12
2-10, 2-10d, 2-10m, 2-10g	-50...100	-30...100	-50...100	-50...100	-	-	8...10
2-12	-40...60	-30...60	-40...60	-40...60	-	-	8...10

DIMENSIONS

Model	Length of the immersion part L, mm
2-4, 2-10, 2-10d	60, 80, 100, 120, 160, 200, 250, 320, 400, 500

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1-20　　**1-21**　　**1-22**　　**1-26**　　**1-26a**　　**1-27**　　**1-28**　　**1-29**　　**1-29k**

1-23　　**1-23m**　　**1-23n**　　**1-23l**　　**1-23p**　　**1-23d**　　**1-23k**　　**1-24**　　**1-24m**

Note: The 1-29 and 1-29k models are not entirely high-temperature resistant along their entire immersion part. Therefore, only the segment covered in ceramic should be exposed to high-temperature areas. The temperature near the RTD/TC head should not exceed 250°C, near the connector - 200°C, and at the junction of steel 321 and ceramic - 800°C.

It is recommended to order the 4-20 mA or RS485 transducer in a Z-type enclosure and place it in an environment with room temperature, which should not exceed 60°C. Keep in mind that all high-temperature thermocouple probes have a limited lifespan, which is directly dependent on operating conditions and the type of ambient gas. In addition to the process temperature, it is crucial to consider the type of ambient gas.

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High-temperature probes 1-20 and 1-21 are constructed using C610 ceramic and a grounded thermocouple cable of type K. Model 1-22 uses C799 ceramic and a grounded thermocouple cable made from platinum alloys. Models from the 1-23 and 1-24 series feature a dual sheath, comprising an outer sheath and an inner sensor made of either an MI cable or a grounded cable with ceramic insulation. This design enables the use of the thermocouple in the most challenging industrial conditions.

1-23 and 1-23m models feature a free stainless hex fitting, while 1-23n, 1-23l, and 1-23p models come with a welded one. The 1-29 model (type T) is constructed using an MI cable made of Nicrobel alloy. This design enables the prolongation of the thermocouple's lifespan compared to RTD probes manufactured using traditional ceramic and thermocouple wire technologies.

Additionally, the 1-29 model can be manufactured using platinum alloy thermocouple wire to measure extreme temperatures up to 1600°C. The 1-29k model is equipped with a dual ceramic sheath to safeguard the sensor from thermal impacts that could potentially damage the ceramic sheath. The outer sheath is constructed from C530 gas-permeable ceramic, while the inner one is made of C799 gas-proof ceramic.

Models 1-26, 1-26a, 1-27, and 1-28 are equipped with MI cables featuring an ungrounded junction and connection elements. These probes offer several distinct advantages, including low thermal inertia, flexibility, and the ability to extend to almost unlimited lengths (up to 20 meters). However, it's important to note that their lifespan is shorter compared to thermocouple probes with dual sheaths. MI cables can be bent in any direction.

Models 1-23p, 1-23d, and 1-23k are specifically designed for temperature measurement inside gas-turbine and steam-turbine systems within thermal power facilities.

TECHNICAL SPECIFICATIONS

Model	Sheath material	Sensor	Process temperature range, °C					Thermal inertia, sec
			TXA (K)	TXK (L)	TNN (N)	TPP (S, R)	TPR (B)	
1-20	N.A.	C610 Ceramic + Wire of Ø1,2 mm	0...1000	0...600	-	-	-	5...7
1-21	N.A.	C610 Ceramic + Wire of Ø3,0 mm	0...1000	0...600	0...1000	-	-	5...7
1-22	N.A.	C799 Ceramic + Wire of Ø0,35 mm	-	-	-	0...1400	600...1400	5...7
		C799 Ceramic + Wire of Ø0,50 mm	-	-	-	0...1600	600...1600	5...7
1-23, 1-23n, 1-24	310S	310S MI cable Ø6,0 mm	0...1050	-	-	-	-	45
1-23m, 1-23l, 1-24m	15Cr25Ti	Wire of Ø3,0 mm / INC MI cable Ø6,0 mm	0...1050	-	0...1050	-	-	90
	INC		0...1100	-	0...1150	-	-	90
1-23p	INC, 310S	Wire of Ø1,2 mm	0...900	-	0...900	-	-	20
1-23d	12X1МФ	321S MI cable Ø6,0 mm	0...585	-	-	-	-	90
1-23k		321S MI cable Ø6,0 mm	0...585	-	-	-	-	90
1-26, 1-26a, 1-27, 1-28	N.A.	321S MI cable Ø3,0 mm*	0...800	-	-	-	-	90
		321S MI cable Ø6,0 mm	0...800	-	-	-	-	45
		310S MI cable Ø6,0 mm	0...1050	-	-	-	-	45
		INC MI cable Ø4,5 mm*	0...1100	-	0...1150	-	-	45
		INC MI cable Ø6,0 mm	0...1100	-	0...1150	-	-	45
		NIC MI cable Ø6,0 mm	-	-	0...1200	-	-	45
1-29	321S + C799 Ceramic	INC MI cable Ø6,0 mm	0...1100	-	0...1150	-	-	60
		NIC MI cable Ø6,0 mm	0...1100	-	0...1200	-	-	60
		Wire of Ø0,35 mm	-	-	-	0...1400	600...1400	60
		Wire of Ø0,50 mm	-	-	-	0...1600	600...1600	60
1-29k	310S + C530 Ceramic	C799 Ceramic + Wire of Ø 3,0 mm	0...1100	-	0...1200	-	-	120
		C799 Ceramic + Wire of Ø 0,35 mm	-	-	-	0...1400	600...1400	120

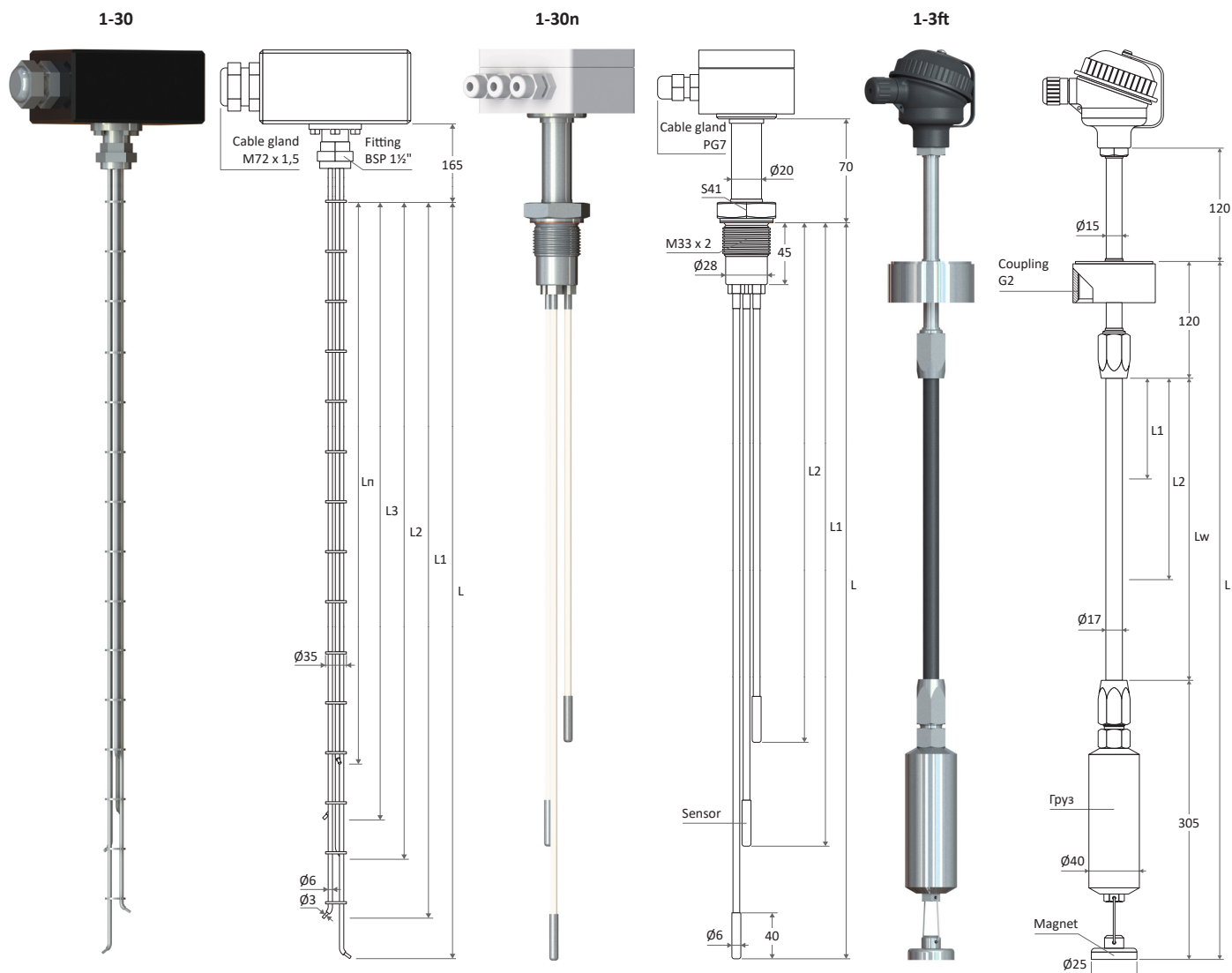* - except 1-28 model

DIMENSIONS

Model	Length of the immersion part L, mm
1-20, 1-21, 1-22 1-26, 1-26a, 1-27, 1-28	250, 320, 400, 500, 630, 800, 1000, 1250, 1500, 2000... up to 20 000
1-23, 1-23n, 1-24	250, 320, 400, 500, 630, 800, 1000, 1250, 1500
1-23d, 1-23k	80, 100, 120, 160, 200, 250, 320
1-23m, 1-23l, 1-23p, 1-24m	250, 320, 400, 500, 630, 800, 1000, 1250, 1500, 2000... up to 6 000
1-29	320 (250), 400 (250), 500 (320), 600 (400), 800 (400), 1000 (400), 1000 (800), 1250 (800), 1500 (800)
1-29k	320 (250), 400 (250), 500 (320), 600 (400), 800 (400), 1000 (400), 1000 (800), 1250 (800), 1500 (800)

МАТЕРІАЛ ЗАХИСНОЇ АРМАТУРИ ВИСОКОТЕМПЕРАТУРНИХ ТЕРМОПЕРЕТВОРЮВАЧІВ

Designation	Alloy name	Max operating temperature, °C	Measuring environments	Weaknesses
321S	08-12X18H10T (AISI321)	850	Gases, air, water, steam, melts, organic products, including foods	Not resistant to acids (can be used with a fluorine plastic sheath or covered with acid-proof materials).
		600	The same, but with pressure or mechanical loads	
15X25T	15X25T	1050	Air, combustion products	Hard to weld.
310S	AISI310	1050	Air and inert gases - without thermocycles	Prohibited for use in molten substances, renewable gas environments, and environments with a high ammonia content. It is not recommended for continuous use in the temperature range of 550 to 850°C.
		1000	Air, gases, combustion products, including those ones containing sulfur	
		900	Gas environments with high content of carbon dioxide	
INC	Inconel 600	1150	Oxidative gas environments, air, inert gas, exhaust fumes - without thermocycles	Usage in environments with high levels of sulfur and its combustion products is prohibited.
		1100	Carbon dioxide, nitrogen, ammonia	
NIC	Nicrobel	1250	Air, inert gases, most of oxidative and renewable gas environments	Continuous usage at temperatures lower than 980°C is not recommended, as an acid-resistant protective film forms above this temperature.
C530	C530	1400	Air, inert gases, exhaust fumes, most of oxidative gas environments	Made of porous ceramic with intermediate thermal conductivity and stiffness. Exhibits good resistance to thermal shock.
C799	C799	1700		Constructed from gas-proof ceramic with limited resistance to thermal shock.

1-30   **1-30n**   **1-3ft**

Cable gland M72 x 1,5   Fitting BSP 1½"   165

Cable gland PG7   Ø20   70

S41

M33 x 2   45
Ø28

Ln
L3
L2
L1
L

Ø35

Ø6
Ø3

L2
L1
L

Sensor

Ø6   40

Coupling G2

Ø15   120

120

L1

L2

Lw

Ø17

L

Груз

Ø40   305

Magnet

Ø25

Multizone temperature probes are intended for measuring temperature gradients at different depths inside an object. In addition to the models mentioned earlier, transducers can be custom-designed based on customer technical drawings or analogous models with various sensors (RTD, TC, DS18B20, etc.). These probes offer various process connection options, including a hex fitting with specific threading, a standard flange, a clutch, and more. Some transducers may feature a load and a magnet for extending the transducer during immersion.

The 1-30 model is a multizone thermocouple designed for measuring the temperature of petroleum products in reactors or catalytic converters at oil refineries. Sensors are positioned at various levels and are constructed using thermocouple MI cables. They are spring-loaded inside guiding pipes to ensure a secure contact with the sheath. This multizone thermocouple can be supplied with a thermowell based on customer drawings.

The 1-30n model is a multizone temperature probe designed to measure the temperature of liquids in tanks at various depths. The sensor's output cable features Teflon insulation, which is chemically inert to most liquid types. Sensors such as Pt100, Pt1000, or type K are used in this probe.

The 1-3ft model is a multizone temperature probe designed for measuring the temperature of liquids in tanks containing petroleum products at various depths. The sheath is constructed from a special intrinsically safe plastic that is chemically inert to petroleum products. Sensors are positioned at different depths within the sheath, and DS18B20 sensors are used. This probe holds an Exia explosion-proof classification.

TECHNICAL SPECIFICATIONS

Model	Process temperature range, °C				Thermal inertia, sec
	TSP (Pt100, Pt1000)	TP (DS18B20)	TJK (J)	TXA (K)	
1-30	-	-	-40...600	0...800	16...18
1-30n	-50...250	-	-	-50...250	10
1-3ft	-	-20...40	-	-	45

DIMENSIONS

Model	Length of the immersion part L, mm
1-30, 1-30n	Any
1-3ft	1000...20000 (upon request)

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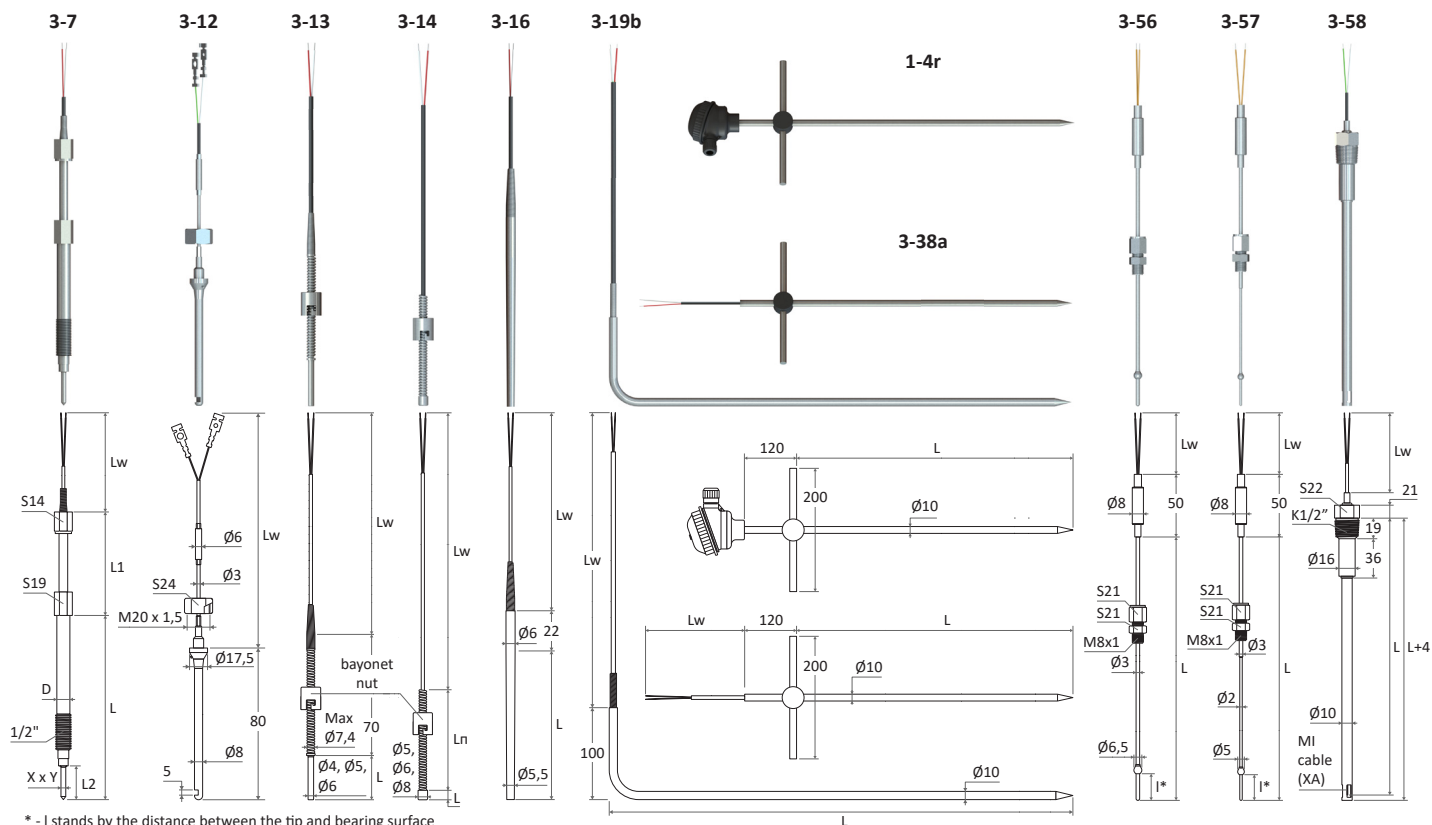
* - l stands by the distance between the tip and bearing surface

Special temperature probes are designed to function within specific technological processes. These probes typically consist of analog units of both foreign and domestic temperature transducers with various specializations.

The 3-7 model is designed for use in plastic extruders and can be custom-made based on customer technical drawings or samples. The sensor of the probe is positioned within the knife (L2), which is immersed directly in the plastic melt within the extrusion channel. Sensor options include Pt100, Pt1000, type J, and type K.

The 3-12 model is specifically designed for measuring the temperature of high-speed gas flows, reaching speeds of up to 300 m/s and temperatures of up to 1000°C. This thermocouple is constructed using a 3 mm diameter MI cable.

The 3-13 and 3-14 models are used in various workshop equipment, injection molding machines, and molds. The probe's sheath is pressed against the measuring surface using a spring and a bayonet nut. The depth of sheath immersion is adjustable via the spring.

The 3-16 model is designed for use in KuASY injection molding machines. Its sheath has a conical shape to ensure a firm fit and improved thermal inertia.

The 3-19b, 3-38a, and 1-4r models are designed for measuring the temperature of soil, substrate, or compost. The 3-38a and 1-4r models are constructed from stainless steel pipe (10x2) to provide additional stiffness, and the immersion part can reach lengths of up to 1,5 meters. These probes feature a cross-like handle for convenient immersion into compost. The 3-19b, 3-38a, and 1-4r models are equipped with sensors (10kNTC, Pt100, Pt1000) and are analogous to compost temperature probes produced by Fancom, Dalsem, and AEM companies. Probes can be manufactured with a special cable featuring polyurethane insulation or a polyamide RTD/TC head for more robust operating conditions with high humidity and ammonia gas.

The 3-56, 3-57, and 3-58 models are specifically designed for measuring the temperature in the gap between wheels on gas pumping units. These thermocouples are constructed using MI cable with diameters of 2 mm, 3 mm, and 1,5...3 mm.

TECHNICAL SPECIFICATIONS

Model	Process temperature range, °C				Thermal inertia, sec
	TSM (50M, 100M)	TSP (Pt100, Pt1000, Cu50, Cu100)	TST (10kNTC)	TXK (L), TJK (J), TXA (K)	
3-7	-	-40...350	-	-40...350	15...20
3-12	-	-	-	-40...1000	2
3-13	-50...150	-50...250, -50...350	-40...120, -20...200	-40...250, -40...400	16...18
3-14	-	-50...250	-	-40...250, -40...400	13...15
3-16	-	-50...250, -50...350	-	-40...250, -40...400	15...18
3-196	-	-40...85	-	-	30
3-38a, 1-4r	-	-40...85	-	-	45
3-56, 3-57	-	-	-	-40...450	3
3-58	-	-	-	-40...600	0,3...3

DIMENSIONS

Model	Length of the immersion part L, mm
3-12	80
3-13	40, 60, 80, 100, 120, 160, 200, 250, 320, 400, 500
3-14	10, 20, 25, 30
3-16	60, 80, 100
3-19b	500, 600
3-38a, 1-4r	500, 600, 800, 1000, 1250, 1500
3-56	885, 1030, 1070, 1255, 1270, 1290, 1500, 2300
3-57	720, 740, 760
3-58	255, 260, 275, 280, 320, 420, 430

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| 1-43 | 1-43n | 1-43p | 1-43w | 1-44 |
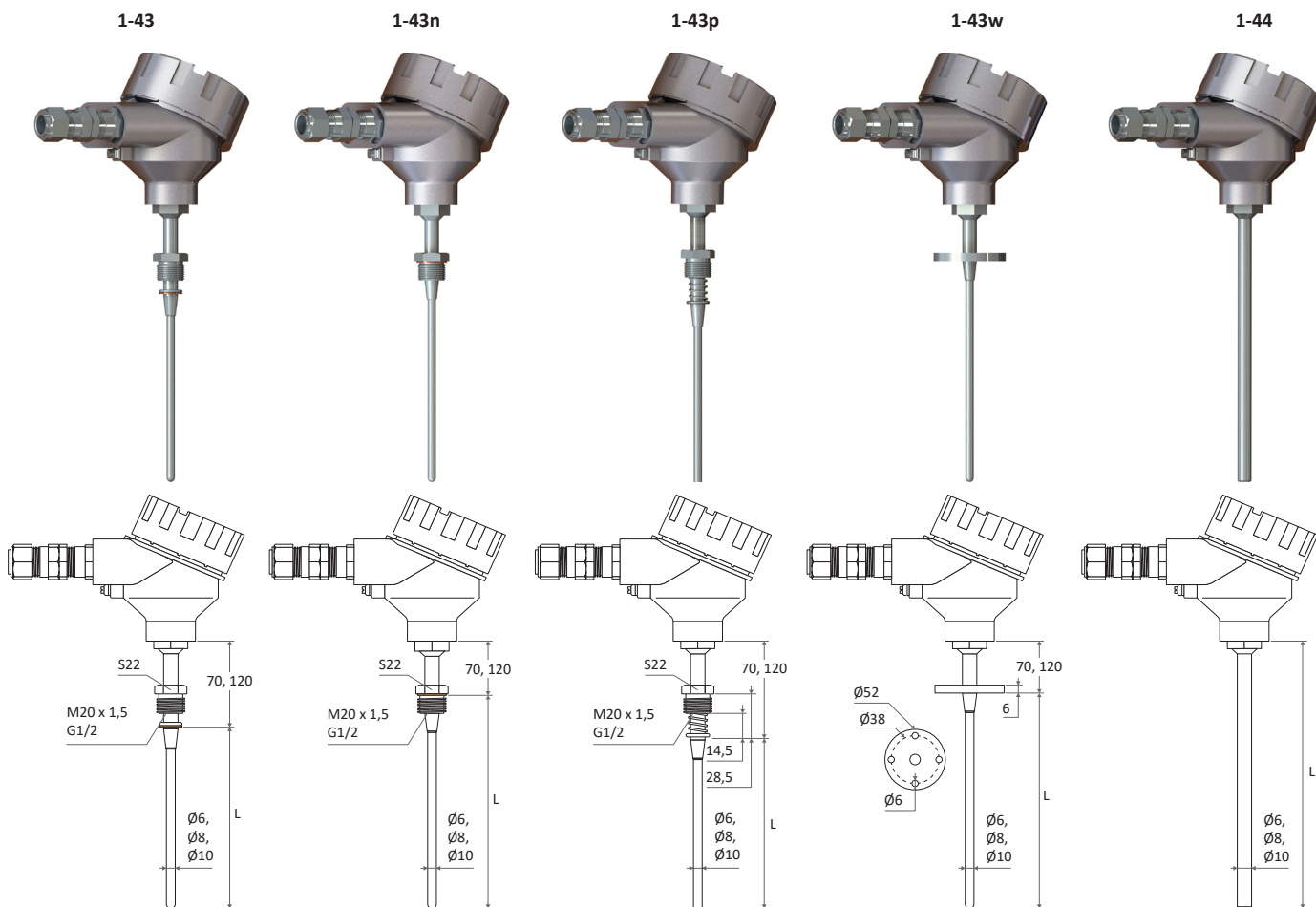
Explosion-proof temperature probes are specially designed for measuring temperatures in explosive environments, whether liquid or gas, as well as for measuring the temperature of solid objects within hazardous zones. Models 1-43, 1-44, 2-46, 2-48, 2-48a, and 2-48m are designed with Exd explosion-proof ratings, ensuring a safe design for use in explosive environments. The 1-43 and 1-44 series come with AX aluminum RTD/TC heads, while the 2-46 and 2-48 series feature AIX heads. Each model is equipped with an explosion-proof cable gland, as indicated in the table below, to guarantee Exd-level protection against explosions.

Models 1-43 and 1-43p come with a free hex fitting, while the 1-43n model features a welded hex fitting that is permanently attached to the sheath. For the 1-43p model, a spring-loaded hex fitting is used to firmly press the probe's sheath against the measuring surface, ensuring a secure connection. Model 1-43w, on the other hand, comes with a flange for mounting.

TECHNICAL SPECIFICATIONS						
Model	Process temperature range, °C					Thermal inertia, sec
	TSM, TSMU	TSP, TSPU, TSP-HART	TXA	TJK	TXK	
1-43, 1-43n, 1-43p, 1-43w, 1-44	-50...150	-50...250,-50...500, -50...600	40...250, -40...500, -40...800	-40...250, -40...500	-40...250, -40...600	15...30

DIMENSIONS	
Model	Length of the immersion part L, mm
1-43, 1-43n, 1-43p, 1-43w, 1-44	60, 80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1500, 2000

EX D CABLE GLANDS FOR AX AND AIX THERMOCOUPLE AND RTD HEADS					
Designation	Type of cable	External diameter of cable, mm	Conditional diameter of metal hose, mm	Operating temperature, °C	
H8	Unreinforced	3,2...8,7	N/A	-40...100	
H14		6,5...14,0			
A12	Reinforced	6,1...11,5			
A20		12,5...20,9			
HM8	Metal hose	3,2...8,1	10, 12		
HM14		6,5...14,0	18, 20, 22		

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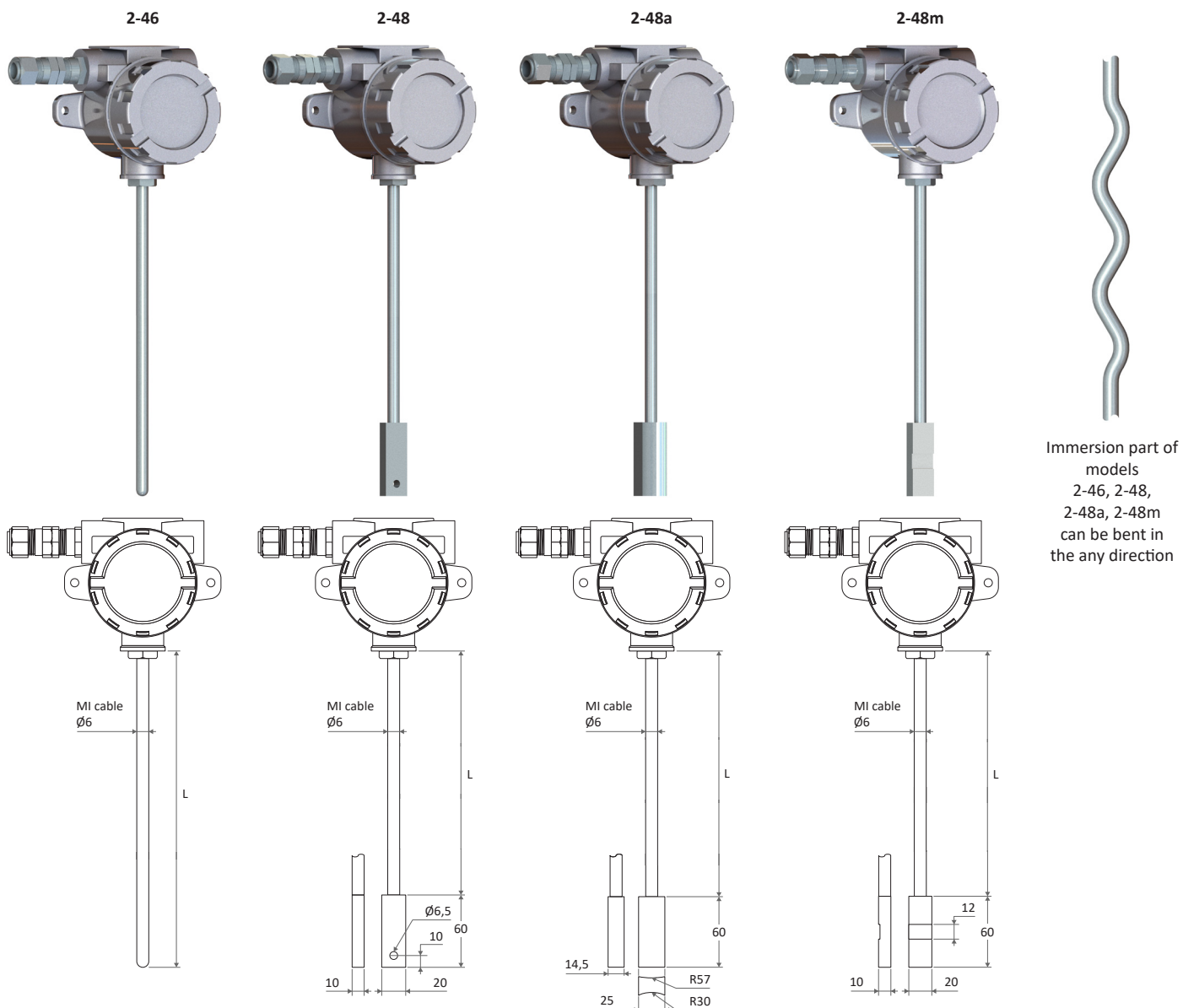
2-46   **2-48**   **2-48a**   **2-48m**

Immersion part of models
2-46, 2-48,
2-48a, 2-48m
can be bent in
the any direction

Models 2-48, 2-48a, and 2-48m are equipped with MI cables, allowing them to be bent in any direction, and their immersion part can extend up to 20 meters. These models are mounted onto the measuring surface using a screw (2-48) or a clamp (2-48a, 2-48m).

TECHNICAL SPECIFICATIONS

Model	Process temperature range of TSP and TSPU, °C	Thermal inertia, sec
2-46	-40...100	15...25
2-48, 2-48a, 2-48m	-50...250	15...25

DIMENSIONS

Model	Length of the immersion part L, mm
2-46, 2-48, 2-48a, 2-48m	80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1500, 2000, up to 20000

EXPLOSION-PROOF DESIGN

Type	Model	RTD/TC Head	Ingress Protection	Explosion Proof Classification	Hazardous Locations
TSM TSMU TSP TSPU TSP-HART TXA TXK TJK	1-43, 1-43n, 1-43p, 1-43w, 1-44	AX	IP66	II 1G Ex ia IIC T6...T1 Ga	Fully in zones 0 (20), 1 (21), 2 (22)
				II 1/2G Ex db IIC T6...T1 Ga/Gb	Fully in zones 1 (21), 2 (22), in zone 0 (20) only immersion part
				II 2G Ex db IIC T6...T1 Gb	Fully in zones 1 (21), 2 (22)
TSP TSPU TSP-HART	2-46, 2-48, 2-48a, 2-48m	AIX	IP66	II 1G Ex ia IIC T6...T1 Ga	Fully in zones 0 (20), 1 (21), 2 (22)
				II 2G Ex db IIC T6...T1 Gb	Fully in zones 1 (21), 2 (22)

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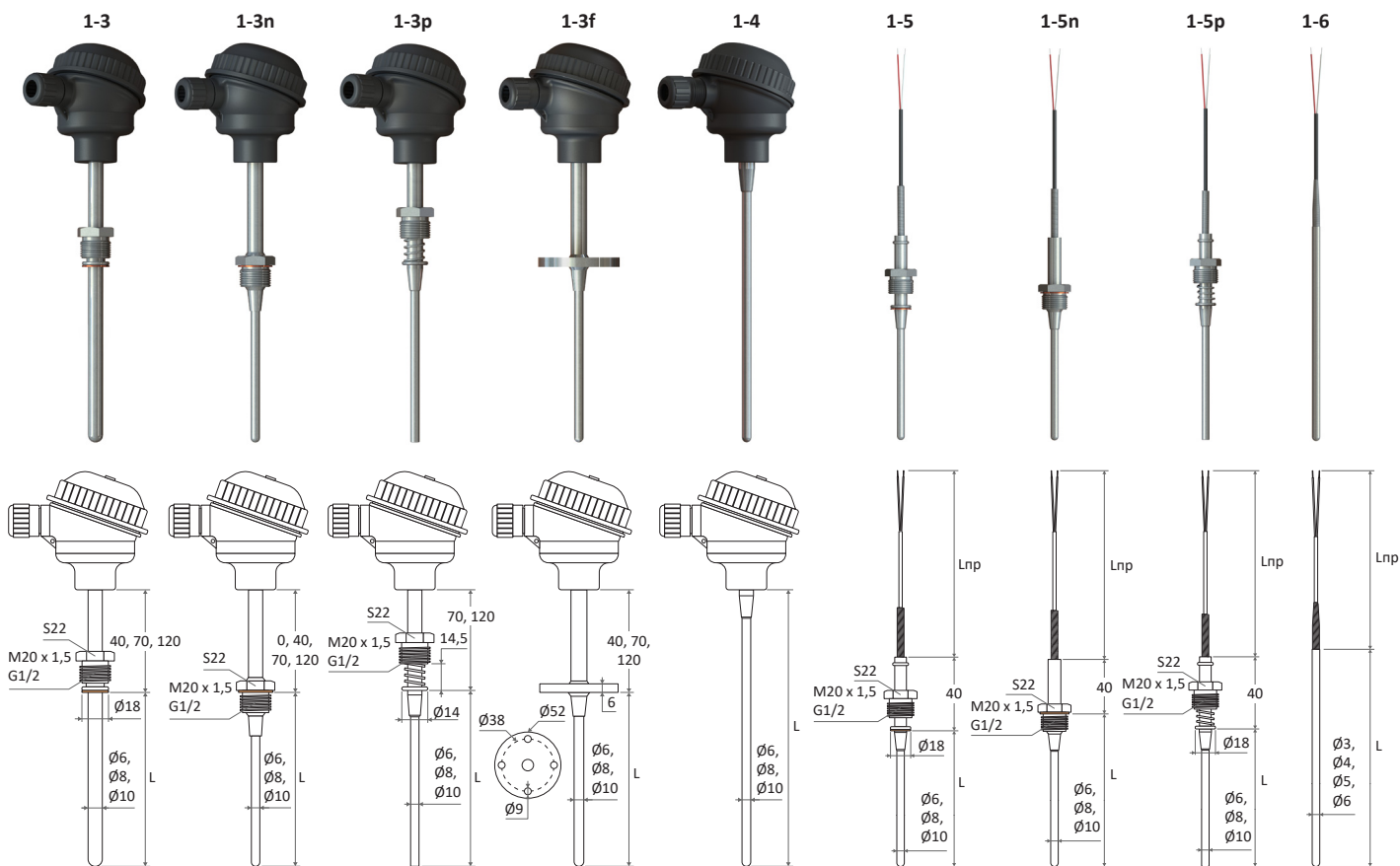
Explosion-proof temperature probes are specifically designed for measuring temperature in environments with explosive gases, liquids, or solids. Models 1-3, 1-3n, 1-3p, 1-3f, 1-4, 1-5, 1-5n, 1-5p, and 1-6 are classified as Exi explosion-proof types, indicating they are safe for use with low current/voltage supply. In addition, the 4-20 mA or HART transducer can be integrated into the BX, AX, and AIX RTD/TC heads of models 1-3, 1-3n, 1-3p, 1-3f, and 1-4.

Models 1-3, 1-3n, 1-3p, 1-3f, and 1-4 are equipped with BX RTD/TC heads made from intrinsically safe antistatic plastic. Meanwhile, models 1-5, 1-5n, 1-5p, and 1-6 are designed with shielded RE cables to ensure Exi explosion-proof functionality. Among these models, 1-3, 1-3a, 1-3h, and 1-3p come with a free hex fitting crafted from galvanized steel 20 (steel 304 available upon request). In contrast, 1-3n model features a welded hex fitting, securely attached to the probe's sheath, made from steel 304. Additionally, the 1-3p model boasts a spring-loaded hex fitting to ensure a tight connection between the probe and the thermowell or measuring surface, while 1-3f model comes with a flange joint for easy mounting on objects.

TECHNICAL SPECIFICATIONS

Model	Process temperature range, °C				
	TSM, TSMU	TSP, TSPU, TSP-HART	TXA	TJK	TXK
1-3, 1-3n, 1-3p, 1-3f, 1-4	-50...150	-50...250,-50...500, -50...600	40...250, -40...500, -40...800	-40...250, -40...500	-40...250, -40...600
1-5, 1-5n, 1-5p	-50...150	-50...250, -50...350, -50...500	-40...250, -40...350	-40...250, -40...350	-40...250
1-6, 1-7	-50...150	-50...250, -50...350	-40...250, -40...350	-40...250, -40...400	-40...250

DIMENSIONS

Model	Length of the immersion part L, mm
1-3, 1-3n, 1-3p, 1-3f, 1-4	40, 60, 80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000
1-5, 1-5n, 1-5p, 1-6	60, 80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000

EXPLOSION-PROOF DESIGN

Type	Model	RTD/TC Head / Cable	Ingress Protection	Explosion Proof Classification	Hazardous Locations
TSM TSMU TSP TSPU TSP-HART	1-3, 1-3n, 1-3p, 1-3f, 1-4	BX	IP67	II 1G Ex ia IIC T6...T1 Ga	0, 1, 2, 20, 21, 22
	1-5, 1-5n, 1-5p, 1-6	RE	IP54		
TXA TXK TJK	1-3, 1-3n, 1-3p, 1-3f, 1-4	BX	IP67		1, 2, 21,22 (between 0, 20 and 1, 21)
	1-5, 1-5n, 1-5p, 1-6	RE	IP54		

Note: The table indicates the maximum process temperature range. It's important to note that the connection between the RTD/TC head and the operating part should not exceed the temperature class of T3 (200°C), T4 (135°C), T5 (100°C), or T6 (85°C), based on an environmental temperature (Ta) of 70°C. Please be aware that the BX RTD/TC head provides an ingress protection rating of IP67 up to 120°C only.

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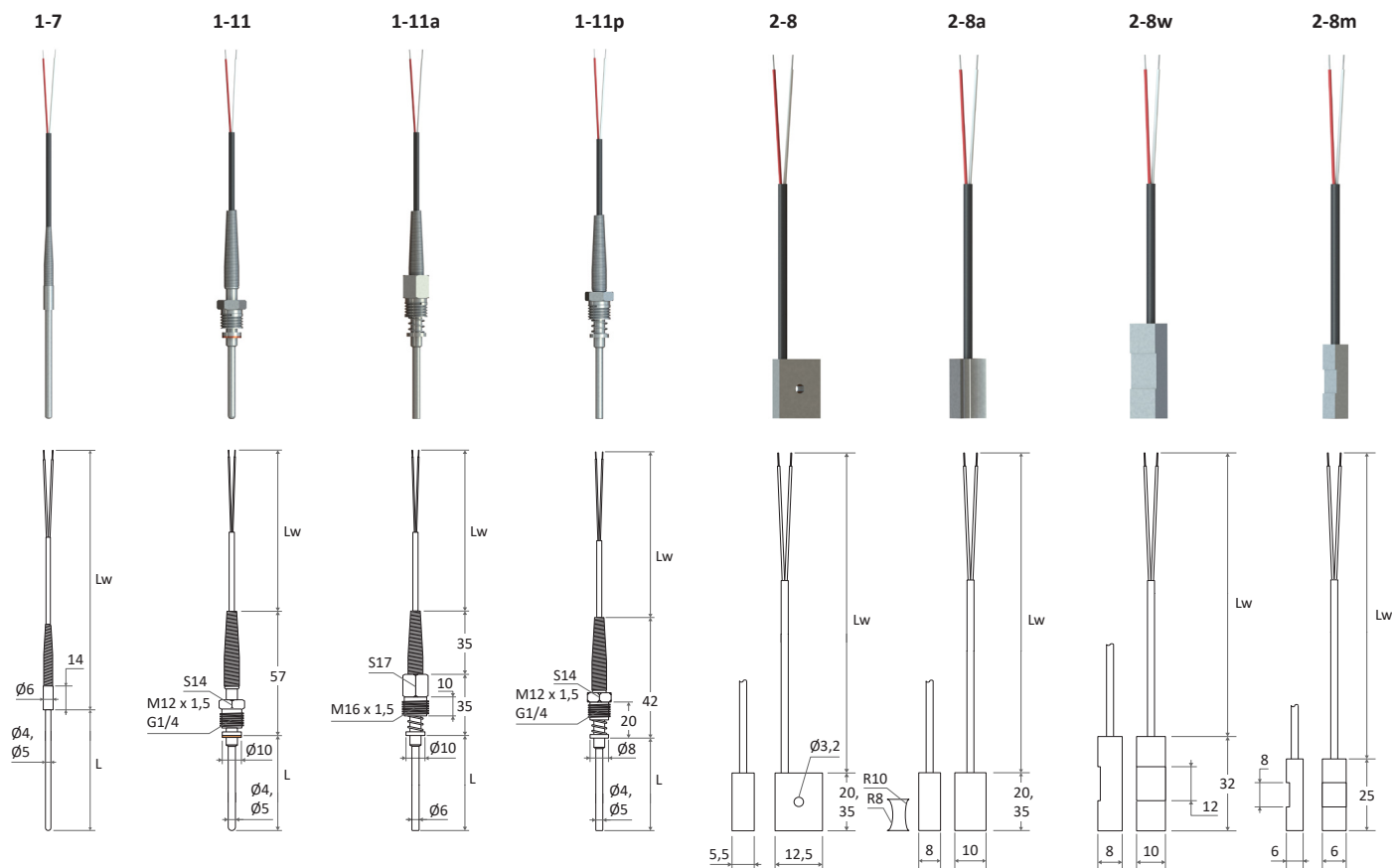
Explosion-proof temperature probes are specifically engineered for measuring temperatures in potentially hazardous environments, including liquids, gas-like substances, and solid materials situated within explosive zones. Models such as 1-7, 1-11, 1-11a, 1-11p, 2-8, 2-8a, 2-8w, and 2-8m are designed with Exi explosion-proof classification, which entails a low current/voltage supply to enhance safety.

Models 1-7, 1-11, 1-11a, 1-11p, 2-8, 2-8a, 2-8w, and 2-8m are equipped with RE output cables, providing Exi explosion-proof classification. Additionally, models 1-11, 1-11a, and 1-11p come with a free hex fitting for mounting purposes, made from galvanized steel 20, and can be ordered in AISI 304 upon request. Furthermore, the 1-11a and 1-11p models feature a spring-loaded hex fitting to ensure secure contact between the probe and the bottom of a thermowell or the measuring surface.

The 2-8 model can be installed on a surface using an M3 screw, while the 2-8a, 2-8v, and 2-8m models are designed to be installed on pipes using a clamp.

TECHNICAL SPECIFICATIONS

Model	Process temperature range, °C				
	TSM	TSP	TXA	TJK	TXK
1-7	-50...150	-50...250, -50...350	-40...250, -40...350	-40...250, -40...400	-40...250
1-11, 1-11a, 1-11p	-50...150	-50...250, -50...350, -50...500	-40...250, -40...350	-40...250, -40...350	-40...250
2-8, 2-8a, 2-8v, 2-8m	-50...150	-50...250	-	-	-

DIMENSIONS

Model	Length of the immersion part L, mm
1-7	20, 32, 40, 60, 80, 100, 120, 160, 200, 250, 320, 400, 500
1-11, 1-11a, 1-11p	32, 40, 60, 80 , 100, 120, 160, 200, 250, 320, 400, 500

EXPLOSION-PROOF DESIGN

Type	Model	Cable	Ingress Protection	Explosion Proof Classification	Hazardous Locations
TSM TSP	1-7, 1-11, 1-11p, 1-11a, 2-8, 2-8a, 2-8m	RE	IP54	II 1G Ex ia IIC T6...T1 Ga	0, 1, 2, 20, 21, 22
TXA TXK TJK	1-7, 1-11, 1-11p, 1-11a				1, 2, 21,22 (between 0, 20 and 1, 21)

Note: The maximum process temperature range is listed in the table. The connection between the cable and the operating part must stay at a temperature that doesn't exceed 230°C. To ensure these conditions, it's necessary to order a longer immersion part or a remote part, which helps protect the sensitive components from excessive heat.

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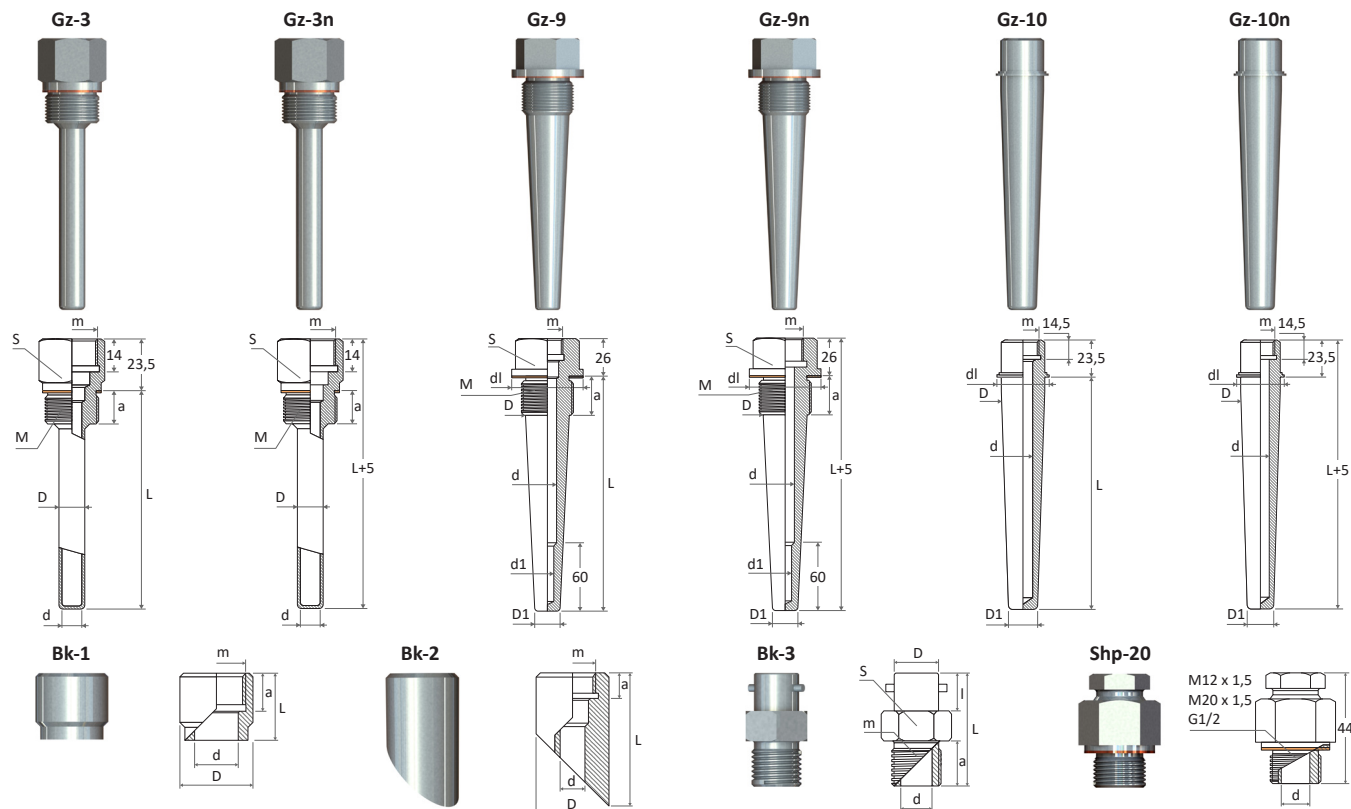
Thermowells serve the purpose of mounting temperature probes in containers, pipelines, and other similar applications. They can be purchased with a temperature probe included or as a separate product. Gz-3, Gz-9, Gz-10 thermowells are designed for temperature probes with a free hex fitting, Gz-3n, Gz-9n, Gz-10n - for temperature probes with a welded hex fitting. Gz-3, Gz-3n, Gz-9, and Gz-9n thermowells are installed at the operation site using a hex fitting, while Gz-10 and Gz-10n thermowells are designed for welding. Each thermowell comes with a 2 mm thick copper washer. During installation, it's recommended to fill the thermowell with oil and copper chips or thermal paste. The design of Gz-3 and Gz-3n thermowells is welded construction, suitable for up to 20 MPa of conditional pressure. Gz-9, Gz-9n, Gz-10, and Gz-10n thermowells are solid-machined, capable of withstanding up to 50 MPa of conditional pressure.

TECHNICAL SPECIFICATIONS														
Model	Gz-3, Gz-3n	Gz-3, Gz-3n	Gz-3, Gz-3n	Gz-3, Gz-3n	Gz-9, Gz-9n	Gz-10, Gz-10n	Bk-1	Bk-1	Bk-2	Bk-2	Bk-3	Bk-3	Shp-20	Shp-20
D, mm	Ø10	Ø14	Ø16	Ø16	Ø29	Ø30	Ø18	Ø30	Ø20	Ø30	Ø12,5	Ø14,5	-	-
D1, mm	-	-	-	-	Ø17	Ø20	-	-	-	-	-	-	-	-
d, mm	Ø7	Ø10	Ø12	Ø11	Ø11	Ø12	Ø7	Ø17	Ø7	Ø17	Ø6,5	Ø8,5	Ø6	Ø10
d1, mm	-	-	-	-	Ø8	-	-	-	-	-	-	-	-	-
PN, MPa	16	20	20	25	50	50	-	-	-	-	-	-	-	-

* PN - the maximum allowable overpressure at an ambient temperature of 293 K (20°C). Please note that this parameter is applicable only to thermowells.

DIMENSIONS	
Model	Length of the immersion part L, mm
Gz-3, Gz-3n	40, 60, 80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000
Gz-9, Gz-9n, Gz-10, Gz-10n	80, 100, 120, 160, 200, 250, 320
Bk-1, Bk-2, Bk-3	18, 30, 35, 50, 60

Threaded bosses are intended for the installation of temperature probes in containers, pipes, and similar applications. They can be acquired either as part of a temperature probe kit or as standalone products.

The Shp-20 **hex fitting** is specifically designed for the installation of temperature probes with 6 or 10 mm diameters, including models 1-4, 1-6, 1-24, 1-26, 1-26a, and 1-27. The materials used for thermowells typically include Steel 321 and Steel 409, while threaded bosses are made from Steel 3, Steel 20, and Steel 40.

Order code for Gz-3 and Gz-3n
<model> - L - D - d - M - m - a - S - <steel> - <PN>
Example:
Gz-3 - 120 - 14 - 10 - M20x1,5 - M20x1,5 - 14 - S27 - 321 - 20MPa

Order code for Gz-9 and Gz-9n
<model> - L - D/D1 - d/d1 - M - m - a - dl - S - <steel> - <PN>
Example:
Gz-9 - 120 - 29/17 - 11/8 - M33x2 - M20x1,5 - 32 - 40 - S32 - 321 - 50MPa

Order code for Gz-10 and Gz-10n
<model> - L - D/D1 - d - m - dl - <steel> - <PN>
Example:
Gz-10 - 160 - 30/20 - 12 - M20x1,5 - 32 - 409 - 50MPa

Order code for Bk-1 and Bk-2
<model> - L - D - d - m - a - <steel>
Example
Bk-1 - 50 - 30 - 11 - M20x1,5 - 14 - Steel20

Order code for Bk-3
<model> - L - l - D - d - M - a - S - <steel>
Example:
Bk-3 - 45 - 20 - 14 - 8 - M16x1,5 - 14 - S17 - 409

Order code for Shp-20
<model> - d - M - <steel>
Example:
Shp-20 - 6 - M20x1,5 - AISI304

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Thermocouple connector (standard)

Thermocouple connector (mini)
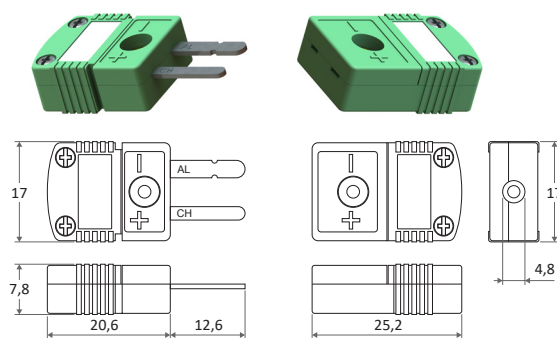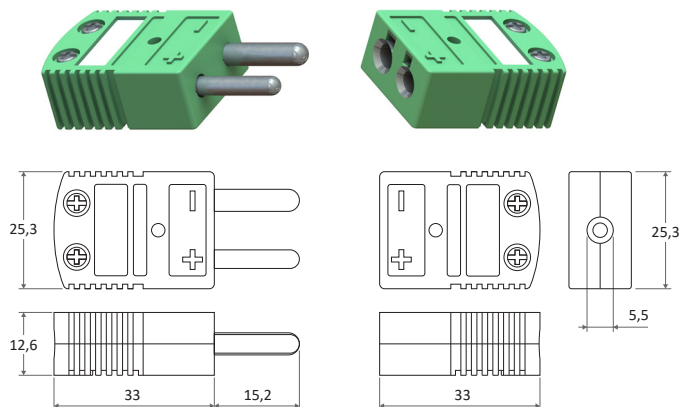
The **thermocouple connector** serves the purpose of connecting thermocouple and thermocompensating cables. These connectors feature pins crafted from the appropriate thermocouple alloys, which helps prevent any additional measurement errors. The polarity of the pins ensures correct connections, and the user-friendly design includes built-in screw terminals for quick and easy wire connections. A complete set typically includes both male and female connectors.

Name	Description	Type	Operating temperature, °C	Max diameter of conductor, mm	Max diameter of cable, mm
KZTC-Mini KX	Mini male + female	TXA (К)	-20...220	0,6	4,9
KZTC-Mini JX	Mini male + female	TJK (J)	-20...220	0,6	4,9
KZTC-Big KX	Standard male + female	TXA (К)	-20...220	0,6	5,5
KZTC-Big JX	Standard male + female	TJK (J)	-20...220	0,6	5,5
KZTC-Big NX	Standard male + female	TNN (N)	-20...220	0,6	5,5

M8 connector with a cable gland
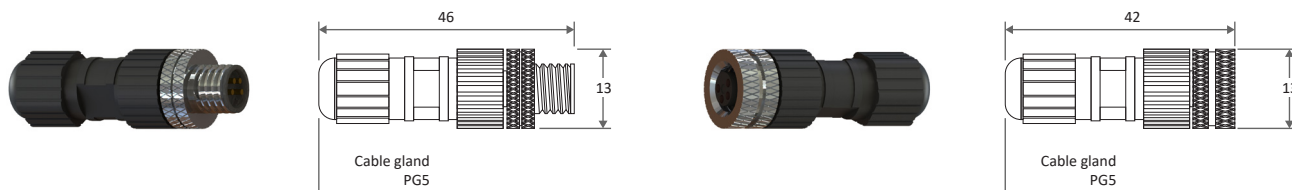
The **M8 connector** is used for connecting RTD and thermistor cables, facilitating cable-to-cable connections. These connectors feature pins crafted from gold-plated brass, while the connector enclosure is constructed from PA6 polyamide and nickel-plated brass.

The M8 connector includes 5 pins, and a complete kit includes both male and female connectors.

Description	Type	Ingress Protection	Operating temperature, °C	Max cross-section of conductor, mm	Outer diameter of cable, mm
M8 connector with a cable gland (set)	TS	IP67	-25...90	0,34	2...4,7

PCA 1.1505 platinum resistor

PCA 1.2003 platinum resistor
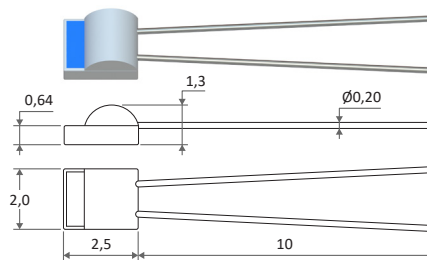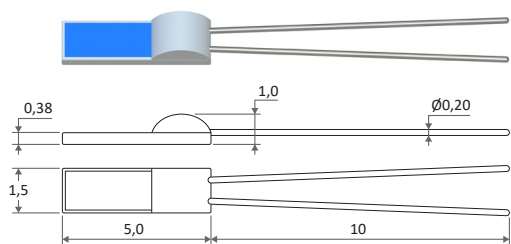
Part Number	Nominal resistance	Connection wires	$\alpha=R_{100}/R_0$, °C^{-1}	Class (accuracy, process temperature range)
PCA 1.1505.1M-<class>	Pt100	Platinum nickel	0,00385	F0.1 (class AA, -50...200 °C) F0.15 (class A, -70...300 °C) F0.3 (class B, -70...550 °C)
PCA 1.1505.10M-<class>	Pt1000			
PCA 1.2003.1M -<class>	Pt100			
PCA 1.2003.10M -<class>	Pt1000			

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Built-in transducer ⟨Ex⟩

Remote transducer

Built-in HART transducer ⟨Ex⟩

Built-in 4-20 mA / RS485 transducer for the RTD/TC head of the temperature probe
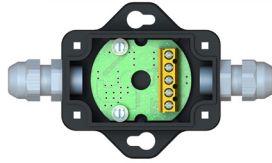
Remote 4-20 mA / RS485 transducer for the temperature probe with an output cable
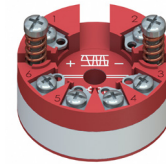
Built-in HART transducer for the RTD/TC head of the temperature probe

TECHNICAL SPECIFICATIONS				
Type	Input signal	Output signal	Process temperature probes, °C	Accuracy, %
TSPU	Pt50, Pt100		0...150, -50...250, -50...650	0,2 or 0,5
TXAU	XA (K)	4-20 mA	0...500, 0...850, 0...1300	1,0
TNNU	NN (N)		0...1300	
TPPU	S, R		0...1700	
TPRU	B		600...1700	
TSP RS	Pt50, Pt100		0...150, -50...250, -50...650	0,5
TXA RS	XA (K)	RS485	0...500, 0...850, 0...1300	1,0
TNN RS	NN (N)			
TPP RS	S, R		0...1700	
TPR RS	B		600...1700	

RS485 exchange protocol	Case
Modbus RTU or Tbus (TEPA)	B, BX, A1, AX, AIX RTD/TC head (built-in), Z67 (remote)

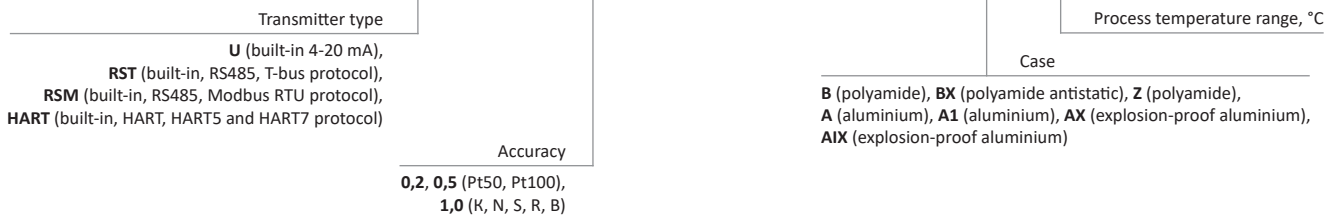| Power supply, V DC	Wire connection to the probe	Operating temperature, °C
12-36, 12-24*	2 or 3 wired for RTD, 2 wired (1 junction) for thermocouple	-40...70

* - for Ex explosion-proof design

TECHNICAL SPECIFICATIONS				
Type	Input signal	Output signal	Process temperature range, °C	Accuracy, %
TSP HART	Pt100, Pt1000		-200...850	0,1
TXA HART	XA (K)	HART 4-20 mA	-180...1372	0,5
TNN HART	NN (N)		-180...1300	
TPP HART	R, S		-50...1760	
TPR HART	B		0...1820	

Exchange protocol	Case	Power supply, V DC
HART7 and HART5	BX, A1, AX, AIX RTD/TC head	8-30

Wire connection to the probe	Operating temperature, °C
2, 3, 4 wired for RTD, 2 or 4 wired (1 or 2 junctions) for TC	-40...85

Standard order code of temperature probe with RTD/TC head or output cable

Example: TSP - U - 1-43 - Pt100 - 0,5% - 3 - 120 - 10 - M20x1,5 - 70 — AX -/-50...250/- Exd
Example: TSP - U - 1-3 - Pt100 - 0,2% - 3 - 60 - 6 - M20x1,5 - 40 — B -/-50...250/
Example: TSP - RST - 1-5 - Pt100 - 0,5% - U - 120 - 10 - M20x1,5 - 70 - RE - 2000 - Z -/-50...250/

Transmitter type
U (built-in 4-20 mA),
RST (built-in, RS485, T-bus protocol),
RSM (built-in, RS485, Modbus RTU protocol),
HART (built-in, HART, HART5 and HART7 protocol)

Accuracy
0,2, **0,5** (Pt50, Pt100),
1,0 (K, N, S, R, B)

Process temperature range, °C

Case
B (polyamide), **BX** (polyamide antistatic), **Z** (polyamide),
A (aluminium), **A1** (aluminium), **AX** (explosion-proof aluminium),
AIX (explosion-proof aluminium)

Standard order code without temperature probe

Example: TSP - U - Pt100 - 0,2% - Z - /-50...250/
Example: TSP - HART - Pt100 - 0,5% - /-200...850/

Type
TSP, TXA, TNN, TPP, TPR

Transmitter type
U (Built-in 4-20 мА),
RST (built-in, RS485, T-bus protocol),
RSM (built-in, RS485, Modbus RTU protocol),
HART (built-in, HART, HART5 and HART7 protocol)

Nominal resistance / type
Cu50, Cu100, Pt50, Pt100, Pt1000, K, N

Accuracy
0,2, **0,5** (Cu50, Cu100, Pt50, Pt100),
1,0 (для К, N, S, R, B)

Z - remote Z67 case (polyamide)

Case (for remote transducer only)

Process temperature range, °C

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BT-1　　　　　　　　　　　　　　　　　　**BT-2**

Measuring inserts serve as a replaceable component of temperature probes, designed to facilitate the replacement of the sensing element within the thermowell sheath. This allows for the easy replacement of a faulty sensor in need of calibration without the need to uninstall the entire temperature probe, thereby avoiding disruptions to the ongoing industrial processes. The insert features a spring-loaded terminal block that ensures firm contact between the insert's end and the bottom of the thermowell, reducing the transducer's thermal inertia.

Measuring inserts are versatile components, suitable for use in both RTD probes with Pt100 and Pt1000 sensors, as well as thermocouple probes of K, J, and N types. The design of temperature probes with interchangeable measuring inserts and an RTD/TC head is prevalent in European, American, and Asian countries.

The typical measuring insert is crafted from MI (Mineral Insulated) cable and comprises a metal sheath that serves to shield the sensor element and connecting wires, along with a terminal block. Within the sheath, there is insulating powder containing high-purity magnesium oxide (MgO). Additionally, you have the option to replace the terminal block with a 4-20mA transducer, a 4-20mA transducer with HART compatibility, or an RS485 transducer as needed.

If the gap between the inner diameter of the sheath, where the measuring insert is placed, and the outer diameter of the insert exceeds 1 mm, it is advisable to request a measuring insert with a nozzle near the sensor element. This helps minimize the space between the sheath and the insert. However, it's crucial not to opt for a nozzle with an overly wide diameter, as it could potentially get stuck inside the sheath. Therefore, maintaining an optimal gap of 0.3 - 0.5 mm between the sheath and the insert is essential for proper functioning.

TECHNICAL SPECIFICATIONS				
Type	Nominal resistance / type	Process temperature range, °C	Wire connection / junction type	Accuracy
TSP	Pt100, Pt1000	-100...250, -50....250, -100...450, -50...450, -50...500, -50...600	2, 3, 4, 2x3, 2x4	AA, A, B
TJK	J	-40...250, -40...500	0,5	1, 2
TNN	N	-40...1000, -40...1150		
TXA	K	-40...250, -40...500, -40...800, -40...1000, -40...1150		
Sheath material			Head	
Stainless steel 316, 321, 310, Inconel 600 alloy			By default - B, AX, AIX, or any head with DIN B standard	

DIMENSIONS	
Length of the immersion part, L, mm	Diameter of the immersion part, mm
Any length from 80 to 2000	3,0 / 4,5 / 6,0

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The outdoor humidity and temperature transmitter is designed for measuring the relative humidity and temperature of outdoor air, essentially functioning as a compact weather station. This transmitter is typically installed outside the building, positioned under the building's roof on the shaded side.

The transmitter features a Swiss capacitive sensor element, which is maintenance-free and safeguarded by a breathable microporous filter. The housing of the transmitter is made from ABS plastic and is designed for wall-mounting.

Data on temperature and relative air humidity can be transmitted using either the RS485 interface or two 4-20 mA analog outputs.

TECHNICAL SPECIFICATIONS				
Process temperature range, °C	Temperature accuracy, %	Resolution, °C	Process humidity range, %	Humidity accuracy, %
-40...60	0,5	0,1	0...100 (no condensation)	4 (0...10), 3 (10...90), 4 (90...100)
Output signal	Response time		Dimensions (HxWxD), mm	Power supply, V DC
2 x 4-20 mA or RS485 (T-bus or Modbus RTU protocol)	From 10 minutes (depends on wind speed)		258 x 73 x 186.5	12-24

Order code for DVT-RST-11

Example: DVT - RST - 11 - SHT - Z

Communication interface

RST (RS485 output signal, T-bus (TERA) protocol),
RSM (RS485 output signal, Modbus RTU protocol),
U (2 x 4-20 mA output signal)

The DVT-07c aspiration psychrometer is employed for precise measurements of both relative humidity and air temperature. This measurement operates on the psychrometric principle, which involves determining the temperatures of dry and wet thermometers through forced air circulation.

The probe features a collapsible design, allowing for easy water replacement in the container, cable replacement, and the withdrawal of the probe with the RTD/TC head for calibration purposes.

DVT-07c operates within a temperature range of up to 75°C, and condensation gathering does not impact the probe's casing.

TECHNICAL SPECIFICATIONS			
Process temperature range, °C	Temperature accuracy, %	Process humidity range, %	Humidity accuracy, %
0...75	0,1	0...100 (no condensation)	1
Dimensions, mm	Response time, minutes	Nominal resistance	Power supply of fan, V DC
262 x 184 x 84	1	2 x Pt1000	12 ±5%

Extension cables are sold separately, and it uses high-quality German polyurethane heavy-duty extension cables with a cross-section of 7x0.50 sq. mm.

Order code for DVT-07c

Example: DVT - 07c - 2xPt1000 - Z - 2000 - OLF - Z56

Cable length
2000, **6000**, **8000** mm

The D-IT Meter measures air humidity and temperature using the DVT-07c aspiration psychrometer, equipped with 2 x Pt1000 sensors with nominal resistance. The device calculates relative humidity based on the difference in measurements between dry and wet thermometers, accounting for forced air blowing. The meter features a seven-segment display for humidity and temperature, one relay output for alarms, and an RS485 output for data transfer. It comes in single, dual, and quad-channel models, allowing you to simultaneously connect from one to four DVT-07c aspiration psychrometers.

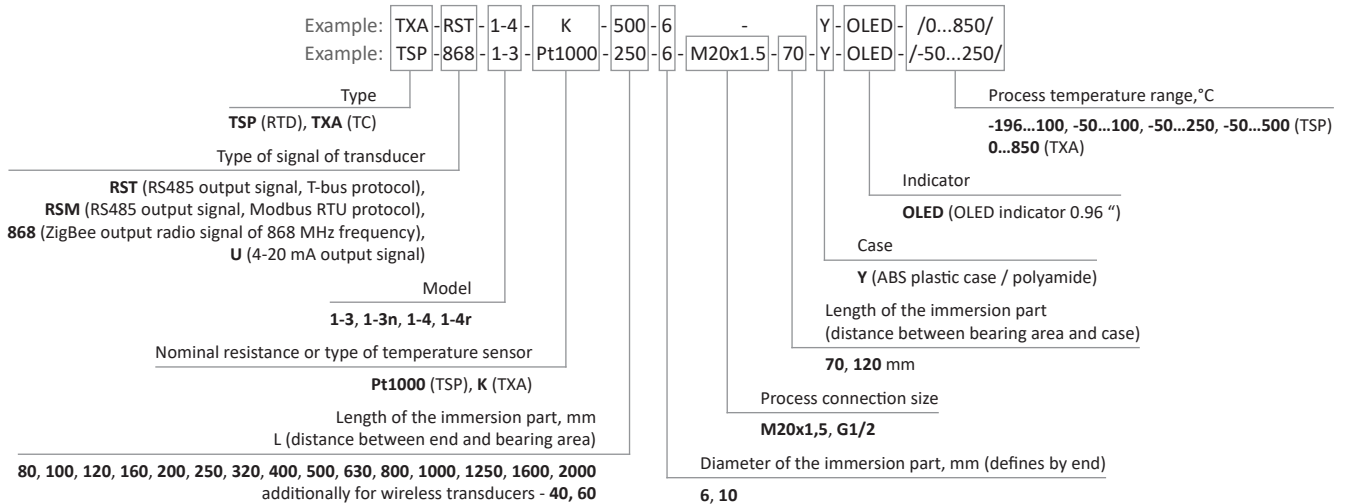| TECHNICAL SPECIFICATIONS			
Process temperature range, °C	Temperature accuracy, °C	Process humidity range, %	Humidity accuracy, %
0...75	0,1	0...100 (no condensation)	1
Case	Dimensions, mm	Nominal resistance	Power supply, V AC
D	96 x 96 x 50	2 x Pt1000	90...242

Order code

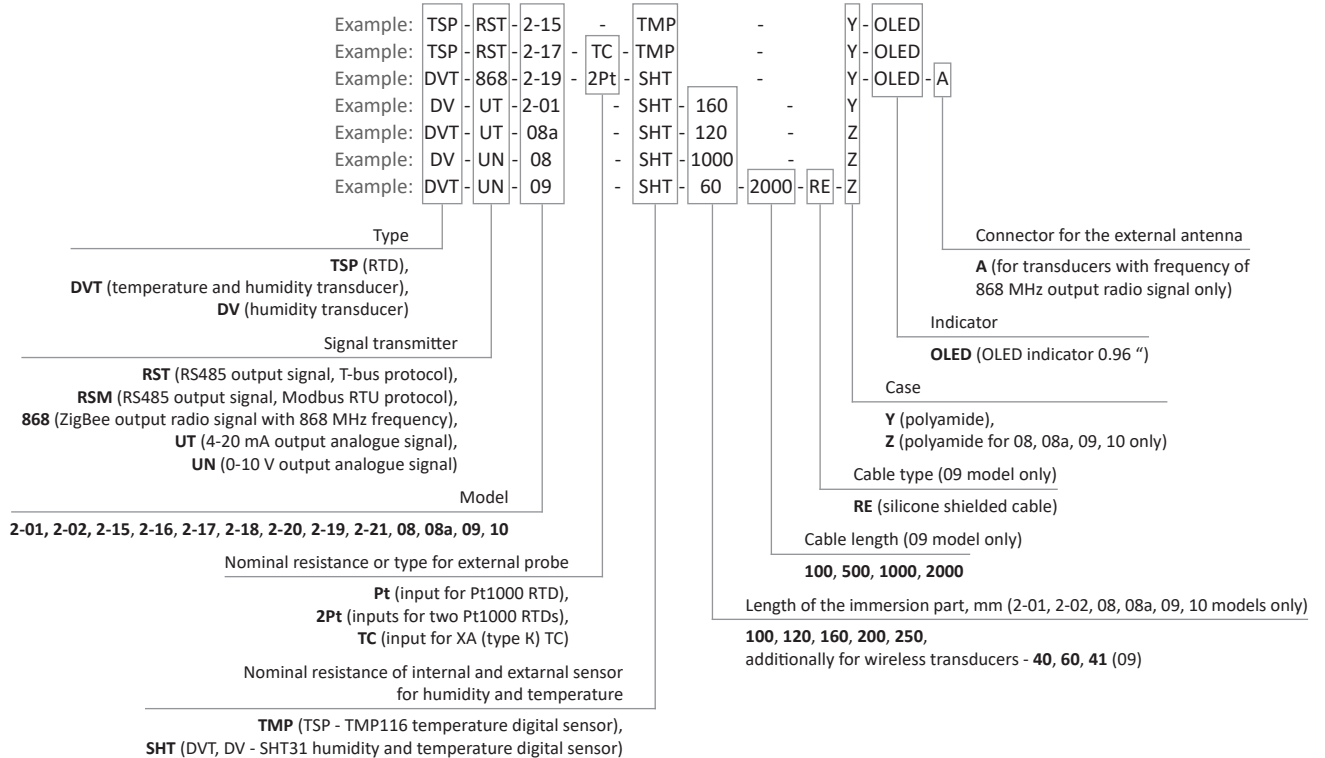Example: D - IT - 2PT01 - EPA - RST - 2U

Number of channels of humidity measurement
2PT01, **2x2PT01**

Exchange protocol
RST (RS485 output signal, T-bus (TERA) protocol),
RSM (RS485 output signal, Modbus RTU protocol)

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Order code for 1-3, 1-3n, 1-4, 1-4r

Example: TXA -RST- 1-4 - K -500- 6 - - Y-OLED- /0...850/
Example: TSP -868- 1-3 -Pt1000-250- 6 - M20x1.5 -70-Y-OLED- /-50...250/

Type
TSP (RTD), **TXA** (TC)

Type of signal of transducer
RST (RS485 output signal, T-bus protocol),
RSM (RS485 output signal, Modbus RTU protocol),
868 (ZigBee output radio signal of 868 MHz frequency),
U (4-20 mA output signal)

Model
1-3, **1-3n**, **1-4**, **1-4r**

Nominal resistance or type of temperature sensor
Pt1000 (TSP), **K** (TXA)

Length of the immersion part, mm
L (distance between end and bearing area)
80, **100**, **120**, **160**, **200**, **250**, **320**, **400**, **500**, **630**, **800**, **1000**, **1250**, **1600**, **2000**
additionally for wireless transducers - **40, 60**

Diameter of the immersion part, mm (defines by end)
6, **10**

Process connection size
M20x1,5, **G1/2**

Length of the immersion part
(distance between bearing area and case)
70, **120** mm

Case
Y (ABS plastic case / polyamide)

Indicator
OLED (OLED indicator 0.96 ")

Process temperature range,°C
-196...100, **-50...100**, **-50...250**, **-50...500** (TSP)
0...850 (TXA)

Order code for 2-01, 2-02, 2-15, 2-16, 2-17, 2-18, 2-19, 2-20, 2-21, 08, 08a, 09, 10

Example: TSP - RST - 2-15 - - TMP - - Y-OLED
Example: TSP - RST - 2-17 - TC - TMP - - Y-OLED
Example: DVT - 868 - 2-19 - 2Pt - SHT - - Y-OLED-A
Example: DV - UT - 2-01 - - SHT - 160 - - Y
Example: DVT - UT - 08a - - SHT - 120 - - Z
Example: DV - UN - 08 - - SHT - 1000 - - Z
Example: DVT - UN - 09 - - SHT - 60 - 2000 -RE- Z

Type
TSP (RTD),
DVT (temperature and humidity transducer),
DV (humidity transducer)

Signal transmitter
RST (RS485 output signal, T-bus protocol),
RSM (RS485 output signal, Modbus RTU protocol),
868 (ZigBee output radio signal with 868 MHz frequency),
UT (4-20 mA output analogue signal),
UN (0-10 V output analogue signal)

Model
2-01, **2-02**, **2-15**, **2-16**, **2-17**, **2-18**, **2-20**, **2-19**, **2-21**, **08**, **08a**, **09**, **10**

Nominal resistance or type for external probe
Pt (input for Pt1000 RTD),
2Pt (inputs for two Pt1000 RTDs),
TC (input for XA (type K) TC)

**Nominal resistance of internal and extarnal sensor
for humidity and temperature**
TMP (TSP - TMP116 temperature digital sensor),
SHT (DVT, DV - SHT31 humidity and temperature digital sensor)

Length of the immersion part, mm (2-01, 2-02, 08, 08a, 09, 10 models only)
100, **120**, **160**, **200**, **250**,
additionally for wireless transducers - **40, 60, 41** (09)

Cable length (09 model only)
100, **500**, **1000**, **2000**

Cable type (09 model only)
RE (silicone shielded cable)

Case
Y (polyamide),
Z (polyamide for 08, 08a, 09, 10 only)

Indicator
OLED (OLED indicator 0.96 ")

Connector for the external antenna
A (for transducers with frequency of
868 MHz output radio signal only)

Order code for 2-17, 2-18, 2-19 external probe

Example: TSP - 1-11 - Pt1000 - B - 2 - 120 - 4 - M12x1.5 - 2000 - RE - M8 - /-50...250/
Example: TSP - 1-26 - K - 1 - I - 2500 - 6 - INC - 5000 - RE - M8 - /-0...1100/
Example: TSP - 2-8 - Pt1000 - B - 2 - 4000 - RE - M5 - /-50...250/
Example: TSP - 1-6 - Pt1000 - A - 2 - 80 - 5 - 8000 - RE - M12 - /-50...250/

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1-3　　**1-3н**　　**1-4**　　**2-01**　　**2-02**　　**2-17**

100　　100　　100　　100　　100　　74

66　　66　　66　　66　　66　　62　45,6

Free Hex Fitting
M20 x 1,5 G1/2
70, 120
Ø18
Ø6, Ø10
L

Welded Hex Fitting
M20 x 1,5 G1/2
70, 120
Ø6, Ø10
L

Ø6, Ø10
L

Ø6* Ø10**
70, 120
L
27
Ø12

Free Hex Fitting
M20 x 1,5 G1/2
70, 120
Ø18
Ø6* Ø10**
L
27
Ø12

Lw
Ø5
L

1-3　　**1-3н**　　**1-4**　　**2-01**　　**2-02**　　**2-19**

46　　46　　46　　46　　46　　52

66　　66　　66　　66　　66　　64　45,6

Free Hex Fitting
M20 x 1,5 G1/2
70, 120
Ø18
Ø6, Ø10
L

Welded Hex Fitting
M20 x 1,5 G1/2
70, 120
Ø18
Ø6, Ø10
L

Ø6, Ø10
L

Ø6* Ø10**
70, 120
L
27
Ø12

Free Hex Fitting
M20 x 1,5 G1/2
70, 120
Ø18
Ø6* Ø10**
L
27
Ø12

Lw
Ø5
L

2-15　　**2-15**　　**2-16**　　**2-16**　　**2-18**　　**2-20**

45,6　　45,6　　74　　74　　55　　74

64　45,6　　64　45,6　　62　45,6　　62　45,6　　72　　62　45,6

Ø44

Ø8
60
27

Front view

34
62

Lw
Ø5
L

Metal board

17
43,6　10
Ø3,2

Lw
Ø5
L

CP-06 Junction Box

65
40
Lw
Ø5
L

2-21

55
72
Ø44

* - Length of the immersion part up to 500 mm
** - Length of the immersion part over 500 mm

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1-3 **1-3n** **1-4** **2-16** **2-16** **2-17**

CP-06 junction box with power supply

RS485 line

Input → Output

Transducer

The Y Case Temperature Transducers with RS485 interface use the RS485 interface for data transfer. This wired interface enables you to connect up to 30 probes in a daisy-chain configuration using a single cable line. The probe connects to RS485 using a 5-wire scheme and uses FTP 5e cables for line installation. RS485 connection is facilitated by a sealed threaded M12 connector with an internal terminal block, eliminating the need for soldering. This design allows for easy uninstallation of the probe when verification or calibration is required. Additionally, the probe is supplied with a junction box CP-06 and its power supply.

The probe's power supply is housed within the CP-06 box, along with the terminal block for convenient organization of RS485 input and output cables. The high-contrast screen displays essential data, including the current measured values for each channel, serial number, and RS485 settings. Additionally, you have the option to order the 2-17 model with several sensors: in addition to the installed temperature sensor, customers can request an external Pt1000 or XA probe, which connects to the probe via a sealed threaded M8 connector. The 2-16 model is equipped with two external Pt1000 probes that connect via non-sealed threaded M5 connectors. Both the 2-16 and 2-17 models come with disk magnets and a metal board with screws for easy mounting on vertical surfaces.

TECHNICAL SPECIFICATIONS				
Model	1-3, 1-3n, 1-4		2-16	2-17
Technical specifications of transducer				
Number of channels	1		1, 2, 3	1, 2
Available channel configuration*	ET		IT, 2ET, IT+2ET	ET, IT + ET (Pt1000 / XA)
Output signal	RS485, T-bus or Modbus RTU protocol			
Indication	OLED 0.96', resolution is 128x64 pixels, display by pressing the button			
RS485 line connection	Via the CP-06 junction box and the M12FA or M12FD connector (IP67)			
Disk magnets	N/A		Vertical	
Operating temperature, °C	-30...60			
Technical specifications of external probe				
Nominal resistance / TC type	Pt1000	XA (К)	Pt1000	Pt1000	XA (К)
Process temperature range, °C	-196...100, -50...100, -50...250, -50...500	0...850	-196...100, -50...100, -50...250, -50...500	-196...100, -50...100, -50...250, -50...500	0...250, 0...500, 0...850, 0...1250
Accuracy, °C	± (0,4 + 0,002 x |T|)**	± (0,5 + 0,008 x |T|)**	± (0,4 + 0,002 x |T|)**	± (0,4 + 0,002 x |T|)**	± (0,5 + 0,008 x |T|)**
Connector for external temperature probe	N/A		M5 (IP52)	M8 (IP67)	
Thermal inertia, sec	15 (Ø6 mm), 25 (Ø10 mm), (water, V=0,2 m/sec)		Determines by the selected external temperature probe	Determines by the selected external temperature probe	
Sheath material	Steel 321				
M20 x 1,5 hex fitting	Free (1-3), welded (1-3n), N/A (1-4)				
Length of immersion part, mm	80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000				
Diameter of immersion part, mm	By default - 6 (up to 500 mm), 10 (over 500 mm)				
Technical specifications of built-in temperature sensor				
Sensor name	N/A		TMP116		
Process temperature range, °C			-30...60		
Accuracy, °C			0,5		
Thermal inertia, sec			240 (air, V=0 m/sec)		
Technical specifications of CP-06 junction box				
Input power supply, V DC	12-24			
Output power supply for transducer, V DC	5			
RS485 line connection	Via the PG7 cable gland using the terminal block on the junction box microcircuit			
Transducer connection	Using the M12FA or M12FD connector (IP67) and the FTP 5e cable by the length of 300 mm			

* - ET - external temperature probe, 2ET - two external temperature probes, IT - internal temperature sensor
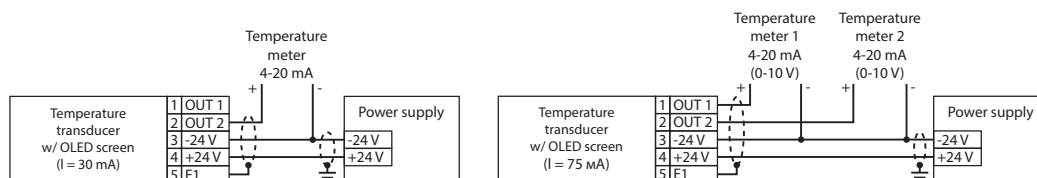** - T - value of operating temperature, that accuracy is calculated for

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1-3	1-3n	1-4	2-16	2-17	2-20

The Y Case Temperature Transducers with a 4-20 mA interface use a 4-20 mA analog interface for data transmission. Depending on the model, the probe connects to the 4-20 mA line using either a 2-wire or 3-wire scheme. It is advisable to employ Shielded Twisted Pair (STP) cable for the line. The 4-20 mA connection is established through a sealed threaded M12 connector with an internal terminal block, eliminating the need for soldering.

The transducer is equipped with a high-contrast OLED display that presents the measured values received from all the channels. Models 2-16, 2-17, and 2-20 are supplied with disk magnets and a metal board with screws for easy mounting, included in the kit.

The 2-17 model is available with an M8 output connector option for an external analog temperature probe, which can be either an RTD (Pt1000) or TC type K. The 2-16 model features two M5 output connectors for temperature probes.

TECHNICAL SPECIFICATIONS					
Model	1-3, 1-3n, 1-4		2-20	2-16	2-17
Technical specifications of transducer					
Number of channels	1		1	2	1
Available channel configuration*	ET		ET	2ET	ET
Output signal	Analogue, 4-20 mA			Analogue, 2 x 4-20 mA	Analogue, 4-20 mA
Indication	OLED 0.96', resolution is 128x64 pixels, display by pressing the button				
4-20 mA line connection	By the 2 or 3 wired connection scheme and the M12FA or M12FD (IP67) connector				
Disk magnets	N/A		Vertical		
Operating temperature, °C	-30...60				
Technical specifications of external probe					
Nominal resistance / TC type / sensor	Pt1000	XA (К)	TMP116	Pt1000	Pt1000	XA (К)
Process temperature range, °C	-196...100, -50...100, -50...250, -50...500	0...850	-30...60	-196...100, -50...100, -50...250, -50...500	-196...100, -50...100, -50...250, -50...500	0...850
Accuracy, °C	± (0,4 + 0,002 x |T|)**	± (0,5 + 0,008 x |T|)**	0,5	± (0,4 + 0,002 x |T|)**	± (0,4 + 0,002 x |T|)**	± (0,5 + 0,008 x |T|)**
Connector for external temperature probe	N/A		N/A	M5 (IP52)	M8 (IP67)	
Thermal inertia, sec	15 (Ø6 mm), 25 (Ø10 mm), (water, V=0,2 m/sec)		240 (air, V=0 m/sec)	Determines by the selected external temperature probe		
Sheath material	Steel 321		ABS plastic			
M20 x 1,5 hex fitting	Free	Welded	N/A	N/A		
Length of the immersion part, mm	80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000		60			
Diameter of the immersion part, mm	By default - 6 (до 500 mm), 10 (over 500 mm)		8 (immersion part) / 12 (filter)			

* - ET - external temperature probe, 2ET - two external temperature probes
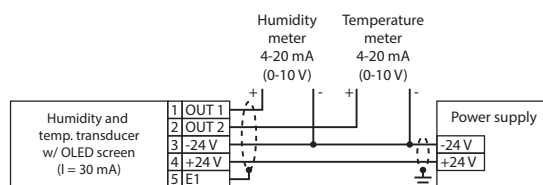** - T - value of operating temperature, that accuracy is calculated for

Connection diagram

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2-01 **2-02** **2-16** **2-16** **2-17**

CP-06 junction box with power supply

RS485 line

Input → → Output

Transducer

The **Y Housing Humidity and Temperature Transducers RS485** use the RS485 interface for data transfer. This wired interface enables the connection of up to 30 transducers in a daisy-chain configuration using a single cable line. The transducer is connected to RS485 using a 5-wire scheme and employs FTP 5e cables for networking. The RS485 connection is facilitated through a sealed M12 threaded connector with an internal terminal block, eliminating the need for soldering. This design allows for easy disassembly of the transducer when verification or calibration is required. The transducer is supplied with the CP-06 junction box, which also houses its power supply. The power supply for the transducer is integrated into the CP-06 junction box, along with a terminal block for convenient organization of RS485 input and output cables.

Depending on the model, the transducer can accommodate multiple sensors. The 2-16 and 2-17 models feature a built-in SHT31 sensor for humidity and temperature measurement within the transducer's housing. Additionally, the 2-17 model allows for the connection of an external Pt1000 temperature probe with a sealed M8 threaded connector. The 2-16 model can connect two external temperature probes using non-sealed M5 connectors. Both the 2-16 and 2-17 models come with magnets and a mounting board with screws, making it easy to mount them on a vertical surface.

TECHNICAL SPECIFICATIONS				
Model	2-01	2-02	2-16	2-17
Technical specifications of transducer				
Number of channels	2		2, 4	3
Available channel configuration*	EHT		IHT, IHT + 2ET	IHT + ET
Output signal	RS485, T-bus or Modbus RTU protocol			
Indications	OLED 0.96', resolution is 128x64 pixels, display by pressing a button			
RS485 line connection	Via junction box CP-06 and M12FA or M12FD connector (IP67)			
Disk magnets	N/A		Vertical	
Operating temperature, °C	-30...60			
Specifications of internal humidity and temperature sensor				
Sensor	N/A		SHT31	
Process temperature / humidity range			-20...60°C / 0...100 % (at temperature 0...60°C)	
Accuracy of temperature / humidity			0,5°C / ≥ 4 % (0...10 % and 90...100 %), 3 % (10...90 %)	
Thermal / moisture inertia, sec			4 / 12 (air, V=0 m/sec)	
Technical specifications of external humidity and temperature probe / external temperature probe				
Sensor / nominal resistance	SHT31		Pt1000	
Process temperature / humidity range	-30...80°C / 0...100 %		-196...100, -50...100, -50...250, -50...500	
Accuracy of temperature / humidity	0,5°C / ≥ 4% (0...10 % and 90...100 %), 3% (10...90 %)		± (0,4 + 0,002 x |T|)**	
Connector for external temperature probe	N/A		M5 (IP52)	M8 (IP67)
Thermal inertia, sec	4 (air V=0 m/sec)			
Moisture inertia, sec	12 (air V=0 m/sec)			
Sheath material	Steel 321 and polyamide		Determines by the selected external temperature probe	
M20 x 1,5 hex fitting	N/A	Free		
Length of the immersion part, mm	100, 120, 160, 200, 250			
Diameter of the immersion part / filter, mm	6 / 12			
Technical specifications of CP-06 junction box				
Input power supply, V DC	12-24			
Output power supply for transducer, V DC	5			
RS485 line connection	Via PG7 cable gland using terminal block on junction box microcircuit			
Transducer connection	Using M12FA or M12FD connector (IP67) and FTP 5e cable by length of 300 mm			

* - ET - external temperature probe, 2ET - two external temperature probes, IHT - internal humidity and temperature probe, EHT - external humidity and temperature probe
** - T - value of operating temperature, that accuracy is calculated for

2-01   **2-02**   **2-20**
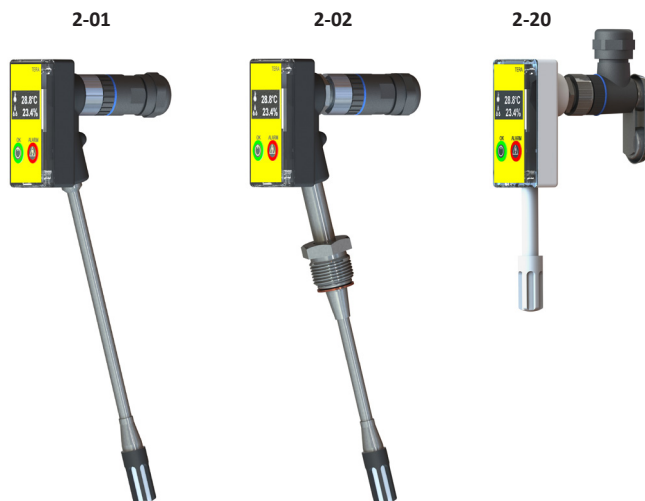
The Y Housing Humidity and Temperature Transducers with 4-20 mA (0-10 V) output interface use a 4-20 mA (0-10 V) analogue interface to transmit data. Depending on the model, the probe connects to the 4-20 mA (0-10 V) line using a 2, 3, or 4 wired scheme. It's advisable to use single or dual Shielded Twisted Pair (STP) cables for the connection, depending on the number of channels being measured. The 4-20 mA (0-10 V) connection is facilitated by a sealed threaded M12 connector with an internal terminal block, eliminating the need for soldering.

These transducers feature a high-contrast OLED display that displays measurements from all the channels. All models are equipped with a built-in SHT31 sensor for temperature and humidity, which is placed outside the enclosure to prevent heat interference from the motherboard. The 2-20 model comes with a magnet and a metal board with screws for mounting.

TECHNICAL SPECIFICATIONS			
Model	2-01	2-02	2-20
Technical specifications of transducer			
Number of channels	2		
Available channel configuration*	EHT		
Output signal	Analogue, 2 x 4-20 mA (EHT) / 2 x 0-10 V (EHT)		
Indication	OLED 0.96', resolution is 128x64 pixels, display by pressing a button		
4-20 mA line connection	By the 2, 3 or 4 wired connection scheme using M12FA or M12FD (IP67) connector		
Disk magnets	N/A		Vertical
Operating temperature, °C	-30...60		
Technical specifications of external humidity and temperature probe			
Sensor	SHT31		
Process temperature / humidity range	-20...80°C / 0...100 %		-20...60°C / 0...100 %
Accuracy of temperature / humidity	0,5°C / ≥ 4 % (0...10 % and 90...100 %), 3 % (10...90 %)		
Thermal inertia, sec	4 (air, V=0 m/sec)		
Moisture inertia, sec	12 (air, V=0 m/sec)		
Sheath material	Steel 321 and polyamide		ABS plastic
M20 x 1,5 hex fitting	N/A	Free	N/A
Length of the immersion part, mm	100, 120, 160, 200, 250		60
Diameter of the immersion part / filter, mm	6 / 12		8 / 12

* - EHT - external humidity and temperature probe

Humidity   Temperature
meter   meter
4-20 mA   4-20 mA
(0-10 V)   (0-10 V)

Humidity and temp. transducer w/ OLED screen (I = 30 mA)	1 OUT 1	
	2 OUT 2	
	3 -24 V	Power supply
	4 +24 V	-24 V
	5 E1	+24 V

Connection diagram

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| 1-3 | 1-3n | 1-4 | 2-15 | 2-15 | 2-18 | 2-19 | 2-21 |

The **Y Housing Wireless Temperature Transducers ZigBee 868** operate using the ZigBee interface with a frequency of 868 MHz for data transmission. The transducer follows a specific sequence of operation: it turns on, takes measurements, transfers data, and then turns off. In other words, frequent measurements can deplete the batteries more quickly. The operation of the transducer requires a Data Logger CS10600 and a wireless Net Coordinator Y6.05-K-868.

The transducer is equipped with a high-contrast OLED display for indication. It shows measurements for each measuring channel and can also display the radio signal level, battery charge, serial number, and network settings. Additionally, the transducer can be paired with a magnetic holder and a mounting board, which can be attached using screws for convenience.

The transducer can be equipped with one, two, or three temperature sensors, depending on the model. It includes a temperature sensor TMP116 inside the transducer's case. Additionally, certain models can be connected to one or two external temperature analog probes with Pt1000 sensors or a type K probe with a cable and M5/M8/M12 connector.

TECHNICAL SPECIFICATIONS							
Model	1-3	1-3n	1-4	2-15	2-21	2-18	2-19
Technical specifications of transducer							
Number of channels	1			1, 2, 3	1	1, 2	1, 2
Available channel configuration*	ET			IT, 2ET, IT+2ET	IT	ET, IT + ET	ET, IT + ET
Output signal	ZigBee (868 MHz)						
Stable connection distance, meters	Up to 100 (indoor), up to 300 (outdoor, no obstacles, by any weather)						
Indication	OLED 0.96', resolution is 128x64 pixels, display by pressing a button						
Battery type	2 batteries (½ AA 3,6 V 1Ah 14250)						
Battery lifetime	5 years (request each 1 min, T = 25°C), 9 years (request each 2 mins, T = 25°C)						
Response time	Between 1minute and 1 hour						
Disk magnets	N/A			Vertical	Horizontal	Horizontal	Vertical
Operating temperature, °C	-30...60						
Technical specifications of external temperature probe							
Nominal resistance / TC type	Pt1000					Pt1000	XA (K)	Pt1000
Process temperature range, °C	-196...100, -50...100, -50...250, -50...500					-196...100, -50...100, -50...250, -50...500	0...250, 0...500, 0...850, 0...1250	-196...100, -50...100, -50...250, -50...500
Accuracy, °C	± (0,4 + 0,002 x |T|)**					± (0,4 + 0,002 x |T|)**	± (0,5 + 0,008 x |T|)**	± (0,4 + 0,002 x |T|)**
Connector for external temperature probe	N/A			M5 (IP52)		M12 (IP67)	M8 (IP67)	
Thermal inertia, sec	15 (Ø6 mm), 25 (Ø10 mm), (water, V=0,2 m/sec)				N/A			
Sheath material	Steel 321			Determines by a chosen external temperature probe		Determines by the selected external temperature probe		
M20 x 1,5 hex fitting	Free	Welded	N/A					
Length of the immersion part, mm	40, 60, 80, 100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000							
Diameter of the immersion part, mm	By default - 6 (up to 500 mm), 10 (over 500 mm)							
Technical specifications of internal temperature sensor							
Sensor's name	N/A			TMP116				
Process temperature range, °C				-30...60				
Accuracy, °C				0,5				
Thermal inertia, sec				240 (air, V=0 m/sec)				

* - ET - external temperature probe, 2ET - two external temperature probes, IT - internal temperature sensor
** - T - value of operating temperature, that accuracy is calculated for

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2-01	2-02	2-15	2-15	2-18	2-19	2-21

The Y Housing Wireless Humidity & Temperature Transducers ZigBee 868 use ZigBee interface operating at a frequency of 868 MHz for data transmission. The transducer follows this sequence of operation: it turns on, takes measurements, transfers data, and then turns off. It's important to note that frequent measurements can lead to quicker battery depletion. To operate the transducer, you will need the CS10600 data logger and the Y6.05-K-868 wireless Net Coordinator.

The transducer uses a high-contrast OLED display for indicating measurements. It displays measurements for each of the transducer's measuring channels. Additionally, it can show information about radio signal strength, battery charge level, serial number, and network settings. The transducer comes with disk magnets and a metal board, which can be easily attached using screws.

The transducer can include multiple sensors depending on the model. It comes with a humidity and temperature sensor, SHT31, placed inside the transducer's case. Additionally, depending on the specific model, the transducer can connect one or two external analog Pt1000 temperature probes using cables and M5/M8/M12 connectors.

TECHNICAL SPECIFICATIONS						
Model	2-01	2-02	2-15	2-21	2-18	2-19
Technical specifications of transducer						
Number of channels	2		2, 4	2	3	3, 4
Available channel configuration*	EHT		IHT, IHT+2ET	IHT	IHT + ET	IHT + ET
Output signal	ZigBee (868 MHz)					
Stable connection distance, meters	Up to 100 (indoor), up to 300 (outdoor, no obstacles, by any weather)					
Indication	OLED 0.96', resolution is 128x64 pixels, display by pressing a button					
Battery type	2 batteries (½ AA 3,6 V 1Ah 14250)					
Battery lifetime	5 years (request each 1 min, T = 25°C), 9 years (request each 2 mins, T = 25°C)					
Response time	Between 1 minute and 1 hour					
Disk magnets	N/A		Vertical	Horizontal	Horizontal	Vertical
Process temperature range, °C	-30...60					
Technical specifications of internal humidity and temperature probe						
Sensor	N/A		SHT31			
Process temperature / humidity range			-20...60°C / 0...100 % (at temperature 0...60°C)			
Accuracy of temperature / humidity			0,5°C / ≥ 4 % (0...10 % and 90...100 %), 3 % (10...90 %)			
Thermal inertia, sec			4 (air, V=0 m/sec)			
Moisture inertia, sec			12 (air, V=0 m/sec)			
Technical specifications of external humidity and temperature probe / external temperature probe						
Sensor / nominal resistance	SHT31		Pt1000		Pt1000	
Process temperature / humidity range	-30...80°C / 0...100 %		-196...100, -50...100, -50...250, -50...500°C		-196...100, -50...100, -50...250, -50...500°C	
Accuracy of temperature / humidity	0,5°C (up to 100°C), 0,8°C (100...120°C)/ ≥ 4 % (0...10 % and 90...100 %), 3% (10...90 %)		± (0,4 + 0,002 x |T|)**		± (0,4 + 0,002 x |T|)**	
Connector for external temperature probe	N/A		M5 (IP52)		M12 (IP67)	M8 (IP67)
Thermal inertia, sec	4 (air, V=0 m/sec)			N/A		
Moisture inertia, sec	12 (air, V=0 m/sec)		Determines by a chosen external temperature probe		Determines by the selected external temperature probe	
Sheath material	Steel 321 and polyamide					
M20 x 1,5 hex fitting	N/A	Free				
Length of the immersion part, mm	80, 100, 120, 160, 200, 250					
Diameter of the immersion part / filter, mm	6 / 12					

* - ET - external temperature probe, 2ET - two external temperature probes, IHT - internal humidity and temperature probe, EHT - external humidity and temperature probe
** - T - value of operating temperature, that accuracy is calculated for

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08 **08a** **09** **10**
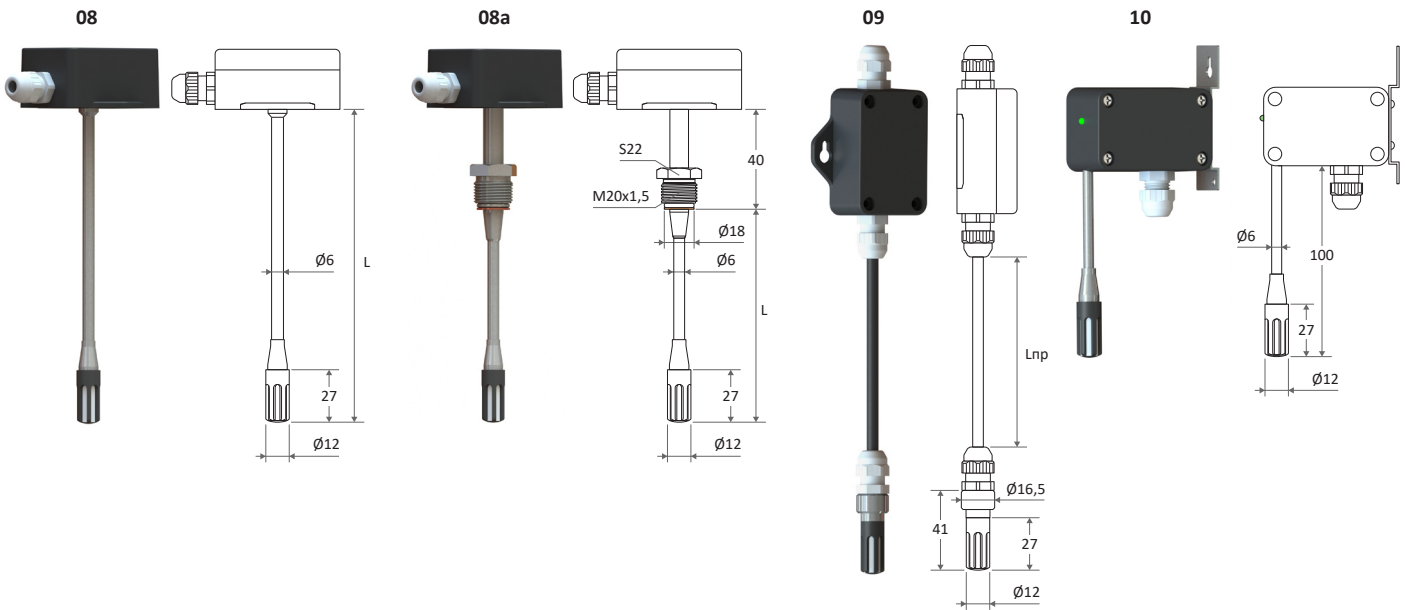
The **Z Case humidity and temperature transducers** use an analog 4-20 mA (0-10 V) interface for data transfer. Depending on the model, the probe connects to the 4-20 mA (0-10 V) line using a 2, 3, or 4-wire scheme with an external power supply. It is advisable to use single or dual Shielded Twisted Pair (STP) cables for the connection, depending on the number of channels for measuring. The transducer connects to the 4-20 mA (0-10 V) line via screw terminals located inside an industrial enclosure.

All the models employ an external SHT31 humidity and temperature sensor, which is positioned remotely from the transducer to prevent any heat impact from the board. The 09 model includes a remote transducer that is housed inside a Z-case, constructed from high-temperature plastic.

TECHNICAL SPECIFICATIONS				
Model	08	08a	09	10
Technical specifications of transducer				
Number of channels	1, 2			
Available channel configuration*	EH, EHT			
Output signal	Analogue, 4-20 mA (EH) or 2 x 4-20 mA (EHT) / 0-10 V (EH) or 2 x 0-10 V (EHT)			
4-20 mA line connection	By the 2, 3 or 4 wired connection scheme using M12FA or M12FD (IP67) connector			
Mounting	Using screws			
Operating temperature, °C	-30...60			
Technical specifications of external humidity and temperature sensor				
Sensor	SHT31			
Process temperature / humidity range	-20...80°C / 0...100 %		-20...80°C / 0...100 %	-20...60°C / 0...100 %
Accuracy of temperature / humidity	0,5°C / ≥ 4 % (0...10 % and 90...100 %), 3 % (10...90 %)			
Thermal inertia, sec	4 (air, V=0 m/sec)			
Moisure inertia, sec	12 (air, V=0 m/sec)			
Sheath material	Steel 321 and polyamide		ABS plastic and polyamide	Steel 321, ABS plastic and polyamide
M20 x 1,5 hex fitting	N/A	Free	N/A	
Length of the immersion part, mm	100, 120, 160, 200, 250		41	100
Diameter of the immersion part / filter, mm	6 / 12		12	6 / 12

* - EH - external temperature probe, EHT - external humidity and temperature probe

Connection diagram

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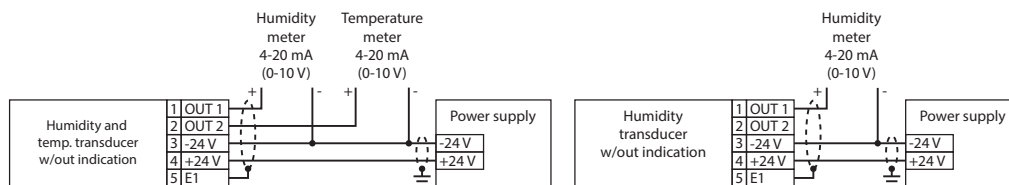
The CS10600 Data Logger is employed to collect data generated by both wired and wireless humidity and temperature transducers. Transducers transfer data to the Data Logger through the RS485 interface and the Y6.05-K-868 Net Coordinator using a radio signal at a frequency of 868 MHz. A single Data Logger can manage up to 30 transducers simultaneously. It stores all data in an energy-independent flash memory and can also copy this data to the cloud or corporate servers for further analysis and storage.

The Data Logger operates on the Linux operating system and uses an SQL Lite database to archive collected data. It also features a web server with WEB HMI SCADA LOCAL WEB, which is installed directly on the Data Logger. This web-based Human-Machine Interface (HMI) uses standard markup web languages to create a user-friendly interface. The Local Web platform displays received data through charts and tables, generates reports, exports information in PDF format, provides access to transducer settings, sets and sends alarm notifications through messengers and SMS, archives and stores data, maintains technology journals, and manages user access and permissions.

The Data Logger can be networked using either an Ethernet connection or 4G LTE. To access information, users simply need to follow the link in their web browser and sign in on the web server. The LOCAL WEB interface is compatible with various devices, including smartphones and PCs, and works smoothly in the Chrome browser. Additionally, if Ethernet networking is unavailable, users can access the system using the built-in 4G LTE modem, which requires a SIM card with mobile internet capability.

In addition to configuring alarm settings based on assigned humidity and temperature ranges, the Data Logger also manages alarm signals in the following situations: when there is no connection with a transducer, when there is no Internet connection via Ethernet or 4G LTE, and when it switches from the uninterruptible power supply to the battery.

You can use the RS485 interface (T-bus protocol) to connect technological controllers and meters manufactured by PJSC TERA. This interface allows you to receive data from meters and regulators for monitoring and archiving, as well as to control the technical process via the WEB HMI interface using LOCAL WEB programs. The Data Logger features a 7" capacitive touch screen that simplifies the interface for monitoring data with its user-friendly layout.
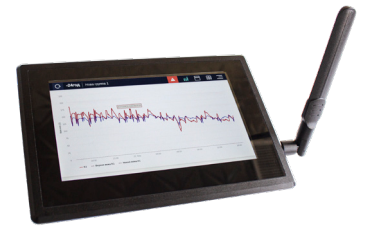
Paperless Recorder with Web Server
CS10600

Net coordinator
Y6.05-K-868

Wireless humidity and temperature transducer

Wired humidity and temperature transducer

TECHNICAL SPECIFICATIONS

Interface	Interface for wired transducers		Interface for wireless transducers	Flash memory capacity for SQL DB
Ethernet, 4G LTE, 2 x RS485	RS485, T-bus protocol		RS485, via net coordinator Y6.05-K-868 by radio signal of 868 MHz frequency	16 Gb (eMMC)

DB type	Operating system	Power supply	Case material	Dimensions, mm	Operating temperature, °C	Display	Touch Screen
SQL Lite	Linux (Raspberry Pi OS)	24 V DC 250 mA	Aluminium	150 x 78 x 40 (L x W x D)	-20 ... 50	Res: 7.0 inch IPS LCD, 1024*600 px, High Brightness: 500 nit	Capacitive Touch

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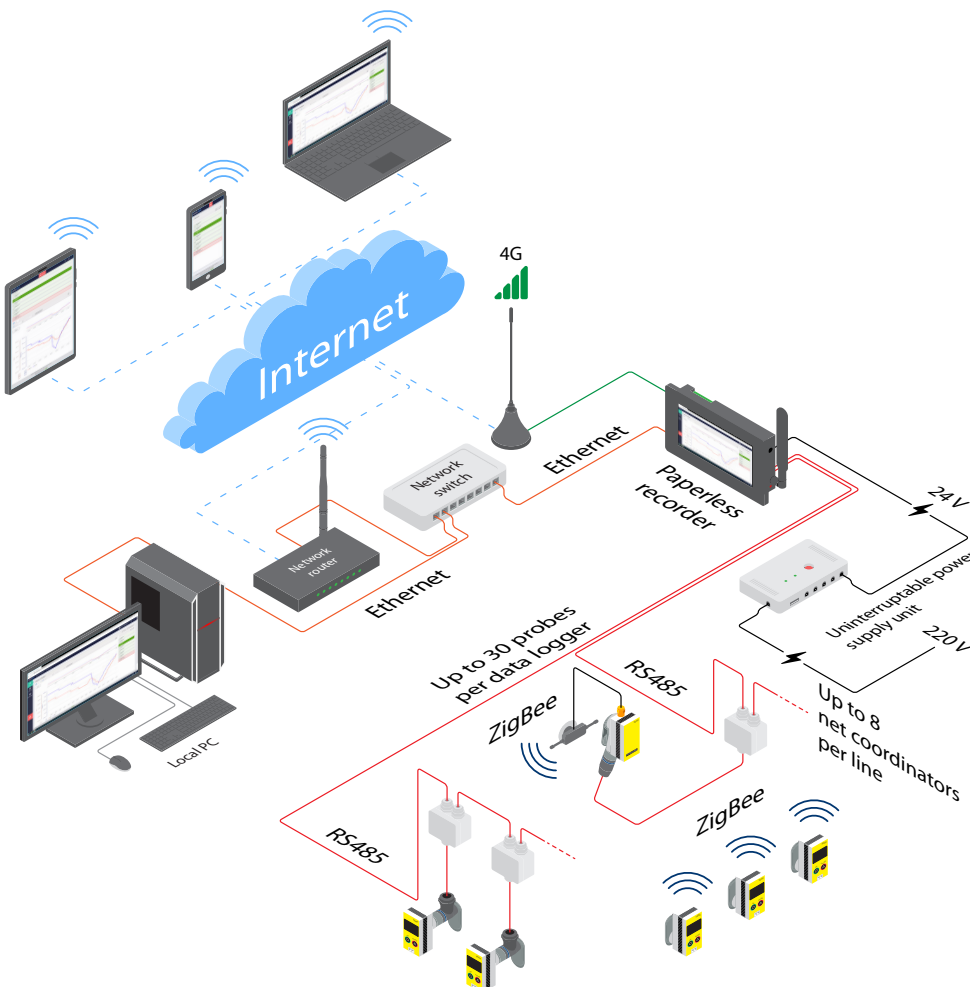
LOCAL WEB is a WEB HMI SCADA application designed for devices using the Embedded Linux operating system. SCADA (Supervisory Control And Data Acquisition) is a software application designed for real-time operations, allowing you to gather, display, and archive information related to monitoring and controlling objects. WEB HMI (Human-Machine Interface) is a web interface based on standard markup web languages that enable users to interact with the system's control features using web browsers.

The Local Web application has been developed and supported by TERA since 2017. In its development, it has incorporated contemporary technologies such as Embedded Linux (Kernel 4.x), NGiNX, NodeJS, AngularJS, WebSocket, Microservice IPC, JSON, and SQL Database. Local Web is installed on the CS10600 Data Logger, which operates with an Embedded Linux operating system, and it uses the Data Logger's CPU and memory. Users do not need to install this application on their own devices, and it does not rely on third-party apps or cloud servers.

The Local Web application is compatible with both wired transducers (Ethernet or RS485 interface) and wireless transducers (WiFi, ZigBee 2.4 GHz and 868 MHz, Bluetooth, etc.). It supports concurrent access by multiple users, enabling monitoring and control of processes from any PC, tablet, or smartphone connected to the Internet. To access and manage the data, users simply need to follow the link in the Chrome browser and enter their login/password for the server they wish to control.

Local Web provides a flexible system for assigning user rights, which can be configured by an administrator in advance. This system allows users to be divided into various groups with their own credentials and roles, including administrators, operators, and standard users. Depending on their assigned rights, users can view and modify specific data and projects within the system. This role-based access control enhances security and ensures that users only have access to the functions and information relevant to their responsibilities.

The Local Web application allows users to create specific projects tailored to individual technological processes, data acquisition, and control requirements. Each project maintains its own set of data, configurations, and preferences for display and control. The application enables users to group online data from devices based on common characteristics, facilitating the generation of charts, reports, and tables for each group. Additionally, users can define alarm thresholds and signalization ranges within these projects to monitor and respond to specific conditions or events. This project-based approach ensures a customized and organized experience for managing and analyzing data.

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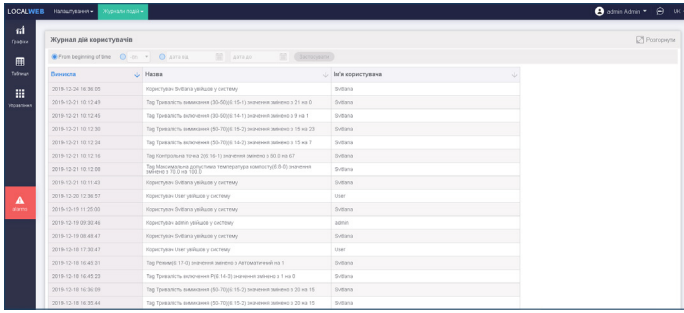
Local Web provides users with the ability to:

- **Remote Device Control:** Users can remotely control devices in real-time.
- **Display Archived Data:** Archived data can be easily accessed and displayed.
- **Generate Charts:** Users can create charts, tables, and reports for specific time periods.
- **Export Data:** Data can be exported in PDF format.
- **Chart Customization:** Users have control over chart scaling, additional axes, colors, line styles, and more.
- **Detailed Charts:** Detailed charts can include various options or groups, and a time line widget simplifies defining the desired time period.
- **Table View:** Users can view archived data in tabular format for specific time intervals.

These features enable users to efficiently analyze data, visualize trends, and make informed decisions.

Local Web includes a flexible alarm notification system with the following features:

- **Alarm Range Configuration:** Users can define the range for alarm detection based on their specific requirements.
- **User Notifications:** Users can select the users who should be notified in the event of an alarm. Notifications can be sent via messaging services.
- **Visual Alarm Indication:** Data and data groups change color in real-time to indicate the device's connection status and alarm states (normal, pre-alarm, alarm).
- **Operator Alerts:** Operators who are online will see a blinking alarm icon on the screen's left-hand side. This icon stops blinking after the operator acknowledges the alarm.

This comprehensive alarm system ensures that users are promptly informed about critical events, allowing for swift response and resolution.

The system maintains both a technological log and a user's action log:

- **Technological Log:** This log records all alarms and errors from the technological devices. It provides a detailed history of issues and notifications. Additionally, it tracks user actions related to current alarms, including who acknowledged them and when.
- **User's Action Log:** The action log records changes made to Local Web settings, configurations, projects, groups, and data. It captures all user interactions within the system, providing an audit trail of user activity over time.

These logs serve as valuable records for monitoring system performance, troubleshooting, and maintaining accountability for user actions within the Local Web application.
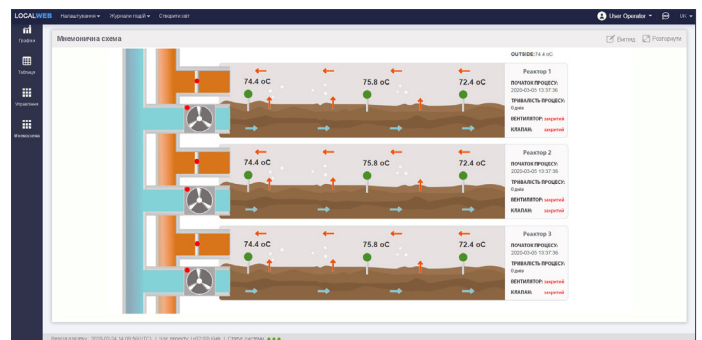
Local Web includes the capability to generate a mnemonic scheme of the technological process using widgets with active components. These widgets enable the visualization of real-time control processes and are customized based on the specific requirements of the customer's technological process. This feature allows users to create a dynamic and interactive representation of their processes within the Local Web application, enhancing their ability to monitor and control systems effectively.

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DLT-20   **DLT-21**   **DLT-20-Pt**   **DLT-20-2Pt**   **DLT-21-Pt**

Start of in 2024 Production

The wireless humidity and temperature GSM logger uses a built-in GSM modem to send data to the cloud server. The logger operates on a simple principle: it turns on, takes measurements, transfers the data, and then turns off. In cases where there's no cellular network coverage, the logger stores the humidity and temperature data in its own non-volatile flash memory.

The logger displays humidity and temperature values for all the channels on its high-contrast OLED screen. It also indicates the signal strength, battery charge, and serial number. The logger is equipped with a protective case to shield it from impacts and drops, and it features a built-in bar magnet for convenient mounting. Additionally, it includes two IP67-rated M8 connectors, allowing for the connection of one or two external Pt1000 temperature probes or an SHT humidity and temperature transducer. The logger is powered by an exchangeable lithium battery of the 18650 type, which can be easily replaced by the user via the USB-C connector for charging.

TECHNICAL SPECIFICATIONS					
Model	DLT-20	DLT-21	DLT-20-Pt	DLT-20-2Pt	DLT-21-Pt
Technical specifications of GSM logger					
Number of channels	1	2	1	2	3
Available channel configuration*	Temperature	Temperature + Humidity	Temperature	2 x Temperature	2 x Temperature + Humidity
Output signal	GSM				
Indication	OLED 1.3', resolution is 128x64 pixels				
Power supply	With battery / with USB Type C adapter				
Battery type	1 x lithium rechargeable battery (4,2 V 3600 mA 18650)				
Battery lifetime	5 years				
Running time with battery	Up to 7 days				
Response time	Between 1 minute to 60 hour (mains supply), between 5 minutes to 1 hour (battery supply)				
Bar magnet	Vertical				
Operating temperature, °C	0...50 (by default), -30...50 (low temperature option)				
Technical specifications of external temperature probe					
Sensor / nominal resistance	TMP116	SHT31	Pt1000		Pt1000 / SHT31
Process temperature range, °C	-30...60	-30...120	-196...100, -50...100, -50...250, -50...500		-196...100, -50...100, -50...250, -50...500 / -30...120
Process humidity range, %	-	0...100% (at temp 0...120 °C)	-		0...100% (at temp 0...120 °C)
Accuracy of temperature, °C	0,5	0,5 (up to 100 °C), 0,8 (100...120 °C)	± (0,4 + 0,002 x |T|)*		± (0,4 + 0,002 x |T|)* / 0,5 (up to 100 °C), 0,8 (100...120 °C)
Accuracy of humidity, %	-	≥ 4% (0...10% and 90...100%), 3% (10...90%)	-		≥ 4% (0...10% and 90...100%), 3% (10...90%)
Connector for external temperature probe	M8	M8	M8	2 x M8	2 x M8
Thermal inertia, sec	240 - air, V=0 m/sec		240 - air, V=0 m/sec, 15 (Ø6 mm) - water, V=0,2 m/sec		240 - air, V=0 m/sec, 15 (Ø6 mm) - water, V=0,2 m/sec
Sheath material			Steel 321		
Length of the immersion part L, mm	-		60, 100, 160, 250		
Diameter of the immersion part, mm			5		

* - T - value of operating temperature, that accuracy is calculated for

DLT-20, DLT-21

45,3

95,4

27

12

DLT-20-Pt

45,3

95,4

Lw

L   Ø5

DLT-20-2Pt

45,3

95,4

Lw

L   Ø5

DLT-21-Pt

45,3

95,4

27

12

Lw

L   Ø5

Side view

29,15

Protective case

108,2

51,3
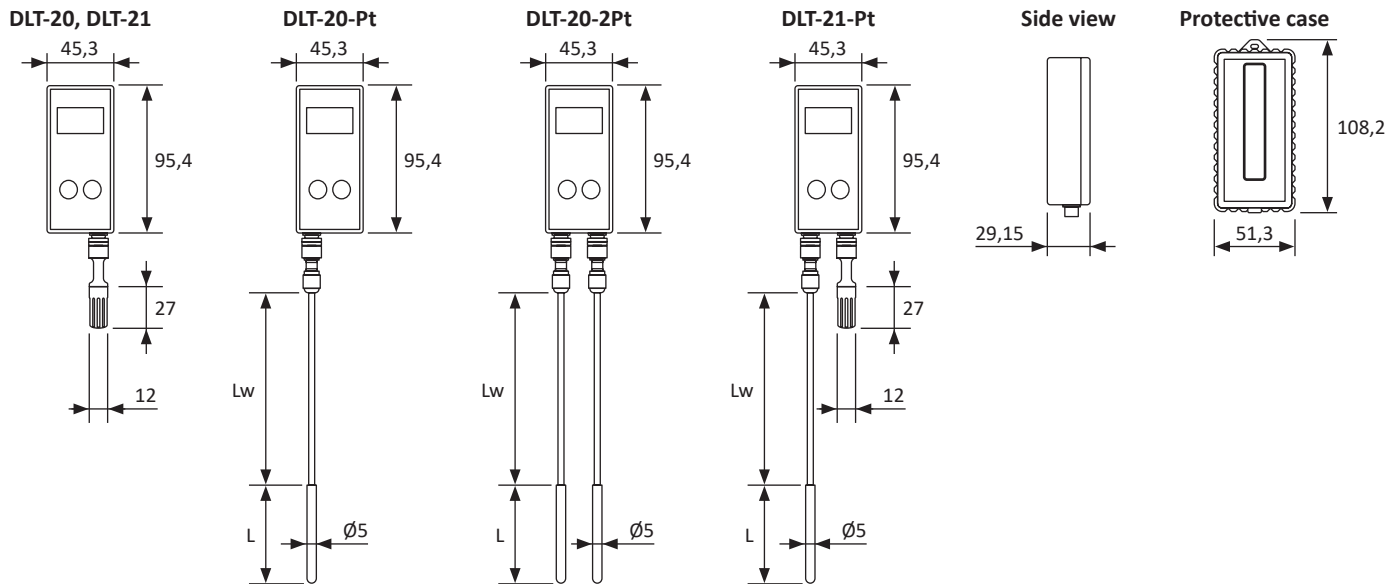
Order code for DLT-20, DLT-21

Example: DLT - GSM - 20 - - TMP - S
Example: DLT - GSM - 20 - 2Pt - TMP - S
Example: DLT - GSM - 21 - Pt - SHT - C

Series
DLT

Signal transducer
GSM (output GSM radio signal)

Model
20, **21**

Type of operating temperature
S (standard),
C (low temperature)

Sensor
TMP (digital temperature TMP116 sensor),
SHT (digital humidity and temperature SHT31 sensor)

Output for external temperature probe
Pt (output for Pt1000 temperature probe),
2Pt (two outputs for Pt1000 temperature probe)

Order code for external temperature probe of DLT-20, DLT-21

Example: TSP - 1-11 - Pt1000 - B - 2 - 120 - 4 - M12x1.5 - 2000 - RE - M8 - /-50...250/
Example: TSP - 2-8 - Pt1000 - B - 2   -   4000 - RE - M8 - /-50...250/
Example: TSP - 1-6 - Pt1000 - A - 2 - 60 - 5   -   8000 - RE - M8 - /-100...100/

The order code for the selected external temperature probe can be found in the Temperature Probes section of the catalog. Any of these probes can be selected as an external temperature probe if it includes a cable with RE and Pt1000 nominal resistance. When placing the order, be sure to include "M8" before specifying the Process Temperature Range in the order code.

Key Features

18650 Battery

Protective rubber case

External temperature probe with connector

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SensorsCloud is a cloud-based SCADA (Supervisory Control and Data Acquisition) system that serves two main purposes:

1. **Data Monitoring and Storage:** SensorsCloud collects and stores data from various measuring devices such as loggers, probes, and recorders. These devices can communicate with SensorsCloud using different data transfer protocols and may be located in different geographical locations.
2. **User Access:** SensorsCloud offers authorized users access to measurement data through a web interface, making it convenient to view and analyze the data. Users can access SensorsCloud through a web browser without the need to install any additional applications on their PC.

SensorsCloud is designed to be platform-independent, ensuring that users can interact with it using a web browser without the need for additional software installations.

The advantage of SensorsCloud lies in its client-server architecture. This architectural approach distributes a portion of data processing tasks from the server to the client's devices or PCs. This design enhances the overall system's productivity and reliability.

On one hand, the server component facilitates interaction with measuring devices (loggers, probes, recorders, etc.) through the server API. On the other hand, the server component interacts via the client API with the client component to deliver data based on user requests. Consequently, the primary functions of the server component include collecting, initial data processing, data storage, backup, and supplying data to the client component.

The server component is a software program coded in JavaScript (Node.js) and C++. It operates on the Linux operating system and is hosted on a server in a data center. The client component is a JavaScript application (AngularJS) that is automatically downloaded to the user's web browser and remains active until the user closes the tab. The client application provides interfaces for real-time data interaction, including displaying graphical representations of archived data from all devices, reviewing graphs, accessing archives, monitoring logical events, managing alarms, using various widgets, configuring system settings, and more.
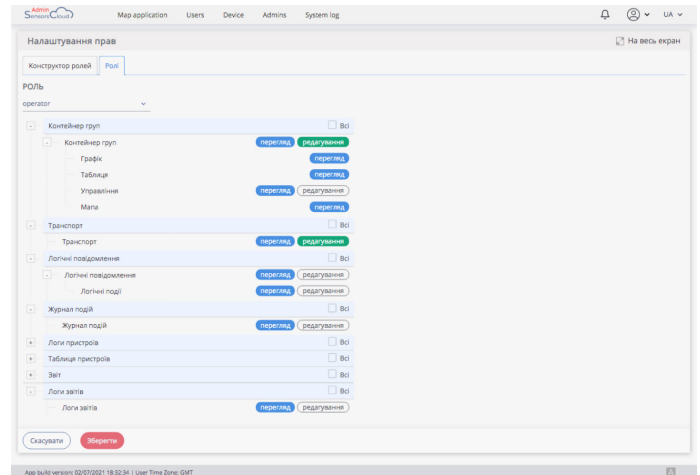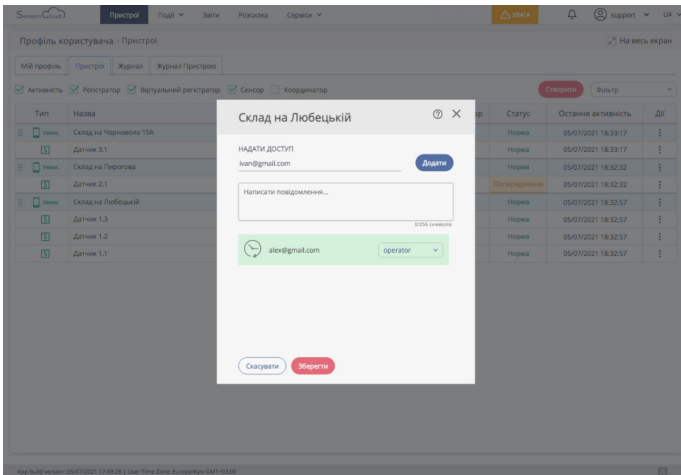
The SensorsCloud offers users a flexible system for managing user permissions, which can be preconfigured by a system administrator. This system allows users to be divided into various groups with different levels of authority and roles, such as administrators, operators, and regular users. Depending on their permissions, users can either change or view specific data and devices that are available to them.

Online data received from various devices can be grouped based on common characteristics. This grouping allows for the generation of graphs, reports, and tables specific to these groups. Users can also set the activation limits for alarms within these groups.

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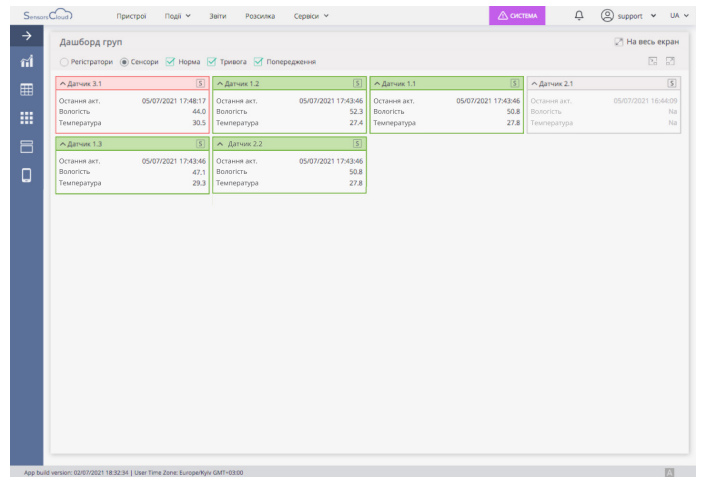
The SensorsCloud system enables users to remotely monitor and manage devices in real-time. It also allows users to access data archives, generate graphs, tables, and reports for specific time periods, and export data in PDF format. Users can customize graph scaling on both the X and Y axes, choose colors and line styles, and display individual parameters or groups of parameters on detailed graphs. Additionally, a widget called "The Temporary Ruler" provides a preview of graph trends and facilitates the selection of the desired time period for generating detailed graphs.

The SensorsCloud offers a versatile system for configuring alarm settings. Users can establish alarm activation thresholds and specify which users should receive emergency notifications through platforms like Telegram, other Internet messengers, or email. Depending on the device's connection status, data that falls within normal, pre-alarm, or alarm states will dynamically change value and group colors in real-time. Furthermore, online operators will see a blinking alarm icon at the top of the screen, which ceases blinking only after the operator acknowledges the alarm.


The SensorsCloud enables users to maintain a technological log, a user action log, and a system log. The technological log records all alarms and errors in technological equipment. It also documents user responses to alarms, including who acknowledged them and when. Changes to settings and configurations within The SensorsCloud, projects, groups, and data made by a user within a specific time frame are documented in the user action log.

The SensorsCloud offers the capability to create mnemonic diagrams of technological processes as widgets with interactive elements. These widgets allow real-time visualization of the monitoring and control processes. Widgets are customized options designed for specific technological processes in accordance with the customer's specific requirements.

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DLT-01, **DLT-02**, **DLT-10**, and **DLT-11** loggers are compact electronic devices designed to measure and record temperature and humidity data in their internal memory. In addition to the built-in temperature and humidity sensor, DLT-01 can connect one external temperature probe, while DLT-10 and DLT-11 can connect two external temperature probes. The DLT-10-AT (2AT) model is equipped to connect an external probe with a 4-20 mA output. To configure parameters and retrieve recorded data, these loggers can be connected to a PC via a USB port and use the free LoggerSoft software. Data is stored in the built-in memory in CSV or PDF format, and the loggers are powered by replaceable lithium batteries.

An external temperature probe with Pt1000 or XA (K) and a 2-wire connection, equipped with the RE cable, as specified in the Temperature Probes section, can be used with these loggers. When ordering, simply follow the ordering information provided in the Temperature Probes section, and remember to add "USB3" to the model name of the temperature probe.
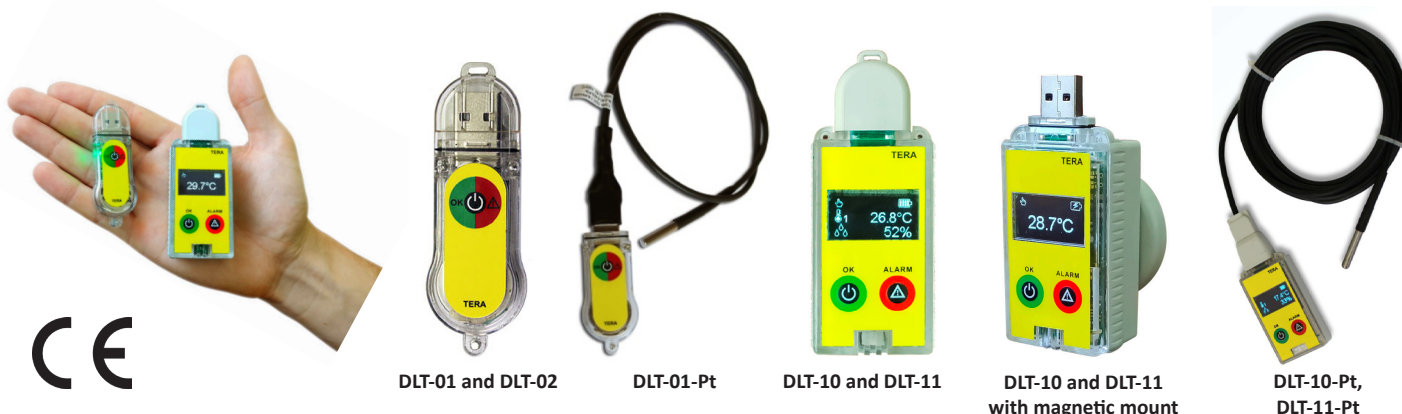
DLT-01 and DLT-02 **DLT-01-Pt** **DLT-10 and DLT-11** **DLT-10 and DLT-11 with magnetic mount** **DLT-10-Pt, DLT-11-Pt**

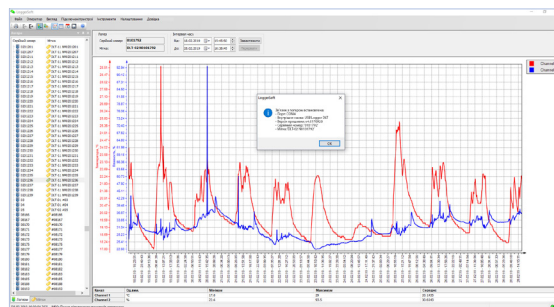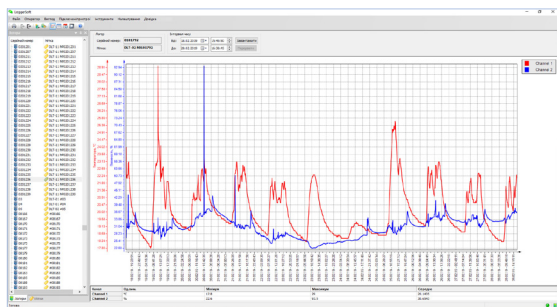|												
TECHNICAL SPECIFICATIONS												
Model	DLT-01	DLT-01-Pt[1]	DLT-02	DLT-10	DLT-10-Pt[1]	DLT-10-2Pt[1]	DLT-10-TC[1]	DLT-10-AT	DLT-10-2AT	DLT-11	DLT-11-Pt[1]	DLT-11-2Pt[1]
Technical specifications of the data logger												
Number of channels	1	2	2	1	2	3	2	2	2	2	3	4
Available channel configurations[2]	IT	IT + ET	IHT	IT	IT + ET	IT + 2 ET	IT + ET	IT + 4-20 mA	2 x 4-20 mA	IHT	IHT + ET	IHT + 2 ET
Indication	-			OLED 0.96', resolution is 128x64 pixels, displaying by pressing a button								
Logging interval	From 1 minute to 1 hour											
Battery	CR2032, 3V			1 battery (½ AA 3,6 V 1Ah 14250)								
Battery lifetime (under normal conditions)	1 year (at 25°C and 1 min of logging interval)			Over 5 years								
Memory (readings)	48000 (temp.), 32000 (temp. and RH)			2 621 440 (temp. and RH)								
Technical specifications of internal temperature sensor												
Sensor curve	TMP116		-	TMP116						-		
Process temperature range, °C	-20…60			-30…60								
Accuracy, °C	0,5			0,5								
Thermal inertia, sec	180			180								
Technical specifications of internal humidity and temperature sensor												
Sensor curve			SHT31				-					SHT31
Process temperature / RH range	-		-30…60°C /0…100 %									-30…60°C / 0…100 %
Accuracy			0,5 °C / 3 %[3]									0,5°C / 3 %[3]
Thermal inertia, sec			180									180
Technical specifications of external temperature probe												
Sensor curve		Pt1000			Pt1000		XA (K)	4-20 mA			Pt1000	
Process temperature range, °C	-	-50…100, -50…250, -100…100	-		-50…100, -50…250, -50…500, -100…100		-40…250, 0…500, 0…850, 0…1250	Set by the logger	-	-	-50…100, -50…250, -50…500, -100…100	-
Accuracy, °C		± (0,4 + 0,002 x |T|[4])			± (0,4 + 0,002 x |T|[4])		± (0,5 + 0,008 x |T|[4])	0,5 %			± (0,4 + 0,002 x |T|[4])	
Process connection type		USB3			USB3			Via USB adapter			USB3	
Thermal inertia, sec		Determines by a chosen external temperature probe			Determines by a chosen external temperature probe			-			Determines by a chosen external temperature probe	
Sheath material												
Length of the immersion part, mm												
Diameter of the immersion part, mm												

[1] - The external temperature probe is sold separately
[2] - ET - external temperature probe, IT - internal temperature sensor, IHT - internal RH and temperature sensor
[3] - RH accuracy is 3% (10…90%), ≥ 4% (0…10% and 90…100%)
[4] - T - operating temperature range

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LoggerSoft is used to operate Data Loggers manufactured by TERA Ukraine. This software enables users to customize logger settings, access the event log and archive, browse and analyze data, and generate reports. All data collected by the logger is stored in the database and can be easily accessed and analyzed whenever needed.

LoggerSoft features a flexible system for granting permissions, allowing for different levels of data access for users. It supports operation over a local network, enabling multiple users to access data simultaneously. The software is optimized for use on Windows 2000/XP/2003/Vista/7/8/10 operating systems.
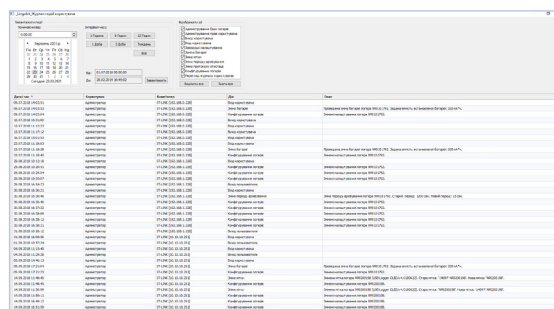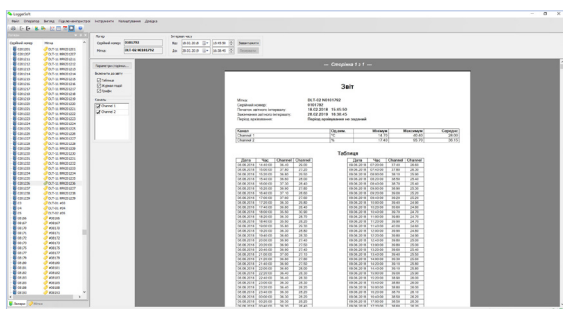
Key Features
- Reading and saving logger's settings
- Reading data saved in the logger's memory
- Browsing the archive for a specific period
- Automatic or arbitrary scaling of the graph on each axis
- Browsing humidity and temperature measurements in table or graph format
- Printing graphs, tables and reports
- Browsing the logger's event log
- Browsing the user's event log
- Setting the archive period
- Configuring humidity and temperature ranges for alarm triggering
- Selecting the data recording mode: **CYCLICAL** or **UNTIL MEMORY FILL**
- Choosing the report format: CSV / PDF
- Configuring the archiving initiation option:
  - Immediate archiving after pressing the button
  - Delayed archiving after pressing the button
  - Immediate archiving after configuration
  - Scheduled archiving at a specific time
  - Delayed archiving after configuration
- Estimating the remaining operation time until battery change
- Support for local network operation
- Searching for connected loggers
- Viewing and configuring information about the metrological attestation of the connected logger

System reguirements
- CPU: 1 GHz or faster
- Memory: 512 MB RAM or more
- Free space for program files: 50 MB or more
- Free space for the database: 4 GB or more

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The paperless recorder is an electronic device enclosed in a protective case, featuring a colored TFT screen and tactile buttons. It is designed for measuring, displaying, and recording various physical parameters, including temperature, humidity, gas concentration, consumption, and more. Additionally, the paperless recorder can record and display discrete signals received from dry contact inputs and trigger alarm signals through relay outputs.

The paperless recorder can operate as part of a network of devices using either the RS485 interface or Ethernet (T-bus protocol). Unlike most recorders that rely on a constant connection to a PC, it comes with a built-in non-volatile flash memory of 2 Mbyte. This eliminates the need for a permanent PC connection. Data can be transferred over the network either on request or automatically based on specified response times. The flash memory ensures that data is retained in case of power failure, RS485 network disruptions, or PC malfunctions. The paperless recorder serves as a modern replacement for outdated paper recorders as it lacks mechanical parts prone to wear and doesn't require supplies. Additionally, it can automatically scale analog input signals into any convenient unit of measurement.

**Paperless Recorders
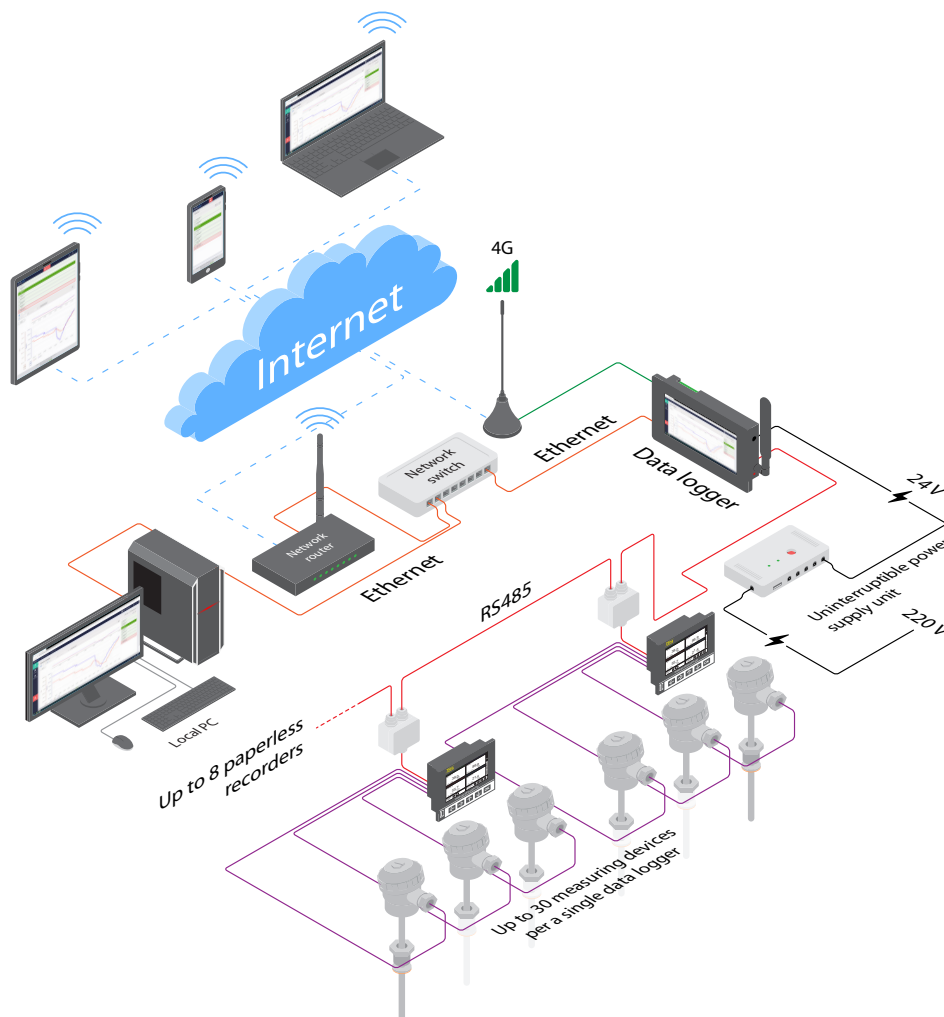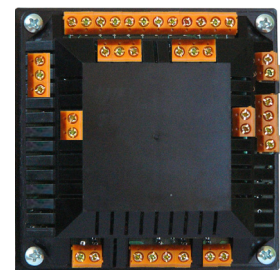with colored TFT display**

Key Features

- Measurement and recording of parameters at user-assigned intervals
- Logging interval options ranging from 10 seconds to 60 minutes
- Displaying data in chart or table format
- Displaying and archiving dry contact inputs
- Visual alarm signals with recording in the event log
- Scaling of measurement parameters
- Adjustable graph scrolling speed
- Programming with the ability to bind to relay outputs
- Access to settings via the menu or remotely through a PC
- Non-volatile 2 Mb flash memory
- Maintenance of event and alarm logs
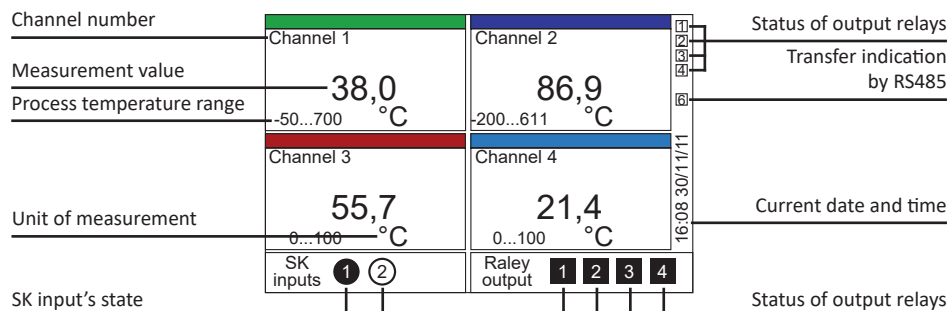- Real-time clock with alarm functionality

TECHNICAL SPECIFICATIONS			
Type and number of inputs	Analogue inputs		Type and number of outputs
12 analogue ones, 4 discrete types of SC (internal power supply)	4-20 mA, 0-20 mA, 0-5 mA (AT) or 0-10 V, 2-10 V (AN), UN (Cu50, Cu100, Pt50, Pt100), XA, XK, JK, NN, MKn, PP, PR		4 relays (2A 220 V AC) for alarm
Interface	Ethernet protocol	Memory	Indication	Screen size, mm
RS485	T-bus (TERA)	USB flash memory	TFT Color graphic indicator with backlight	74 x 50
Resolution, px	Power supply, V DC	Power supply unit	Housing	Ingress protection	Dimensions, mm
420 x 380	24	Built-in 90-242 V AC 50 Hz (option)	D	IP54 (by the front panel)	96 x 96 x 50

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Main windows of data display of the recorder

Channel number — Measurement value — Process temperature range — Unit of measurement — SK input's state

Channel 1   38,0 °C   -50...700

Channel 2   86,9 °C   -200...611

Channel 3   55,7 °C   0...100

Channel 4   21,4 °C   0...100

SK inputs ① ②   Raley output 1 2 3 4

16:08 30/11/11

Status of output relays — Transfer indication by RS485 — Current date and time — Status of output relays

Picture 38-1. Text view of measurements

Main manu
Settings
Archive browsing
Event and alarm log
Authorization
Help
Exit
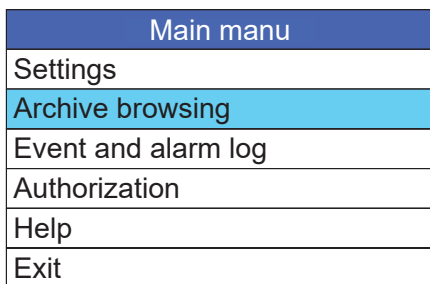
Picture 38-1. Menu of selecting and defining settings

16:06 30/11/11
Channel 1   44,7
Channel 2   43,8
Channel 3   22,9
Channel 4   21,8
SK1 Input   SK2 Input   20mm/m
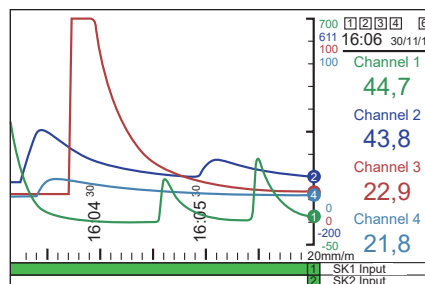
Picture 38-2. Graphical detailed display view

	Event and alarm log	
321	14:15:10 01/12/11	Power supply ON
320	14:14:32 01/12/11	Power supply OFF
319	16:10:48 30/11/11	Reset automatically SETTINGS
318	16:08:08 30/11/11	Temp. value #3 within rate
317	16:08:03 30/11/11	Temp. value #3 over rate
▲ + ▼ - Reset OK - Exit Previous ▼		

Picture 38-3. Event and alarm log

14:37 01/12/11
Reading archive data
Channel 1   22,8
Channel 2   22,9
Channel 3   22,7
Channel 4   22,4
SK1 input   SK2 input
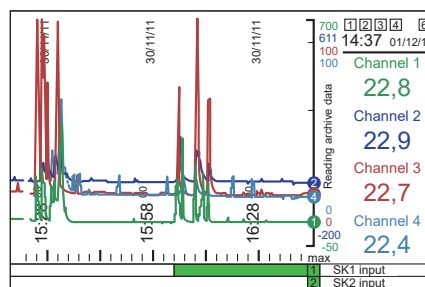
Picture 38-4. Window of archive data display

ORDER CODE	
Model	Description
D-IT-4UN08-4SK08-4EZA-RST-USB-N3*-TFT5	4-channel recorder (4 inputs of RTD or thermocouple), 4 dry contacts, 4 relays, RS485
D-IT-4AN08-4SK08-4EZA-RST-USB-N3*-TFT5	4-channel recorder (4 voltage inputs by AN), 4 dry contacts, 4 relays, RS485
D-IT-4AT08-4SK08-4EZA-RST-USB-N3*-TFT5	4-channel recorder (4 current inputs by AT), 4 dry contacts, 4 relays, RS485
D-IT-8UN08-4SK08-4EZA-RST-USB-N3-TFT5	8-channel recorder (8 inputs of RTD or thermocouple), 4 dry contacts, 4 relays, RS485
D-IT-8AN08-4SK08-4EZA-RST-USB-N3-TFT5	8-channel recorder (8 voltage inputs by AN), 4 dry contacts, 4 relays, RS485
D-IT-8AT08-4SK08-4EZA-RST-USB-N3-TFT5	8-channel recorder (8 current inputs by AT), 4 dry contacts, 4 relays, RS485
D-IT-12UN08-4SK08-4EZA-RST-USB-N3-TFT5	12-channel recorder (12 inputs of RTD or thermocouple), 4 dry contacts, 4 relays, RS485
D-IT-12AN08-4SK08-4EZA-RST-USB-N3-TFT5	12-channel recorder (12 voltage inputs by AN), 4 dry contacts, 4 relays, RS485
D-IT-12AT08-4SK08-4EZA-RST-USB-N3-TFT5	12-channel recorder (12 current inputs by AT), 4 dry contacts, 4 relays, RS485
D-IT-2UN08-2AN08-4SK08-4EZA-RST-USB-N3*-TFT5	4-channel recorder (2 inputs RTD or thermocouple + 2 inputs AN), 4 dry contacts, 4 relays, RS485
D-IT-2UN08-2AT08-4SK08-4EZA-RST-USB-N3*-TFT5	4-channel recorder (2 inputs RTD or thermocouple + 2 inputs AT), 4 dry contacts, 4 relays, RS485
D-IT-4UN08-4AN08-4SK08-4EZA-RST-USB-N3-TFT5	8-channel recorder (4 inputs RTD or thermocouple + 4 inputs AN), 4 dry contacts, 4 relays, RS485
D-IT-4UN08-4AT08-4SK08-4EZA-RST-USB-N3-TFT5	8-channel recorder (4 inputs RTD or thermocouple + 4 inputs AT), 4 dry contacts, 4 relays, RS485
D-IT-4UN08-8AN08-4SK08-4EZA-RST-USB-N3-TFT5	12-channel recorder (4 inputs RTD or thermocouple + 8 inputs AN), 4 dry contacts, 4 relays, RS485
D-IT-4UN08-8AT08-4SK08-4EZA-RST-USB-N3-TFT5	12-channel recorder (4 inputs RTD or thermocouple + 8 inputs AT), 4 dry contacts, 4 relays, RS485
D-IT-8UN08-4AN08-4SK08-4EZA-RST-USB-N3-TFT5	12-channel recorder (8 inputs RTD or thermocouple + 4 inputs AN), 4 dry contacts, 4 relays, RS485
D-IT-8UN08-4AT08-4SK08-4EZA-RST-USB-N3-TFT5	12-channel recorder (8 inputs RTD or thermocouple + 4 inputs AT), 4 dry contacts, 4 relays, RS485
D-IT-4AN08-8AT08-4SK08-4EZA-RST-USB-N3-TFT5	12-channel recorder (4 inputs AN + 8 inputs AT), 4 dry contacts, 4 relays, RS485
D-IT-4AT08-8AN08-4SK08-4EZA-RST-USB-N3-TFT5	12-channel recorder (4 inputs AT + 8 inputs AN), 4 dry contacts, 4 relays, RS485
BP5-RG-USB	RS485 adapter / with USB power supply and cable to connect PC
TechnologSoft LA**	Software for a single PC + archive for devices
TechnologSoft NA**	Software for the PC network + archive for devices

* - To order a device with the built-in power supply unit of 90-242 V AC 50 Hz for 4-channel recorders without an Ethernet interface, change "N3" to "N1" in the model name
** - You can find detailed information about the TechnologSoft software on the "Software" page
*** - Change 'RST' to 'ETH' to order a device with Ethernet interface support (only applicable to 4-channel recorders)

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The ITP series portable temperature meter is designed for measuring temperatures in various environments. It offers the flexibility to measure temperature using a range of external probes.

TECHNICAL SPECIFICATIONS					
Model	ITP-3-01	ITP-3-03	ITP-3-07	ITP-3-08	ITP-6-09
	Technical specifications of the meter				
Number of channels	1	2	2	2	1
Available channel configuration	TSP	TSP	TXA	2 TSP	2 TXA	TSP
Process temperature range, °C	-50...600	-50...600	-50...1300	-50...600	-50...1300	-50...150
Accuracy	Up to 200°C - 0,2, over 200°C - 0,5	Up to 100°C - 0,2, over 200°C - 0,5	1	Up to 100°C - 0,2, over 200°C - 0,5	1	0,5
Resolution, °C	-50...199 - 0,1, 200...1300 - 1					0,1
Operating temperature, °C	0...50					-30...50
Dimensions, mm	138 x 69 x 31					

ITP-3-01...08

1-50

1-52

1-56

1-56n

1-58

1-58n

1-58s

1-59

TECHNICAL SPECIFICATIONS OF ITP SERIES EXTERNAL TEMPERATURE PROBES							
Model	Probe's application	Nominal resistance / Type	Process temperature range, °C	Thermal inertia, sec	Length of the cable, mm	Length of the immersion part L, mm	Diameter of the immersion part, mm
1-50	Surface	TXA	-40...230	4	850	-	-
1-52	Air	TXA	-40...230	3	850	100...1000	6
		TSP	-50...230	4	850		
1-56	Immersion	TXA	-40...800	7...9	850	100...1500	6
		TSP, TSM	-50...500	8...10	850		
1-56n	Immersion	TXA	-40...800	7...9	850	100...1500	6
		TSP, TSM	-50...500	8...10	850		
1-58	Immersion	TXA	-40...250	7...9	850	100...1500	4, 6
		TSP, TSM	-50...250	8...10	850		
1-58n	Pointed	TXA	-40...250	7...9	850	100...1500	4, 6
		TSP, TSM	-50...250	8...10	850		
1-58s	Needle	TXA	-40...250	4	850	100...250	1,5
1-59	High temperature	TXA	0...1000	10	850	100...1500	6
		TXA	0...1150	14	850		
Cable	To connect the stationary probe	TXA	N/A	N/A	850	-	-
		TSP, TSM			850		

TECHNICAL SPECIFICATIONS OF ITP-6-09 EXTERNAL PROBE							
Model	Probe's application	Nominal resistance	Process temperature range, °C	Thermal inertia, sec	Length of the cable, mm	Length of the immersion part L, mm	Diameter of the immersion part, mm
ITP-6-09	Pointed	TSP	-50...150	20	N/A	1000, 1500	10

Order code for ITP-3 external probes

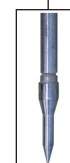Example: TXA - 1-59 - 500 - 6 - /0...1150/

Length of the immersion part

100, 120, 160, 200, 250, 320, 400, 500, 630, 800, 1000, 1250, 1500 mm

Diameter of the immersion part

∅**1,5**, ∅**4**, ∅**6**

Process temperature range, °C
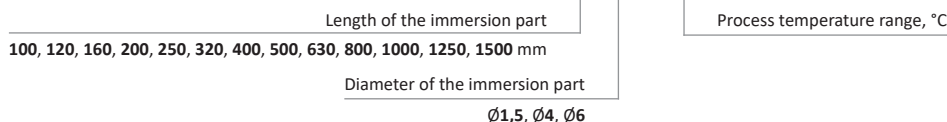
Order info for ITP-3

Example: ITP - 3-02

Model

01, **02**, **03**, **07**, **08**

Order info for ITP-6-09

Example: ITP - 6-09 - 1500

Length of the immersion part

1000, **1250**, **1500** mm

ITP-6-09

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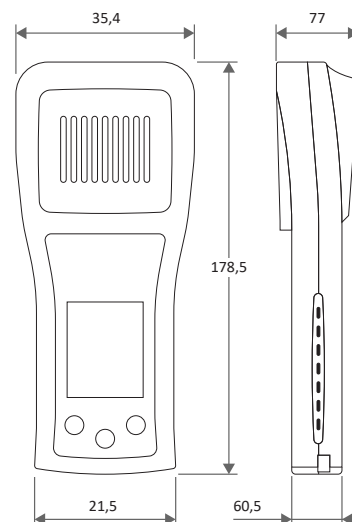
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The ITP-4 CO2 portable meter is designed for measuring and controlling the concentration of CO2 inside a growing room.

The easy-to-use meter features a TFT color display that shows CO2 measuring values up to 5000 ppm. It also has a built-in battery and comes with a charger.

TECHNICAL SPECIFICATIONS		
Process CO2 range, ppm		Accuracy, ppm
0...5000		85 ppm
Resolution, ppm	Response time, min	Battery voltage, V
1	5	3,6
Frequency of calibration, months	Case material	Ingress protection of the housing
12	ABS plastic	IP 20

The ITP-7 CO2 portable meter is specifically designed to measure and control the CO2 concentration inside a growing room. It uses a built-in pump to draw air into the meter, thereby reducing the response time for measurements.

The easy-to-use meter features a TFT color display that shows CO2 measuring values up to 5000 ppm. The ITP-7 comes equipped with a built-in battery and includes a charger for your convenience.

TECHNICAL SPECIFICATIONS		
Process CO2 range, ppm		Accuracy, ppm
0...5000 ppm		85 ppm
Resolution, ppm	Response time, minutes	Battery voltage, V
1	1 (using built-in pump)	3,6
Frequency of calibration, months	Case material	Ingress protection
12	ABS plastic	IP 20
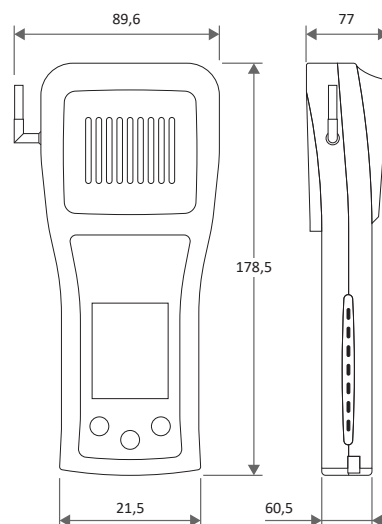
The AG-06e CO2 transmitter is specifically designed for measuring CO2 concentrations in ambient air, capable of detecting levels up to 5000 ppm. This transmitter is equipped with a built-in monochrome display that provides real-time readings of the current CO2 concentration.

The device uses natural gas circulation to measure CO2 levels. Ambient air containing CO2 is drawn through openings in the transmitter's casing and directed to the CO2 sensor for measurement, which can accurately detect concentrations up to 5000 ppm. The measured value is then converted into analog output signals of 4-20 mA (0-10 V) and RS485, and it is also displayed on the built-in monochrome display.

TECHNICAL SPECIFICATIONS		
Process CO2 range, ppm		Accuracy, ppm
0...5000 (0...30000 - option)		85
Type of output	Type of output 2	Response time, minutes
4-20 mA (0-10 V - option)	RS485	1
Voltage (CO2 module), V	Operating temperature, °C	Case material
24	0...50	ABS plastic
Ingress protection	Dimensions (HxWxD), mm	
IP 41	141 x 78 x 70	

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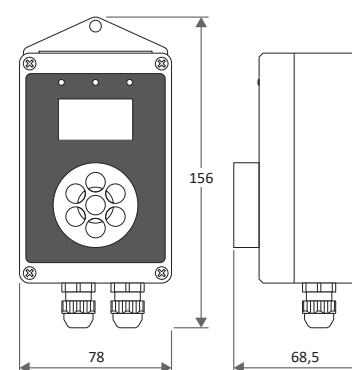
Types of case

| Case A | Case B | Case C1 | Case D | Case E |
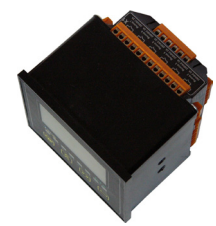
SPECIFICATIONS		SPECIFICATIONS		SPECIFICATIONS		SPECIFICATIONS		SPECIFICATIONS	
Dimesions, mm	Ingress protection	Dimesions, mm	Ingress protection	Dimesions, mm	Ingress protection	Dimesions, mm	Ingress protection	Dimesions, mm	Ingress protection
48 x 48 x 91	IP54	96 x 96 x 28	IP54	96 x 96 x 75	IP54	96 x 96 x 50	IP54	96 x 96 x 96	IP54
Cutout in panel, mm		Cutout in panel, mm		Cutout in panel, mm		Cutout in panel, mm		Cutout in panel, mm	
45,2 x 45,2		91,4 x 91,4		92,2 x 92,2		91,4 x 91,4		92,2 x 92,2	

Types of input devices (types of inputs)

- **Thermoresistance** (code - TS)

TECHNICAL SPECIFICATIONS			
Type	Name	Nominal resistance ($W_{100} = R_0 / R_{100}$)	Process temperature range, °C
TSM	Copper resistance temperature transducer	Cu50 (1,4280)	-50...180
		Cu100 (1,4280)	
		Cu53 graduation 23 (1,4260)	
TSP	Platinum resistance temperature transducer	Pt46 graduation 21 (1,3910)	-50...650 (h. A, B), -200...650 (h. C1, D, 2D, E)
		Pt100 (1,3850)	
		Pt50 (1,3910)	
		Pt100 (1,3910)	

- **Thermoresistance** (code - PT)

TECHNICAL SPECIFICATIONS			
Type	Name	Nominal resistance ($W_{100} = R_0 / R_{100}$)	Process temperature range, °C
TSP	Platinum resistance temperature transducer	Pt500, Pt1000 (1,3850)	-50...650 (h. B), -200...650 (h. C1, D, E)

- **Thermocouple** (code - TP)

TECHNICAL SPECIFICATIONS			
Type	Name	Nominal resistance ($W_{100} = R_0 / R_{100}$)	Process temperature range, °C
TMKn	Copper-constantan thermocouple	Type T	-50...350
TXK	Chromel-coppel thermocouple	Type L	-50...650
TJK	Iron-constantan thermocouple	Type J	-50...750
TXKn	Chromel-constantan thermocouple	Type E	-50...700
TXA	Chromel-alumel thermocouple	Type K	-50...1300
TNN	Nicrosil-nisil thermocouple	Type N	
TPP	Platinum/rhodium-platinum thermocouple	Type S	0...1450
TPP	Platinum/rhodium-platinum thermocouple	Type R	
TPR	Platinum/rhodium-rhodium thermocouple	Type B	600...1700

- **Universal TS / TP** (code - UN)
  All the types of thermoresistances and thermocouples listed above (except PT) can be connected to this type of input.

- **Psychometric (aspiration)** (code - PS)
  Two thermoresistances (the dry-wet thermometer for measuring relative humidity of air using either the psychometric or the aspirative method) can be connected to this type of input.

- **Thermistor** (code - TR)

TECHNICAL SPECIFICATIONS			
Type	Name	Nominal resistance	Process temperature range, °C
TST	Thermistor	10kNTC 633 (640)	-40...200 (-40...150)

- **Analogue current 0 ... 5 mA, 4 ... 20mA, 0 ... 20mA** (code - AT)
  All probes with the unified current signal 4-20 mA, 0-20 mA, 0-5 mA can be connected to this type of input. Devices in cases A and D are powered by an external power supply. Devices in case B are powered by the built-in 12 V DC power supply (with a maximum line length of up to 10 meters). Devices in case E are powered by the built-in 24 V DC power supply (with a maximum line length of up to 150-200 meters).

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- **Analogue voltage 2 ... 10 V, 0 ... 10 V** (code - AN)
  All types of probes with the unified signal by voltage of 0-10 V, 2-10 V can be connected to this type of input. The length of connection lines for all the devices should not exceed 50 meters.

- **External key** (code - SK)
  Probes and devices with the Dry Contact (front panel buttons, switches, reed switches, relays, etc.) can be connected to this type of input. The length of connection lines for all the devices should not exceed 50 meters.

- **Pulse by voltage** (code - NP)
  Probes generating the discrete signal can be connected to this type of input. In the binary system, 0-0.7 V DC represents zero, while 2.5-12 V DC represents one.

- **Resistive** (code - RZ)
  Resistive setpoint adjusters or resistive limit switches for feedback with devices can be connected to this type of input.

- **Consistent digital interface I²C** (code - EM)
  Probes with the of I²C output interface, such as DVT humidity and temperature transducers with the SHT sensor, can be connected to this type of input. The length of connection lines for all the devices should not exceed 15 meters.

- **Inductive** (code - PV)
  Pressure gauges, dehuminifiers, vacuum gauges with a range of -10-10 mH or 0-10 mH can be connected to this type of input. The length of connection lines for all the devices should not exceed 15 meters.

- **Conductometric** (code - DU)
  Conductometric probes designed for measuring the liquid level in electrically conductive liquids can be connected to this type of input.

Accuracy

TECHNICAL SPECIFICATIONS					
Code of the input	Accuracy depending on the type of a case				
	A	B	C1	D	E
UN (TS), PT	0,5	0,5	0,2	0,2	0,2
UN (TP)	0,5	0,5	0,5	0,5	0,5
TR	-	1,0	-	1,0	-
AT	0,5	0,5	0,5	0,5	0,5
AN	0,5	0,5	0,5	0,5	0,5

Response time

TECHNICAL SPECIFICATIONS					
Code of the input	Response time with calculation for a single channel depending on the type of a case				
	A	B	C1	D	E
UN (TS), PT	0,25	0,25	0,2	0,2	0,2
UN (TP)	0,25	0,25	0,2	0,4	0,2
TR	-	0,25	-	0,25	-
AT	0,25	0,25	0,2	0,2	0,2
AN	0,25	0,25	0,2	0,2	0,2

The result obtained from the request undergoes mathematical calculations, the duration of which depends on the filtration coefficient specified by the user. No calculations are performed when the filtration coefficient is set to 1.

When the coefficient is less than or equal to 5 (available for devices in case C and D1), results are averaged based on a request duration of 3 times the filtration coefficient, multiplied by the response time and the number of channels.

For coefficients greater than 5, adaptive filtration is applied, followed by averaging based on a request duration of 5 times the filtration coefficient, multiplied by the response time and the number of channels.

Specifications of connection line of device and probe

TECHNICAL SPECIFICATIONS		
Code of the input	Max resistance of the line (of a single conductor), Ohm	Type of line
UN (TS)	3,0 (h. A, B), 20,0 (h. C1, D)	Shielded 3-wired
UN (TP)	25,0 (h. A, B), 100,0 (h. C1, D, E)	Thermocompensatory (thermocouple) shielded cable
PT	1,0	Shielded 2-wired
TR	1,0	Shielded 2-wired
AT	For U_{power} = 24B DC: 100,0 (h. A, B), 250 (h. D, E)	Shielded 2-wired
AN	5,0	Shielded 2-wired
EM	1,5	Shielded 4-wired

Devices in cases C1, D, and E are capable of operating with 3-wire intrinsic safety barriers that have a channel resistance of up to 360 Ohms. In this case, the controller introduces a correction to account for the accuracy issues caused by the intrinsic safety barrier and the variations in channel resistance.

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Basic functions of input devices

The basic programming functions of input devices are integrated into every meter and regulator, regardless of the model or configuration chosen by the user. These functions include:

- **Compensation of probe accuracy error (picture 1, picture 2):** This function helps mitigate the impact of accuracy errors originating from the primary measuring instrument (the probe) and any errors introduced by the connection line. Users have the flexibility to adjust the characteristics and modify the curve to align it as closely as possible with the standard reference (ethelon).

- **Programming interference filtration and stabilizing measurements (Picture 3):** This feature is designed to minimize the impact of interference in the measurement channel and fluctuations in measurements caused by signal transduction. It employs a specialized algorithm to enhance measurement stability and reliability to the greatest extent possible. When needed, users can manually adjust the filtration coefficient in the device preferences to fine-tune the balance between stability and reliability.
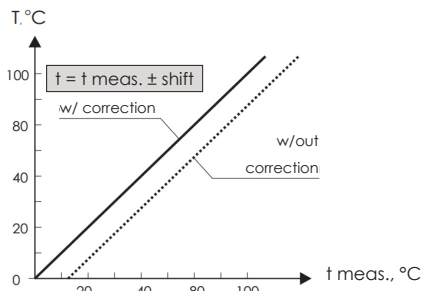
Picture 1
Compensation of probe accuracy error
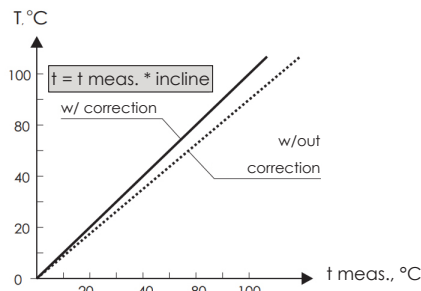
Picture 2
Compensation of probe accuracy error
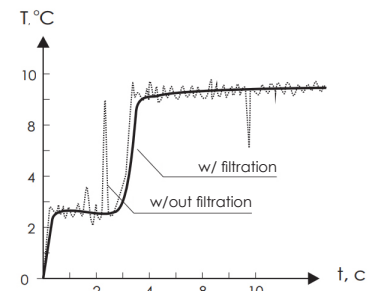
Picture 3
Programming interference filtration and stabilizing measurements

Optional functions of input devices

Additional functions of input devices provide users with advanced capabilities to enhance device customization and streamline the adjustment process. These functions are available when the corresponding inputs are ordered and significantly expand the range of device applications while making adjustments more convenient and efficient. Here's an overview of these functions:

- **Feedback with executive device** (code - 02, criteria - presence of current input (AT), voltage input (AN) or input for resistive feedback, as well as corresponding output signal in an executive device). This function enables tracking the position of an executive device (e.g., a valve, latch, damper) and its response to control output signals. It is recommended for PID regulation of devices like valves, latches, and dampers with PWM (three-point) control. The degree of open/close status can be displayed on the device's indicator.

- **Executive device ON/OFF** (code - 03, criteria - presence of input of external key type of Dry Contact (SK)). This function displays the state of an executive device (ON/OFF) using a separate LED on the device. It can also be used in the device's programmable logic.

- **Cease/launch regulator/programming timer** (code - 04, criteria - presence of input of external key type of Dry Contact (SK)). This function allows starting or stopping the execution of the regulation program or programmable timer, controlled by an external key (e.g., relay, button) on the device.

- **Switch to the next step of the program** (code - 05, criteria - presence of input of the external key type of the Dry Contact (SK) and the function of the Regulation by The Program output). In a regulator, this function enables manual switching from the Regulation by The Program output to the next step of the program using an external key (e.g., front panel button).

- **Switch between manual and automatic** (code - 06, criteria - presence of input of the external key type of the Dry Contact (SK)). This function allows changing the control mode between Manual and Automatic using an external key (e.g., front panel button).

- **Switch between On-Off and PID** (code - 07, criteria - presence of input of the external key type of the Dry Contact (SK)). This function lets the user switch between On-Off and PID regulation types using an external key.

- **Device archive** (code - 08). This function allows the user to store the current value at specified intervals in the device's independent memory. The memory capacity is 32 KB, and each record occupies 4 * the number of channels + 4 bytes. You can choose the archiving period ranging from 15 seconds to 60 minutes. The maximum archiving capacity in hours can be calculated using the formula: 0.37 / (4 * the number of channels + 4) * archiving period in seconds.

  In addition to the current value, each recording cell stores the current time, the current output power value (in percentage), and the regulation type (manual or automatic). The user can access these values using the device's buttons or through the TechnologSoft software if the device has an RS485 output using the T-bus protocol.

  TechnologSoft offers a dedicated module for working with devices that support device archiving. This module allows you to retrieve data from the device archive in batches at specified time intervals. It ensures 100% data retention even if there is no connection with the PC during certain periods, freeing the PC from the continuous task of receiving and recording real-time data.

- **Mathematical function** (code - 09) This function enables transducing measurement results using specified mathematical formulas.

- **External setpoint adjuster** (code -10) This feature enables the connection of an external setpoint adjuster, enhancing the convenience of adjusting the set value. You can use this function to set the desired value for a regulator or program number (for program-based regulation). It's adaptable for sensors with variable output resistance, which can be connected to the thermistor inputs, or sensors with the appropriate output, which can be connected to voltage or current inputs.

- **Output of current parameter to control** (code - 11). This function allows converting the measured current value into a unified 4-20 mA signal for transfer to control or duplicate devices like paperless recorders, loggers, and controllers.

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Types of output devices (types of outputs)

Output devices, also referred to as outputs, serve the purpose of initiating and controlling executive devices or interim amplifying units. These outputs are categorized into several types, including key, analog, and digital. They can also be further classified based on whether they provide galvanic isolation from or non-isolation with respect to executive devices.

Key outputs of galvanic isolation:

- **Electromagnetic relay** (code - EZ or EP, picture 1). It can directly operate small and medium-capacity executive devices, both active and reactive, as well as interim amplifying units like relays and launchers. There are two types available: the on/off relay (code - EZ) and the changeover relay (code - EP).

- **Optical triac** (code - OS, picture 2). It can directly operate small-capacity executive devices, both active and reactive, such as relays, launchers, and incandescent lamps, or interim amplifying units using powerful triacs.

- **Semiconductor optical switch** (code - PK, picture 3). It can directly control small-capacity executive devices, both active and reactive, such as relays, launchers, and incandescent lamps. Additionally, it can be used as a Dry Contact type switch to transmit the signal indicating the state of the control device.

Key outputs of galvanic non-isolation:

- **Output of open collector type** (code - OK, picture 4). It can directly operate small-capacity executive devices, including relays, DC launchers, incandescent lamps, and LED indicators. Alternatively, it can function as a Dry Contact type switch to transmit signals indicating the status of the control device.

- **Output with active output by voltage** (code - IV, picture 5). It can directly operate small-capacity executive devices, such as relays, DC launchers, incandescent lamps, and LED indicators. Alternatively, it can handle interim amplifying capacity through powerful triacs. This type of output can be powered by either internal or external power sources.

Types of analogue outputs (can be whether galvanic isolation or galvanic non-isolation):

- **Regulated current generator** 4-20 mA, 0-20 mA, 0-5 mA (code - AV, picture 6). It can directly manage medium and high-capacity executive devices equipped with standard 4-20 mA inputs, including frequency transducers, valve actuators, latches, dampers, and more.

- **Regulated voltage generator** 0-10 V, 2-10 V (code - AM, picture 7). It can directly manage medium and large-capacity executive devices equipped with standard 0-10 V and 2-10 V inputs, such as frequency transducers, valve actuators, latches, dampers, and more.
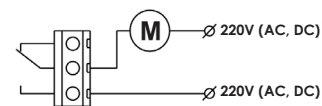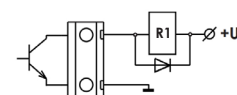

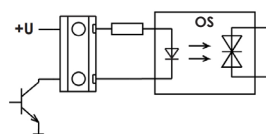*Picture 1*
Electromagnetic relay (EMR)
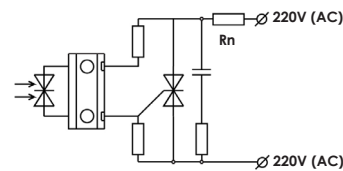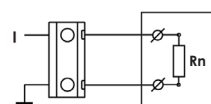

Picture 2
Optical triac
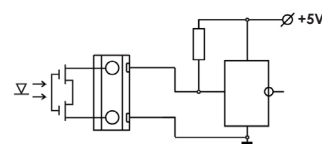
Picture 3
Semiconductor optical switch

Picture 4
Output of open collector type

Picture 5
Output with active output by voltage
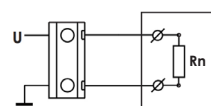
TECHNICAL SPECIFICATIONS OF CRUCIAL AND ANALOGUE OUTPUT DEVICES			
Output code	Output device	Parameter	Description
EZ	On-Off relay	U / I	220 V 2 A (3A) AC / 30 V 2A DC
EP	Changeover relay	U / I	220 V 2 A (3A) AC / 30 V 2A DC
OS	Optical triac	U / I	220 V 50 mA AC in permanent mode, 220 V 800 mA AC in pulse mode
PK	Optical switch	U / I	180 V 100 mA AC/DC
OK	Common collector	U / I	40 V 30 mA DC
IV	Output by voltage	U / I	12 V 20 mA DC
AV	Current generator	I	4...20 mA, load 100...500 Om
AM	Voltage generator	U	2...10 V, load >100 kOm

Types of digital outputs:

- **RS485 galvanic non-isolation digital output** (code - RS). It is used for connecting to a PC and transferring data over a network. It can support up to 64 devices on a single network with a maximum length of 500 meters and minimal interference. The data transfer rate is 9600 Kbit per second. For more detailed information about the RS485 network structure, please refer to the Software section.

- **RS485 galvanic isolation digital output** (code - RG). It is used to connect to a PC and transfer data over a network. It can support up to 64 devices on a single network with a maximum length of up to 500 meters. Galvanic isolation is included to prevent the impact of longitudinal interferences, whether they are generated within the network or acquired externally, especially in a single earthing bar setup. The data transfer rate is 9600 Kbit per second. For more detailed information about the structure of the RS485 network, please refer to the Software section.

- **10BASE-T digital output** (code - ET). Ethernet is the most widely used technology for computer networks. Each segment of an Ethernet network can have a maximum length of 100 meters, and it supports data rates of up to 10 Mbit per second.

- **USB 2.0 digital output** (code - US). It's a serial interface used for transferring data between peripheral devices and PCs via a 4-wire connection. This interface allows direct data exchange between devices and computers.

Picture 6
Regulated current generator

Picture 7
Regulated voltage generator

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Exchange protocol for digital output devices:

- **T-bus exchange protocol** (code - T) is a proprietary protocol developed by PJSC TERA. It is specifically designed for transferring data between devices manufactured by PJSC TERA using the RS485 network. All software systems and loggers developed by PJSC TERA operate based on this exchange protocol.

- **Modbus RTU exchange protocol** (code - M). This protocol is used to transfer data over the RS485 network between devices from different manufacturers that support this protocol. It's worth noting that most SCADA systems are compatible with this exchange protocol, making it a widely accepted standard for data communication in industrial automation.

- **UDP / IP exchange protocol** (code - U). This protocol is used to transport packets of the T-bus protocol and facilitate data exchange between PCs and devices manufactured by PJSC TERA that have a 10Base-T output (code ET).

Output devices operating mode:

- **Heater** - as the measured temperature increases, the output signal decreases, and vice versa
- **Cooler** - as the measured temperature increases, the output signal increases, and vice versa
  The control mode is configured individually for each output device within the controller's settings.

Functions of output devices:

- **2-point control with a single setpoint** (code - D). 2-point control with a single setpoint (code - D) involves turning on and off key output devices based on a set temperature value and a hysteresis (insensitive zone) value of $\triangle T$. There are two types of 2-point control: straight hysteresis and reverse hysteresis:
  - In 2-point control with straight hysteresis, an output device turns on when $T_{measuring} < T_{set} - \triangle T$ and turns off when $T_{measuring} > T_{set} - \triangle T$.
  - In 2-point control with reverse hysteresis, an output device turns on when $T_{measuring} > T_{set} - \triangle T$ and turns off when $T_{measuring} < T_{set} - \triangle T$.
  This type of control is commonly used in simple and fast-acting heating and cooling systems.

- **2-point control with a dual setpoint** (code - E). This is 2-point control with two setpoints for a single output device. In the case of a heater-type device, the output turns on when the value is $T_{measuring} < T_{set1}$, turns off when the value is $T_{measuring} > T_{set2}$, and turns on again when $T_{measuring} < T_{set1}$. This implementation uses straight hysteresis control with a hysteresis range of $T_{set2} - T_{set1}$ (where T_{set1} must be less than T_{set2}).
  For a cooler-type device, the output turns on when the value is $T_{measuring} > T_{set2}$, turns off when the value is $T_{measuring} < T_{set1}$, and turns on again when $T_{measuring} > T_{set2}$. This implements reverse hysteresis control with a hysteresis range of $T_{set2} - T_{set1}$.

- **3-point control** (code - R) can operate with a single output device or two output devices, one acting as a heater and the other as a cooler. Here's how it works:

  For a single output device:
  1. The user sets three levels of output capacity: Maximum Heating (e.g., 100%), Nominal Heating (e.g., 50%), and Minimal Heating (e.g., 10%).
  2. Two setpoints, PWM (Pulse Width Modulation) period in seconds, and hysteresis $\triangle T$ are configured.
  3. When the measured temperature ($T_{measuring}$) is less than T_{set1}, the output device runs at maximum capacity (100%), remaining on continuously.
  4. When $T_{set1} + \triangle T < T_{measuring} < T_{set2} - \triangle T$, the output device operates at nominal capacity (50%), cycling on for half of the PWM period and off for the other half.
  5. When $T_{measuring}$ is greater than T_{set2}, the output device runs at minimal capacity (10%).
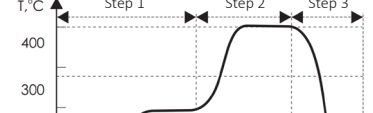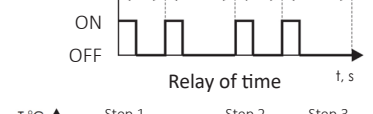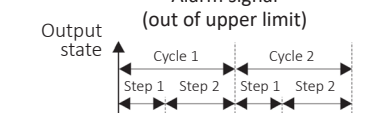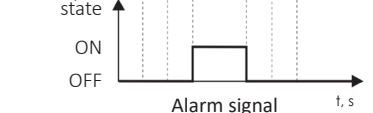
  For two output devices:
  1. Output device #1 is configured as a heater, and output device #2 is configured as a cooler.
  2. Control is based on the set value T_{set} and the hysteresis $\triangle T$.
  3. The regulator activates output device #1 when $T_{measuring}$ is less than $T_{set} - \triangle T$ and deactivates it when $T_{measuring}$ equals T_{set}.
  4. It activates output device #2 when $T_{measuring}$ is greater than $T_{set} + \triangle T$ and deactivates it when $T_{measuring}$ equals T_{set}.
  This control method is commonly used in fast-acting temperature control systems.

- **2-/3-point control** (code - L) can be either a 2-point control for a single output or a 3-point control for two outputs.

- **10BASE-T digital output** (code - ET). Ethernet is the most commonly used technology in computer networks. It has a maximum segment length of 100 meters and supports data rates of up to 10 megabits per second.
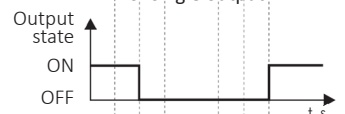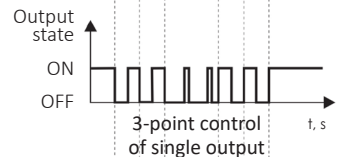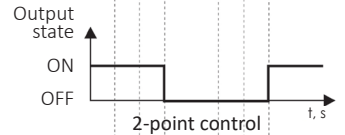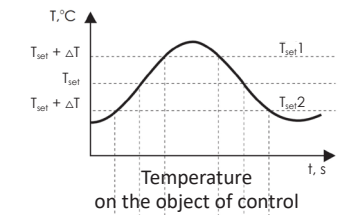
- **Alarm signal** (code - A) is designed for use with key output devices. Its purpose is to alert when the measured temperature falls outside the specified range. The output device is activated when the measured temperature is either below T_{min} or above T_{max}, indicating that it has left the desired range. Additionally, it allows you to set the duration of the output device activation based on the current temperature value. Furthermore, the output device is triggered if there is a disruption in the electrical circuit of the measurement channel. This type of signal is commonly used in temperature monitoring and control systems.

- **Transfer of the parameter to the registrar** (code - S) is used with analog outputs (4-20 mA, 0-5 mA, etc.) to send parameters to a recording device.

Temperature on the object of control

2-point control

3-point control of single output

3-point control of two outputs

Alarm signal (out of range)

Alarm signal (out of lower limit)

Alarm signal (out of upper limit)

Relay of time

Control by a program
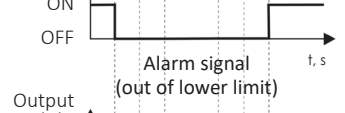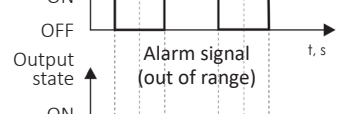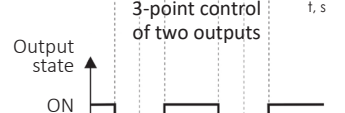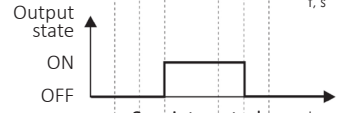
- **Non-volatile relay of time** (code - N) controls key output devices based on time settings. The user specifies the duration for which the output device should be turned on and the duration of the pause before the next step. Each pair of these two settings constitutes one execution step, and you can have up to 10 steps. You can set the program to run from 1 to an infinite number of cycles for the entire sequence of steps. The program can be started and stopped manually using the front panel buttons or by an external signal from a switch (code - SK). This type of relay is commonly used in simple timer applications.

Standard PID controller
(auto adjustment, soldering iron, Tset=100°C)

- **PID control with auto adjustment** (code - P) is used with key or analogue output devices. The output signal's capacity is a combination of three components: proportional, integral, and differential.
  The proportional component is directly proportional to the control error.
  The integral component is proportional to the duration of the error's existence.
  The differential component is proportional to the rate at which the error is decreasing.
  You can calculate PID coefficients either through manual tuning or automatically using the device's auto-adjustment function on the control object. When ordering a PID controller, it's not recommended to use electromagnetic relays as output devices. Instead, it's more suitable to order a PID controller with voltage-based key output devices (9-12 V, code - IV), and then amplify the output signal using a power reinforcement triac.
  PID control is typically used in systems with inertial objects and in applications requiring precise temperature regulation.

PID controller manufactured by PJSC TERA
(auto adjustment, soldering iron, Tset=100°C)

- **PI or PID control of electric drive valves or dampers** (code - K) involves a special algorithm for managing executive devices like electric drive valves or dampers.
  For executive devices with feedback (analogue output of 4-20 mA, 2-10 V, or resistive output up to 10 kΩ), PID control with auto adjustment is applied.
  For cases where there is no feedback, PI control with auto adjustment is used.
  The control of the executive device can be achieved either through an analogue output device or with a pair of output devices, often referred to as More-Less or 3-point control, depending on the type of control needed.
  Additionally, this function allows for manual control of the executive device using the front panel buttons.

- **Control by a program** (code - V) enables step-by-step adjustments to the set value based on time or events. Each output channel in the device can accommodate up to 16 programs, each with 24 steps. Each step in a program can define several parameters, including input value, setpoint of the input value, speed, time to reach the setpoint, and conditions to progress to the next step.
  Additionally, each program can specify start time, the number of cycles, the function of the output device, the output device's numbers, and conditions for triggering an emergency shutdown of the output devices.
  In cases where PID control is part of the program, it's necessary to perform auto adjustment PID once for all set temperatures.
  All program and device settings are stored in non-volatile memory. This control mode is typically used in applications involving technological lines with various temperature processes occurring over time.
  Features of P, PI and PID control:
  When the output device has PID control capability (code - P or K), it opens up the possibility of implementing three types of control: P, PI, and PID control.

Standard PID controller
(auto adjustment, soldering iron, Tset=100°C)

- **PID control** is a method where the output capacity is determined by the combination of three components: proportional, integral, and differential. The proportional component is directly proportional to the control error; a higher proportionality coefficient leads to lower output capacity for the same error. The integral component accumulates over time, with a longer integral time resulting in slower accumulation. The derivative component's strength of reaction to disturbances increases with a higher derivative time constant.
  PID controllers are well-suited for inertial systems with relatively low levels of interference in the measurement channel. They offer advantages such as quick attainment of the desired mode, precise maintenance of the set temperature, and rapid response to disturbances. However, manually tuning a PID controller can be challenging, which is why it is recommended to use the auto-adjustment function for optimal performance.

PID controller manufactured by PJSC TERA
(auto adjustment, soldering iron, Tset=100°C)

Auto adjustment of PID control of devices manufactured by PJSC TERA:
The key factor determining the quality of a PID controller is its ability to precisely and rapidly reach the set temperature. Modern PID controllers incorporate an essential feature: auto-adjustment. It's important to note that there's no universal algorithm for PID auto-adjustment. In practice, each manufacturer employs its own algorithm. Therefore, users who purchase PID controllers from different manufacturers may experience significantly different results in their operational environments.

One of the primary advantages of the auto-adjustment algorithm in PID controllers provided by PJSC TERA is:

- Auto-adjustment with minimal or no overshoot: Overshoot in standard PID controllers can be substantial, sometimes reaching 50-70% above the set temperature. This level of overshoot is often not recommended or even prohibited in certain operational environments.
- Faster auto-adjustment: On average, the auto-adjustment process in PJSC TERA's PID controllers is approximately twice as fast as that of controllers from other manufacturers. This is a crucial characteristic, particularly for environments with frequently changing properties, such as inertial systems.

Auto-adjustment can be performed at any stable state of the operational environment. Furthermore, the greater the difference between the initial and set temperatures, the more accurately the PID controller's defining coefficients can be determined. It's worth noting that all the PID coefficients are stored in the non-volatile memory of the device for future reference and use.
Auto-adjustment should be repeated under several circumstances:
- If the capacity of an executive device is modified.
- When there are changes in the physical properties of the operational environment, such as mass, capacity, or heat exchange characteristics.
- When transitioning to another non-identical operational environment with a significant change in the set temperature.
Repeating the auto-adjustment under these conditions helps ensure that the PID controller maintains accurate and effective control over the new parameters or environment.
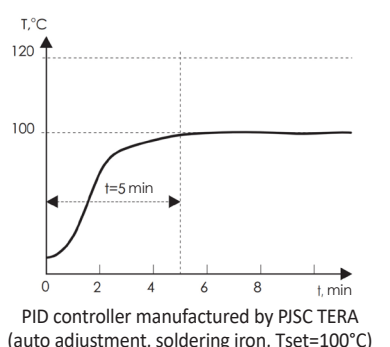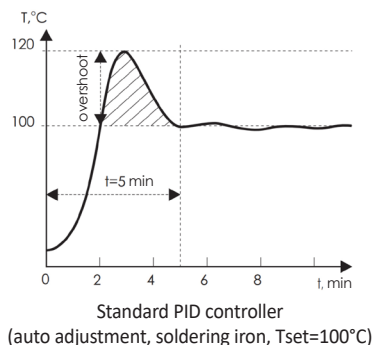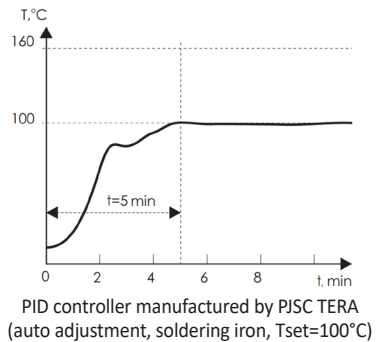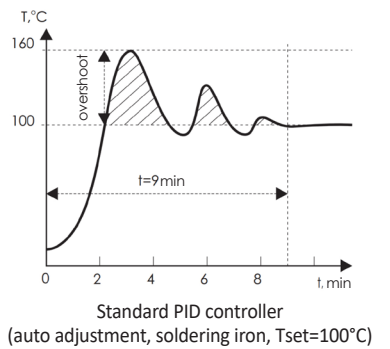
Single-, dual-, quad- and octa-channel controllers

Key Features

- Capable of measuring various physical parameters, including temperature, pressure, current, voltage, etc.
- Supports different types of inputs:
  - TS: Compatible with all types of RTD temperature probes.
  - TP: Compatible with thermocouples such as TMKn, TXK, TXKn, TXA, TJK, TNN, TPP, TPR.
  - UN: Compatible with all types of RTD and thermocouple temperature probes with R0=100Ω.
  - AT: Accepts analog current signals in the range of 0-20 mA, 4-20 mA, and 0-5 mA.
  - AN: Accepts analog voltage signals in the range of 0-1 V, 0-10 V, and 2-10 V.
- Offers accuracy ranging from 0.2 to 1.0.
- Provides quick response times, starting from 0.2 seconds per channel.
- Supports input quantity scaling.
- Offers the ability to calculate the difference (available on dual-channel controllers).
- Provides arithmetic mean calculations (available on quad- and octa-channel controllers).
- Allows square root extraction.
- Includes interference and instability filtering for accurate readings.
- Offers sensor error compensation.
- Features LED indication to detect transducer breakage.
- Optionally includes an RS output (RS485 output, no galvanic isolation, T-bus exchange protocol).
- Optionally provides an EZ output for alarm (1A 220 V AC/DC short-circuit electromagnetic relay output).
- Available in various models with different case sizes, including A (48x48x71 mm), B (96x96x28 mm), C1 (96x96x75 mm), and D (96x96x50 mm).
- Compatible with a power supply range of 90 to 242 V AC.

Controllers in different housings

TECHNICAL SPECIFICATIONS						
Model*	Description	Number (type) of inputs	Additional output for alarm	RS485 output	Case	Indication
B-IT-UN-I	Single-channel controller	1 (UN)	N/A	N/A	B	
B-IT-xx-I	Single-channel controller	1 (AT, AN)	N/A	N/A	B	1
z-IT-2UN-2I	Dual-channel controller	2 (UN)	N/A	N/A	A, B	2
z-IT-2UN-EZA-RST-2I	Dual-channel controller	2 (UN)	1 (EZ)	1 (RS)	A, B	2
z-IT-2xx-2I	Dual-channel controller	2 (AT, AN)	N/A	N/A	A, B	2
z-IT-2xx-EZA-RST-2I	Dual-channel controller	2 (AT, AN)	1 (EZ)	1 (RS)	A, B	2
C1-IT-4UN-EZA-RST-3I	Quad-channel controller	4 (UN)	1 (EZ)	1 (RS)	C1	2 + 1
E-IT-4xx-EZA-RST-3I	Quad-channel controller	4 (AT, AN)	1 (EZ)	1 (RS)	E	2 + 1
D-IT-8xx-EZA-RST-2I	Octa-channel controller	8 (TS, TP)	1 (EZ)	1 (RS)	D	2
D-IT-8xx-EZA-RST-2I	Octa-channel controller	8 (AT, AN)	1 (EZ)	1 (RS)	D	2

* - Please insert the case type instead of "z" and the output type instead of "xx" in the model name.

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Single-, dual-, quad- and octa-channel on-off controllers

Key Features

- Supports measurement of various physical parameters, including temperature, pressure, and more.
- Offers 2-/3-point control and 3-point control for one or two outputs (available on dual- and quad-channel controllers).
- Supports different types of inputs:
  - UN: Accepts all types of RTD and thermocouple temperature probes.
  - AT: Supports analog current signals in the range of 0-20 mA, 4-20 mA, and 0-5 mA.
  - AN: Accepts analog voltage signals in the range of 0-10 V and 2-10 V.
- Allows for calculations such as the difference (on dual-channel models), square root extraction, and scaling.
- Features sensor error compensation and filtering to reduce interference and instability in readings.
- Offers accuracy ranging from 0.2 to 0.5, depending on the output type and the model's housing.
- Provides quick response times, starting from 0.2 seconds per channel.
- Access to controller configurations is protected by a password.
- Supports normal and inverse hysteresis, allows setting output polarity, and offers Cooler and Heater modes.
- Offers various types of key outputs:
  - EZ: Electromagnetic relay with a rating of 2A at 220 V AC or 2A at 30 V DC.
  - OS: Optosymistor with a rating of 220 V 50 mA AC.
  - IV (voltage): Voltage output options include 12 V 20 mA DC (except for case D) and 24 V 200 mA DC (case D only).
  - OK: Open collector with a rating of 40V 30 mA DC.
- Optionally includes an RS output (RS485 output, no galvanic isolation, T-bus exchange protocol).
- Optionally offers an additional EZ output (2A 220 V AC/DC electronic relay) for alarms (IV output 24 V 200 mA DC in case D).
- Available in various models with different case sizes, including A (48x48x91 mm), B (96x96x28 mm), C1 (96x96x75 mm), E (96x96x91 mm), and D (96x96x50 mm).
- Compatible with a power supply range of 90-242 V AC (octa-channel controller in case D requires an additional external 24 V DC 2A power supply).

On-off controllers in different cases

TECHNICAL SPECIFICATIONS							
Model*	Description	Number (type) of inputs	Number (type) of control outputs	Additional output for alarm	RS485 output	Case	Indication
B-RT-UNyyD-I	Single-channel on-off controller	1 (UN)	1 (EZ, OS, OK, IV)	N/A	N/A	B	1
B-RT-xxyyD-I	Single-channel on-off controller	1 (AT, AN)	1 (EZ, OS, OK, IV)	N/A	N/A	B	1
z-RT-UNyyD-EZA-RST-2I	Single-channel on-off controller	1 (UN)	1 (EZ, OS, OK, IV)	1 (EZ)	1 (RS)	A, B	2
z-RT-xxyyD-EZA-RST-2I	Single-channel on-off controller	1 (AT, AN)	1 (EZ, OS, OK, IV)	1 (EZ)	1 (RS)	A, B	2
B-RT-2UNyyL-2I	Dual-channel on-off controller	2 (UN)	2 (EZ, OS, OK, IV)	N/A	N/A	B	2
B-RT-2xxyyL-2I	Dual-channel on-off controller	2 (AT, AN)	2 (EZ, OS, OK, IV)	N/A	N/A	B	2
z-RT-2UNyyL-EZA-RST-2I	Dual-channel on-off controller	2 (UN)	2 (EZ, OS, OK, IV)	1 (EZ)	1 (RS)	A, B	2
z-RT-2xxyyL-EZA-RST-2I	Dual-channel on-off controller	2 (AT, AN)	2 (EZ, OS, OK, IV)	1 (EZ)	1 (RS)	A, B	2
C1-RT-4UNyyL-EZA-RST-3I	Quad-channel on-off controller	4 (UN)	4 (EZ, OS, OK, IV)	1 (EZ)	1 (RS)	C1	2 + 1
E-RT-4xxyyL-EZA-RST-3I	Quad-channel on-off controller	4 (AT, AN)	4 (EZ, OS, OK, IV)	1 (EZ)	1 (RS)	E	2 + 1

* - Please insert the case type instead of "z", the output type instead of "xx" and the feedback type instead of "yy" in the model name.

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Single-, dual- and quad-channel PID controllers

Key Features

- Designed for accurate temperature control in inertial technological processes.
- Supports 2-point control.
- Offers control using P, PI, and PID auto adjustment functions without the need for readjustment.
- Provides PWM control for electric drives of valves, dampers, etc., using the more-less control type.
- Allows PWM control of heating and cooling devices.
- Supports analog control for inverters of electric motors and electric drives of valves, dampers, etc.
- Supports different types of inputs:
  - UN: Accepts all types of RTD and thermocouple temperature probes.
  - AT: Supports analog current signals in the range of 0-20 mA, 4-20 mA, and 0-5 mA.
  - AN: Accepts analog voltage signals in the range of 0-1 V, 0-10 V, and 2-10 V.
- Offers accuracy ranging from 0.2 to 0.5, depending on the output type and the model's housing.
- Provides quick response times, starting from 0.2 seconds per channel.
- Allows scaling of input quantities.
- Features sensor error compensation and filtering to reduce interference and instability in readings.
- Access to controller configurations is protected by a password.
- Offers various types of outputs:
  - Key Outputs:
    - IV (12 V 20 mA DC, except for case D)
    - IV (24 V 200 mA DC, case D only)
    - OS (optosymistor 220 V 50 mA AC)
    - OK (open collector 40 V 30 mA DC)
  - Analog Outputs:
    - AV (current 4-20 mA, 0-20 mA, 0-5 mA)
    - AM (voltage 0-10 V, 2-10 V)
- Optionally supports AT or AN output for feedback with executive devices, plus a manual control mode.
- Optionally includes an RS output (RS485 output, no galvanic isolation, T-bus exchange protocol).
- Optionally provides an additional EZ output for alarms (2A 220 V AC/DC electromagnetic relay).
- Available in various models with different case sizes, including A (48x48x91 mm), B (96x96x28 mm), C1 (96x96x75 mm), E (96x96x91 mm), and D (96x96x50 mm).
- Compatible with a power supply range of 90-242 V AC (the octa-channel controller in case D requires an additional 24 V DC 2 A power supply).

PID controllers in different housings

PID controllers with PWM control

TECHNICAL SPECIFICATIONS								
Model*	Description	Number (type) of inputs	Number (type) of control outputs	Feedback type	Additional output for alarm	RS485 output	Case	Indication
B-RT-UNyyP-I	Single-channel PID controller	1 (UN)	1 (OS, OK, IV)	N/A	N/A	N/A	B	1
B-RT-ATyyP-I	Single-channel PID controller	1 (AT)	1 (OS, OK, IV)	N/A	N/A	N/A	B	1
z-RT-UNyyP-EZA-RST-2I	Single-channel PID controller	1 (UN)	1 (OS, OK, IV)	N/A	1 (EZ)	1 (RS)	A, B	2
z-RT-ATyyP-EZA-RST-2I	Single-channel PID controller	1 (AT)	1 (OS, OK, IV)	N/A	1 (EZ)	1 (RS)	A, B	2
B-RT-2UNyyP-2I	Dual-channel PID controller	2 (UN)	2 (OS, OK, IV)	N/A	N/A	N/A	B	2
B-RT-2ATyyP-2I	Dual-channel PID controller	2 (AT)	2 (OS, OK, IV)	N/A	N/A	N/A	B	2
z-RT-2UNyyP-EZA-RST-2I	Dual-channel PID controller	2 (UN)	2 (OS, OK, IV)	N/A	1 (EZ)	1 (RS)	A, B	2
z-RT-2ATyyP-EZA-RST-2I	Dual-channel PID controller	2 (AT)	2 (OS, OK, IV)	N/A	1 (EZ)	1 (RS)	A, B	2
C1-RT-4UNyyP-EZA-RST-3I	Quad-channel PID controller	4 (UN)	4 (OS, OK, IV)	N/A	1 (EZ)	1 (RS)	C1	2 + 1
E-RT-4ATyyP-EZA-RST-3I	Quad-channel PID controller	4 (AT)	4 (OS, OK, IV)	N/A	1 (EZ)	1 (RS)	E	2 + 1

* - Please insert the case type instead of "z", the output type instead of "yy" and the feedback type instead of "ww" in the model name.

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PID controllers with PWM control the electric drives (more-less, three-point)

	TECHNICAL SPECIFICATIONS							
Model*	Description	Number (type) of inputs	Number (type) of control outputs	Feedback type	Additional output for alarm	RS485 output	Case	Indication
B-RT-UNyyyyK-I	Single-channel PID controller	1 (UN)	2 (OS, OK, IV)	N/A	N/A	N/A	B	1
B-RT-ATyyyyK-I	Single-channel PID controller	1 (AT)	2 (OS, OK, IV)	N/A	N/A	N/A	B	1
z-RT-UNyyyyK-ww02-EZA-RST-2I	Single-channel PID controller	1 (UN)	2 (OS, OK, IV)	1 (AT, AN)	1 (EZ)	1 (RS)	A, B	2
z-RT-ATyyyyK-ww02-EZA-RST-2I	Single-channel PID controller	1 (AT)	2 (OS, OK, IV)	1 (AT, AN)	1 (EZ)	1 (RS)	A, B	2
B-RT-2UNyyyyK-2I	Dual-channel PID controller	2 (UN)	4 (OS, OK, IV)	N/A	N/A	N/A	B	2
B-RT-2ATyyyyK-2I	Dual-channel PID controller	2 (AT)	4 (OS, OK, IV)	N/A	N/A	N/A	B	2
B-RT-2UNyyyyK-2ww02-RST-2I	Dual-channel PID controller	2 (UN)	4 (OS, OK, IV)	2 (AT, AN)	N/A	1 (RS)	A, B	2
B-RT-2ATyyyyK-RST-2I	Dual-channel PID controller	2 (AT)	4 (OS, OK, IV)	N/A	N/A	1 (RS)	A, B	2
C1-RT-4UNIVIVK-4ww02-EZA-RST-3I	Quad-channel PID controller	4 (UN)	8 (IV)	4 (AT, AN)	1 (EZ)	1 (RS)	C1	2 + 1
E-RT-4ATIVIVK-EZA-RST-3I	Quad-channel PID controller	4 (AT)	8 (IV)	N/A	1 (EZ)	1 (RS)	E	2 + 1

* - Please insert the case type instead of "z", the output type instead of "yy" and the feedback type instead of "ww" in the model name.

PID controller with analogue control the electric drives and the inverters

	TECHNICAL SPECIFICATIONS							
Model*	Description	Number (type) of inputs	Number (type) of control outputs	Feedback type	Additional output for alarm	RS485 output	Case	Indication
B-RT-UNyyyK-I	Single-channel PID controller	1 (UN)	1 (AV, AM)	N/A	N/A	N/A	B	1
B-RT-ATyyyK-I	Single-channel PID controller	1 (AT)	1 (AV, AM)	N/A	N/A	N/A	B	1
z-RT-UNyyyK-ww02-EZA-RST-2K	Single-channel PID controller	1 (UN)	1 (AV, AM)	1 (AT, AN)	1 (EZ)	1 (RS)	A, B	2
z-RT-ATyyyK-ww02-EZA-RST-2K	Single-channel PID controller	1 (AT)	1 (AV, AM)	1 (AT, AN)	1 (EZ)	1 (RS)	A, B	2
B-RT-2UNyyyK-2I	Dual-channel PID controller	2 (UN)	2 (AV, AM)	N/A	N/A	N/A	B	2
B-RT-2ATyyyK-2I	Dual-channel PID controller	2 (AT)	2 (AV, AM)	N/A	N/A	N/A	B	2
B-RT-2UNyyK-2ww02-RST-2I	Dual-channel PID controller	2 (UN)	2 (AV, AM)	2 (AT, AN)	N/A	1 (RS)	A, B	2
B-RT-2ATyyK-EZA-RST-2I	Dual-channel PID controller	2 (AT)	2 (AV, AM)	N/A	N/A	1 (RS)	A, B	2
C1-RT-4UNyyK-4ww02-EZA-RST-3I	Quad-channel PID controller	4 (UN)	4 (AV, AM)	4 (AT, AN)	1 (EZ)	1 (RS)	C1	2 + 1
E-RT-4ATyyK-EZA-RST-3I	Quad-channel PID controller	4 (AT)	4 (AV, AM)	N/A	1 (EZ)	1 (RS)	E	2 + 1

* - Please insert the case type instead of "z", the output type instead of "yy" and the feedback type instead of "ww" in the model name.

External Setpoint Adjuster

Key Features
- Enables quick adjustment of controller values.
- Suitable for remote manual control using executive devices.
- Generates analog output signals:
  - AV: Supports analog current signals in the range of 0-20 mA, 4-20 mA, and 0-5 mA.
  - AM: Supports analog voltage signals in the range of 0-10 V, and 2-10 V.
- Allows for input quantity scaling.
- Offers optional switching between manual and automatic modes via the generation of an OK discrete signal (open collector 40 V, 30 mA DC).
- Available in case B (96x96x28 mm) with a power supply of 90-242 V AC.

External setpoint adjuster in the case B

	TECHNICAL SPECIFICATIONS				
Model**	Description	Number (type) of control outputs	Additional output to set manual-automatic mode	Case	Indication
B-ZT-yy-I	External setpoint adjuster	1 (AV, AM)	N/A	B	1
B-ZT-yy-OK-I	External setpoint adjuster	1 (AV, AM)	1 (OK)	B	1

** - Please insert the output type instead of "yy" in the model name.

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Single-channel multi-loop controllers with control by the program

Key Features
- Ideal for temperature control through predefined step-by-step programs.
- Supports up to 16 programs, each with 12 configurable steps.
- For each program, users can set program number, step count, start time, hysteresis, and control period.
- Each program step can be customized with specific temperature settings, acceleration time, retention time, and control law.
- Three conditions to advance to the next step: move at a specified speed, move after a set time, or move after a minimum time.
- Manual step progression and program termination options available.
- Non-volatile memory retains all controller settings and program execution progress.
- Single-time auto-adjustment of PID for the entire program.
- Supports different input types:
  - UN: Supports all types of RTD and thermocouple temperature probes.
  - AT: Supports analog current signals in the range of 0-20 mA, 4-20 mA, 0-5 mA.
  - AN: Supports analog current signals in the range of 0-10 V, 2-10 V.
- Accuracy ranges from 0.2 to 1.0 seconds, with quick response times as fast as 0.2 seconds per channel.
- Additional features include input quantity scaling, sensor error compensation, and interference filtering.
- Controller configurations can be accessed securely using a password.
- Offers both normal and inverse hysteresis, output polarity settings, and Cooler and Heater modes.
- Multiple output options available:
  - EZ (short-circuit electromagnetic relay 5 A 220 V AC/DC)
  - EP (switching electromagnetic relay 5 A 220 V AC/DC)
  - IV (voltage 12 V 20 mA DC)
  - OS (optosymistor 220 V 50 mA AC)
  - OK (open collector 40 V 30 mA DC)
  - AV (current 4-20 mA, 0-20 mA, 0-5 mA)
  - AM (voltage 0-10 V, 2-10 V)
- Optional RS output (RS485 output, non-galvanic isolation, T-bus exchange protocol)*.
- Optional additional EZ output (electromagnetic relay 1A 220 V AC/DC) for alarm.
- Available in C1 (96x96x75 mm) and E (96x96x91 mm) cases, with power supply support of 90-242 V AC.

**Multi-loop controller
with control by the program
in the case C1**

TECHNICAL SPECIFICATIONS							
Model**	Description	Number (type) of inputs	Number (type) of control outputs	Additional output for alarm	RS485 output	Case	Indication
C1-RT-UNyyV-RST-3I	Single-channel multi-loop controller	1 (UN)	1 (EZ, EP, OS, OK, IV)	N/A	1 (RS)	C1	2 + 1
E-RT-ATyyV-RST-3I	Single-channel multi-loop controller	1 (AT, AN)	1 (EZ, EP, OS, OK, IV)	N/A	1 (RS)	E	2 + 1
C1-RT-UNyyV-RST-3I	Single-channel multi-loop controller	1 (UN)	1 (AV, AM)	N/A	1 (RS)	C1	2 + 1
E-RT-ATyyV-RST-3I	Single-channel multi-loop controller	1 (AT, AN)	1 (AV, AM)	N/A	1 (RS)	E	2 + 1
C1-RT-UNyyV-EZA-RST-3I	Single-channel multi-loop controller	1 (UN)	1 (EZ, EP, OS, OK, IV)	1 (EZ)	1 (RS)	C1	2 + 1
E-RT-ATyyV-EZA-RST-3I	Single-channel multi-loop controller	1 (AT, AN)	1 (EZ, EP, OS, OK, IV)	1 (EZ)	1 (RS)	E	2 + 1
C1-RT-UNyyV-EZA-RST-3I	Single-channel multi-loop controller	1 (UN)	1 (AV, AM)	1 (EZ)	1 (RS)	C1	2 + 1
E-RT-ATyyV-EZA-RST-3I	Single-channel multi-loop controller	1 (AT, AN)	1 (AV, AM)	1 (EZ)	1 (RS)	E	2 + 1

* - For added convenience in controlling the multi-loop controller, we recommend ordering it along with the TechnologSoft software. This software comes with special features designed to facilitate the operation of the multi-loop controller. You can find more details about these features in the Software section.
** - Please insert the case type instead of "z" and the output type instead of "yy" in the model name.

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Switching DC Power Supplies on DIN rail in the case Z65

The DC power supplies BPI-V1-24/0.3 and BPI-V2-24/1.0 are designed for powering small-capacity electrical loads. These power supplies come in four different configurations: +24 V output, +12 V output, +6 V output, and +5 V output. They are available in a housing designed for DIN rail mounting or in a case Z65. The power supply's output is connected to four separate 2-pin terminals on the coupler, making it easy to connect parallel electrical loads.

Key Features
- Input power supply: 110-242 V AC
- Number of output channels: 4
- Four output voltage options: 24 V DC, 12 V DC, 6 V DC, and 5 V DC *
- Nominal output current: Ranging from 100 mA to 2 A
- Output voltage stability factor: Greater than 200
- Maximum ripple and noise: Up to 50 mV (for case V1) and 80 mV (for cases V1 and Z65)
- Number of galvanic isolation-related outputs: 4 (for V1 and V2 housing), 1 (for case Z65)
- Energy conversion efficiency: Over 75%
- Dimensions: 95 x 52 x 58 mm (for case B1), 95 x 72 x 65 mm (for case B2), 64 x 40 x 30 mm (for case Z65)

BPI-V1-24/0,3

BPI-V2-24/1,0

TECHNICAL SPECIFICATIONS			
Model	Description	Model	Description
BPI-V1-24/0,3	Power supply of 24 V DC with output current of 300 mA in housing on DIN rail	BPI-V21-6/1,2	Power supply of 6 V DC with output current of 1,2 A in housing on DIN rail
BPI-V1-12/0,3	Power supply of 12 V DC with output current of 300 mA in housing on DIN rail	BPI-Z65-24/0,1	Power supply of 24 V DC with output current of 100 mA in Z65 housing
BPI-V21-24/1,0	Power supply of 24 V DC with output current of 1 A in housing on DIN rail	BPI-Z65-12/0,15	Power supply of 12 V DC with output current of 150 mA in Z65 housing
BPI-V21-12/1,0	Power supply of 12 V DC with output current of 1 A in housing on DIN rail	BPI-Z65-5/0,2	Power supply of 5 V DC with output current of 200 mA in Z65 housing

* - Custom power supplies with output voltages of 9 V, 18 V, and 36 V DC can be manufactured upon request.

Relay box in the Z56 case

The BPI-B2-24/1.0 relay box, housed in a case Z56, serves as an intermediary device between low-power output devices such as open collector types or optical keys found in industrial controllers, and active electrical loads with moderate power requirements, capable of handling up to 8 A, such as heaters, contactors, and starters. This relay box enables the switching of up to 6 output devices and can be conveniently mounted either inside an industrial control panel or on a wall.

Key Features
- Output voltage options: 12 V DC or 24 V DC
- Control inputs: 5 or 6 OK or PK with control current exceeding 10 mA
- Outputs: 5 or 6 electromagnetic relays with normally open contacts, rated at 8A, 220 V AC
- Protection against reverse polarity of the input voltage
- Dimensions: 88 x 63 x 42 mm (case Z56)

BR-6-12V

TECHNICAL SPECIFICATIONS	
Model	Description
BR-Z56-6-24V	Relay box with 6 relay outputs of V 8 A DC
BR-Z56-6-12V	Relay box with 6 relay outputs of 12 V 8 A DC
BR-Z56-5-12V	Relay box with 5 relay outputs of 12 V 8 A DC

Network filter FS-1/4

The FS-1/4 network filter is designed to reduce interference in the 220 V, 50 Hz electrical network.

Key Features
- Voltage filtering: 220 V, 50 Hz
- Number of channels: 14
- Maximum current capacity: 1st and 2nd channels - 0.2 A; 3rd and 4th channels - 0.1 A *
- Ripple and noise (max): up to 50 mV (case V1) and 80 mV (cases V1 and Z65)
- Number of outputs with galvanic isolation: 4 (cases V1 and V2), 1 (case Z65)
- Energy conversion efficiency: over 75%
- Ingress protection: IP20
- Dimensions: 70x90x58 mm (case V21)

FS-1/4

TECHNICAL SPECIFICATIONS	
Model	Description
FS-1/4	Network filter

* - The 1st and 2nd channels are equipped with built-in current protection set at 150 mA.

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Power supply industrial control panels are designed for the control of various environmental control devices such as air handling units, fans, steam generators, water pumps, electrical heaters, chillers, and more. These panels effectively convert low-power input signals received from digital controllers into high-power output signals for energy-intensive electrical devices. They offer isolation and electromagnetic field (EMF) protection for signal and power supply lines.

Industrial control panels are constructed with sealed metal or plastic housings, equipped with control and indicator components. The selection of power components (triacs, solid-state relays, contactors, starters, circuit breakers, frequency converters, automatic switches) is customized based on the specific requirements and preferences of the customer.

TERA company specializes in the design and manufacturing of industrial control panels. They provide comprehensive technical documentation, including circuit diagrams, external connection diagrams, cable lists, material specifications, product passports, and manuals. Additionally, TERA offers installation services and provides consultation and training for operational staff to ensure efficient and reliable control panel operation.

Key Features

- Control environmental equipment such as air handling units, steam generators, air dampers, fans, water pumps, and electrical heaters.
- Provide power supply and decoupling functions.
- Offer overcurrent and thermal protection for electric motors.
- Ensure protection against short circuits and electromagnetic interference (EMF).
- Include both sound and light alarm signals.
- Provide automatic backup power supply.
- Allow for the control of power units in setting mode.
- Enable switching between operating modes using front panel buttons or switches.

**Power supply
industrial control panel**

Samples of industrial control panel

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PJSC TERA maintains its own engineering team, responsible for the installation and commissioning of equipment at customer facilities. Our team members undergo extensive engineering training, possess a deep understanding of safety regulations related to commissioning activities, and hold the required certifications for occupational safety

The work performed at customer facilities is typically divided into several key stages:

- **Cabling:** This involves the installation of the necessary cables and wiring infrastructure.
- **Equipment Installation and Connection:** Our team installs and connects the equipment according to specifications.
- **Software Installation and Configuration:** We set up and configure the required software to ensure seamless operation.
- **Staff Training:** We provide training to your staff on the operation and maintenance of the installed equipment.
- **Validation Procedure:** Our experts conduct validation procedures to ensure that the equipment meets the required standards and functions as expected.

The number of engineers deployed to a customer's facility may vary depending on the specific stage of work, ranging from installers to validation experts. We are committed to delivering top-notch service and support throughout the commissioning process.

Once the system is completed, it undergoes a thorough inspection and is accepted for warranty and post-warranty technical maintenance, which is formalized through an appropriate contract. Our technical support service uses a monitoring system to efficiently serve our customers. This service also has the capability to connect to the customer's system through the internet, enabling us to promptly address and resolve any technical issues that may arise.

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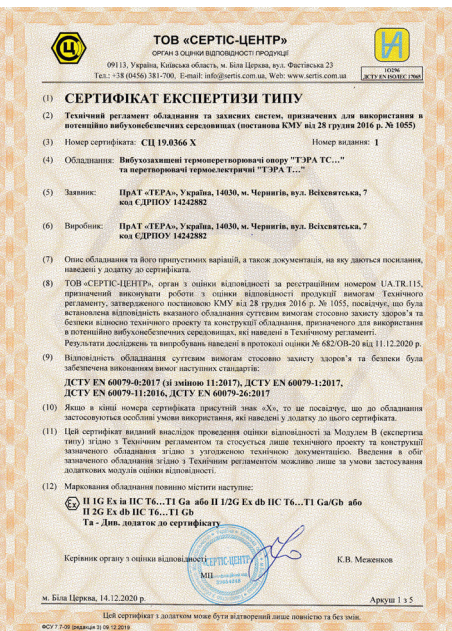
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Сертифікат перевірки типу, модуль В
Техрегламент законодавчо
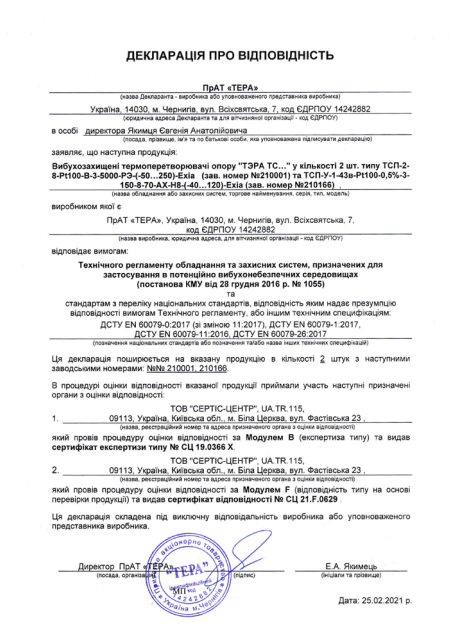регульованих ЗВТ для DLT

Сертифікат відповідності, модуль В
Техрегламент законодавчо
регульованих ЗВТ для DVT

Сертифікат ISO 9001:2015
на систему управління якістю

Сертифікат перевірки типу, модуль В
Техрегламент законодавчо
регульованих ЗВТ для вибухозахищених датчиків

Декларація про відповідність
для вибухозахищених датчиків

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