SCIENTIFIC AND PRODUCTION ASSOCIATION

"THERMOPRYLAD"

CATALOGUE

Temperature measurement and control instruments

LVIV

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

Quality Austria
has issued an IQNet recognized certificate that the organization:

Private joint-stock Company “Scientific and Production Association "Thermoprylad" named after V. Lakh” (PJSC "Thermoprylad")
Ukraine, 79060, Lviv, Naukova str. 3

for the following scope:

Development, manufacturing, delivery and modernization of items for measurement and control of temperature, including for nuclear power

EAC: 19

has implemented and maintains a

QUALITY MANAGEMENT SYSTEM

which fulfils the requirements of the following standard

ISO 9001:2015

Issued on:	2018-07-25
Validity date:	2021-07-24
Quality Austria certified since:	2018-07-25

This attestation is directly linked to the IQNet Partner's original certificate and shall not be used as a stand-alone document

Registration Number: AT-20908/0

Signatures removed for security reasons

IQNet — *Alex Stoichitoiu, President of IQNet*

Mag. Friedrich Khuen-Belasi, Authorised Representative of Quality Austria — qualityaustria, Succeed with Quality

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CERTIFICATE

Quality Austria - Trainings, Zertifizierungs und Begutachtungs GmbH awards this **quality**austria certificate to the following organisation:

This **quality**austria certificate confirms the application and further development of an effective

Private joint-stock Company "Scientific and Production Association "Thermoprylad" named after V. Lakh" (PJSC "Thermoprylad")
Ukraine, 79060, Lviv, Naukova str. 3

QUALITY MANAGEMENT SYSTEM
complying with the requirements of standard
ISO 9001:2015

Development, manufacturing, delivery and modernization of items for measurement and control of temperature, including for nuclear power

Registration No.: 20908/0
Date of initial issue: 25 July 2018
Valid until: 24 July 2021

The validity of the **quality**austria certificate will be maintained by annual surveillance audits and one renewal audit after three years.

Vienna, 25 July 2018

Quality Austria - Trainings, Zertifizierungs und Begutachtungs GmbH,
AT-1010 Vienna, Zelinkagasse 10/3

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Konrad Scheiber
General Manager

Dr. Mag. Anni Koubek
Specialist representative

Quality Austria - Trainings, Zertifizierungs und Begutachtungs GmbH is accredited according to the Austrian Accreditation Act by the BMWFW (Federal Ministry of Science, Research and Economy).

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The current validity of the certificate is documented exclusively on the Internet under http://www.qualityaustria.com/en/cert EAC: 19

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МІНІСТЕРСТВО ЕКОНОМІЧНОГО РОЗВИТКУ І ТОРГІВЛІ УКРАЇНИ
ДЕРЖАВНЕ ПІДПРИЄМСТВО
"ЛЬВІВСЬКИЙ НАУКОВО-ВИРОБНИЧИЙ
ЦЕНТР СТАНДАРТИЗАЦІЇ, МЕТРОЛОГІЇ ТА СЕРТИФІКАЦІЇ"

СВІДОЦТВО ПРО АТЕСТАЦІЮ

№ РД 056/14 Видано 12 травня 2014 року
Чинне до 12 травня 2019 року

Це свідоцтво засвідчує, що лабораторія надійності і комплексних випробувань ПАТ «НВО «Термоприлад»
(79060, м. Львів, вул. Наукова, 3)
(повна назва та адреса)
відповідає критеріям атестації і атестований(а) на проведення вимірювань у сфері та поза сферою поширення державного метрологічного нагляду згідно галузі атестації.

Галузь атестації наведена в додатку до цього свідоцтва і є його невід'ємною частиною.

Керівник органу з атестації генеральний директор О.В. Косінський

Сертифікат

Нормативні перевірки: ISO 9001:2008

Реєстр. № сертифікату 01 100 1319545

TÜV Rheinland Cert GmbH засвідчує:

Держатель сертифіката: Публічне акціонерне товариство "Науково-виробниче об'єднання «Термоприлад» ім. В. Лаха"
вул. Наукова, 3
79060, м.Львів
Україна

Галузь: Розроблення, виготовлення, поставлення та модернізація виробів для вимірювання і контролю температури, в т.ч. для атомної енергетики.

Перевірочний аудит. № звіту 1319545, підтвердив, що вимоги ISO 9001:2008 виконані.

Чинність: Цей сертифікат дійсний з 2014-11-05 по 2017-11-05.

2014-12-02

TÜV Rheinland Cert GmbH
Am Grauen Stein · 51105 Köln

DAkkS Deutsche Akkreditierungsstelle D-ZM-16031-04-00

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Precisely Right.

МІНІСТЕРСТВО ЕНЕРГЕТИКИ ТА ВУГІЛЬНОЇ ПРОМИСЛОВОСТІ УКРАЇНИ НАЦІОНАЛЬНА АТОМНА ЕНЕРГОГЕНЕРУЮЧА КОМПАНІЯ
ЕНЕРГОАТОМ

УТВЕРЖДАЮ
Первый вице-президент – технический директор
А.В. Шавлаков
«13» 09 2013 г.

РЕШЕНИЕ ОБ УТВЕРЖДЕНИИ ПОСТАВЩИКА
№ РШ-П 0.03.093-13

На основании результатов оценки закрытого акционерного общества «Научно-производственное объединение «Термоприлад» им. В.Лаха» (далее – «ЗАО «НПО «Термоприлад»), расположенного по адресу: Украина, 79060 г.Львов, ул. Научная, 3

РЕШИЛИ:

1. **Утвердить «ЗАО «НПО «Термоприлад» в качестве поставщика ГП «НАЭК «Энергоатом»** и, при условии его выбора в установленном порядке, предоставить ему право осуществлять для ГП «НАЭК «Энергоатом» и его обособленных подразделений следующие виды деятельности:
   - изготовление и поставка продукции, указанной в приложении А к данному решению;
   - сервисное обслуживание и авторское сопровождение термометрического оборудования для АЭС.
2. **Объем поставок** – согласно контрактам.
3. **Срок действия решения**: до 20.09.2016 г.
4. **Представительства поставщика, имеющие право поставлять его продукцию:** отсутствуют.
5. **Основание для принятия решения:**
   - оценка поставщика, выполненная комиссией Дирекции ГП «НАЭК «Энергоатом» 16-20 сентября 2013 года методом документальной проверки;
   - отчет об оценке поставщика ОЧ-П 0.03.093-13, утвержденный Первым вице-президентом - техническим директором.
7. **Дополнительные условия и ограничения:**
   - поставщик должен своевременно информировать ГП «НАЭК «Энергоатом» о существенных изменениях, влияющих на качество его продукции и оказываемых услуг (об изменении формы собственности, смене руководства предприятия, освоении новых видов продукции).

СОГЛАСОВАНО:

Исполнительный директор по качеству и управлению С.А. Попов «18» 09 2013 г.

Директор по организации входного контроля А.И. Демьяненко «23» 09 2013 г.

Dear Sirs,

Scientific and Production Association "THERMOPRYLAD" named after V. Lakh was established in 1956 and is a specialized company for the development and production of temperature control devices and systems.

We would like to call your attention to a new version of our catalogue.

Here you will find the information on control devices for the temperature from minus 200 up to 2500 °C:

- Thermocouple of resistance (resistance thermometers);
- thermoelectric Couples (thermocouples);
- thermocouples with unified signal;
- digital thermometers including portable ones;
- temperature regulators, alarm devices;
- pyrometric transformers and pyrometers;
- hygrometers and humidity regulators;
- other devices and tools (measuring transducers, spark protection barriers, compensation devices, junction boxes, reference and other metrological supplies, etc.).

This catalogue of measuring instruments (MI) for temperature control does not cover the entire range of devices released by our Association.

Many years of experience, high professionalism of our team, the use of the completing units of famous world firms allows us to constantly expand and modernize the nomenclature of new MI.

Our Association manufactures temperature control MI, that replace foreign ones, as well as MI of non-standard and old (discontinued from production) grading.

All MI for temperature control are subjected to acceptance tests, calibration in the calibration laboratory of the Association or check-out. Terms of delivery are stipulated by a contract.

Most of the serially released MI is listed in the State Register of Ukraine and has the Pattern Approval Certificates. Declarations of Conformity are issued for the MI subject to technical regulations.

The quality management system has been implemented and certified at the enterprise in accordance with ISO 9001: 2008.

We are able to satisfy all your requests and requirements and to provide all the necessary services related to the temperature control.

We look forward to mutually beneficial cooperation with you.

With best regards,

General Director N. Guk

General Information

1. Thermocouple of resistance

Thermocouple of resistance manufactured by the enterprise meet the following standards:

ДСТУ IEC 60751: 2012;

ДСТУ ГОСТ 6651: 2014.

Below is a brief summary on the types of Thermocouple of resistance, conventional indication of their nominal static conversion characteristics NSC), tolerance classes, tolerances (maximum permissible deviations from NSC), and measuring ranges, circuit diagrams of internal wires.

Designation of type, temperature coefficients and tolerance classes of Thermocouple of resistance and sensing elements

Thermocouple of resistance type	Designation	α, ° C^{-1}	Tolerance class		
			For wire-wound sensing elements (SE)	For film-type SE	For thermocouple of resistance
Platinum	Pt	0,00385	W0.1, W0.15, W0.3, W0.6	F0.1, F0.15, F0.3, F0.6	AA, A, B, C
	П*	0,00391	AA, A, B, C	AA, A, B, C	AA, A, B, C
Copper	M*	0,00428	A, B, C	-	A, B, C
Nickel	H	0,00617	C	-	C
* When exporting the designation of П type is changed for Pt(391), M for Cu					

Conventional designator of the nominal static conversion characteristic (NSC) for Thermocouple of resistance

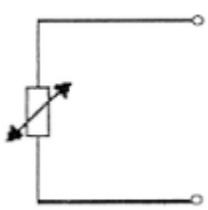
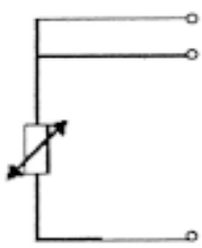
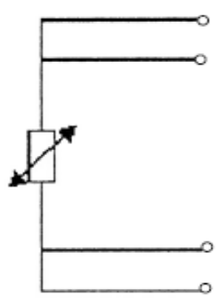
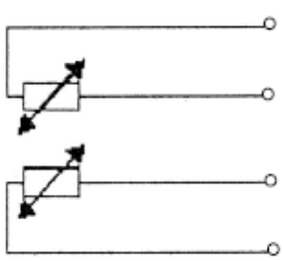
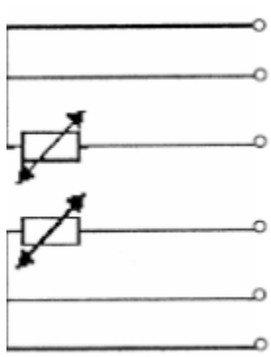
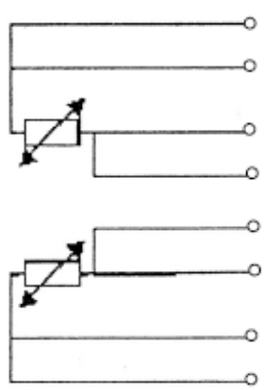
Thermocouple of resistance type	Nominal resistance value with 0° C, R_0, O	Conventional designator of NSC*		
		α=0,003851 °C^{-1}	α=0,00391 °C^{-1}	
			Domestic market	For export
Platinum	10 50 100 500 1000	Pt10 Pt50 Pt100 Pt500 Pt1000	10П 50П 100П 500П 1000П	Pt(391)10 Pt(391)50 Pt(391)100 Pt(391)500 Pt(391)1000
Copper	50 100	-	α =0,00428 °C^{-1}	
			50M 100M	Cu50 Cu100
* At the customer's request it is possible to produce thermocouple of resistance from NSC gr. 21 with α =0,00391 °C^{-1}; gr. 23, 50M, 100M with α =0,00426 °C^{-1}.				

Tolerances and measurement ranges

for Thermocouple of resistance and sensing elements

Tolerance class	Tolerance, °C	Measurement range, °C			
		Platinum		Copper thermocouple of resistance, SE	Nickel thermocouple of resistance, SE
		For wire-wound sensing elements (SE)	For film-type SE		
AA W0.1 F0.1	±(0.1+0.0017|t|)	from -50 to +250	from 0 to +150	-	-
A W0.15 F0.15	±(0.15+0.002|t|)	from -100 to +450	from -30 to +300	from -50 to +120	-
B W0.3 F0.3	±(0.3+0.005|t|)	from -196 to +660	from -50 to +500	from -50 to +200	-
C W0.6 F0.6	±(0.6+0.01|t|)	from -196 to +660	from -50 to +600	from -180 to +200	from -60 to +180
Note - |t| - absolute temperature value.					

Scheme of internal wires connections for Thermocouple of resistance *

Number of SE	Two-wire circuit	Three-wire circuit	Four-wire circuit
1			
2			

***** Marking of terminals (wires) is made in digital, color or other way.

2. Thermoelectric couples

Thermoelectric Couples made by the enterprise meet the following standards:

ДСТУ IEC 60584-1: 2009;

ДСТУ IEC 60584-2: 2009;

ДСТУ 2837-94 (ГОСТ 3044-94);

ДСТУ 2857 (ГОСТ 6616-94)

Below is a brief summary on the types of the most used thermoelectric couples, their nominal static conversion characteristics (NSC) and tolerance classes.

Letter designation of nominal static conversion characteristic (NSC) for thermoelectric Couples (TC)

Type of TC	Letter designation of NSC	Temperature measuring range for long-term use, °C	Limit temperature for short-term use, °C
ТПП-13 Platinum Rhodium - Platinum (Platinum - 13 %)	R	0 - 1300	1600
ТПП-10 Platinum Rhodium - Platinum (Platinum - 10%)	S	0 - 1300	1600
ТПР Platinum Rhodium - Platinum Rhodium	B	600 - 1600	1700
ТНН Nichrosil-Nisil	N	minus 270 - 1200	1300
ТХА Chromel - Alumel	K	minus 270 - 1200	1300
ТХК Chromel - Kopel	L	minus 200 - 600	800
ТВР Wolfram-Rhenium Wolfram-Rhenium	A-1 A-2 A-3	0 - 2200 0 - 1800 0 - 1800	2500

Tolerance classes for (TC)

Types	Tolerance class 1	Tolerance class 2	Tolerance class 3
Type R, type S			
Temperature rage	from 0°C to 1100°C	from 0°C to 600°C	-
Tolerance value	±1°C	±1,5°C	-
Temperature rage	from 0°C to 1600°C	from 600°C to 1600°C	-
Tolerance value	±[1+0,003(t-1100)]°C	±0,0025°C	-
Type B			
Temperature rage	-	-	from 600°C to 800°C
Tolerance value	-	-	±4°C
Temperature rage	-	from 600°C to 1700C	from 800°C to 1700°C
Tolerance value	-	±0,0025x|t|	±0,005x|t|
Type K, type N			
Temperature rage	from - 40°C to 375°C	from - 40°C to 333°C	from -167°C to 40°C
Tolerance value	±1,5°C	±2,5°C	±2,5°C
Temperature rage	from 375°C to 1000°C	from 333°C to 1200°C	from -200°C to -167°C
Tolerance value	±0,004x|t|	±0,0075x|t|	±0,015x|t|
Type L			
Temperature rage	-	from -40°C to 300°C	from -100°C to 100°C
Tolerance value	-	±2,5°C	±2,5°C
Temperature rage	-	from 300°C to 800°C	from -200°C to -100°C
Tolerance value	-	±0,0075x|t|	±0,015x|t|
Type A-1, A-2, A-3			
Temperature rage	-	from 1000°C to 2500°C	from 1000°C to 2500°C
Tolerance value	-	±0,005x|t|	±0,007x|t|

Table of steel conformity

Steel grade	EN	AISI
08Х13	1,400	403
12Х18Н10Т	1,4541	321
08Х18Н10Т	1,4541	321
08Х18Н12Б	1,4550	347
10Х17Н13М2Т	1,4571	(316 Ti)
20Х13	1,4021	420
15Х25Т	1,4746	446
ХН45Ю	-	-

Procedure of order, payment and receipt of products

To order measuring instruments (MI) of temperature control it is necessary to send a written order to the Private Joint-Stock Company “Scientific and Production Association "THERMOPRYLAD":

- by post: 3, Naukova str., Lviv, 79060;

- by fax: +38(032) 263 13 61;

- by e-mail: thermo@mail.lviv.ua

with the specification of the MI, which indicates full technical specifications, quantity, terms of shipping (by mail, rail, "Nova Poshta", UPS, EMS, etc.), as well as all postal, payment details for MI shipping, contact telephone numbers and surname of the customer for contact calls to him.

On the basis of the customer's order, we issue an invoice for 100% prepayment, taking into account all taxes established in Ukraine, cost of packing materials, transportation tariffs (if the order does not specify "self-delivery" or delivery on the terms of EXW) and customs clearance (for export).

Products of the Association are sent to the customer on terms specified in the order within 5-30 days from the date of payment, depending on the type and number of devices.

In the order for Thermocouple of resistance and thermoelectric couple, it is necessary to specify:

Type	NSC	Fig.	Temperature measuring range, °C	Scheme of connections	Class	Mounting length L, mm	Protective armature material, number of SE	Insulation of working end (for ТХА/ТХК)	Number, pcs.
Examples									
ТСП-1088	50 П	1	minus 200-450	Three-wire circuit	A	160	12Х18 Н10 Т	-	5
ТХА-2088	К	2	minus 50 - 600	-	2	320	12Х18 Н10Т; 2 sensing elements	(non) insulated	10

In the order for pyrometers it is necessary to specify:

a) for portable pyrometers:

- working range, °C;

- indicator of visibility (minimum distance of the pyrometer from the object of measurement and the minimum size of the object of measurement);

- ambient temperature;

- brief description of the technological process.

b) for stationary pyrometers:

- operating range, °C (from ... to ...) in the interval;

- control temperature (if required);

- analogue signal level (0 - 5 mA or 4 - 20 mA);
- minimum distance of the primary pyrometric converter from the object of measurement;
- minimum linear dimension of the object of measurement;
- distance from the primary pyrometric converter to the measuring transducer (cable length);
- ambient temperature in the zone where the primary pyrometric converter is installed (presence of cooling device);
- object of measurement: oven, bath, inductor, presence of a window or opening (its diameter), other;
- brief description of the technological process;
- type of registrar (if used);
- distance from the measuring transducer to the computer (RS-interface type).

In the order for regulators and alarm devices it is necessary to specify:
- sensor type;
- output (relay, semistor, etc.);
- need of output for an alarm signal;
- communication with the computer;
- work in the program mode;
- supply voltage.

In the order for thermocouples with a standardized output signal it is necessary to specify:
- type;
- temperature range, °C (from ... to ...);
- type of output signal;
- length of the working part;
- presence of the fitting.

In the order for thermocouples with unified signal:
- type of NSC;
- type of the casing;
- power parameters.

The order should also include:
- full name of the enterprise (company) of the customer;
- legal address;
- postal address;
- code EDRPOU (code in accordance with the Unified State Register of Enterprises and Organizations of Ukraine);
- Extract from the Register of VAT Payers;
-individual tax number;
- fax number;
- telephone number;
- surname, name, patronymic of the customer.

Notes for consumers

In order to determine which temperature sensor you would need, a number of factors should be considered.

If you need to measure a temperature which doesn't exceed 200 ° C by platinum THERMOCOUPLE OF RESISTANCE, you should specify it in the order, because the outputs of the sensitive element, as well as the conductors from the sensitive element to the output terminals of thermocouple of resistance, the solder material can be made of cheaper materials, which affects the price of the device.

Therefore, you need to specify the upper range of measured temperatures in the order.

Similarly, it is necessary to indicate the actual maximum measured temperature with thermoelectric couples, since the price of the protective armature for sensors made from high temperature steel grades 15X25T, XH45Ю is more than two to three times higher than the price of conventional steels.

We manufacture temperature control devices with different NSC, and also constantly develop new types.

Therefore, we would ask you to send all your preferences on the process of operation to our address:

Private Joint-Stock Company "Scientific and Production Association "THERMOPRYLAD".

3, Naukova str., Lviv, 79060, Ukraine

Tel. +38(032) 263 03 08

+38(032) 263 21 14

Fax:+38(032) 263 13 61

website: www.thermo.lviv.ua

e-mail: thermo@mail.lviv.ua

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THERMOCOUPLE OF RESISTANCE OF WIDE SPREAD APPLICATION

THERMOCOUPLE OF RESISTANCE
ТСП-1088 (ТУ 25-7363.042-90),
ТСМ-1088 (ТУ 25-7363.032-89)

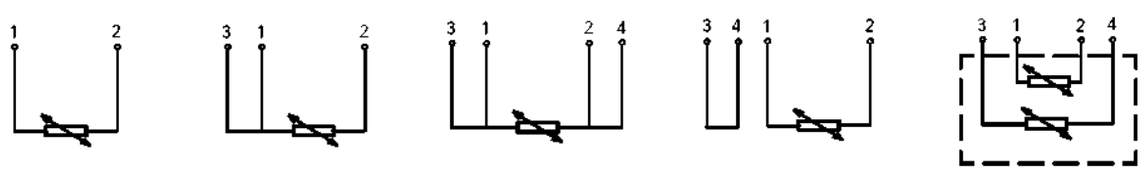
Designed for measuring temperature of liquid and gaseous medium.

Operational range of measured temperatures, ° С:

for ТСП-1088	**from minus 200 to 500**
for ТСМ-1088	**from minus 50 to 150**
Designation of NSC	
for ТСП-1088	**10П, 50П, 100П, 500П, Pt50, Pt100, Pt500, Pt1000**
for ТСМ-1088	**50М, 100М**
Tolerance class:	
for ТСП-1088	**A, B**
for ТСМ-1088	**A, B, C**
Number of sensing elements:	
for ТСП-1088	**1 or 2**
for ТСМ-1088	**1**
Nominal pressure of measured medium Pnom, MPa:	
for figure 1, 6	**10**
for figure 3, 4	**6,3**
for figure 2, 5	**0,4**
Material of protection fitting:	
for ТСП-1088	**12Х18Н10Т, Х23Ю5**
for ТСМ-1088	**12Х18Н10Т,**
Material of thermocouple head:	**press material АГ-4В, propylene**

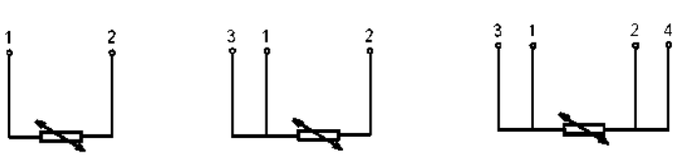
Thermocouples can be completed with
figure 1,6 with Pnom= 25 mPa with protective cartridge 5Ц4.819.015
figure 2,5 with Pnom= 0.4 mPa with 5Ц4.473.002
figure 3,4 with Pnom= 50 mPa with protective cartridge 5Ц4.819.016

The length of the assembling part L. of a thermocouple of resistance should be chosen out of the options below:
100, 120, 160, 200,250, 320, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150mm
On the request of the customer the length of the assembling part can be different from the above.



for the double element

for ТСП-1088



for ТСМ-1088

Schematic representation of connections

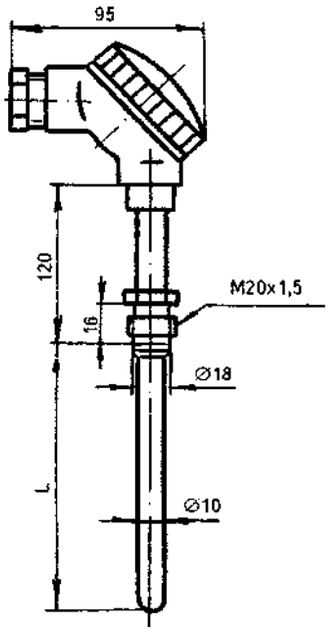


Figure 1

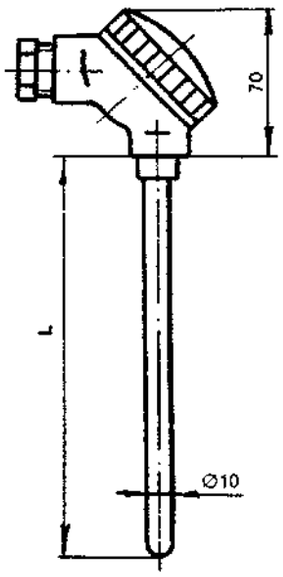


Figure 2

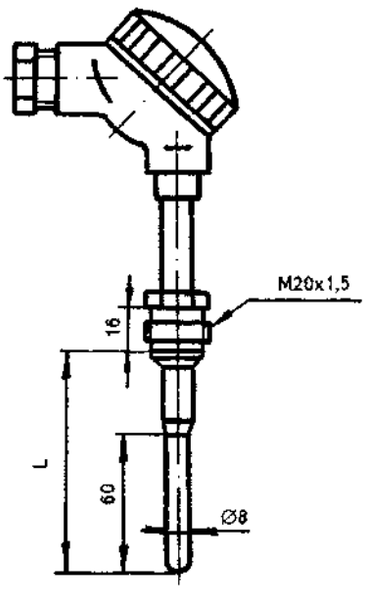


Figure 3

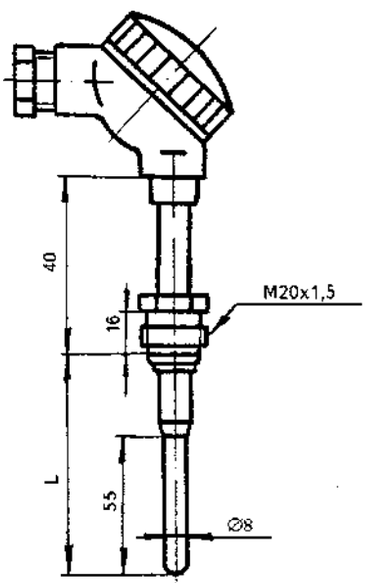


Figure 4

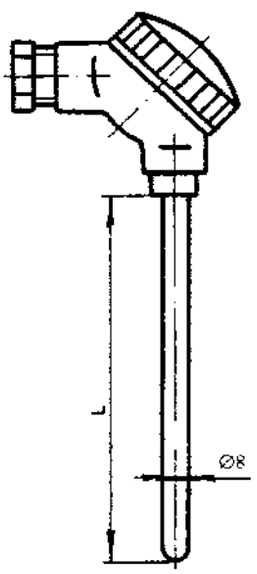


Figure 5

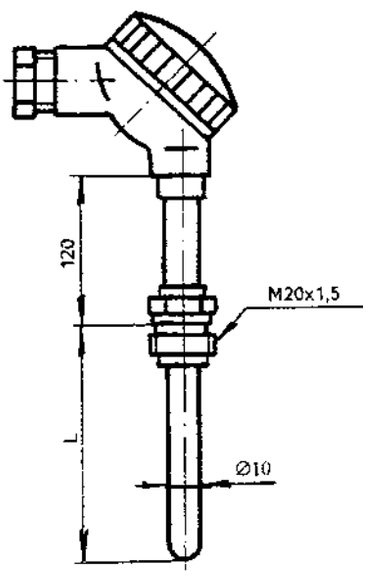


Figure 6

THERMOCOUPLE OF RESISTANCE

ТСП-1187 (ТУ 25-7363.036-90),
ТСМ-1187 (ТУ 25-7363.036-89)

Designed for measuring temperature of liquid and gaseous medium in explosive hazardous zones, which may contain ammonia, hydronitric mixture, carbon dioxide, natural or converted gas or its components and as well aggressive impurities of hydrogen sulphide (H2S), sulphuric anhydride (SO2).

Thermocouple of resistance have the non-explosive level of explosion protection “explosive-proof enclosure” and explosion protection marking “1ExdIICT6”.

Operational range of measured temperatures, °C:	
for ТСП-1187 (figure1, 4)	from minus 50 to 200
for ТСП-1187 (figure2, 5)	from minus 200 to 500
for ТСМ-1187 (figure 3, 4)	from minus 50 to 150
Designation of NSC:	
for ТСП-1187	50П, 100П, Pt50, Pt100
for ТСМ-1187	50М, 100М, 2000М
Tolerance class	B
Number of sensing elements:	
for ТСП-1187	1 or 2
for ТСМ-1187	1
Nominal pressure of measured medium Pnom, MPa:	
for ТСП-1187 (figure4,5), ТСМ-1187 (figure 4)	1
for ТСП-1187 (figure2), ТСМ-1187 (figure 3)	16
for ТСП-1187 (figure1, d = 6,5 mm)	25
for ТСП-1187 (figure1, d = 6 mm)	32
Material of protection fitting:	
for ТСП-1187 (figure 1)	steel 12Х18Н10Т, 10Х17Н13М2Т or alloy ВТ1-0
for ТСП-1187 (figure 2)	steel 12Х18Н10Т
for ТСП-1187 (figure 4, 5)	steel 10Х17Н13М2Т
for ТСМ-1187 (figure 3, 4)	10Х17Н13М2Т
Material of thermocouple head	press material АГ-4В

Thermocouples of resistance of ТСП type are made in accordance with the figures 1,2,4,5, Thermocouple of resistance of ТСМ type - in accordance with the figures 3,4

Length, L, mm:	
for ТСП-118	from 80 to 2000
for ТСМ-1187	from 120 to 2000
l, mm for ТСП-1187 (figure 1)	40 or 45
Diameter, D, mm for ТСП-1187 (figure 1)	8 or 10
Diameter, d, mm for ТСП-1187 (figure 1)	6 or 6,5

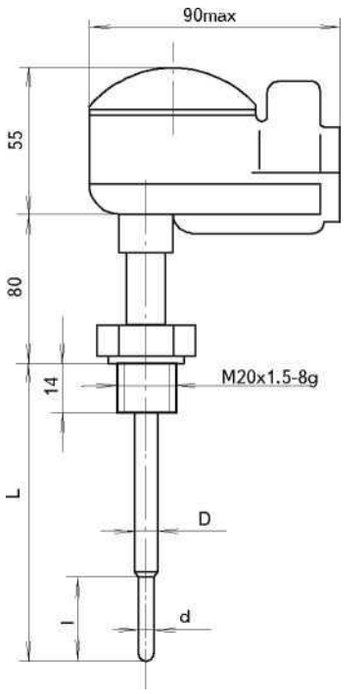


Figure 1

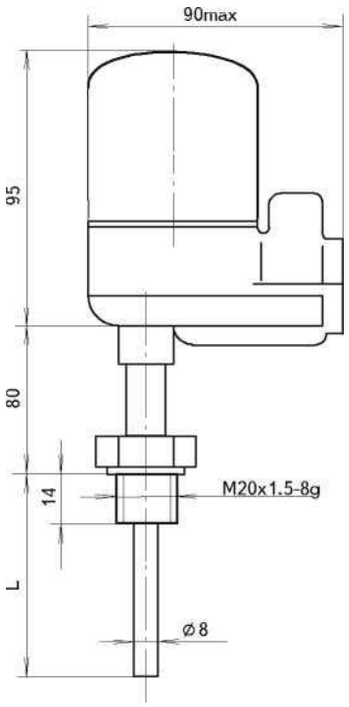


Figure 2

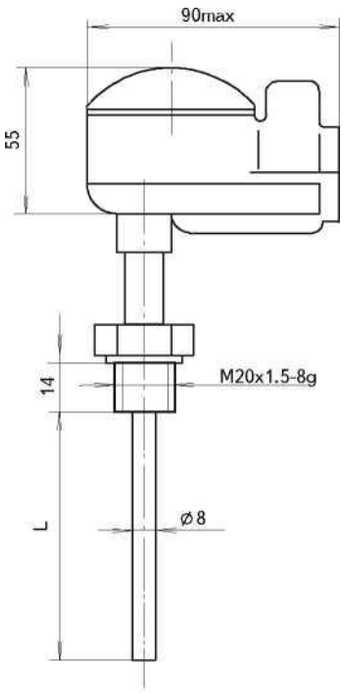


Figure 3

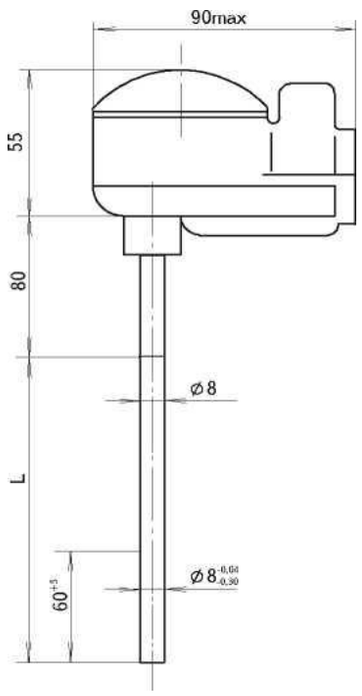


Figure 4

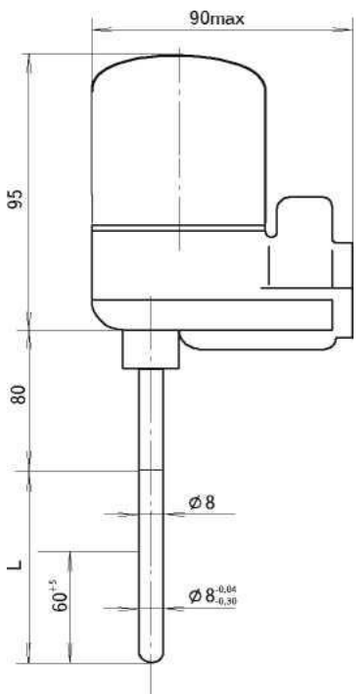
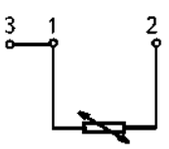
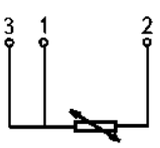


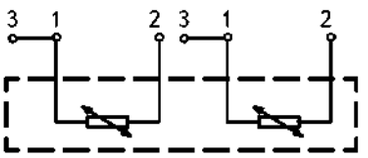
Figure 5



2 - for figure 1, 3, 4



3 - for figure 1, 3, 4



2 - for figure 2, 5 (double)

Schematic representation of connections

THERMOCOUPLE OF RESISTANCE

ТСМ-1188 (ТУ 25-7363.032-89)

Designed for measuring temperature of liquid and gaseous medium in blast-furnace surface.

Operational range of measured temperatures, °C	from minus 50 to 150
Designation of NSC	50M, 100M
Tolerance class	B, C
Nominal pressure of measured medium Pnom, MPa:	
for figure 1	0,4
for figure 2, 3	6,3
Material of protection fitting:	steel 12X18H10T
Material of thermocouple head	aluminium alloy

Thermocouples can be completed with
figure 1with Pnom= 0.4 mPa with mobile fitting
figure 2 with Pnom= 25 mPa with protective cartridge 5Ц4.819.015
figure 3 with Pnom= 50 mPa with protective cartridge 5Ц4.819.016

The length of the assembling part L. of a thermocouple of resistance should be chosen out of the options below:
120; 160; 200; 250; 320; 400; 500; 630; 800; 1000; 1250; 1600; 2000; 2500; 3150 mm.

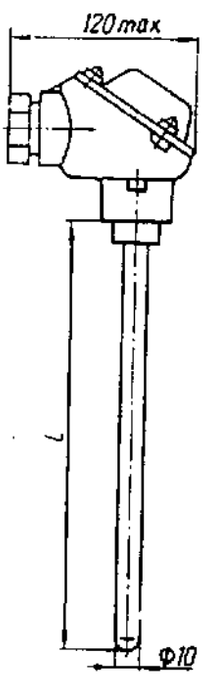


Figure 1

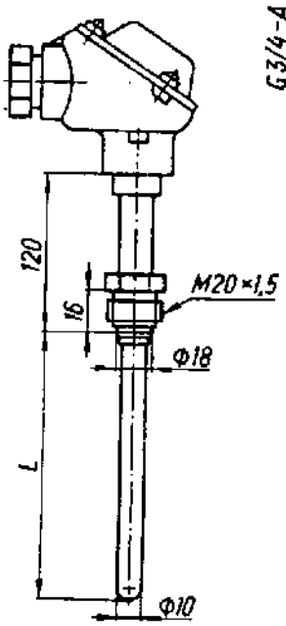


Figure 2

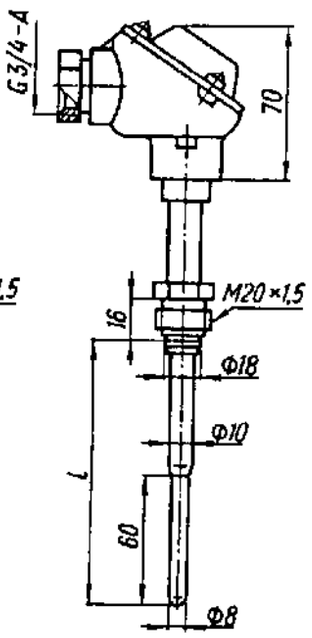
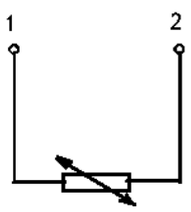


Figure 3



Schematic representation of connection

THERMOCOUPLE OF RESISTANCE
ТСП-1287 (ТУ 25-7363.028-89)

Designed for measuring temperature of liquid and gaseous medium in chemical and gas industry, in cryogenic engineering.

Operational range of measured temperatures, °C:	
for figure 1	**from minus 220 to 500**
for figure 2	**from minus 50 to 200**
for figure 3	**from minus 220 to 200**
for figure 4, 5	**from 0 to 500**
Designation of NSC	**50П, 100П, Pt50, Pt100**
Tolerance class	**A, B**
Material of protection fitting	**steel 12Х18Н10Т**
Length of the assembling part, L, mm	**from 80 to 500**
Material of thermocouple head:	
for figure 1	**aluminium alloy steel**
for figure 4	**12Х18Н10Т**
Protection grade of outside part from dust and water:	
for figure 1, 3, 4	**IP54**
for figure 2	**IP20**
for figure 5	**IP00**
Resistance to mechanical influence	**vibration-proof**
Nominal pressure of measured medium Pnom, MPa:	
for the length of assembling part L from 80 to 250 mm	**25**
for the length of assembling part L from 320 to 500 mm	**2,5**

The construction of Thermocouple of resistance ТСП-1287 (fig.4) is block-modular and is completed with armatures БАУИ 408721.015, БАУИ 408721.016, БАУИ 408721.019 and БАУИ 408721.020.

ТСП-1287(fig.5) in block-modular Thermocouple of resistance the replaceable thermometric inserts are used.

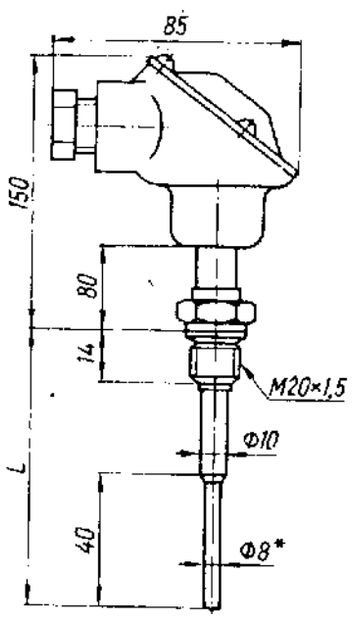


Figure 1

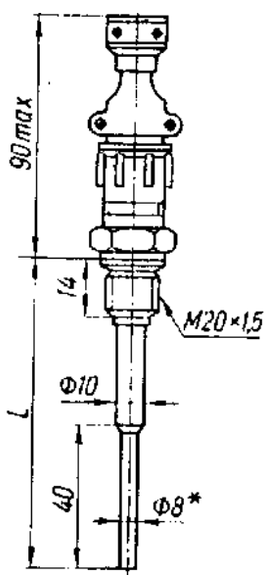


Figure 2

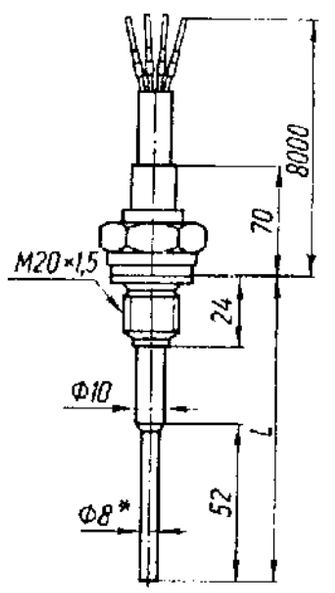


Figure 3

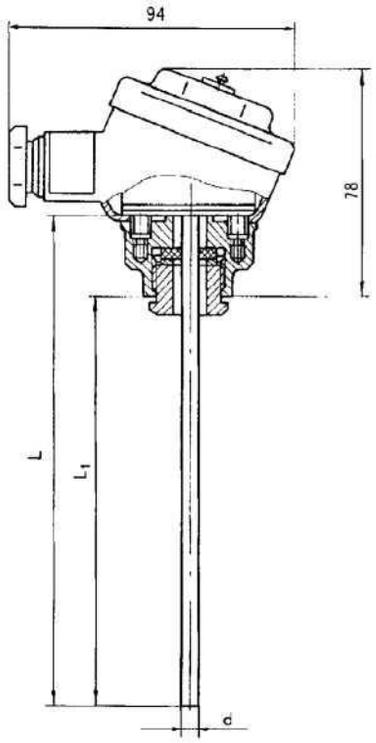


Figure 4

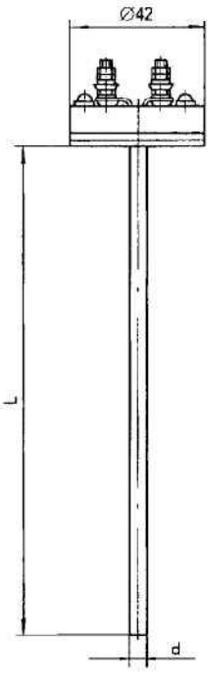
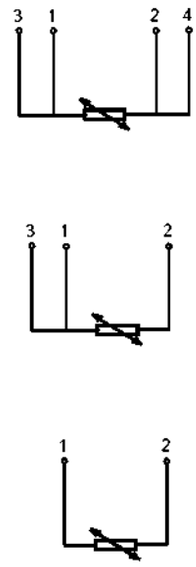


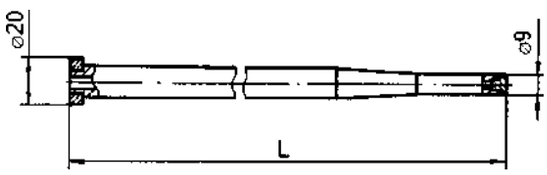
Figure 5



Schematic representation of connection

ARMATURE БАУИ.408721.015

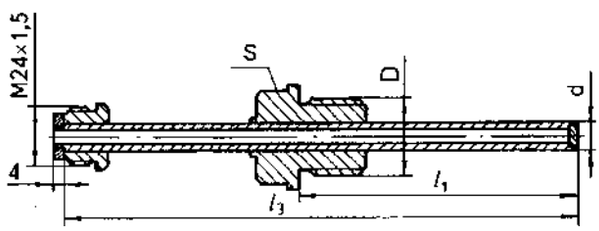
Material - steel 12Х18Н10Т



L, mm	307	367	4К7

ARMATURE БАУИ.408721.016

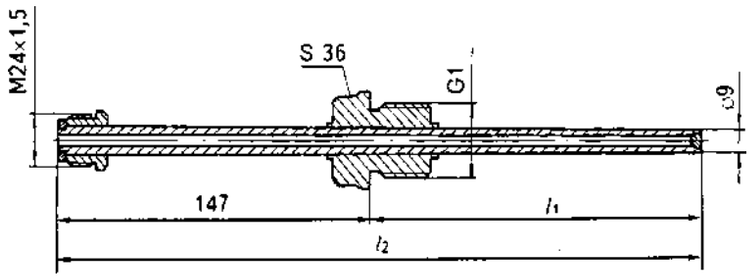
Material - steel 12Х18Н10Т



1c, mm	*Iз*	D	S , mm	d
160	305	G1/K	К4	9
250	395			
400	545			
160	305	G1	36	11
250	395			

ARMATURE БАУИ.408721.017

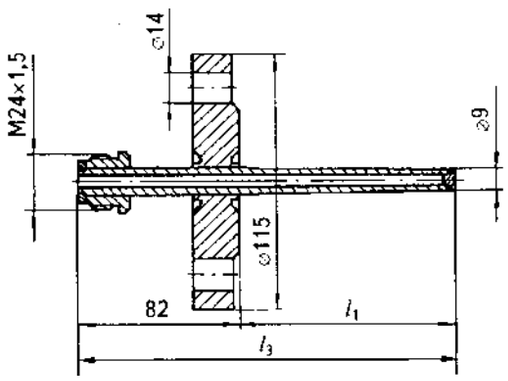
Material - steel 12Х18Н10Т



l1	160	220	280
l2	307	367	427

ARMATURE БАУИ.408721.019

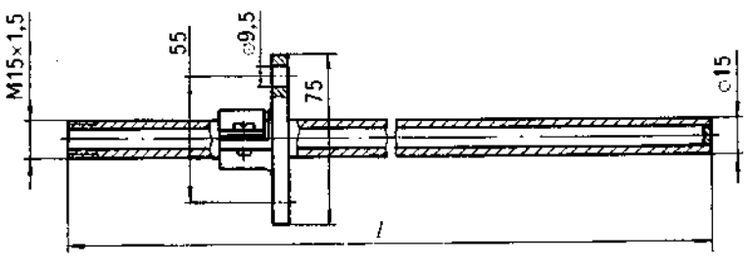
Material - steel 12Х18Н10Т



L_1	*225*	*285*	345
L_2	*307*	*367*	427

ARMATURE БАУИ.408721.020

Material - steel 12Х18Н10Т



L, mm	517	727	1017	1417	2017

THERMOCOUPLE OF RESISTANCE
ТСП-1288 (ТУ 25-7363.042-90),
ТСМ-1288 (ТУ 25-7363.032-89)

Designed for measuring temperature of liquid and gaseous medium (ТСП-1288, ТСМ-1288,fig.1,4), solid bodies (ТСП-1288,fig.2), air of freight and isothermal cars (ТСП-1288,fig.3).

Operational range of measured temperatures, °С:

for ТСП-1288 (figure 1, 4; d=6mm, б=8mm)	**from minus 50 to 250**
for ТСП-1288 (figure 2)	**from 0 to 300**
for ТСП-1288 (figure 3)	**from minus 50 to 60**
for ТСМ-1288 (figure 1, 4; s=6mm, б=8mm)	**from minus 50 to 150**

Designation of NSC:

for ТСП-1288	**50П, 100П, Pt50, Pt100**
for ТСМ-1288	**50М, 100М**

Tolerance class:

for ТСП-1288	**A, B**
for ТСМ-1288	**B, C**

Nominal pressure of measured medium Pnom, MPa:

for d=6 mm	**0,4**
for d=8 mm	**4,0**

Material of protection fitting	**steel 12Х18Н10Т**
Material of thermocouple head (figure 1)	**press material АГ-4В**

The length L, mm:

for ТСП-1288, ТСМ-1288 (figure 1)	**from 143 to 563**
for ТСП-1288, ТСМ-1288 (figure 4)	**from 620 to 1040**
for ТСП-1288 (figure 3)	**from 530 to 20080**

The length l, mm:

for ТСП/ТСМ-1288 (figure 1, 4)	**from 80 to 500**

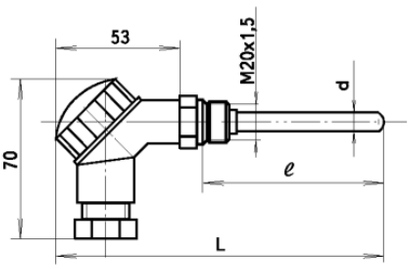


Figure 1

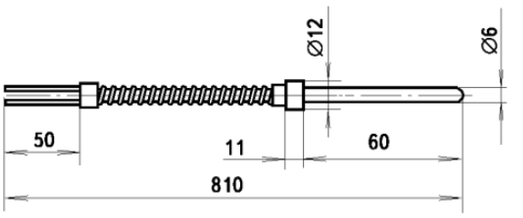
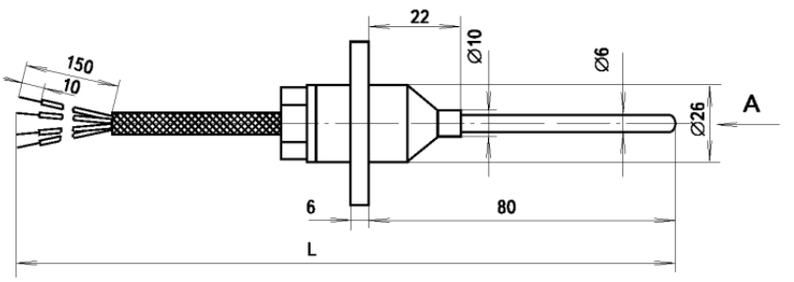


Figure 2



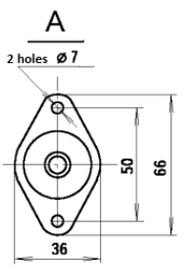


Figure 3

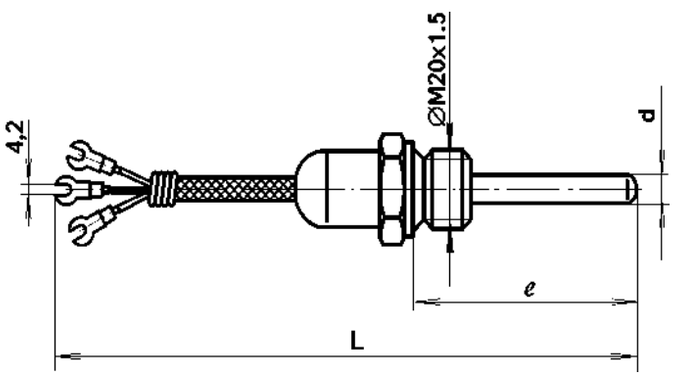
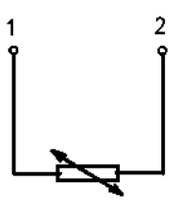
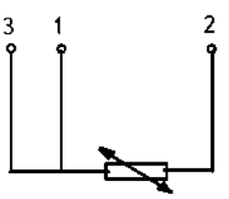


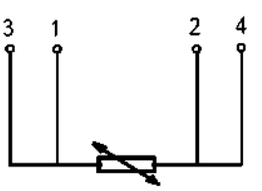
Figure 4



for figure 2 (Tolerance class B), for figure 1, 4 (Tolerance class B, C)



for figure1, 4 (Tolerance class A)



for figure 3 (Tolerance class A, B)

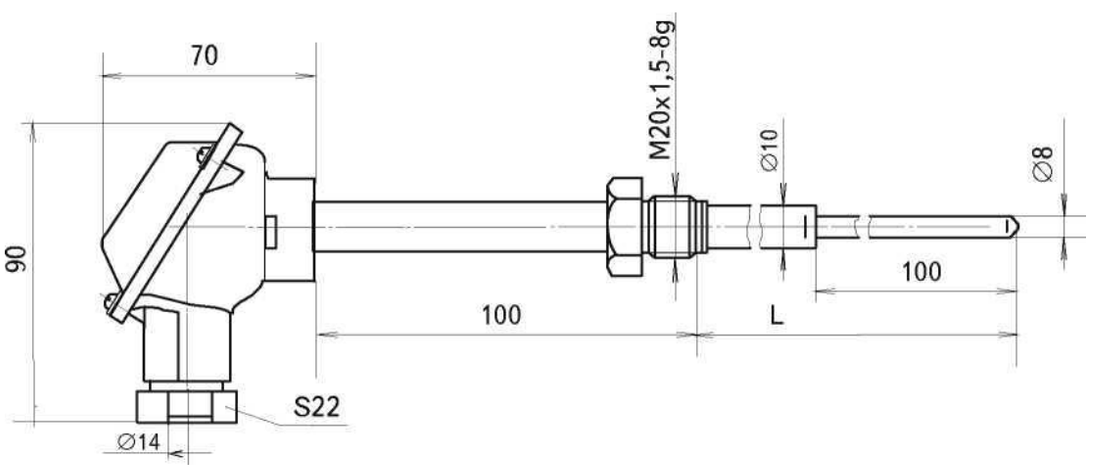
Schematic representation of connections

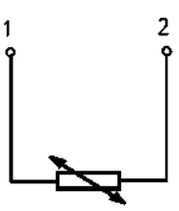
THERMOCOUPLE OF RESISTANCE
ТСМР-1291 (БАУИ.405212.007 ТУ)

It consists of two same-type thermocouples of resistance (a pair of THERMOCOUPLE OF RESISTANCE), which are designed to measure the temperature difference in water used for the cool tap-holes in blast furnace production.

Operational range of measured temperature differences, °C	**from 0 to 25**
Temperature change rate, °C	**from 0 to 100**
Designation of NSC	**500M**
Tolerance class	**C**
Admissible values of resistance difference of a pair of Thermocouple of resistance in the temperature equivalent for the same temperatures throughout the whole range of temperature change, °C, not more	**0,25**
Nominal pressure of measured medium Pnom, MPa	**1,6**
Material of protection fitting	**steel 12X18H10T**
The length L, mm	**from 120 to 500**

The production of ТСМР-1291 without converter head with outlet cable of the proper length is allowed.



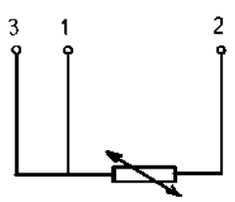


Schematic representation of connections

THERMOCOUPLE OF RESISTANCE
ТСП-1388 (ТУ 25-7363.042-90),
ТСМ-1388 (ТУ 25-7363.032-89)

Designed for measuring the temperature of small-scale bearings (fig.1,2,5) and the surface of sold bodies.

Operational range of measured temperatures, °C	**from minus 50 to 120**
Designation of NSC:	
for ТСП-1388	**50П, 100П, Pt50, Pt100**
for ТСМ-1388	**50М**
Tolerance class:	
for ТСП-1388	**B, C**
for ТСМ-1388	**C**
Nominal pressure of measured medium Pnom, MPa:	
for figure 1, 2, 3, 4, 5	**0,4**
Material of protection fitting:	
for ТСП-1388 і ТСМ-1388 (figure 1, 2)	**brass L62 or L96**
for ТСП-1388 і ТСМ-1388 (figure 3, 4)	**coper M1**
for ТСМ-1388 (figure5)	**steel 08Х18Н10Т, 12Х18Н10Т**
Length, mm:	
L	**from 20 to 400**
ℓ	**from 120 to 3005**



Schematic representation of connections

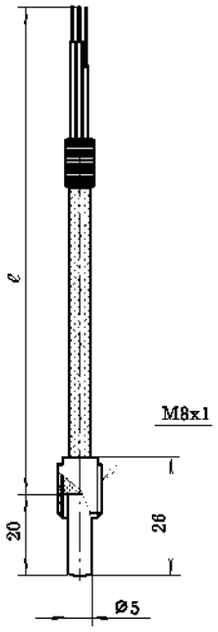


Figure 1

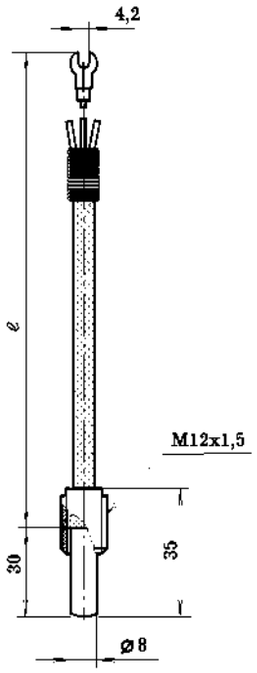


Figure 2

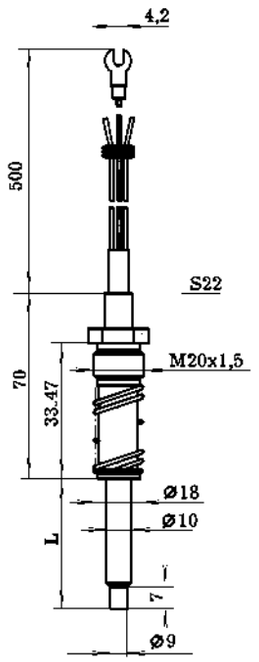


Figure 3

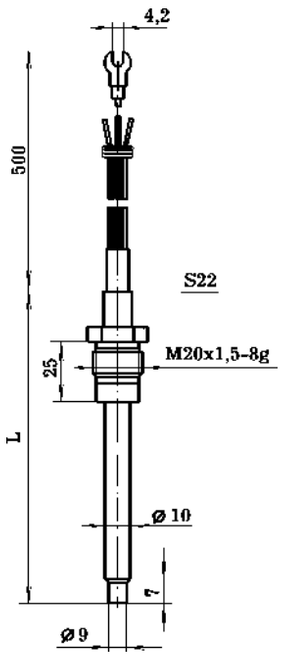


Figure 4

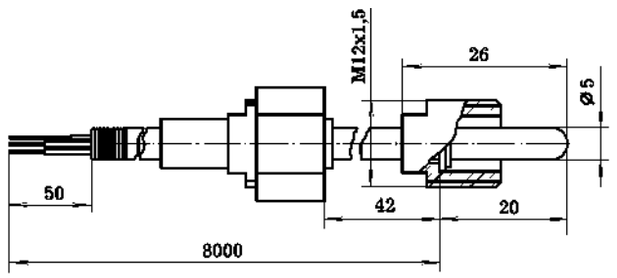
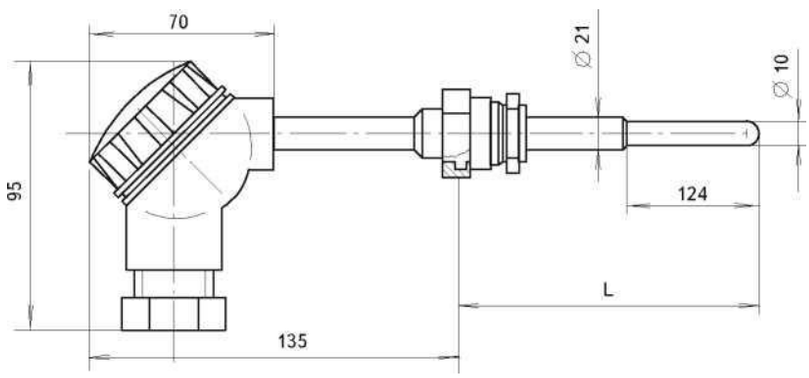


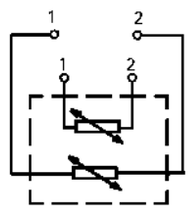
Figure 5

THERMOCOUPLE OF RESISTANCE ТСП-1588 (ТУ 25-7363.042-90)

Designed for measuring temperature of liquid and gaseous medium.

Operational range of measured temperatures, °C	**from 0 to 150 100П,**
Designation of NSC	**Pt100 B**
Tolerance class	**see the Table**
Material of protection fitting	**press material АГ-4В**
Material of thermocouple head	**water-proof**
Nominal pressure Pnom, MPa	**1**
Number of sensing elements	**2**





Schematic representation of connection

Designation	L, mm	Material of protection fitting	Weight kg	Designation	L, mm	Material of protection fitting	Weight kg
5Ц2.822.037	200	Steel 12Х18Н10Т	0,90	5Ц2.822.037-17	1250	Steel 08Х18Н12Б	3,10
-01	320		1,09	-18	1600		3,80
-02	400		1,25	-19	2000		4,70
-03	500		1,46	-20	2500		6,0
-04	800		2,15	-21	3150		7,0
-05	1000		2,54	-22	200	Steel 10Х17Н13М2Т	0,90
-06	1250		3,10	-23	320		1,09
-07	1600		3,80	-24	400		1,25
-08	2000		4,70	-25	500		1,46
-09	2500		6,0	-26	800		2,15
-10	3150		7,0	-27	1000		2,54
-11	200	Steel 08Х18Н12Б	0,90	-28	1250		3,10
-12	320		1,09	-29	1600		3,80
-13	400		1,25	-30	2000		4,70
-14	500		1,46	-31	2500		6,0
-15	800		2,15	-32	3150		7,0
-16	1000		2,54				

THERMOCOUPLE OF RESISTANCE
ТСПР-0196 (ТУ У3.48-04850451-040-97)

Designed for measuring the difference in temperature of heat carriers in open and closed systems of heat supply. It is used as a part of the measuring systems for recording the amount of heat energy used by consumers.

The ТСПР -0196 incorporates two types of Thermocouple of resistance (a pair of THERMOCOUPLE OF RESISTANCE).

Operational range of measured temperature differences, °C	**from 0 to 155**
Temperature change rate, °C	**from 0 to 160**
Admissible values of resistance difference of a pair of Thermocouple of resistance in the temperature equivalent for the same temperatures throughout the whole	**0,05; 0,1**
Designation of NSC	**100П, 500П, 1000П, Pt100, Pt500, Ptl000**
Tolerance class	**B**
Nominal pressure of measured medium Pnom, MPa	**6,3**
Material of protection fitting	**12Х18Н10Т**
Assembling length L, mm	**80,100,120,160,200**
Cable length l, mm	**2000, 4000, 6000**
Thread diameter D, mm	**M20x1,5; G1/2 (for figure 1, 2)**

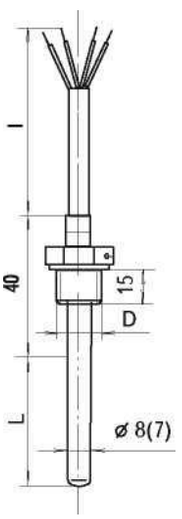


Figure 1

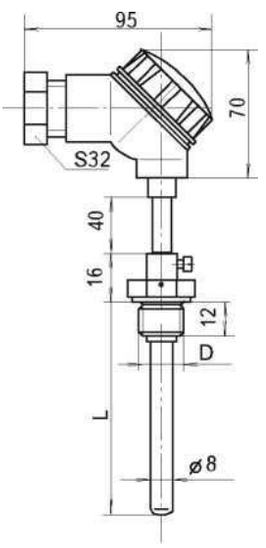


Figure 2

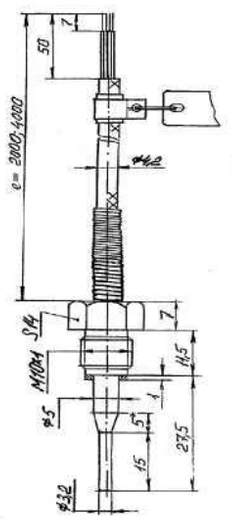
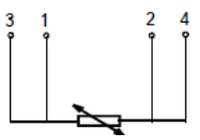


Figure 3



Schematic representation of connections

THERMOCOUPLE OF RESISTANCE
ТСП-0287 (ТУ У 33.2-04850451-026:2007)

Designed for measuring the temperature of solid bodies (metal) as well as liquids and gaseous media in means of transport and in industry.

Operational range of measured temperatures, °C		**from minus 50 to 400 (see the table)**
Designation of NSC		**100П, 500П, 1000П**
Tolerance class:		
	figure 1	**A**
	figure 2, 3, 4, 5	**B**
Material of protection fitting:		
	figure1	**ВТ1-0, 12Х18Н10Т**
	figure 2, 3	**12Х18Н10Т**
	figure 4	**12Х18Н10Т or 10Х17Н13М2Т**
	figure 5	**aluminium alloy D16T**
Nominal pressure of measured medium, MPa:		
	figure1, 2, 3, 5	**0,4**
	figure 4	**32**
Cable length L_{cab}, m	figure 4, 5	**from 1 to 10 (according to the order)**

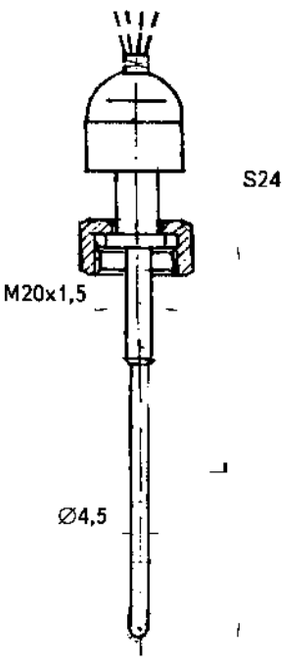


Figure 1

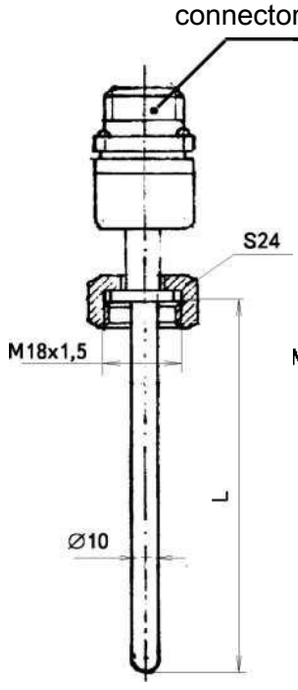


Figure 2

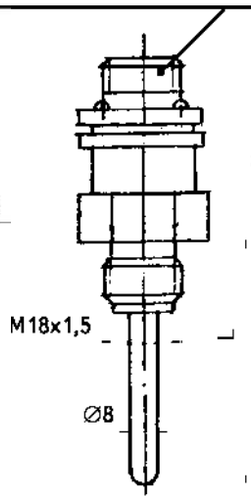


Figure 3

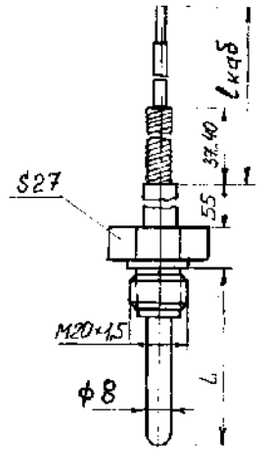


Figure 4

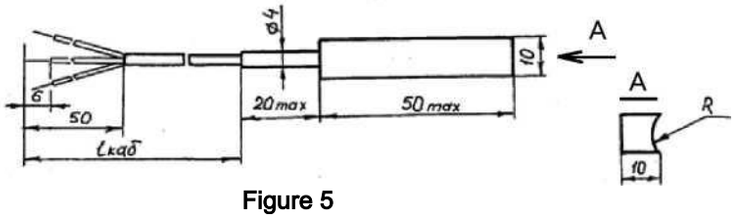
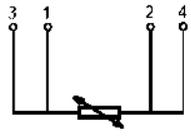
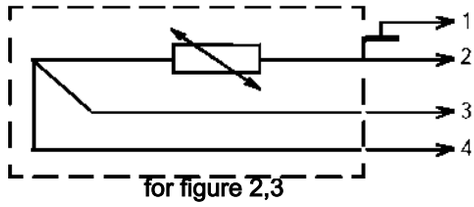


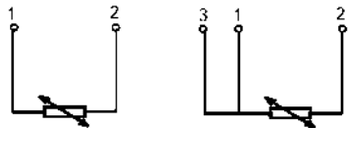
Figure 5



for figure 1



for figure 2,3



for figure 4 for figure 4, 5

Fig.	Length of assembling part,	Measuring range, °C	Weight, kg
1	80	from minus 50 to 150	0,150
2	120	from minus 50 to 100	0,120
	200	from 0 to 400	0,150
3	45	from minus 50 to 100	0,100
4	80 - 250	from minus 50 to 200	0,350 - 0,900
5	50	from minus 50 to 400	0,1

Schematic representation of

THERMOCOUPLE OF RESISTANCE
ТСМ-0387 (ТУ 25-7363.021-88)

Designed for measuring the temperature of windings of turbo and hydro generators and large electric machines.

Operational range of measured temperatures, °C	**from 0 to 150**
Designation of NSC	**50M**
Tolerance class	**C**
Weight, kg, not more than	**0,02**

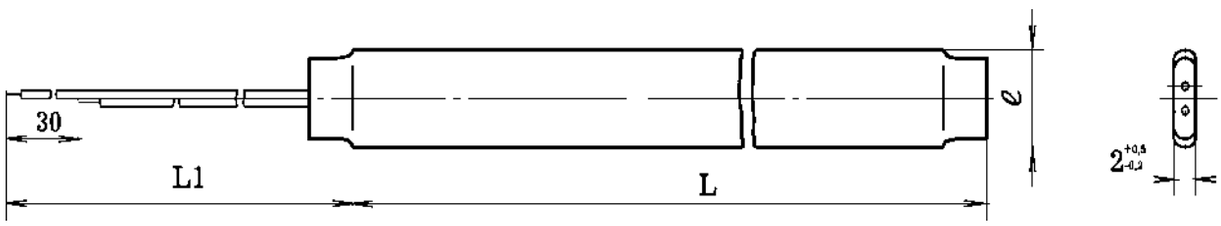
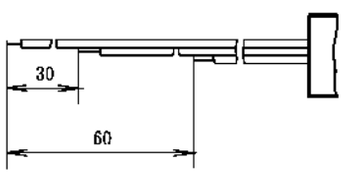
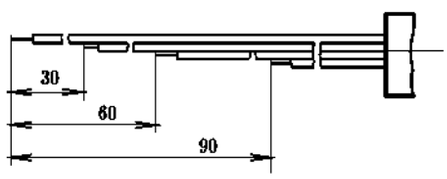


Figure 1

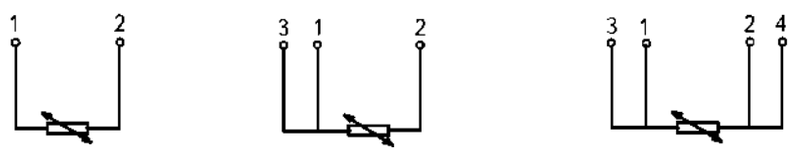


The rest see figure 1
Figure 2



The rest see figure 1
Figure 3

Designation	Figure	Scheme of connection	Dimensions, mm		
			l	L	L_1
5ц2.822.019	1	2	10	150	100
-0.1			25	65	
-0.2	2	3	10	150	260
-0.3			25	65	
-0.4	3	4	10	150	
-0.5			25	65	



Schematic representation of connections

THERMOCOUPLE OF RESISTANCE TCM-0890
(ТУ У3.48-04850451-060-1999)

Designed to measure the temperature of water, lubricant, steam, air, metal structures, bearings, etc. equipment of nuclear power plants.

It is intended for installation in premises of technological equipment.

The thermocouple of resistance functions with the ambient air from minus 50 to 60 °C and the relative humidity of 100% at a temperature of 30 °C.

Operational range of measured temperatures, °C	**from minus 50 to 150**
Designation of NSC	**50M, 100M**
Reference resistance value with 0 °C, Ohm	**50±0,06, 100±0,12**
Tolerance class	**B**
Temperature coefficient TO α C-1	**0,00428; 0,00426**
Range of admissible resistance deviation from NSC, °C	**±(0,3+0,005|t|)**
Nominal pressure, MPa	
Figure1	**4**
Figure2,5,6	**0,63**
Figure3,4	**6,3**
Resource, hours	**80000**
Seismic resistance	**9 points according to MSK-64**
Fire resistance	**fire-proofed, don't spread fire**
Dust and water protection level	
Figure 2, 3, 4	**IP65**
Figure 1, 5, 6, 7	**IP00**
Safety class	**3Н по НП 306.2.141**

Overall dimensions are shown in the Figures.

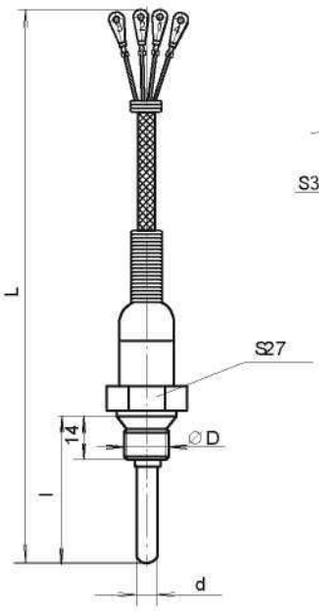


Figure1

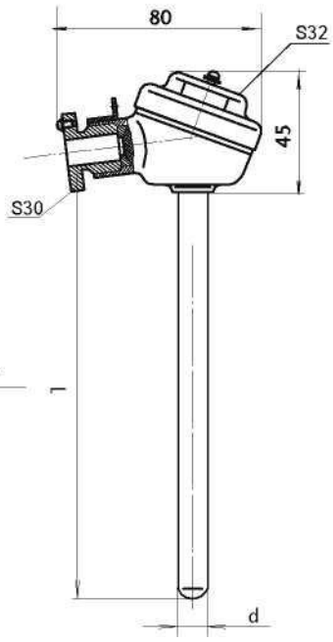


Figure 2

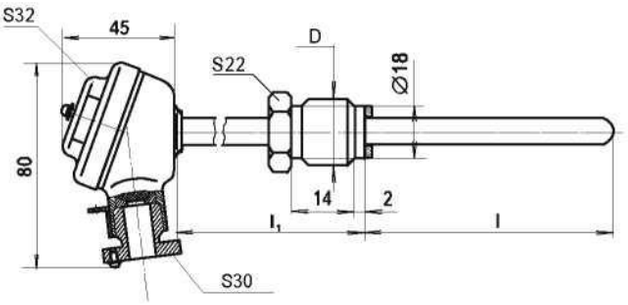


Figure 3

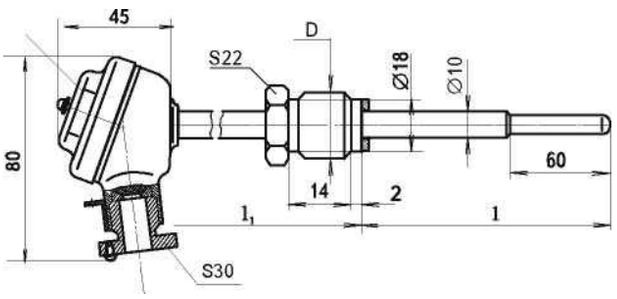


Figure 4

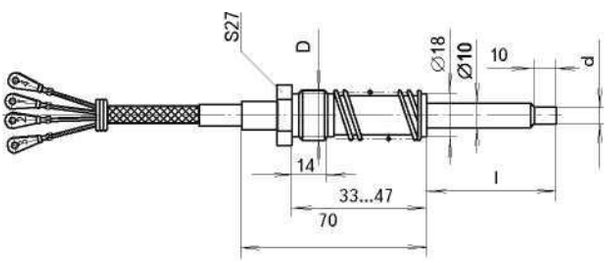


Figure 5

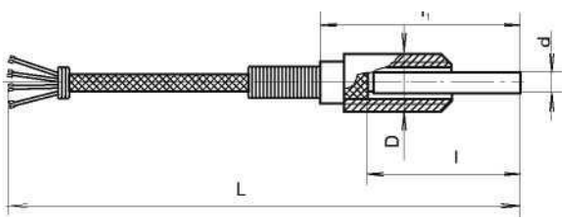


Figure 6

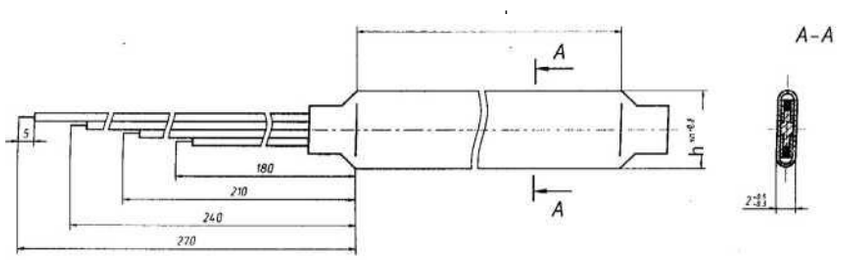
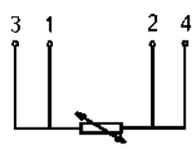


Figure 7



for figure 1 - 5

for figure 6, 7

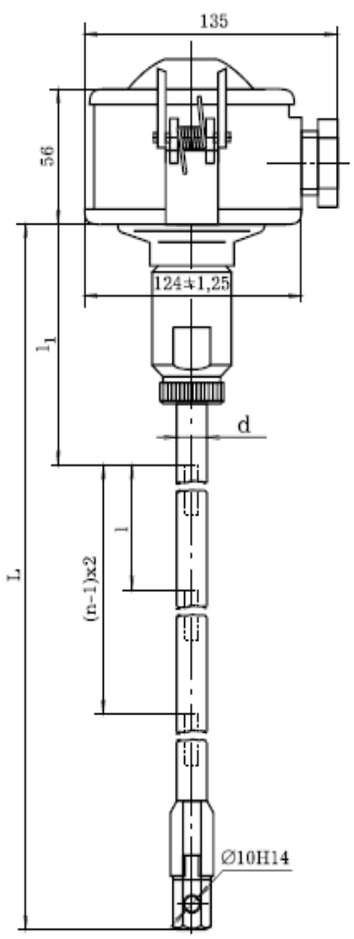
Schematic representation of connections

THERMOCOUPLE OF RESISTANCE TOM -0591
(БАУИ.405212.006 ТУ)

Designed for remote temperature measuring and control of grain, bran and other agricultural products during storage in elevators, granaries and bunkers
.

Operational range of measured temperatures, °C	**from minus 30 to 60**
Designation of NSC	**50M**
Tolerance class	**B**
Number of sensing elements	**6, 12**
Assembling part (thermal cable) withstands the bursting effort, kg	**3000**
Number of zones	**6, 12**

Thermocouple of resistance can operate with digital thermometer ТО-Ц022.

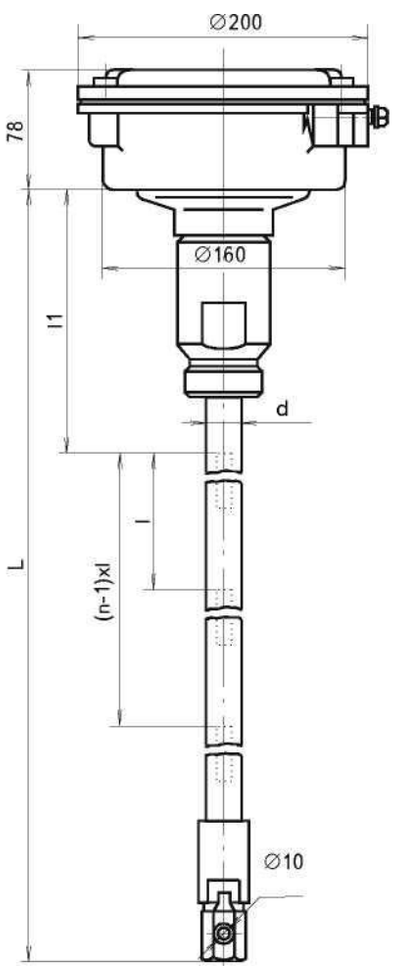


Designation	Lm	ll,m	Lm	d, mm	Number of elements	Number of zones	Production
БАУИ 40522112/005	10	1.3	1.7	21	6	6	General
-01	12		2.1				
-02	14	1.8	2.4				
-03	16	2.3	2.7				
-04	18	2.7	3.1				
-05	20	2.9	3.4				
-06	22	3.3	3.7				
-07	24		4.1				
-08	26	3.8	4.4				
-09	28	4.3	4.7		12	12	
-10	18	1.1	1.52				
-11	20	1.3	1.7				
-12	22	1.5	1.85				
-13	28		2.4				
-14	40	2.4	3.4				
-20	10	1.3	1.7				
-21	12		2.1	21	6	6	Tropical
-22	14	1.8	2.4				
-23	16	2.3	2.7				
-24	18	2.7	3.1				
-25	20	2.9	3.4				
-26	22	3.3	3.7				
-27	24		4.1				
-28	26	3.8	4.4				
-29	28	4.3	4.7				
-30	18	1.1	1.52		12	12	
-31	20	1.2	1.7				
-32	22	1.5	1.85				
-33	28		2.4				
-34	40	2.4	3.4				

THERMOCOUPLE OF RESISTANCE WITH IMPULSE OUTPUT SIGNAL TOMI-0591
(БАУИ.405212.005 ТУ)

Designed to convert the temperature value into a pulse current output signal. Thermal transducer is part of the "РОСЬ-1" temperature control system.

Operational range of measured temperatures, °C	**from minus 30 to 60**
Designation of NSC	**50M**
Tolerance class	**B**
Load resistance , Ohm	**100**
Time of running control of the thermocouple, sec	**9**
Time to set the operating mode, sec	**2**
Number of sensing elements	**6, 12**
Assembling part (thermocouple) withstands the action of the bursting force, kg	**3000**
Number of zones	**6, 12**



Designation	L,m	L1,m	L,m	d, mm	Number of elements	Number of zones	Production
БАУИ 40522112/005	10	1.3	1.7	21	6	6	General
-01	12		2.1				
-02	14	1.8	2.4				
-03	16	2.3	2.7				
-04	18	2.7	3.1				
-05	20	2.9	3.4				
-06	22	3.3	3.7				
-07	24		4.1				
-08	26	3.8	4.4				
-09	28	4.3	4.7		12	12	
-10	18	1.1	1.52				
-11	20	1.3	1.7				
-12	22	1.5	1.85				
-13	28		2.4				
-14	40	2.4	3.4				
-20	10	1.3	1.7				
-21	12		2.1	21	6	6	Tropical
-22	14	1.8	2.4				
-23	16	2.3	2.7				
-24	18	2.7	3.1				
-25	20	2.9	3.4				
-26	22	3.3	3.7				
-27	24		4.1				
-28	26	3.8	4.4				
-29	28	4.3	4.7				
-30	18	1.1	1.52		12	12	
-31	20	1.2	1.7				
-32	22	1.5	1.85				
-33	28		2.4				
-34	40	2.4	3.4				

THERMOCOUPLE OF RESISTANCE
ТСП-0889 (ТУ 25-7363.076-91)

Designed to measure the temperature of operation zone metal of thermoplastautomats (KuASY, ТСП-0889 type, Figure 3) and on production lines of chemical fiber (ТСП-0889 type, Figure 1,2).

Operational range of measured temperatures, °C: for figure 1, 2 for figure 3	 **from minus 50 to 350** **from minus 50 to 300**
Designation of NSC	**100П, Pt100**
Nominal pressure of measured medium Pnom, MPa	**0,1**
Tolerance class	**B**
Material of protection fitting	**steel 12X18H10T press**
Material of thermocouple head for figure 1	**material АГ-4В from 35 to**
Weight, g	**130**

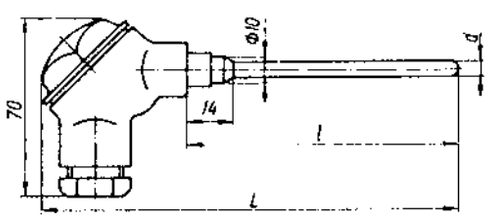


Figure 1

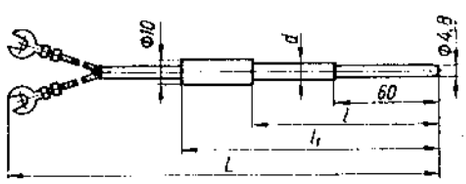


Figure 2

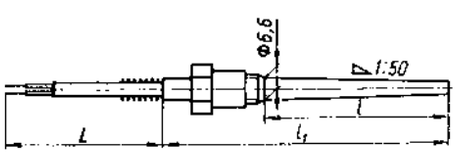
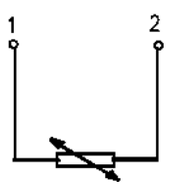


Figure 3

Designation	Figure	d, mm	L,m	L_1	l_1	Material of protection fitting
БАУИ 40522112/005	1	6	213	160		Steel 08X13
-01			303	250		
-02			373	320		
-03			453	400		
-04			213	160		
-05			303	250		Steel 12X18H10T
-06			373	320		
-07			453	400		
-08	2	-	340	60	85	Steel 08X18H10T
-09		5	440	150	185	
-10			500	320	345	
-11			785	630	655	
-12		-	340	60	85	
-13		5	440	160	185	
-14			600	320	345	
-15			785	630	655	
-16	3	-	800	40	75	Steel 08X13 (12X18H9T)
-17			1000			
-18				65	100	



Schematic representation of connections

THERMOCOUPLE OF RESISTANCE
ТСП-0987, ТСМ-0987 (ТУ 25-7363.024-88)

Designed to measure the air temperature in the premises of different purposes.

Operational range of measured temperatures, °C	**from minus 50 to 100**
Designation of NSC:	
for ТСП-0987	**100П, Pt100**
for ТСМ-0987	**50М**
Tolerance class:	
for ТСП-0987	**A**
for ТСМ-0987	**B**
Material of protection fitting	**steel 12Х18Н10Т**

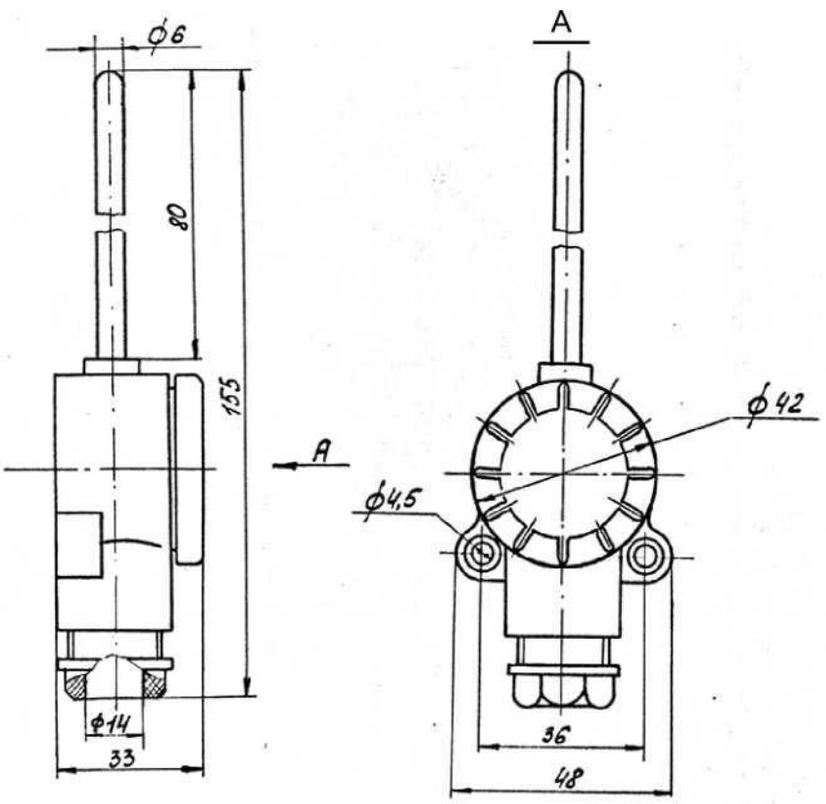
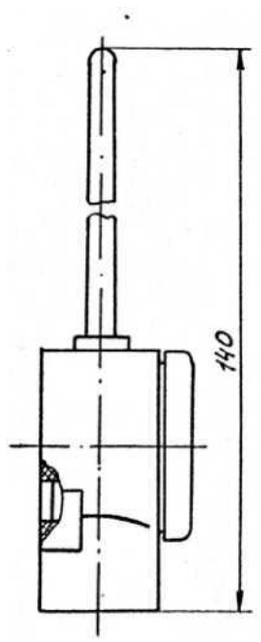
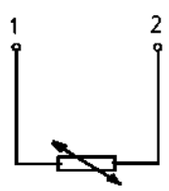


Figure 1

Designation	Resistance Ro with 0°C, Ohm	Figure	Housing material
5Ц2.822.024 -01	100 50	1	Press material АГ-4В
-02 -03	100 50	2	
-04 -05	100 50	1	Phenolic plastic 03-010-02
-06 -07	100 50	2	



For the rest see figure 1
Figure 2



Schematic representation of connection

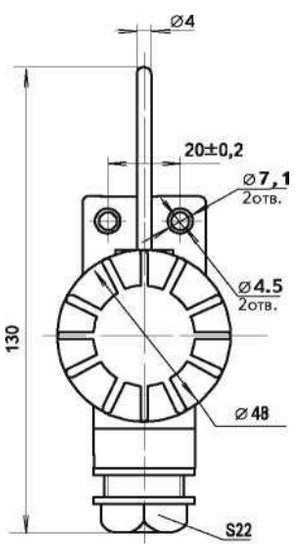
THERMOCOUPLE OF RESISTANCE ТСП-1290, ТСМ-1290
(ТУ У3.48-04850451-059-1999)

Designed to measure the air temperature in premises including nuclear power plants.

For the power plants they are installed in premises out of technological service in the zones of severe regimes.

The Thermocouple of resistance are operable at the ambient temperature from minus 50 to 150° C and relative air humidity 100% at 35°C.

Operational range of measured temperatures, °C	**from minus 50 to 150**
Designation of NSC	
ТСП-1290	**50П, 100П, Pt50, Pt100**
ТСМ-1290	**50М**
Reference resistance value with 0 °C, Ohm	
ТСП-1290	**50±0,06; 100±0,12**
ТСМ-1290	**50±0,06**
Tolerance class	**B**
Temperature coefficient TO α С-1	
ТСП-1290	**0,00391; 0,00385 0,00428;**
ТСМ-1290	**0,00426**
Range of admissible resistance deviation from NSC, °C	**±(0,3+0,005|t|)**
Nominal pressure, MPa	**0,4**
Resource, hours	**80000**
Material of enclosure	
for figure 1	**press material АГ-4В**
for figure 2	**steel 12Х18Н10Т**
Seismic resistance	**9 points according to MSK-64**
Fire resistance	**fire-proofed, don't spread fire**
Dust and water protection level	**IP65**
Safety class	**3Н according to НП 306.2.141**



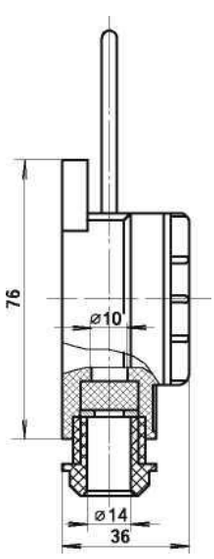
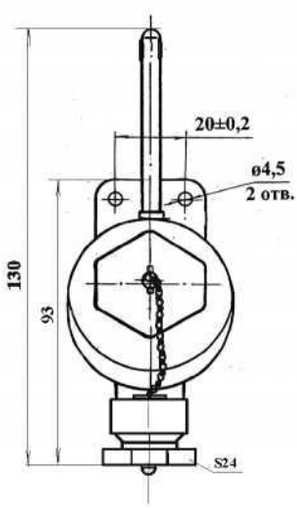


Figure 1



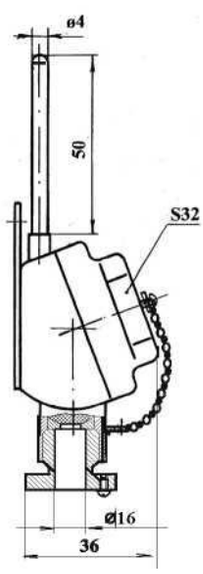
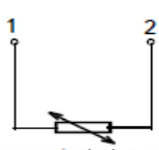


Figure 2

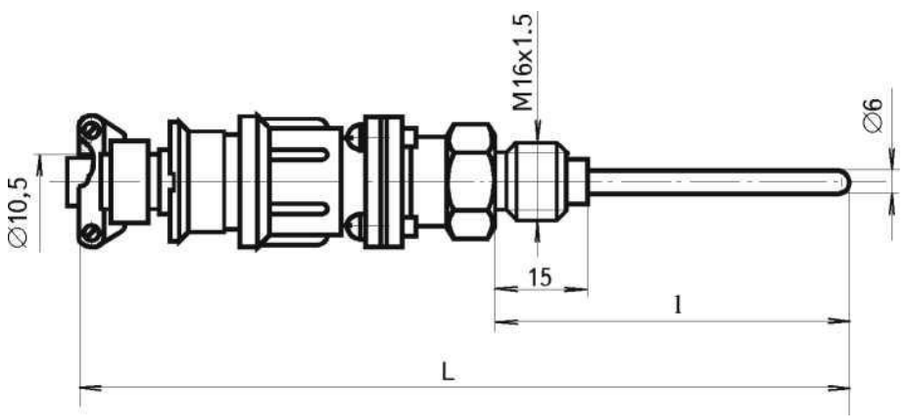


Schematic representation of connections

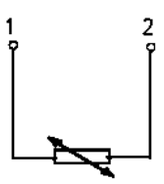
THERMOCOUPLE OF RESISTANCE
ТСМ-364-01 (ТУ 25-0470.0143-85)

Designed to measure the temperature of liquids and gases (water, oil, air) of diesel locomotive.

Operational range of measured temperatures, °C	**from 0 to 150**
Designation of NSC	**50M**
Tolerance class	**B**
Nominal pressure of measured medium Pnom, MPa	**1,6**
Material of protection fitting	**steel 12X18H10T**



Designation	Dimensions, mm		Weight, g
	L	l	
5Ц2.821.410	160	60	115
-01	180	80	120
-02	200	100	125
-03	220	120	130



Schematic representation of connections

THERMOCOUPLE OF RESISTANCE ТСП-8052 (ТУ 25-02.221837-79)

Designed for measuring the temperature of air media of test chambers including climatic test chambers.

Operational range of measured temperatures, °C	**from minus 200 to 600 (see the table)**
Designation of NSC	**100П, Pt100**
Nominal pressure, MPa	**0,16**
Stability to mechanical impacts	**Vibration resistant**
Material of protection fitting	**steel 08Х18Н10Т**
Tolerance class	**A, B**

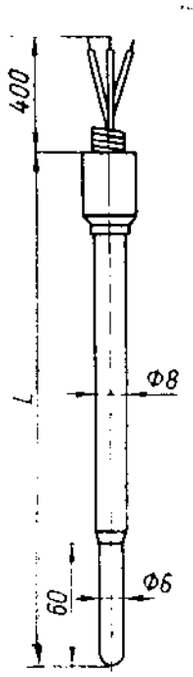


Figure 1

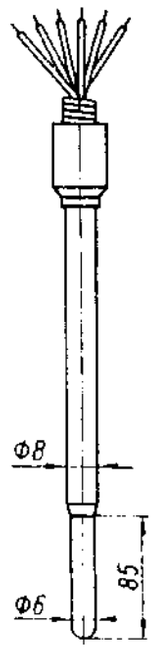
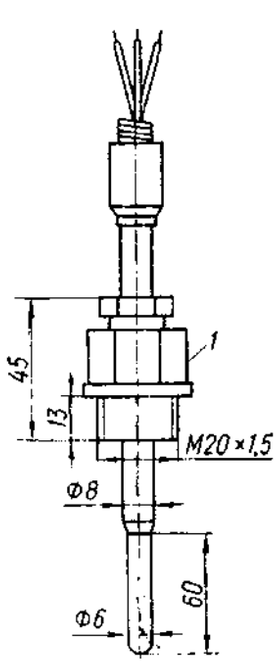
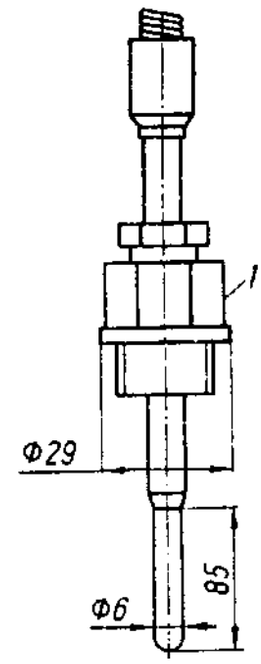


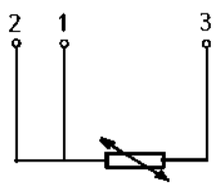
Figure 2



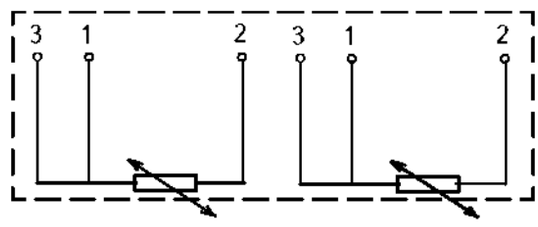


1 - Movable connector

Figure 3, 4



for figure 1, 3



for figure 2, 4

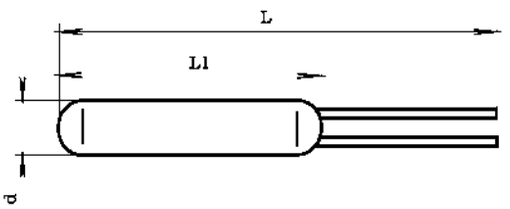
Schematic representation of connections

Designation	L, mm	Tolerance class	Designation	L, mm	Tolerance class
from minus 100 to 200°C			from minus 200 to 600°C		
Figure 1			Figure 3		
5Ц2.821.289	120	A	5Ц2.821.289-08	250	A
-01	120	B	-09	250	B
Figure 2			-10	320	A
5Ц2.821.289-02	120	A	-11	320	B
-03	120	B	-12	400	A
Figure 3			-13	400	B
5Ц2.821.289-04	160	A	-14	630	A
-05	160	B	-15	630	B
-06	200	A	Figure 4		
-07	200	B			
Figure 4					
5Ц2.821.289-16	160	A	5Ц2.821.289-20	250	A
-17	160	B	-21	250	B
-18	200	A	-22	320	A
-19	200	B	-23	320	B
			-24	400	A
			-25	400	B
			-26	630	A
			-27	630	B

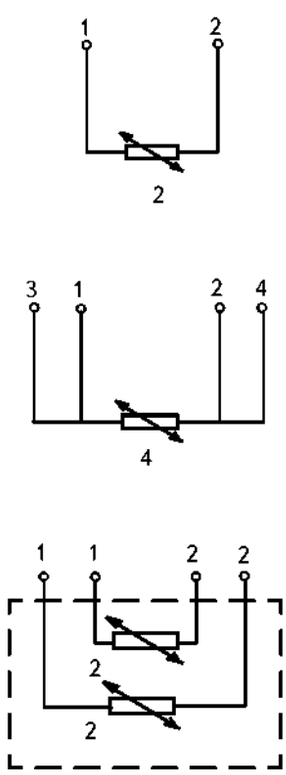
SENSITIVE THERMOMETRIC ELEMENT
PLATINUM ЕЧП-0183 (ТУ 25-7558.007-86)

Designed for using as a separate device for measuring temperature of solid granular substances and gaseous media.

Operational range of measured temperatures, °C	see the table
Designation of NSC	1П, 10П, 50П, 100П, 500П, Pt1, Pt10, Pt50, Pt100, Pt500
Tolerance class	A, B, C
Number of sensing elements	1 or 2
Indicator of thermal inertia, sec, not more	see the table
Material of sensing element enclosure	ceramic



Designation	Tolerance class	NSC	Operational range of measured temperatures	Vibration resistance		Indicator of thermal inertia, sec	d, mm	L1, mm	L, mm	Scheme of connection	Number of sensing elements
				Frequency, Hz	Acceleration m/sec						
5Ц4.679.069	B	1П	From 850 to 1000	From 5 to 80	9.8	3	6.5	28	43	2.4	1
-1	C										
-5	B	10П				2	4.8	45	60		
-6	C										
-7	B	50П						70	85		
-8	C										
-9	B	100П						127	142		
-10	C										
-11	A	10П	From minus 200 to 750	From 5 to 120	19.6	1.5	4.2	13	20	2x2	2
-12	B										
-13	A	50П						38	45		
-14	B										
-15	A	100П						53	60		
-16	B										
-18	A	10П						18	25		
-19	B	50П						53	60		
-20	A										
-21	B	100П						103	110		
-22	A										
-23	B	10П	From minus 200 to 400	From 10 to 500	49			13	20	2,4	1
-24	A										
-25	B	50П	From minus 200 to 450					38	45		
-26	A										
-27	B	100П						53	60		
-28	A										
-30	B	10П						18	25	2x2	2
-31	A	50П						53	60		
-32	B										
-33	A	100П						103	110		
-34	B										



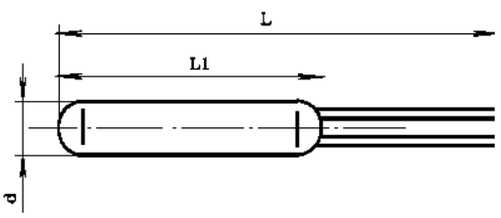
Schematic representation of connection

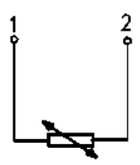
Designation	Tolerance class	NSC	Operational range of measured temperatures	Vibration resistance		Indicator of thermal inertia, sec	d, mm	L1, mm	L, mm	Scheme of connection	Number of sensing elements
				Frequency, Hz	Acceleration m/sec						
5Ц4.679.069 -35	A	10П	From minus 200 to 600	From 5 to 80	9,8	1	2.5, 2.8	13	20	2.4	1
-36	B										
-37	A	50П						38	45		
-38	B										
-39	A	100П						53	60		
-40	B										
-42		10						18	25	2,2	2
-43	A	50П									
-44	B							53	60		
-45	A	100 П									
-46	B							103	110		
-50	A	50П	From minus 50 to 400					28	43	2,4	1
-51	B										
-52	C										
-53	A	100П						43	58		
-54	B										
-55	C										
-59	A	50П								2x2	2
-60	B										
-61	C										
-62	A	50П	From minus 260 to 300			1,5	4,2	38	50	2.4	1
-63		100П						53	65		
-64		5000П	From minus 200 to 200				5.8	105	125		
-65	B	300П	From 0 to 200	From 5 to 120	19,6	5			113		
-66		100П	From 0 to 50	From 5 to 80	9.8	8	5	65	120		

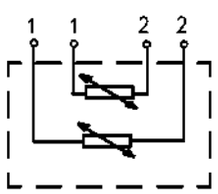
THERMAL SENSING ELEMENT PLATINUM ЕЧП БАУИ.408712.039

Designed for using as a separate device for measuring temperature of solid granular substances and gaseous media.

Operational range of measured temperatures, °C	**from minus 50 to 400**
Designation of NSC	**46П, 50П,100П, Pt50,Pt100**
Tolerance class	**A, B, C**
Number of sensing elements	**1 or 2**
Indicator of thermal inertia, sec., not more	**see the table**
Material of sensing element enclosure	**ceramic**
Structural design is shown in the table	







Schematic representation of connections

Designation	Tole-rance class	NSC	Indicator of thermal inertia	Scheme of connection	d, mm	L1, mm	L, mm	Number of sensing elements
БАУИ.408712.039	A	100П	5	2	6	10	25	1
-01	B							
-02	C							
-03	A		1		3	15	30	
-04	B							
-05	C							
-06	A	50П						
-07	B							
-08	C							
-09	A	46 П						
-10	B							
-11	C							
-12	A	100П				33	48	
-13	B							
-14	C							
-15	A	50П				43	58	
-16	B							
-17	C							
-18	A	46 П				53	68	
-19	B							
-20	C							
-21	A	100П		2x2		33	48	2
-22	B							
-23	C							
-24	A	50П				43	58	
-25	B							
-26	C							
-27	A	46 П				53	68	
-28	B							
-29	C							
-30	A	100П	1,5	2	4,2	15	30	1
-31	B							
-32	C							
-33	A	50П				43	58	
-34	B							
-35	C							
-36	A			2x				2
-37	B							
-38	C							

THERMAL SENSING ELEMENT
COPPER ЕЧМ-0183 (ТУ 25-7558.008-86)

Designed for using as a separate device for measuring temperature of solid granular substances and gaseous media

Operational range of measured temperatures, °C	**see the table**
Designation of NSC	**10M, 50M, 100M,**
Tolerance class	**B, C**
Indicator of thermal inertia, sec., not more	**9; 10; 12; 15; 20; 25; 30**
Material of protection fitting	**fluoroplastric film, latten**

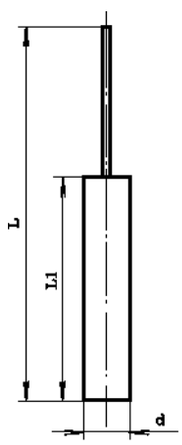


Figure 1

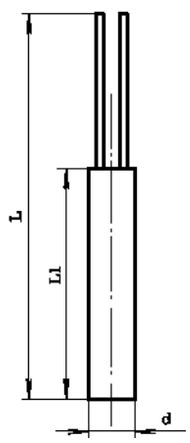


Figure 2

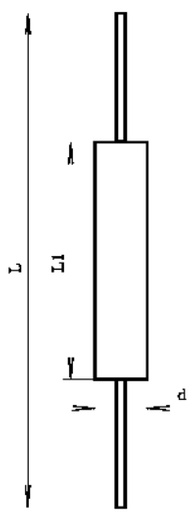
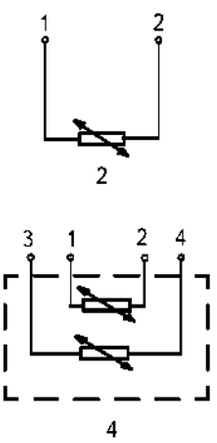


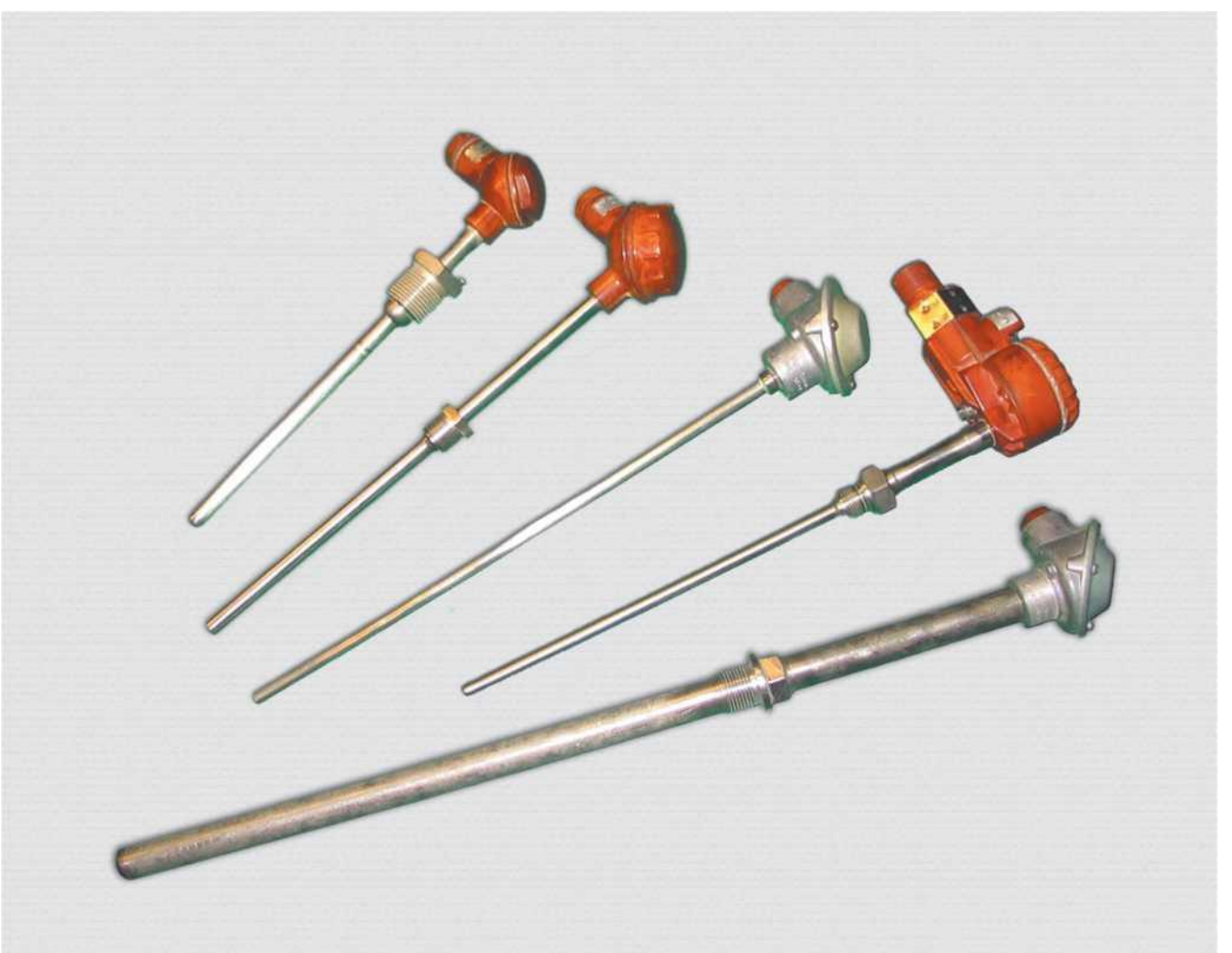
Figure 3

Designation	Figure	Tolerance class	NSC	Operation range of measured temp., °C	Indicator of thermal inertia, sec	Scheme of	d, mm	L1, mm	L, mm
5Ц4.679.070-01		C	10M		10			20	50
-02		B	50M		12			50	80
-03	1	c				2	5		
-04		в	100M		15			80	110
-05		c							
-07			10M		20			32	62
-08		в	50M		25			80	110
-09	2	c				4	7		
-10		в	100M		30			100	130
-11		c							
-13			10M		10			20	50
-14		в	50M		12			50	80
-15	1	c				2	5		
-16		в	100M		15			80	110
-17		c							
-19			10M		20			32	62
-20		в	50M		25			80	110
-21	2	c				4	7		
-22		в	100M		30			100	130
-23		c							
-25	1		50M		9	2	4	25	55
-26			100M		10			40	70
-28	2		50M		25	4	5	32	62
-29			100M		30			50	80
-30	3		50M	from minus 50 to 100	12	2		55	110



Schematic representation of connection

THERMOELECTRIC COUPLES OF WIDE SPREAD APPLICATION



THERMOELECTRIC COUPLES
TXA-0188, TXK-0188 (ТУ 25-7363.033-89)

Designed for measuring temperature of clean air, gaseous chemical non-aggressive media with humidity not more than 80%.

Operational range of measured temperatures, °C:	
for TXA-0188 (figure 1, 2)	**from minus 40 to 1000**
for TXA-0188 (figure 3, 4)	**from minus 40 to 1200**
for TXK-0188 (figure 1, 2, 3, 4)	**from minus 40 to 600**
Literal designation NSC:	
for TXA-0188	**K**
for TXK-0188	**L**
Class:	
for TXA-0188	**1, 2**
for TXK-0188, TXA-0188 (figure 3.4)	**2**
Indicator of thermal inertia, sec., not more	
for figure 1, 2	**20**
for figure 3, 4	**10**
Diameter of thermoelectrode cable, mm	
for figure 1	**1,2**
for figure 2	**3,2**
for figure 3, 4	**from 0,5 to 1,2**
Material of thermocouple head	
for figure 3	**steel 12X18H10T**

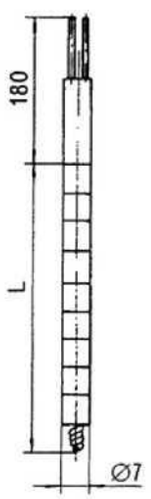


Figure 1

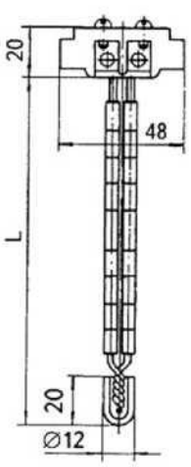


Figure 2

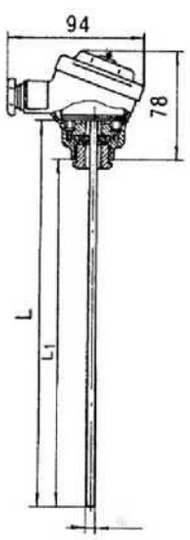


Figure 3

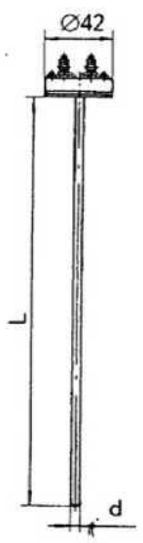


Figure 4

Figure1	*L, mm*	1000	1250	1600	2000	2500	3150	3550	4000		
		4500	5000	5600	6300	7100	8000	9000	10000		
		11200	12500	14000	16000	18000	20000				
Figure2	*L, mm*	320	400	500	630	800	1000	1250	1600		
		2000	2500	3150							
Figure3	*L, mm*	215	315	375	405	435	525	555	655	735	825
	L1, mm	250	290	350	380	410	500	530	630	710	800
	d, mm	6									
	L, mm	315	375	435	525	735	1025	1425	2025		
	L1, mm	290	350	410	500	710	1000	1400	2000		
	d, mm	6			8						
Figure4	*L, mm*	275	315	375	405	435	525	555	655	735	825
	d, mm	6									
	d, mm	315	375	435	525	735	1025	1425	2025		
	d, mm	6			8						

THERMOELECTRIC COUPLES
ТХА-2088, ТХК-2088 (ТУ 25-7363.041-89)

Designed for measuring temperature of gaseous and liquid chemical non-aggressive and aggressive media not destroying the protective fitting, solid bodies (metal).

Operational range of measured temperatures, °C:	
for ТХА-2088	
figure 1-3	from minus 40 to 900
	from minus 40 to 600
figure 4	from minus 40 to 600
for ТХК-2088	
figure 1-3	from minus 40 to 600
figure 4	from minus 40 to 400
Literal designation of NSC:	
for ТХА-2088	K
for ТХК-2088	L
Class	1 or 2
Number of operational thermal pairs	1 or 2
Indicator of thermal inertia, sec., not more :	
for ТХА-2088, ТХК-2088	
figure 1,4	50
figure 2	40
figure 3 (with insulated working end)	20
figure 3 (with non-insulated working end)	8
Nominal pressure of measured media, MPa	
for ТХА-2088, ТХК-2088	
figure 1	0,4
figure 2,3	6,3
Material of protection fitting:	
for figure 1,2,3 to 900 °C	20Х23Н18,08Х20Н14С2
for figure 1,2,3,4 to 600 °C	12Х18Н10Т
for figure 2 to 400 °C (spec.)	10Х17Н13М2Т
Material of thermocouplehead	press material АГ-4В or aluminium alloy
The length L, mm:	
for figure 1	from 320 to 2000
for figure 2, 3	from 120 to 2000
for figure 4	from 10 to 320
The length *e*, mm, figure Structure of working end:	from100 to 320
for figure 1,2,3	insulated,non-insulated
for figure 4	non-insulated

Thermoelectric Couples can be completes with protective connectors:
5Ц4.6819.015 with Pnom=25 MPa, 5Ц4.6819.016 with Pnom=50 MPa.

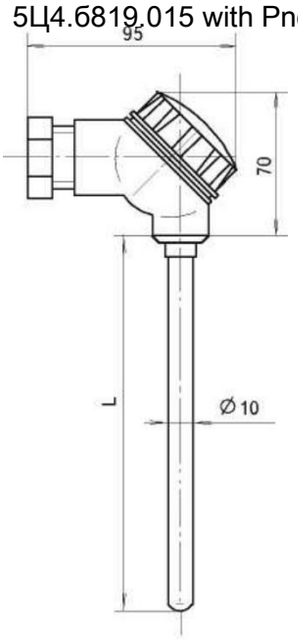


Figure 1

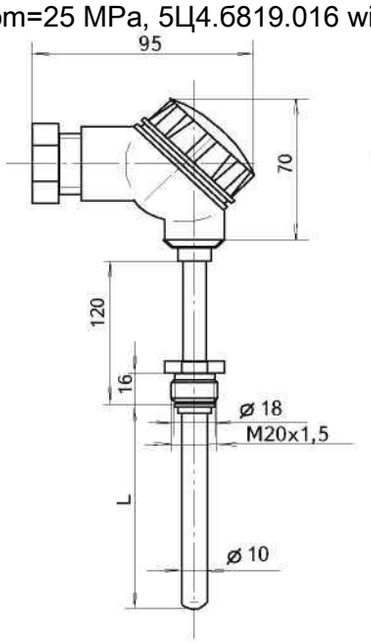


Figure 2

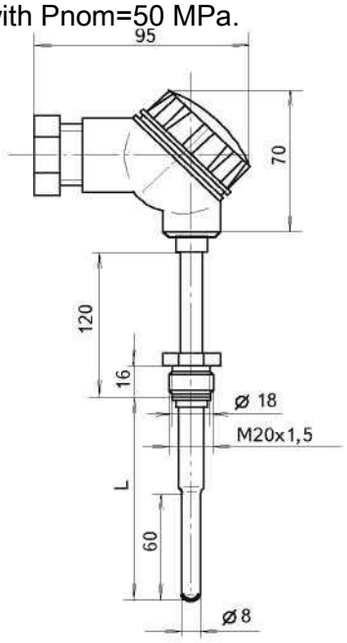


Figure 3

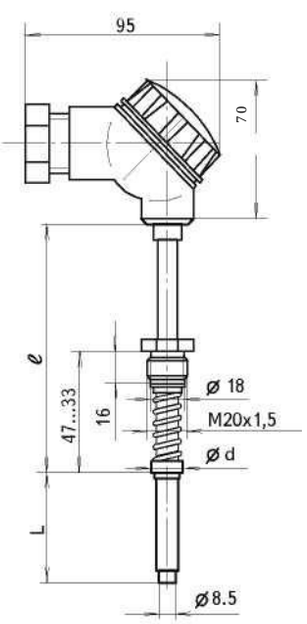


Figure 4

THERMOELECTRIC COUPLES
ТХА-2188 (ТУ 25-7363.041-89)

Designed for measuring temperature of gaseous and liquid chemical non-aggressive and aggressive media not destroying the protective fitting, solid bodies (metal)

Operational range of measured temperatures, °C: for figure 1-3 for figure 4	**from minus 40 to 900** **from 0 to 600**
Literal designation of NSC	**K**
Class	**1 or 2**
Number of operational thermal pairs	**1 or 2**
Indicator of thermal inertia, sec., not more : for figure 1,2,4 for figure 3	**40** **20**
Nominal pressure of measured media, MPa for figure 1 for figure 2,3	**0,4** **6,3**
Material of protection fitting: for figure 1,2,3 for figure 4	**steel 08X20H14C2, 20X23H18** **steel 12X18H10T**
Material of thermocouplehead:	**aluminium alloy**
Structure of working end: for figure 1, 2, 3 for figure 4	**insulated** **non-insulated**
The length L, mm for figure 1 for figure 2, 3 for figure 4	**from 320 to 2000** **from 120 to 2000** **from 250 to 1600**
The length *e*, mm, figure 4	**200 or 320**

Thermoelectric Couples can be completed with protective connectors: 5Ц4.819.015 with Pnom=25 MPa, 5Ц4.819.016 with Pnom=50 MPa.

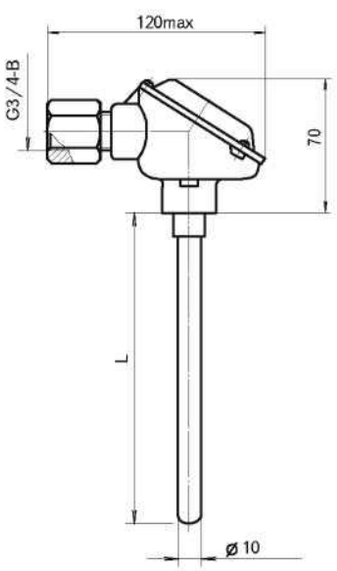


Figure 1

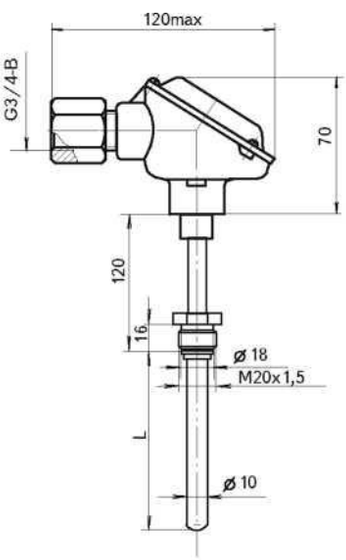


Figure 2

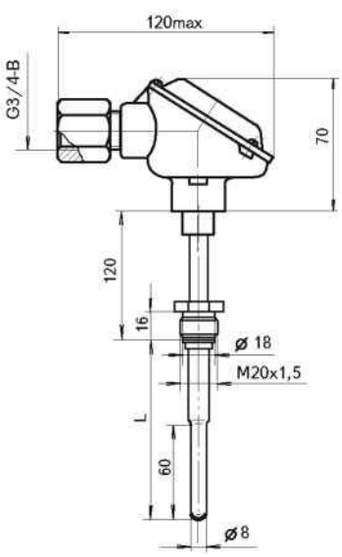


Figure 3

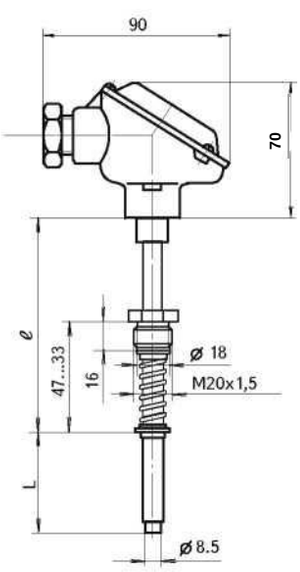


Figure 4

THERMOELECTRIC COUPLES
ТХА-2288, ТХК-2288 (ТУ 25-7363.041-89)

Designed to measure the temperature of gaseous and liquid chemically non-aggressive media.

Operational range of measured temperatures, °C:	
for ТХА-2288	**from minus 40 to 900**
for ТХК-2288	**from minus 40 to 600**
Designation of NSC	
for ТХА-2288	**K**
for ТХК-2288	**L**
Indicator of thermal inertia, sec., not more	**80**
Tolerance class	**2**
Length L, mm:	
for Fig. 1	**from 320 to 1000**
for Fig. 2.	**from 120 to 1000**
Design of the working end	**isolated**
Material of protective reinforcement (armature):	
for ТХА-2288	**steel 20Х23Н13, 08Х20Н14С2**
for ТХК-2288	**steel 12Х18Н10Т**
Material of head	**aluminum alloy**

Design of the thermocouples is modular and allows changing the sensing element.

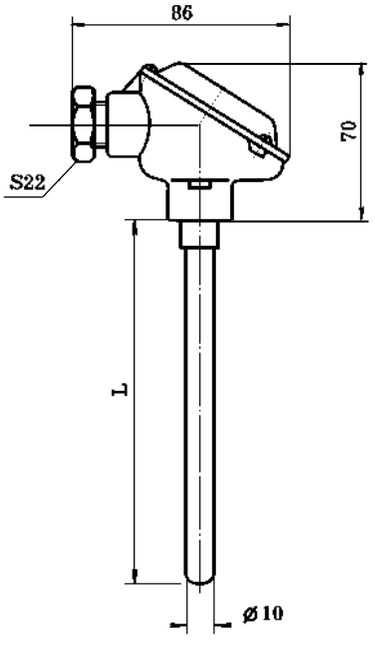


Fig. 1

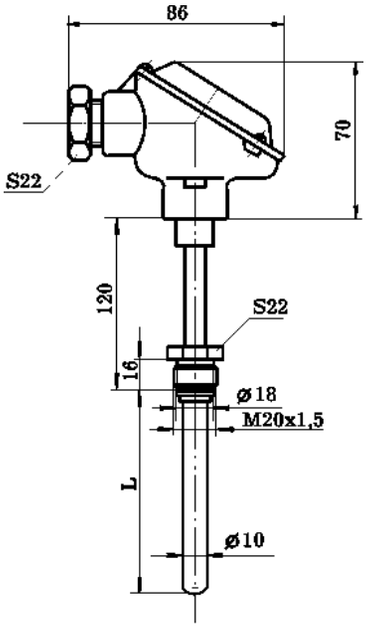


Fig. 2

THERMOELECTRIC COUPLES
ТХА-2388, ТХК-2388 (ТУ 25-7363.034-89)

Operational range of measured temperatures, °C:	
for ТХА-2388	**from minus 40 to 1000 (1050)**
for ТХК-2388	**from minus 40 to 800** **from minus 40 to 600**
Designation of NSC	
for ТХА-2388	**K**
for ТХК-2388	**L**
Indicator of thermal inertia, sec., not more	**180**
Class	**1 or 2**
Nominal pressure of the measured medium, MPa	**0,25 or 4,0**
Length L, mm	**from 200 to 3150**
Design of the working end	**isolated**
Material of protective reinforcement (armature)	
for ТХА-2388, 1000 °C	**steel 15Х25Т, 20Х23Н18**
for ТХА-2388, 600 °C and ТХК-2388 600°C	**steel 12Х18Н10Т**
Material of head	**aluminum alloy**

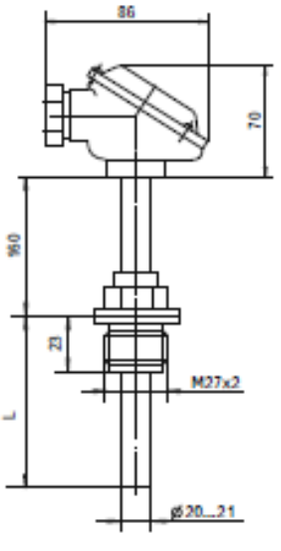


Fig. 1

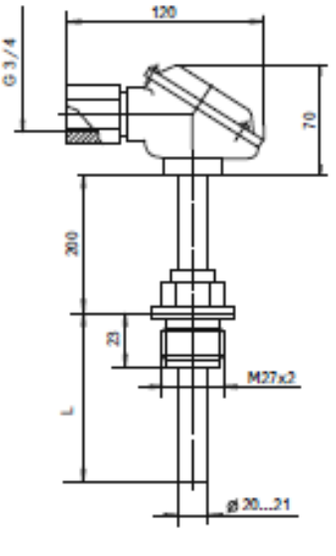


Fig. 2

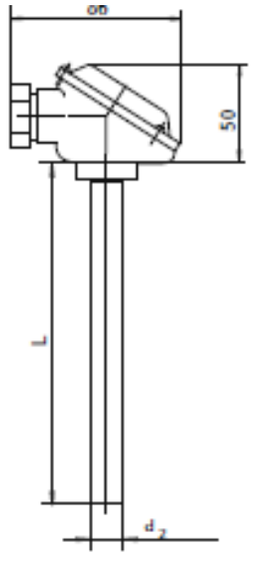


Fig. 3

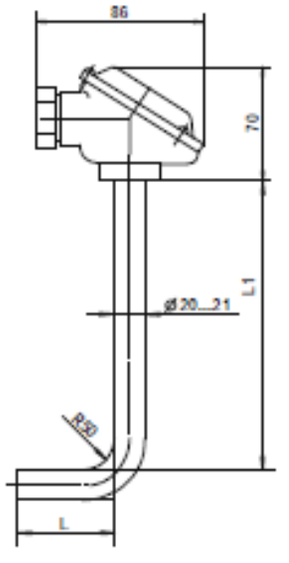


Fig. 4

THERMOELECTRIC COUPLES ТХК-2488 (ТУ 25-7363.041-89)

Designed to measure the temperature of the bodies and heads of extruding press for the processing of plastic masses, rubber compounds, liquid and gaseous media, solids.

Operational range of measured temperatures, °C	**from minus 40 to 400**
Designation of NSC	**L**
Class	**2**
Indicator of thermal inertia, sec., not more:	
with non-insulated working end	**5**
with insulated working end	**30**
Material of mounting part of the protective reinforcement (armature)	**steel 12X18H10T**

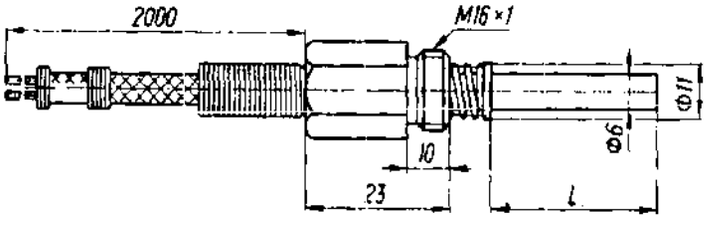


Fig. 1

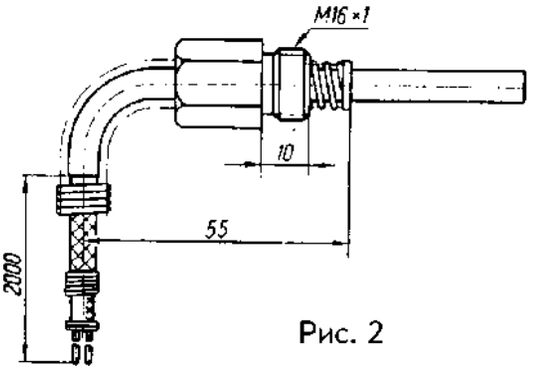


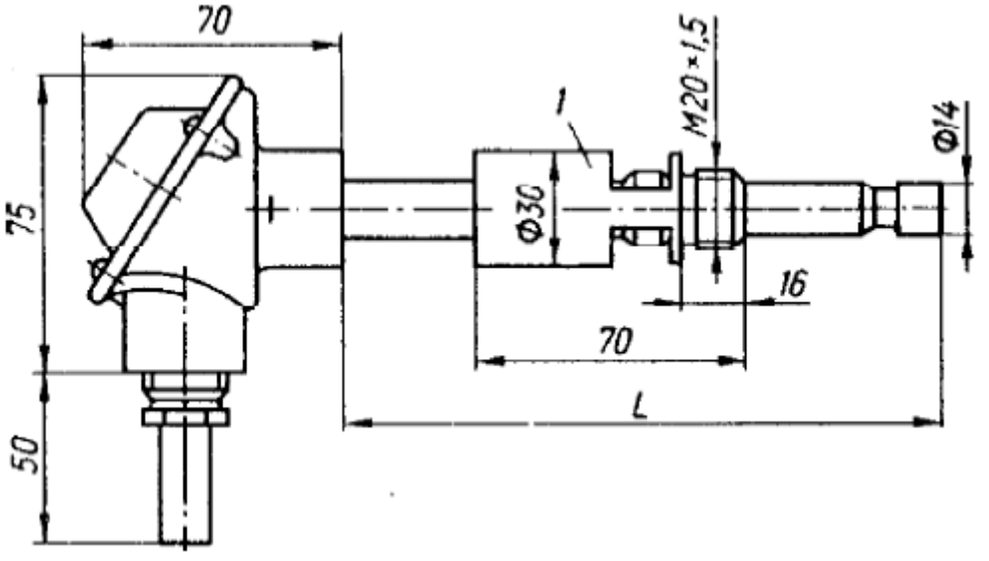
Рис. 2

Designation	Working end	Designation	Working end	Fig.	L, mm	Weight, kg
5Ц2.822.066	non-insulated		isolated	1	10	0.17
-01					32	
-02		5Ц2.822.066-18			60	0.18
-03		-19			100	
-04		-20			120	0.19
-05		-21			160	
-06		-22			200	0.20
-07		-23			250	0.21
-08		-24			320	0.22
-09				2	10	0.17
-10					32	
-11		-25			60	0.18
-12		-26			100	
-13		-27			120	0.19
-14		-28			160	
-15		-29			200	0.20
-16		-30			250	0.21
-17		-31			320	0.22

THERMOELECTRIC COUPLES
ТХА-2588, ТХК-2588 (ТУ 25-7363.041-89)

Designed to measure the temperature of the body and head of the extruding presses for the processing of plastics and rubber compounds.

Operational range of measured temperatures, °C:	
for ТХА-2588	**from minus 40 to 800**
for ТХК-2588	**from minus 40 to 600**
Designation of NSC	
for ТХА-2588	**K**
for ТХК-2588	**L**
Class	**1 or 2**
Number of working thermocouples	**1 or 2**
Indicator of thermal inertia, sec., not more	**40**
Material of protective reinforcement (armature)	**steel 12Х18Н10Т**
Material of head	**aluminum alloy**
Fastening of thermocouples at the facility	**Movable connector (pos.1) with a collet chuck**
Length L, mm	**from 120 to 800**
Design of the working end	**isolated**

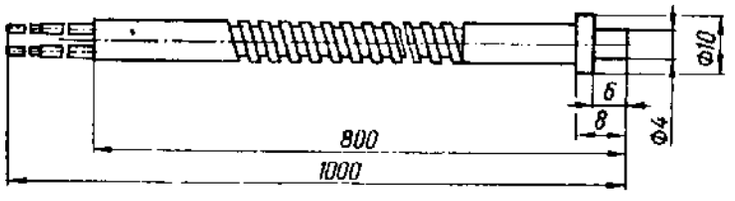


THERMOELECTRIC COUPLES

ТХК-2688 (ТУ 25-7363.041-89)

Designed to measure the temperature in the mixing chamber of the rubber mixer.

Operational range of measured temperatures, °C	**from minus 40 to 200**
Designation of NSC	**L**
Class	**2**
Indicator of thermal inertia, sec., not more	**8**
Nominal pressure, MPa	**4**
Material of protective reinforcement (armature)	**steel 12X18H10T**
Design of the working end	**non-insulated**

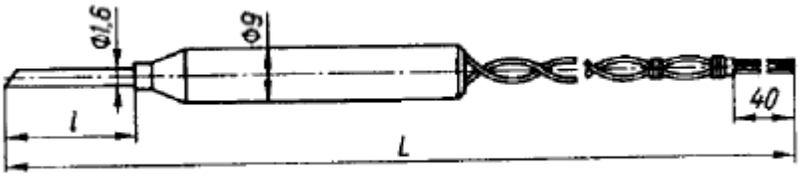


THERMOELECTRIC COUPLES

ТХК-2788 (ТУ 25-7363.041-89)

Designed to measure the temperature of linked sausage and other food products in steam roasting chambers.

Operational range of measured temperatures, °C	**from minus 40 to 200**
Designation of NSC	**L**
Class	**2**
Material of protective reinforcement (armature)	**steel 12X18H10T**
Indicator of thermal inertia, sec., not more	**8**
Nominal pressure, MPa	**0.6**
Design of working end	**non-insulated**



Table

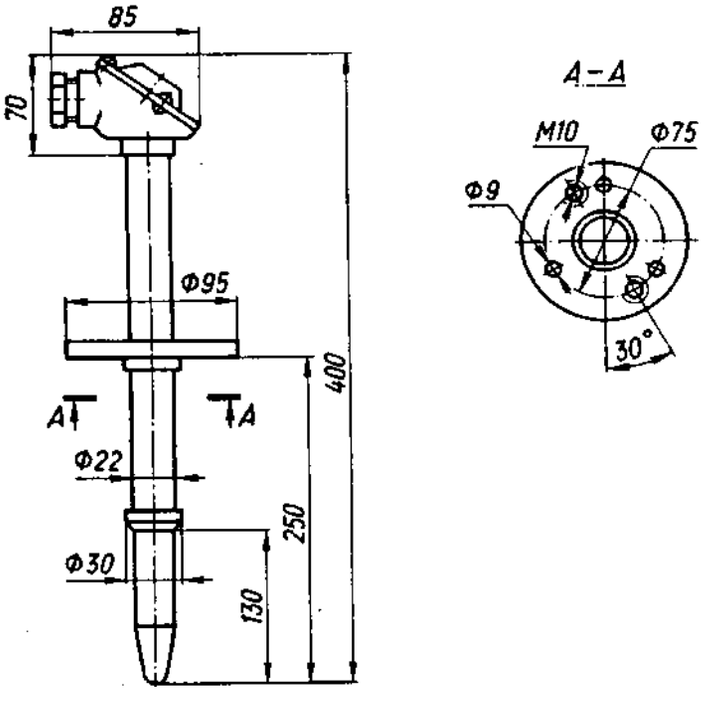
Designation	Dimensions, mm		Weight, g
	L	l	
5Ц2.822.069	6130	60	65
-01	6150	80	68
-02	6170	100	71

THERMOELECTRIC COUPLES

ТХК-2888 (ТУ 25-7363.041-89)

Designed to measure the temperature in the mixing chamber of the rubber mixer.

Operational range of measured temperatures, °C	**from minus 40 to 600**
Designation of NSC	**L**
Class	**2**
Indicator of thermal inertia, sec., not more	**8**
Nominal pressure, MPa	**4**
Design of the working end	**non-insulated**
Material of protective reinforcement (armature)	**steel 40X**
Material of head	**aluminum alloy**
Production of head	**waterproof**
Weight, kg	**1.7**

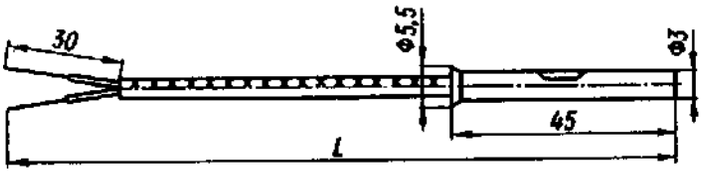


THERMOELECTRIC COUPLES

ТХК-3088 (ТУ 25-7363.041-89)

Designed to measure the temperature of the head of spinning machine and the heating iron of hot drawing machine.

Operational range of measured temperatures, °C	**From 1 to 300**
Designation of NSC	**L**
Class	**2**
Indicator of thermal inertia, sec., not more	**5**
Design of the working end	**non-insulated**
Material of protective reinforcement (armature)	**copper M3**
Length L, mm	**see table**



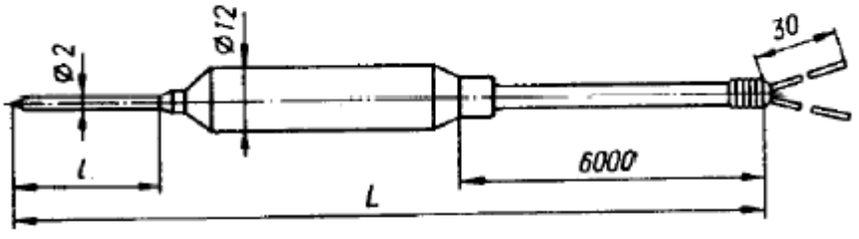
Designation	L, mm	Weight, g
5Ц2.822.072	500	35
-01	1000	70

THERMOELECTRIC COUPLES

ТХК-0583 (ТУ 25-7558.015-86)

Designed for continuous temperature control of technological processes of sausage production.

Operational range of measured temperatures, °C	**from 0 to 200**
Designation of NSC	**L**
Class	**2**
Indicator of thermal inertia, sec., not more	**3**
Material of protective reinforcement (armature)	**steel 12Х18Н10Т or 36НХТЮ-А**
Design of the working end	**non-insulated**



Designation	Dimensions, mm		Weight, kg
	l	L	
5Ц2.821.933	60	6115	0.10
-01	80	6135	0.10
-02	100	6155	0.11
-03	200	6255	0.11
-04	320	6375	0.11

THERMOELECTRIC COUPLES

ТХА-706-02 (ТУ 25-02.792247-80)

Designed to measure temperature in blast-furnace process of peripheral gasses, blast-furnace masonry.

Operational range of measured temperatures, °C	**from minus 50 to 1050**
Designation of NSC	**K**
Class	**2**
Number of working thermocouples	**1 or 2**
Indicator of thermal inertia, sec., not more	**50**
Nominal pressure of measured medium, MPa	**1.6**
Design of the working end	**isolated**
Material of protective reinforcement (armature) (armature)	**steel 20X23H18, alloy XH78T**
Material of head	**steel 12X18H10T**

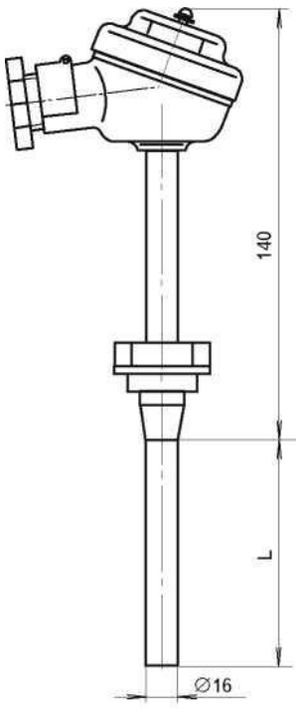


Fig. 1

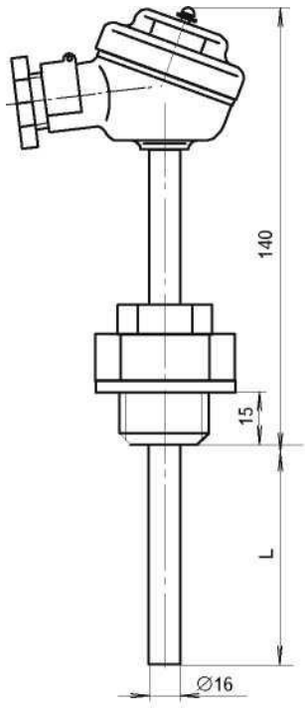


Fig. 2

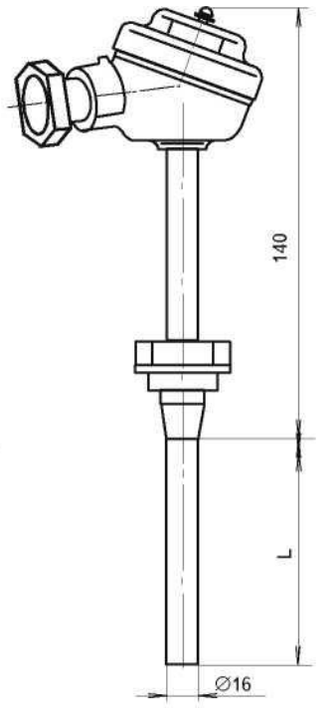


Fig. 3

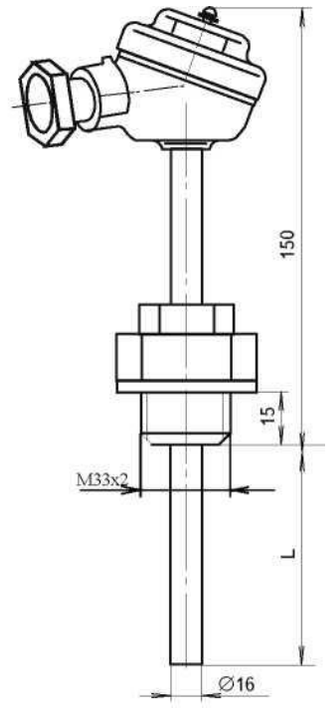


Fig. 4

Designation	Fig.	L, mm	Weight, kg	Designation	Fig.	L, mm	Weight, kg	Designation	Fig.	L, mm	Weight, kg	Designation	Fig.	L, mm	Weight, kg
5Ц2.821.862	1	320	0.3	5Ц2.821.862-10	2	320	1.3	5Ц2.821.862-20	3	320	1.0	5Ц2.821.862-30	4	320	2.0
-01		400	0.5	-11		400	1.9	-21		400	1.1	-31		400	2.1
-02		500	1.0	-12		500	2.0	-22		500	1.2	-32		500	2.2
-03		630	1.1	-13		630	2.1	-23		630	1.3	-33		630	2.3
-04		800	1.3	-14		800	2.3	-24		800	1.5	-34		800	2.5
-05		1000	1.8	-15		1000	2.6	-25		1000	1.8	-35		1000	2.8
-06		1250	1.9	-16		1250	2.9	-26		1250	2.1	-36		1250	3.1
-07		1600	2.3	-17		1600	3.3	-27		1600	2.5	-37		1600	3.5
-08		2000	2.6	-18		2000	3.6	-28		2000	3.0	-38		2000	4.0
-09		2500	3.5	-19		2500	4.5	-29		2500	3.7	-39		2500	4.7

THERMOELECTRIC COUPLES

ТХА-1007 (ТУ У 33.2-04850451-078:2005)

Designed to measure the temperature of solid, liquid and gaseous media and the hearth

Operational range of measured temperatures, °C	**from 0 to 600 (Fig. 1)** **from 0 to 1100 (Fig. 2-5)** **from 0 to 1200 (Fig. 2-5)**
Designation of NSC	**К**
Class	**1 or 2**
Length L, mm:	**from 3550 to 10000 (Fig. 1)** **from 320 to 3150 (Fig. 2-5)**

THERMOELECTRIC COUPLES Fig. 2, 3 can be mounted in the protective reinforcement (armature) (armature) Fig. 6; Fig. 5 - in the protective cartridge - Fig. 7.

1 Thermocouples are made on the basis of a flexible thermocouple cable (with a shell).

2 The design of transducers and connectors, lengths, fastening units and temperature ranges can be replaced in accordance with the operating conditions.

3 To thermoelectric couples in Fig. 2 and Fig. 3 a compensation cable of the desired length can be connected, as well as a connector (plug+socket).

4 Connectors design can be produced under the order. Connectors operating temperature is determined by connector material:

alloy XH78T - 1100 °C; steel 20X23H18 - 1050 °C.

5 Cable shell is produced from materials: 12X18H10T, alloys Inconel 600 and Inconel 601, and also other materials depending on the application temperature and media.

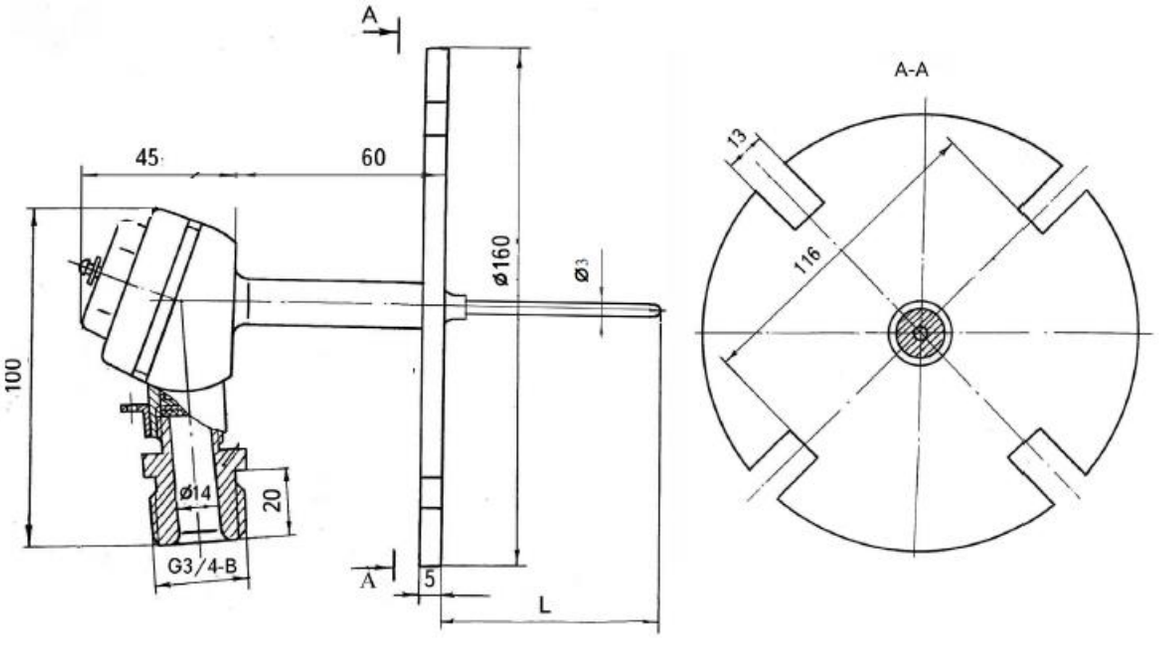


Fig. 1

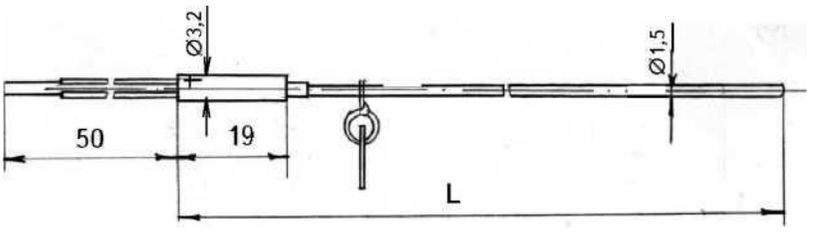


Fig. 2

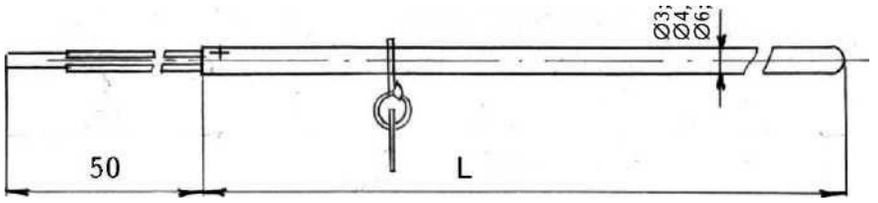


Fig. 3

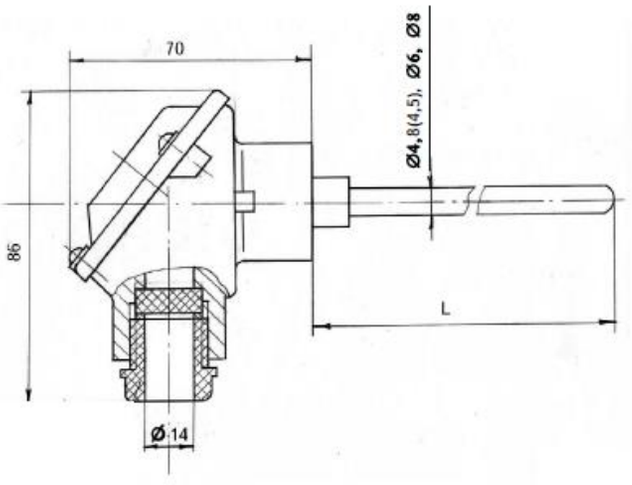


Fig. 4

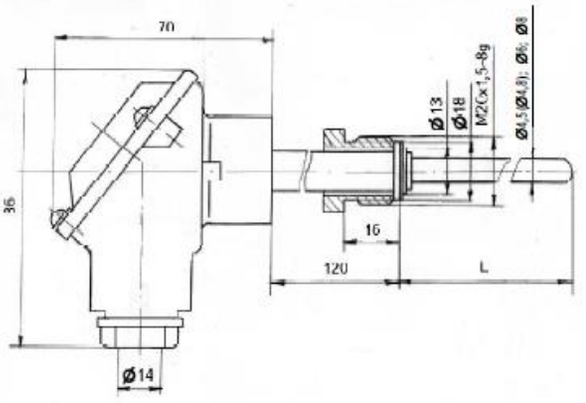


Fig. 5

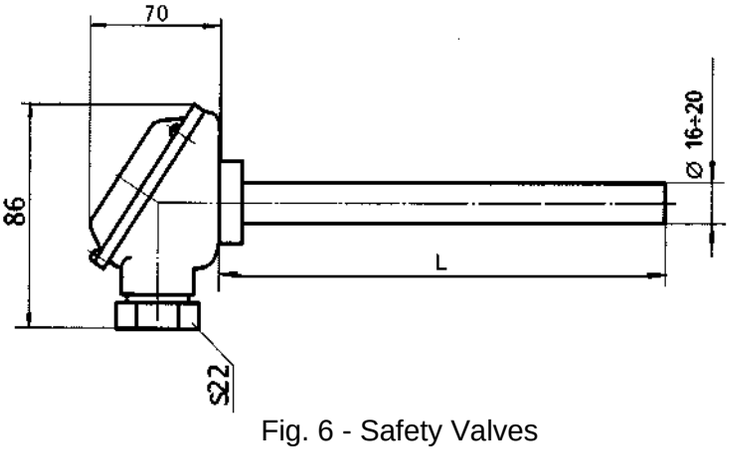


Fig. 6 - Safety Valves

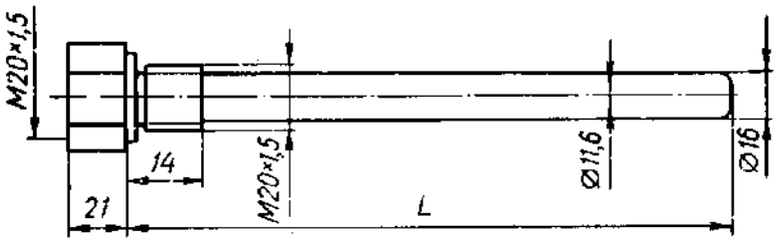


Fig. 7 - Protective Connector

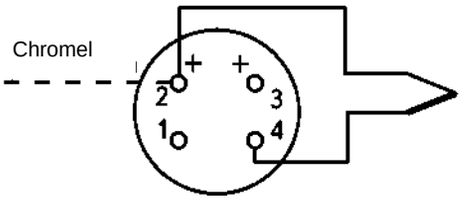
THERMOELECTRIC COUPLES
ТХА-1072, ТХК-1072
(ТУ В 25-04.4112-84)

Designed to measure the water temperature, high purity water, distillate, bidistillate, protective

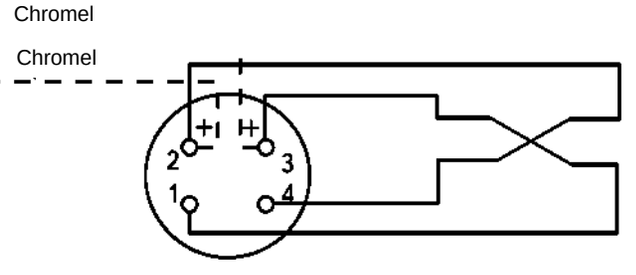
Measuring range, °C:	
for ТХА-1072 Fig.1-4, ТХК-1072 Fig. 1-7	**from 0 to 400**
for ТХА-1072 Fig.6,7	**from 0 to 500**
Designation of NSC	
for ТХА-1072	**К**
for ТХК-1072	**L**
Tolerance class:	
for ТХА-1072	**1, 2**
for ТХК-1072	**2**
Indicator of thermal inertia, sec. not more with insulated working end	**5**
with non-insulated working end	**1**
Design of the working end	**insulated or non-insulated depending on the design**
Nominal pressure of the measured medium, MPa	**25; 0.63 depending on the design**
Length of mounting part, mm	**from 630 to 10600 depending on the design**
Material of protective reinforcement (armature) (armature)	**steel08X18H10T, 12X18H10T**
Material of head	**steel 12X18H10T**

Schematic Diagram of Connections

for Fig. 1-4



for Fig.6.7



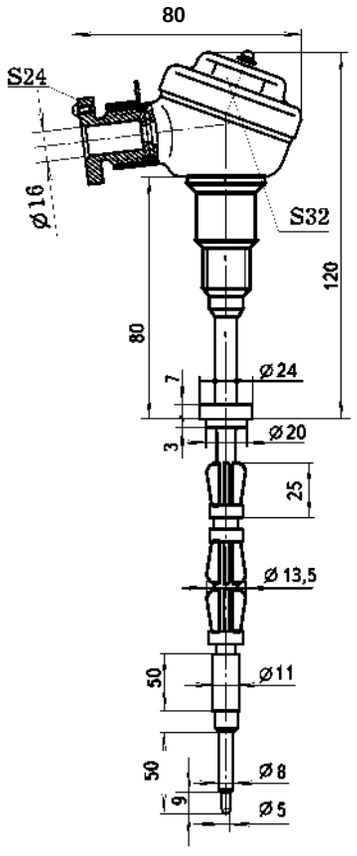


Fig. 1

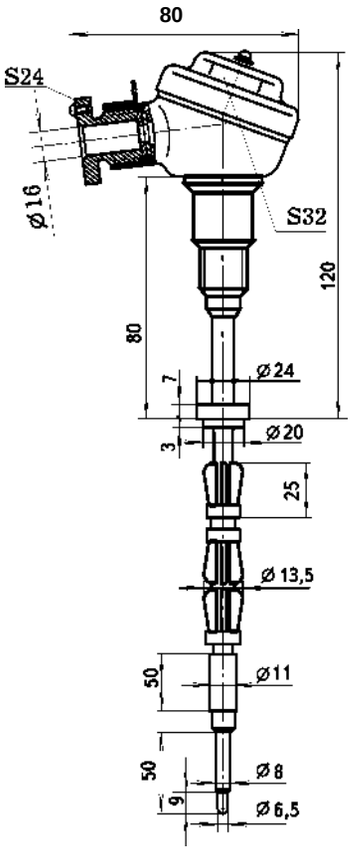


Fig. 2

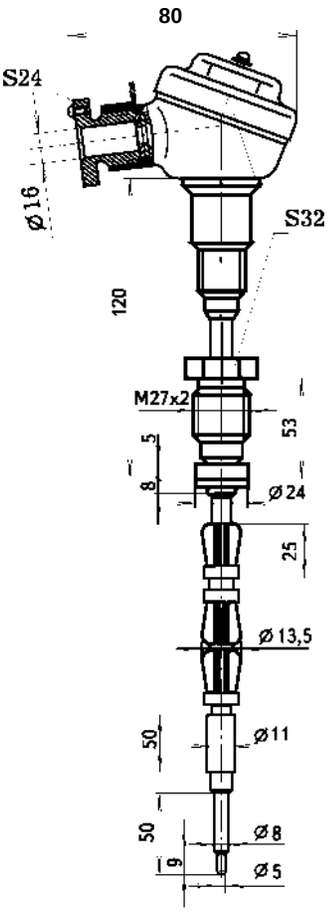
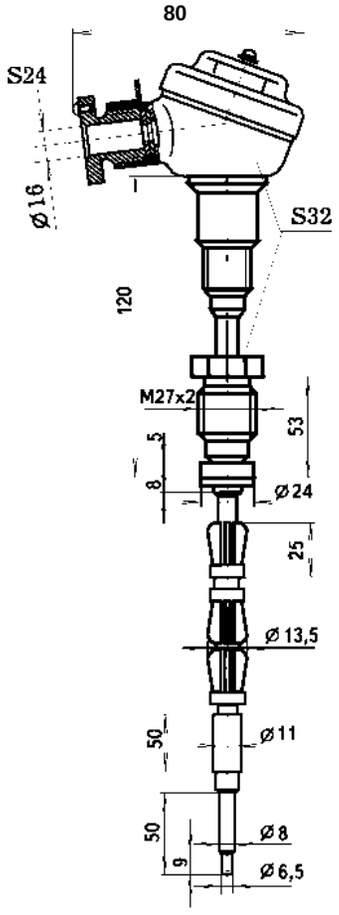


Fig. 3



Fi g. 4

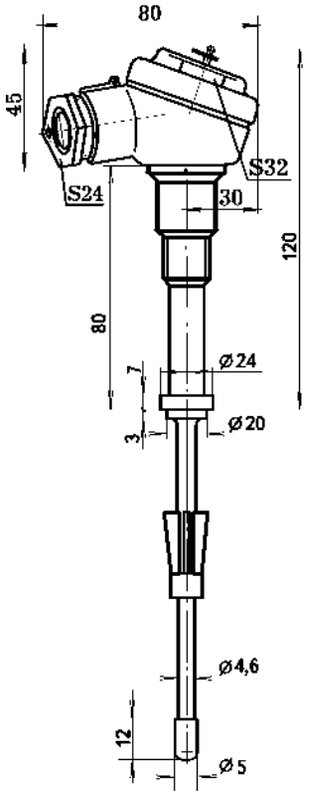


Fig. 6

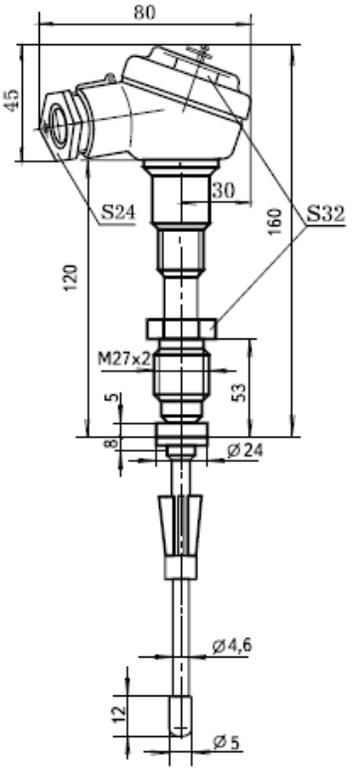


Fig. 7

THERMOELECTRIC COUPLES

ТХА-1085 (ТУ 25-7558.016-86)

Designed to control the temperature of natural gas combustion products, as well as on the units of compressor stations of main gas pipelines at the gas flow rate in front of the protective screen of the working end of the thermoelectric couples up to 70 m/sec.

Operational range of measured temperatures, °C	**from minus 50 to 600**
Designation of NSC	**K**
Class	**2**
Indicator of thermal inertia, sec., not more	**0.35**
Nominal pressure of the measured medium, MPa	**4**
Material of protective reinforcement (armature)	**steel 12X18H10T**
Material of the head (Fig.1)	**steel 12X18H10T**
Production of head	**waterproof**
Weight, kg	**0.54**
Length L, mm	**from 280 to 420**
Design of the working end	**non-insulated**

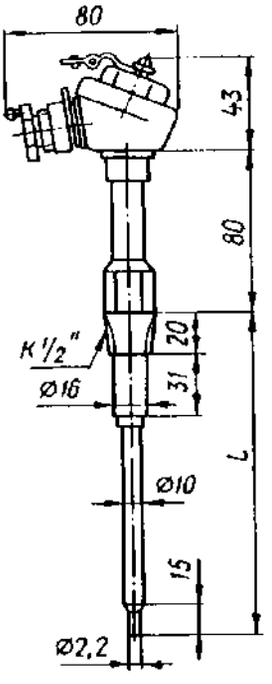


Fig. 1

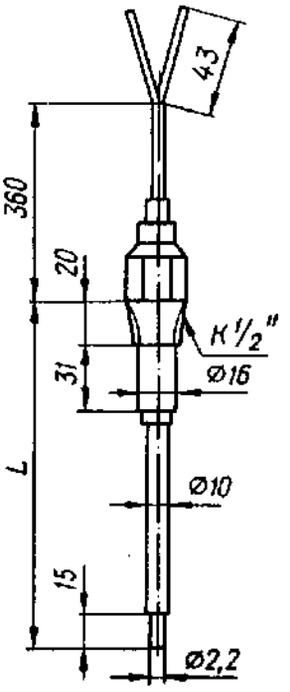


Fig. 2

THERMOELECTRIC COUPLES
ТХА-1087, ТХК-1087 (ТУ 25-7363.027-89)

Designed to measure the temperature of the nitrogen-water mixture and gases after combustion of natural gas (H_2, N_2, CO, O_2, H_2O, CH_4), gaseous and liquid ammonia, natural gas, convertible gas, monoethanol amine solution with impurities of hydrogen sulfide (H_2S) and sulfur dioxide (SO_2) (Fig.1.2); turbine oils in the bearing lubrication system in ammonia production (Fig.3); in tanks and pipelines containing media in which the resistant material of the protective reinforcement (armature) at a liquid speed of up to 3 m/s of gas is up to 40 m/s (Fig.4).

THERMOELECTRIC COUPLES have explosion-proof level of explosion protection "flameproof enclosure" and the explosion protection marking "IExdIICT6".

Operational range of measured temperatures, °C:	
for TXA-1087 (Fig. 1, 2)	**from 0 to 800**
for TXK-1087 (Fig. 1, 2)	**from 0 to 600**
for TXK-1087 (Fig. 3, 4)	**From 1 to 300**
Designation of NSC:	
for TXA-1087	**K**
for TXK-1087	**L**
Class	**2**
Indicator of thermal inertia, sec., not more	
for TXA-1087, TXK-1087 (Fig. 1, 2)	**20**
for TXK-1087 (Fig. 3)	**8**
for TXK-1087 (Fig. 4)	**25**
Nominal pressure of the measured medium, MPa	**from 0,4 to 20**
Number of working thermocouples	**1 or 2**
Material of protective reinforcement (armature)	
for Fig. 1, 2, 4	**steel 12X18H10T or steel 10X17H13M2T**
for Fig. 3	**steel 12X18H10T**
Length L, mm	
for TXA-1087	**from 200 to 2000**
for TXK-1087	**from 50 to 1600**

For cable connection the installation kits for laying in pipes or under the armored cable are used.

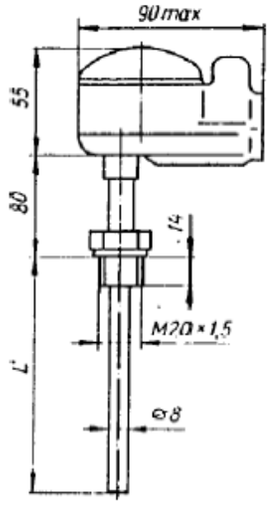


Fig. 1

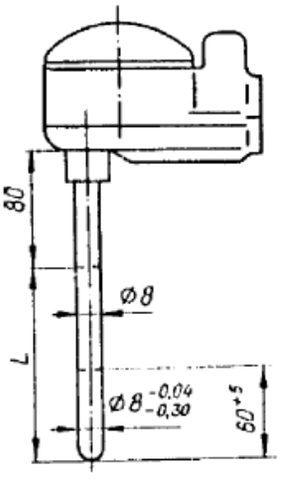


Fig. 2

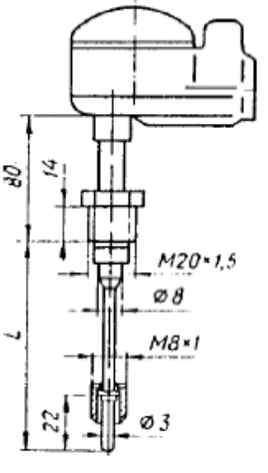


Fig. 3

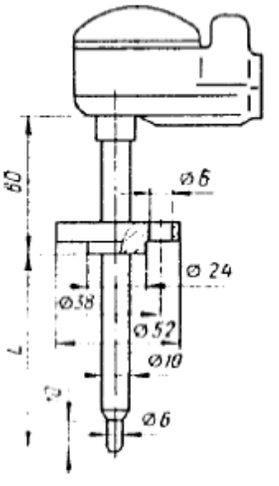


Fig. 4

THERMOELECTRIC COUPLES

ТХА-1368М1 (ТУ У3.48-04850451-041-1999)

Designed to measure the temperature of high-speed gas flows in gas turbine engines.

Operational range of measured temperatures, °C	**from 0 to 1000**
Maximum gas flow rate, m/s	**300**
Designation of NSC	**K**
Class	**2**
Tightness to the measured medium	**sealed**
Degree of protection from dust and water penetration	**IP00**
Resistance to mechanical loads	**vibration and vibration resistant (up to vibrations from 10 to 2000 Hz with an acceleration amplitude of 50 m/c^2), shock and impact resistant (up to multiple shocks with a peak acceleration of 150 m/s^2)**
Number of sensing elements for Fig. 1 - 5 for Fig. 6, 8, 9 for Fig. 7	 **1** **2 - with two working ends** **2 - with one working end**
Design of the working end	**isolated**
Material of protective reinforcement (armature)	**heat-resistant, heat-proof alloys**
Overall dimensions	**see Table 1**
Index of thermal inertia in the gas flow, *ε,* s	**see Table 2**

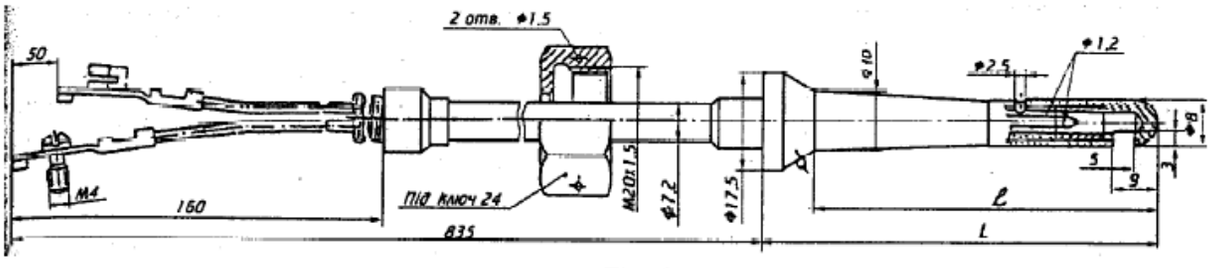


Fig. 1

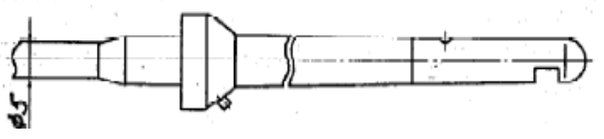


Fig. 2
for rest see Fig. 1

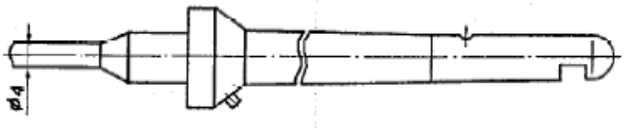


Fig. 3
for rest see Fig. 1

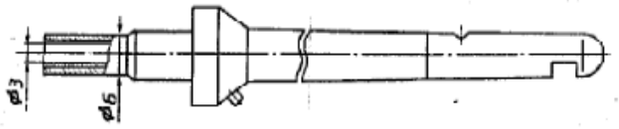


Fig. 4
for rest see Fig. 1

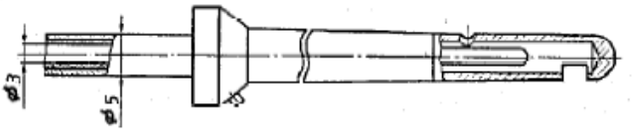


Fig. 5
for rest see Fig. 1

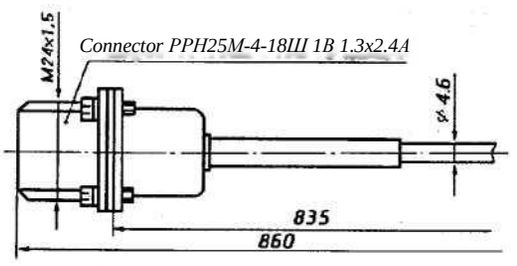


Fig. 6
for rest see Fig. 1

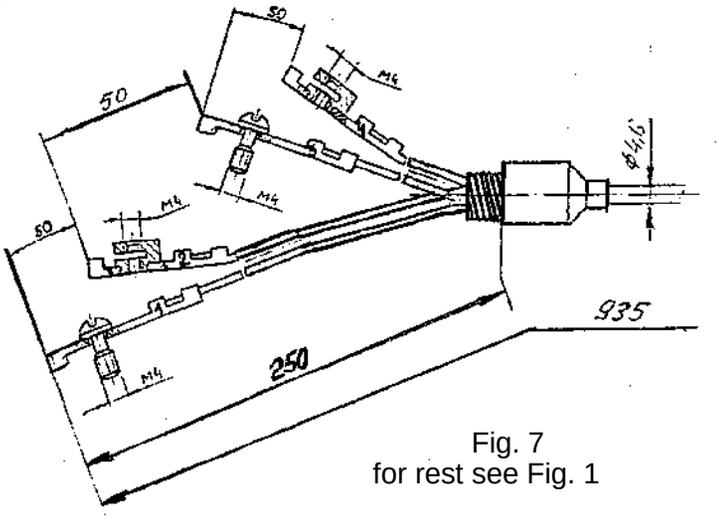


Fig. 7
for rest see Fig. 1

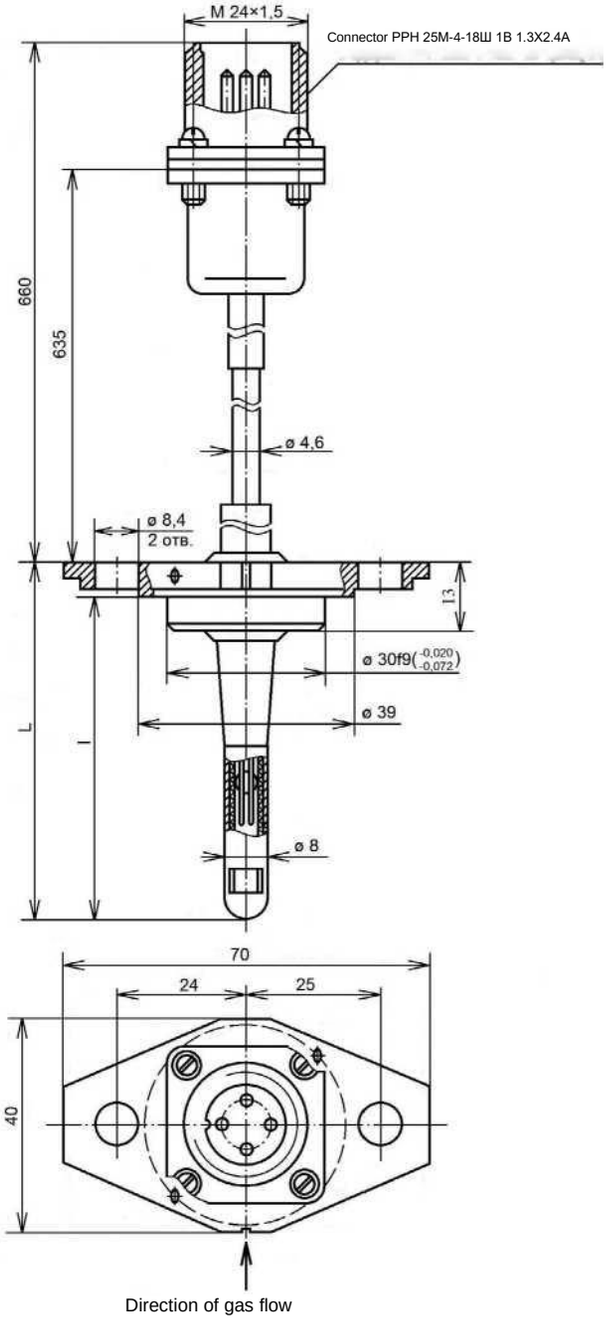


Fig. 8
for rest see Fig. 1

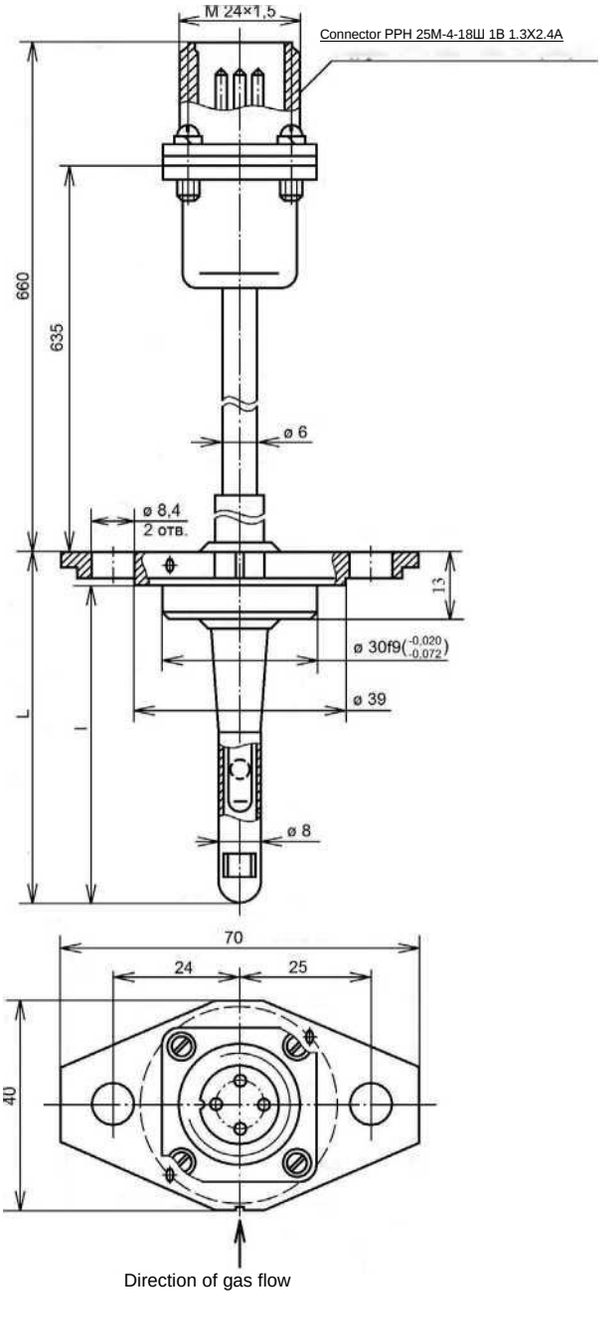
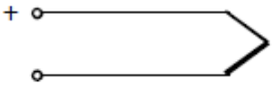


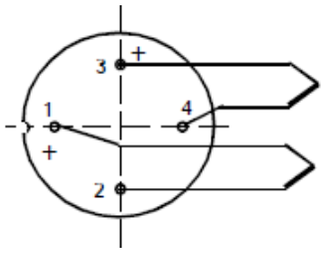
Fig. 9
for rest see Fig. 1

Table 1

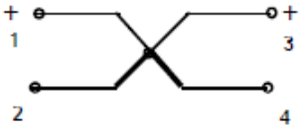
TC Execution Designation	Figure	Dimensions, mm		Weight, kg, no more
		L	1	
БАУИ.405221.027	1	80	69	0.30
-01		120	109	0.31
-02	2	80	69	0.22
-03		120	109	0.23
-04	3	80	69	0.20
-05		120	109	0.21
-06	4	80	69	0.22
-07		120	109	0.23
-08	5	80	69	0.22
-09		120	109	0.23
-10	6	80	69	0.28
-11		120	109	0.29
-12	7	80	69	0.24
-13		120	109	0.25
-14	8	69	63	0.30
-15		82	76	0.31
-16	9	69	63	0.30
-17		82	76	0.31



for TC (Fig. 1-5)



for TC (Fig. 6, 8, 9)



for TC (Fig. 7)

Internal wiring diagram

Table 2

Indicator of Thermal Inertia, sec., not more		Maximum Gas Flow Rate, m/s
TC (Figures 1-4)	TC (Figures 5-9)	
16.0	25.0	20
9.0	14.0	50
5.0	10.0	100
4.0	6.5	150
3.3	5.5	200
3.0	4.6	250
2.4	3.9	300

THERMOELECTRIC COUPLES

ТХА-1387 (ТУ 25-7363.039-89)

Designed for temperature measurement in gas turbine and steam turbine installations on heat power engineering facilities:

- of combustion products of liquid or gaseous fuels up to 900 °C in a pulsating flow moving at a speed of up to 170 m/s with a pressure of up to 3 MPa; the rate of temperature change of the measured medium is up to 150 °C/min (Fig. 1,2,3);
- of superheated to 585°C steam in the flow at a speed of up to 60 m/s, with a pressure of up to 25.5 MPa (Fig.4).

Operational range of measured temperatures, °C:	
for Fig. 1, 2, 3	**from 0 to 900**
for Fig. 4	**from 0 to 585**
Designation of NSC	**К**
Class	**2**
Indicator of thermal inertia, sec., not more:	
for Fig. 1, 2, 3	**3**
for Fig. 4	**15**
Resistance to mechanical loads	**shakeproof**
Number of sensing elements	
for Fig. 1, 2, 3	**2**
for Fig. 4	**1**
Material of mounting part:	
for Fig. 1, 2, 3	**alloys ХН45Ю. ХН78Т, steel 20Х23Н18**
for Fig. 4	**alloy 12Х1МФ (20Х1МФ)**
Material of head	**aluminum alloy**
Design of the working end	**non-insulated**
Sensing element (Fig. 4)	**changable**

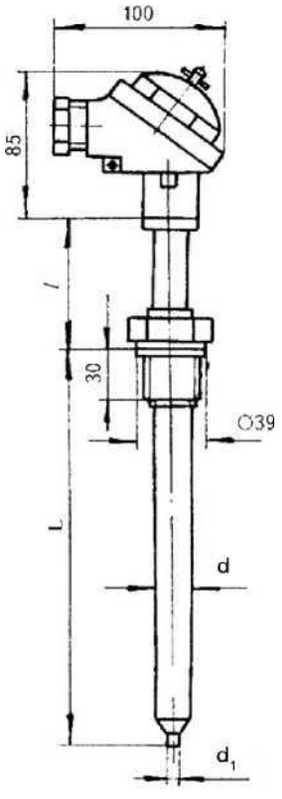


Fig. 1

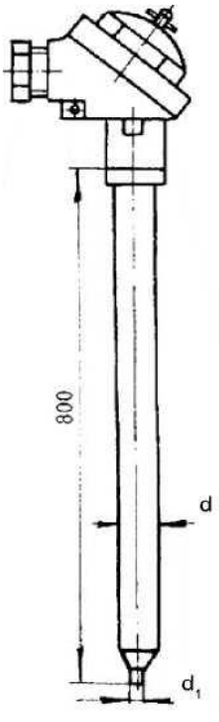


Fig. 2

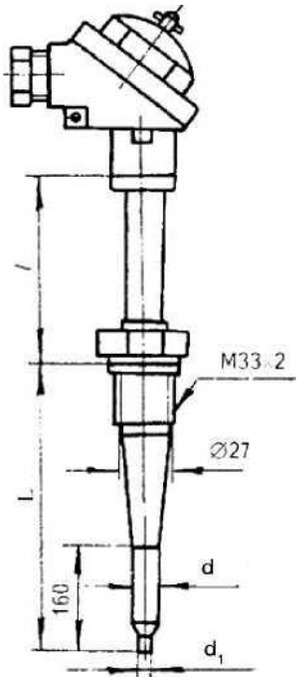


Fig. 3

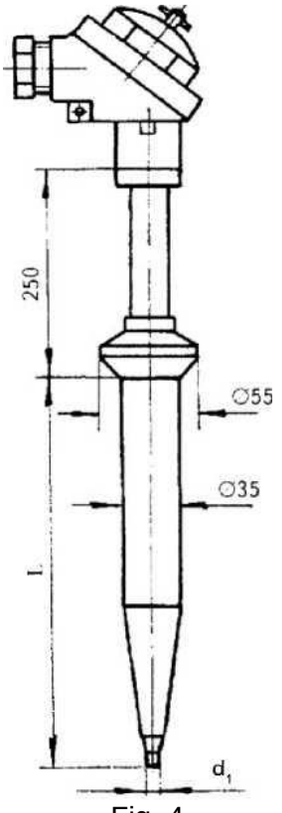


Fig. 4

Designation	Fig.	L, mm	l, mm	d, mm	d1, mm	Weight, kg
5Ц2.821.962	1	250	160	20	5.3	1.15
-01		320				1.30
-02		400				1.50
-03		500				1.70
-04		630				1.80
-05		800				2.20
-06		320	320			1.50
-07		500				1.90
-08	2	800	-			2.05
-09	3	320	160	22		1.70
-10		500				1.90
-11		630				2.10
-12		320	400			2.00
-13		500				2.20
-14		630				2.35
-15		500	630			2.50
-16	4	80	250	-	7	1.60
-17		100				1.70
-18		120				1.80
-19		160				2.10
-20		200				2.40

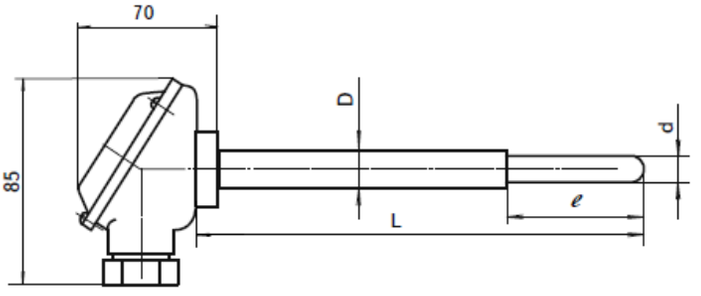
THERMOELECTRIC COUPLES FOR HIGH TEMPERATURE MEASURINGS

THERMOELECTRIC COUPLES ТПП-1788,
ТПР-1788 (ТУ 25-7363.043-90)

Designed to measure the temperature of oxidized and neutral media.

Operational range of measured temperatures, °C	
for ТПП-1788	**from 0 to 1300**
for ТПР-1788	**from 600 to 1600**
Designation of NSC	
for ТПП-1788	**S**
for ТПР-1788	**B**
Class:	
for ТПП-1788	**2**
for ТПР-1788	**2 or 3**
Indicator of thermal inertia, sec., not more	**80**
Nominal pressure of the measured medium Py, MPa	**0.6**
Diameter of thermoelectrodes, d, mm	**0.4 and 0.5**
Length L, mm	**see table**
Material of head	**aluminum alloy**

* The ceramic submerged part of length 1 is only calculated for upper values of the measured temperature range, above 1000 °C.



Designation ТПП 1788	L, mm	*l*,mm	d, mm	D, mm	Material of the submerged reinforcement	Weight, kg
5Ц2.821.041	320	250	8	14	Corundum	0.28
-01	500	400				0.33
-02			15	25		0.76
-03	800					1.41
-04	1000					1.92
-05	1250					2.51
-06	1600					3.38
-07	2000					4.21

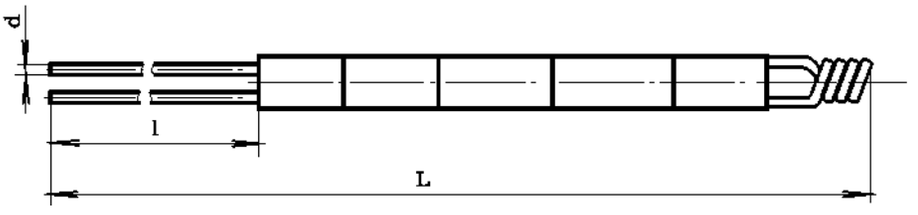
Designation ТПП 1788	Class	L, mm	*l*, mm	d, mm	D, mm	Material of submerged reinforcement	Weight, kg	Designation ТПП 1788	Class	L, mm	*l*, mm	d, mm	D, mm	Material of submerged reinforcement	Weight, kg
5Ц2.822.041-08	2	320	250	8	14	Corundum	0.27	5Ц2.822.041-32	2	320	250	8	14	Beryllium oxide	0.27
-09		500	400				0.32	-33		500	400				0.32
-10				15	25		0.74	-34				15	25		0.74
-11		800					1.39	-35		800					1.39
-12		1000					1.87	-36		1000					1.87
-13		1250					2.46	-37		1250					2.46
-14		1600					3.33	-38		1600					3.33
-15		2000					4.16	-39		2000					4.16
-16	3	320	250	8	14		0.27	-40	3	320	250	8	14		0.27
-17		500	400				0.32	-41		500	400				0.32
-18				15	25		0.74	-42				15	25		0.74
-19		800					1.39	-43		800					1.39
-20		1000					1.87	-44		1000					1.87
-21		1250					2.46	-45		1200					2.46
-22		1600					3.33	-46		1600					3.33
-23		2000					4.16	-47		2000					4.16

THERMOELECTRIC COUPLES
ТПП-1888, ТПР-1888 (ТУ 25-7363.043-90)

Designed to measure air temperature, inert gases and other non-corrosive media.

Operational range of measured temperatures, °C:

for ТПП-1888	from 0 to 1300
for ТПР-1888	from 600 to 1600
Designation of NSC	
for ТПП-1888	S
for ТПР-1888	B
Class:	
for ТПП-1888	2
for ТПР-1888	2 or 3
Indicator of thermal inertia, sec., not more	5
Diameter of thermoelectrodes, d, mm	0.4 and 0.5



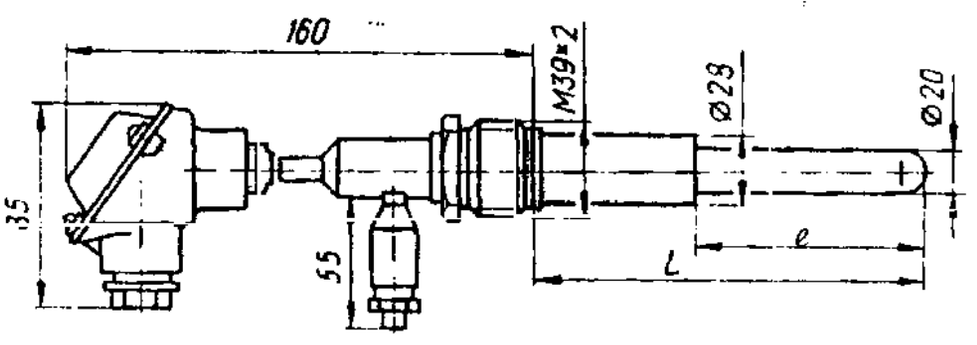
Delivery of d=0,4 mm and length L according to the order is possible.

Designation ТПП-1888	L, mm	L, mm	d, mm	Designation ТПР-1888 Class 2	Designation ТПР-1888 Class 3	L, mm	l, mm	d, mm
5Ц2.821.042	320	20	0.5	5Ц2.822.042-31	5Ц2.822.042-62	320	20	0.5
-01	400			-32	-63	400		
-02	500			-33	-64	500		
-03	630			-34	-65	630		
-04	800			-35	-66	800		
-05	1000			-36	-67	1000		
-06	1250	50		-37	-68	1250	50	
-07	1600			-38	-69	1600		
-08	2000			-39	-70	2000		
-09	2500			-40	-71	2500		
-10	3150			-41	-72	3150		
-11	4000			-42	-73	4000		
-12	4500			-43	-74	4500		
-13	5000			-44	-75	5000		
-14	5600			-45	-76	5600		
-15	6300			-46	-77	6300		
-16	7100			-47	-78	7100		
-17	8000			-48	-79	8000		
-18	9000			-49	-80	9000		
-19	10000			-50	-81	10000		
-20	320	20	0.3	-51	-82	320	20	0.3
-21	400			-52	-83	400		
-22	500			-53	-84	500		
-23	630			-54	-85	630		
-24	800			-55	-86	800		
-25	1000			-56	-87	1000		
-26	1250	50		-57	-88	1250	50	
-27	1600			-58	-89	1600		
-28	2000			-59	-90	2000		
-29	2500			-60	-91	2500		
-30	3150			-61	-92	3150		

THERMOELECTRIC COUPLES
ТПР-1988 (ТУ 25-7363.043-90)

Designed to measure the temperature of hydrogen, carbon monoxide, water steam, higher hydrocarbons.

Operational range of measured temperatures, °C	**from 600 to 1600**
Designation of NSC	**B**
Class	**2 or 3**
Indicator of thermal inertia, sec., not more	**50**
Material of the submerged part of the protective reinforcement (armature) (1)	**corundum**
Material of head	**aluminum alloy**



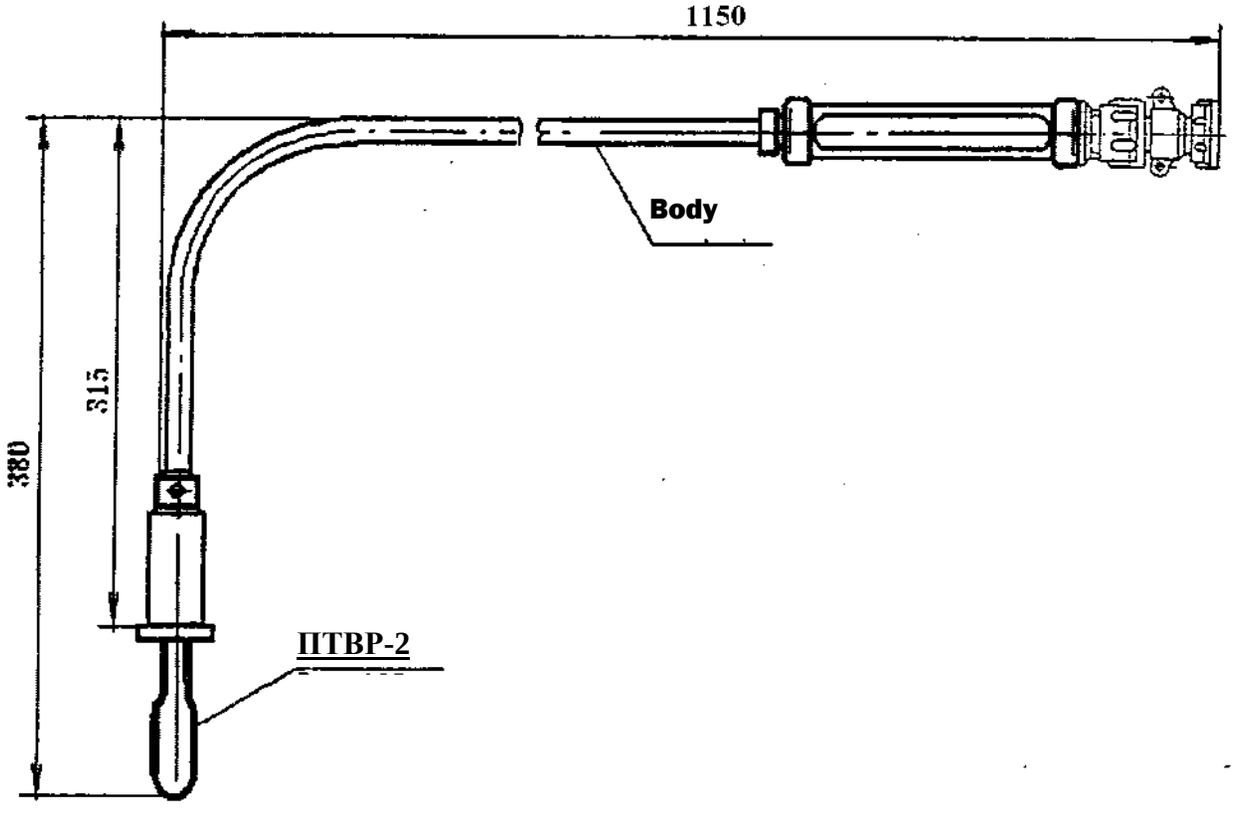
Designation	Class	Dimensions, mm		Designation	Class	Dimensions, mm	
		L	*e*			L	*e*
5Ц2.822.044	2	630	320	5Ц2.822.044 -05	3	630	320
-01		800	400	-06		800	400
-02		1000	400	-07		1000	400
-03		1250	630	-08		1250	630
-04		1600	1000	-09		1600	1000

THERMOELECTRIC COUPLES
ТВР-301-01 (ТУ 25.02.7921.46-79)

Designed for repeated short-term measurement of slag purified molten iron temperature in the casting ladles of foundries by THERMOELECTRIC COUPLES ПТВР-2 packages immersion into the measured medium.

Packages of type ПТВР-2 are products of one-time short-term use and are supplied as a standalone product.

Operational range of measured temperatures, °C	**from 1200 to 1550**
Designation of NSC	**A-1, A-2, A-3**
Class	**2 or 3**
Duration of package ПТВР-2 stay in the hot melt (time of one measurement), s	**5**
Number of measurements per package when immersed in purified cast iron	**10**
Number of measurements by one thermoelectric couple, subject to package replacement, times, no more	**1500**
Indicator of thermal inertia, sec., not more	**2**
Weight, kg, no more:	
thermoelectric couple,	**1.0**
package	**0.05**



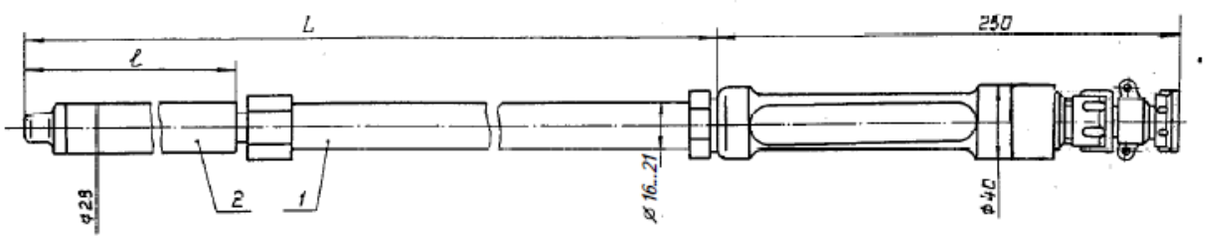
THERMOELECTRIC COUPLES ТПР-0290 (ТУ У 33.2-04850451-088:2007)

Designed to measure the temperature of liquid steel by short-term (5 s) immersion of thermoelectric couple ПТПР-0290 package in the measured medium, with its following change. Packages of type ПТПР-0290 are products of single use and can be delivered as an independent product according to ТУ У 33.2-04850451-089:2007.

Operational range of measured temperatures, °C	from 1000 to 1800
Designation of NSC	B
Class	2 or 3
Indicator of thermal inertia, sec., not more	2
Duration of package ПТПР-0290 stay in molten steel (time of one measurement), no more, s	5

After measuring the package should be replaced.

On customer demand packages ПТПР-0290 delivery is allowed (Fig. 3) with connector length of the range: 100; 200; 250; 300; 500; 600; 900; 1000; 1200 mm.



1 - body, 2 - replaceable package

Fig. 1 - ТПР-0290

Designation	Implementation	L, mm	e, mm
БАУИ.405223.001	ТПР-0290	1600	250
-01	ТПР-0290-01	2000	500
-02	ТПР-0290-02	2500	
-03	ТПР-0290-03	3150	1000
-04	ТПР-0290-04	4000	
-05	ТПР-0290-05	4500	1200

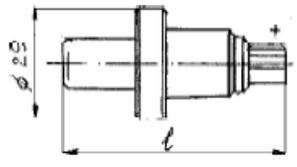


Fig. 2 - Package П ТПР-0290

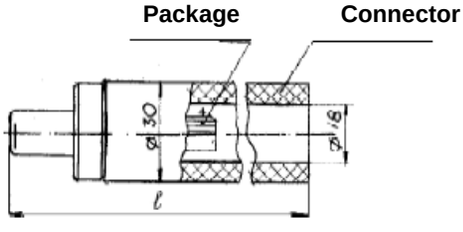


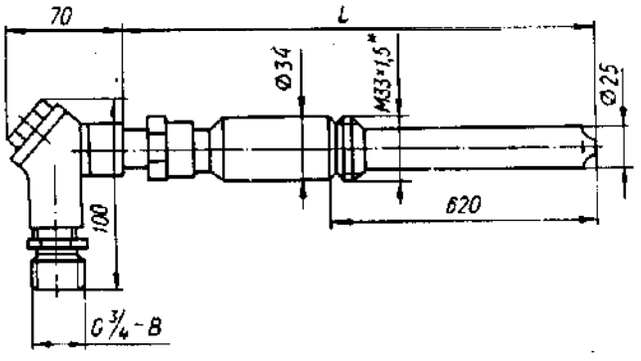
Fig. 3

Designation	Implementation	Fig.	e, mm
БАУИ.408713.009	ПТПР-0290	2	60
-01	ПТПР-0290-01	3	250
-02	ПТПР-0290-02		500
-03	ПТПР-0290-03		1000
-04	ПТПР-0290-04		1200

THERMOELECTRIC COUPLES
ТПР-0573 (ТУ 25-02.792059-77)

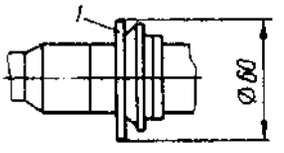
Designed to measure the temperature of hot blast furnaces.

Operational range of measured temperatures, °C	**from 600 to 1350**
Designation of NSC	**B**
Class	**2 or 3**
Indicator of thermal inertia, sec., not more	**180**
Material of the submerged part of protective reinforcement (armature)	**self-bonded silicon carbide (SSC) or other similar material**
Material of head	**steel 12X18H10T**
Production of head	**waterproof**



* small-step thread for fixing the protective cover, used for transportation and storage of the product.

Fig. 1



1-mobile sealing fastening unit; the rest - see Fig. 1.

Fig. 2

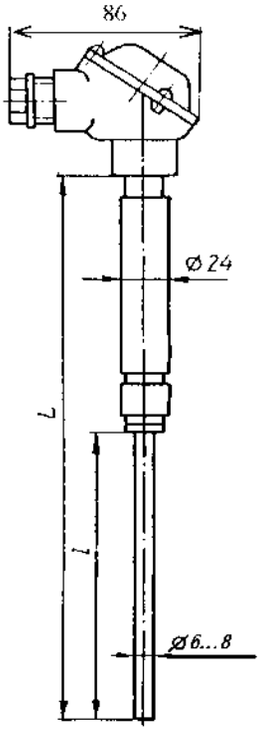
Designation	Fig.	L, mm	Weight, kg
5Ц2.821.694	1	1250	4.0
-01		1600	4.5
-02		2000	5.0
-03		2500	5.5
-04	2	1250	4.0
-05		1600	4.5
-06		2000	5.0
-07		2500	5.5

THERMOELECTRIC COUPLES

TBP-0687 (ТУ 25-7363.031-89)

Designed to measure the temperature in high temperature furnaces with tungsten or molybdenum heaters in argon or vacuum.

Operational range of measured temperatures, °C for different versions	**see table**
Designation of NSC	**see table**
Class	**2 or 3**
Indicator of thermal inertia, sec., not more	**30**
Material of protective reinforcement (armature)	**molybdenum**



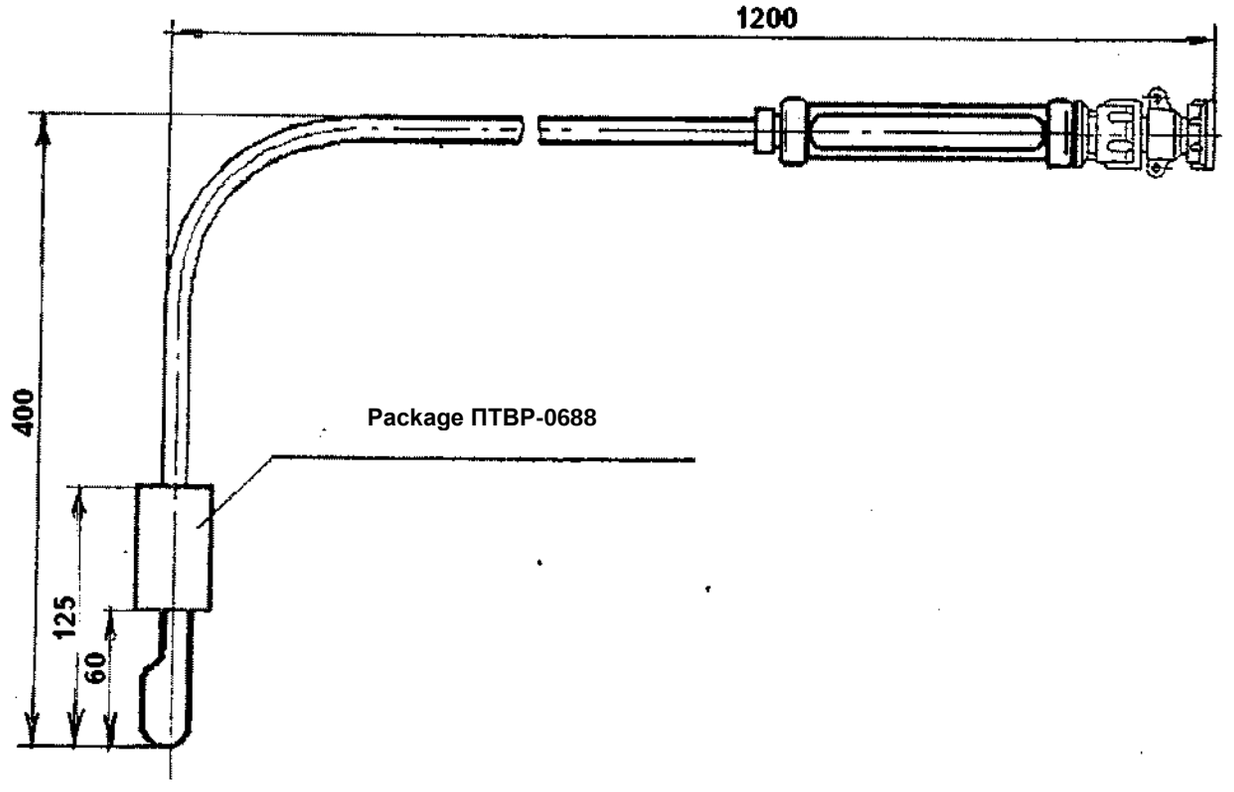
Designation	l, mm	L, mm	Operating temperature range, °C	NSC
5Ц2.821.964	250	400	0...2000	A-1
-01	320			
-02		500		
-03	250	400	0...1800	A-2 or A-3
-04	320			
-05		500		

THERMOELECTRIC COUPLES
ТВР-0688 (ТУ 25-7363.054-90)

Designed to measure the temperature of slag-free cast iron on various units of cast iron production by short-term (5 s) immersion in the measured medium, followed by the replacement of THERMOELECTRIC COUPLES packages ПТВР-0688, which are products of single use or, depending on the conditions of use, re-single short-term use.

The package can be supplied as a standalone product according to ТУ 25.7363.055-90.

Operational range of measured temperatures, °C	**from 1200 to 1800**
Designation of NSC	**A-1, A-2, A-3**
Class	**2 or 3**
Indicator of thermal inertia, sec., not more	**2**
Weight, kg, no more:	
thermoelectric couple,	**1.5**
package,	**0.2**



THERMOELECTRIC COUPLES
TBP-3488 (ТУ 25-7363.054-90)

Designed for measuring temperature in high temperature furnaces in a neutral environment, in dry hydrogen medium, in vacuum up to 0,133 10^{-3} -т- 0,133 10^{-4} KPa.

Operational range of measured temperatures, °C	**from 0 to 2000 (A-1)** **from 0 to 1800 (A-2)**
Nominal value of application temperature, °C	**1750**
Designation of NSC	**A- 1; A-2**
Tolerance class	**2**
Indicator of thermal inertia, sec., not more	**30**
Material of submersible part of the protective reinforcement (armature)	**BeO (beryllium oxide) Fig. 1, 2** **Mo (molybdenum) Fig. 3**

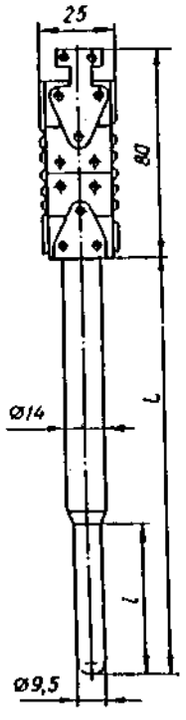


Fig. 1

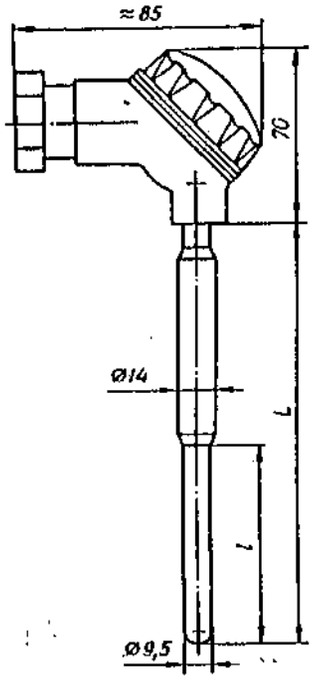


Fig. 2

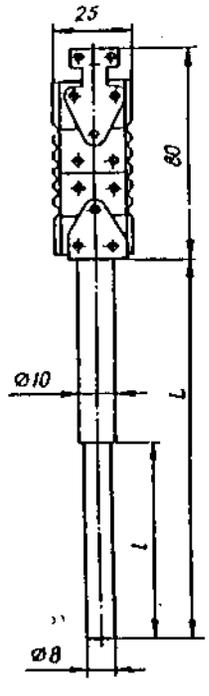


Fig.3

THERMOELECTRIC COUPLES
ТПП-0788 (ТУ 25-7363.056-90)

Designed to measure the temperature of the molten metal by short-term (5 s) immersion of thermoelectric couple package ПТПП-0788 in the measured medium, with its following replacement.

Packages of type ПТПП-0788 are the products of single use and can be supplied as a standalone product according to ТУ 25-7363.057-90.

Operational range of measured temperatures, °C:	**see table**
Designation of NSC	**S**
Class	**2**
Indicator of thermal inertia, sec., not more	**2**

After measuring the package should be replaced.

At consumer request the supplying of thermocouples ТПП-0788 with a body length of 1000...1400 mm, packages ПТПП-0788 with a connector length within 200... 1200 mm is allowed.

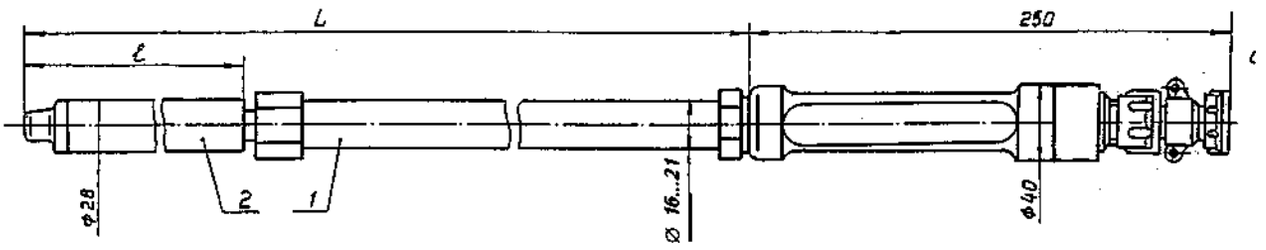


Fig. 1 - ТПП-0788
1 - Body; 2 - Replaceable Package

Designation	Dimensions, mm		Range of measured temperatures, °C
	L	1	
ТПП-0788	1600	250	1300... 1700
ТПП-0788-01	2500	500	
ТПП-0788-02	3150	1000	
ТПП-0788-03	1600	250	900... 1400
ТПП-0788-04	2500	500	

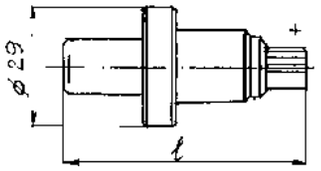


Fig. 2 - Package ПТПР-0788

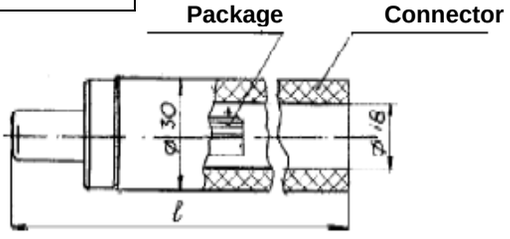


Fig. 3

Designation	Implementation	Fig.	L, mm	Weight, g	Range of Measured Temperatures, °C
5Ц5.182.885	ПТПП-0788	2	60	25	1300.1700
5Ц5.182.885-01	ПТПП-0788-01	3	200.250	100	
5Ц5.182.885-02	ПТПП-0788-02		450.600	200	
5Ц5.182.885-03	ПТПП-0788-03		900.1200	400	
5Ц5.182.885-04	ПТПП-0788-04	2	80	25	900.1400
5Ц5.182.885-05	ПТПП-0788-05	3	200.250	100	
5Ц5.182.885-06	ПТПП-0788-06		450.600	200	

THERMOCOUPLES OF RESISTANCE AND THERMOELECTRIC COUPLES OF MARITIME REGISTER

THERMOCOUPLE OF RESISTANCE

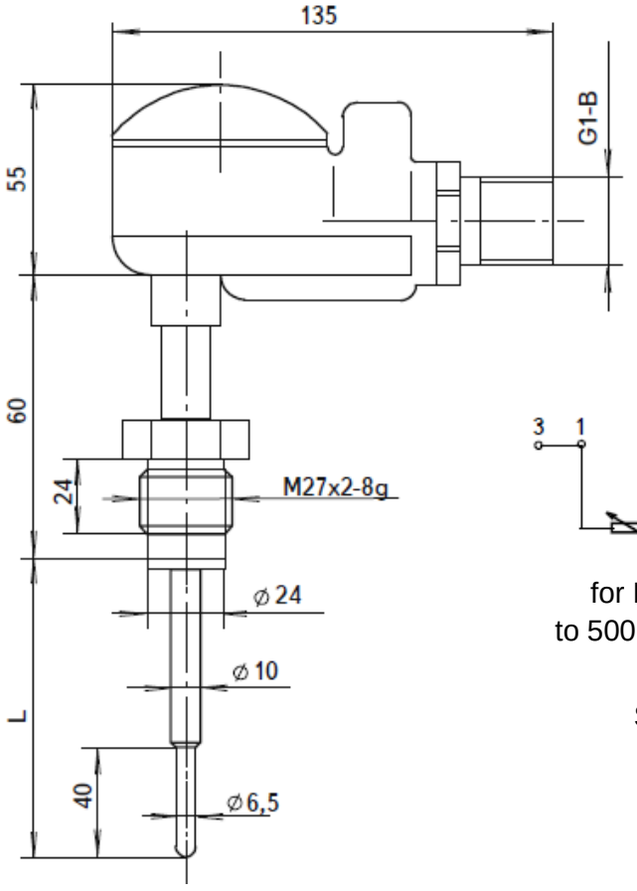
ТСП-0989Р, ТСМ-0989Р (ТУ У 33.2-04850451-070-2003)

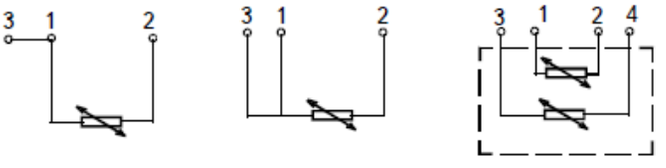
Designed to measure gas temperature, polymer glycerin paste, gaseous oxygen, hydrogen, nitrogen, carbon dioxide, carbon monoxide, hydrocarbon, antimony hydrogen, sulphuric acid mist.

Thermocouples are explosion-proof level of explosion protection, type of protection "flameproof enclosure", the explosion protection marking1EdIICT6, the sign "x" and high degree of mechanical strength.

Used on ships with unlimited navigation area.

Range of measured temperatures,°C:	
for ТСП-0989Р	**from minus 200 to 400**
for ТСМ-0989Р	**from minus 50 to 150**
Designation of NSC:	
for ТСП-0989Р	**50П, 100П, Pt50, Pt100**
for ТСМ-0989Р	**50М**
Tolerance class:	
for ТСП-0989Р	**B**
for ТСМ-0989Р	**C**
Nominal pressure of the measured medium Py, MPa	**16**
Material of protective reinforcement (armature)	**steel 12Х18Н10Т**
Material of thermocouple head	**pressmaterial АГ-4В**
Degree of protection from dust and water penetration	**IP65**
Length L, mm:	
for ТСП-0989Р	**from 60 to 1600**
for ТСМ-0989Р	**from 60 to 500**





for L to 500 mm

for L more than 500 mm

for double element

Schematic Diagram of Connections

THERMOCOUPLE OF RESISTANCE
ТСМ-8040Р (ТУ У 33.2-04850451-069-2003)

Designed to measure the temperature of fresh water, steam, air, boiler water, oil, oxygen, hydrogen, sulphuric acid mist, carbon dioxide, sea water, distillate, bidistillate, freon, halocarbon, and the like.

Used on ships with unlimited navigation area.

Operational range of measured temperatures, °C	**from minus 50 to 150**
Designation of NSC	**50M**
Tolerance class	**C**
Material of protective reinforcement (armature)	**steel 08X18H10T**
Material of thermocouple head	**steel 12X18H10T**
Degree of protection from dust and water penetration	**IP65**

Designation	Fig.	L, mm	l, mm	D, mm	Weight, kg
5Ц2.822.170	1	60	60	6.5	0.38
-01		80			0.40
-02		100			0.42
-03		120			0.41
-04		160			0.43
-05		200			0.44
-06		250			0.46
-07		320			0.48
-08		400			0.57
-09		500			0.62
-10	2	60	100		0.35
-11		80			0.40
-12		100			0.42
-13		120			0.42
-14		160			0.43
-15		200			0.44
-16		250			0.46
-17		320			0.48
-18		400			0.57
-19		500			0.62
-20	3	60	60	7.5	0.38
-21		80			0.40
-22			320		0.51
-23		100	60		0.43
-24		120			0.43
-25		160			0.44
-26		200			0.45
-27		250			0.47
-28	4	80			0.37
-29		100			0.39
-30		120			0.41
-31		160			0.46
-32		200			0.51
-33		250			0.58

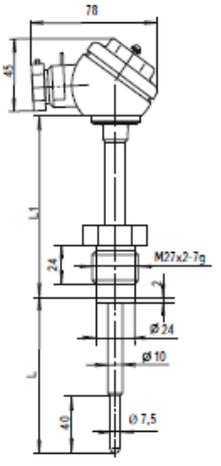
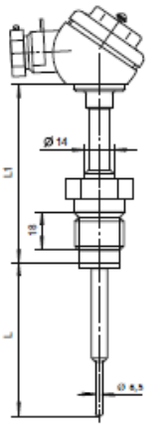
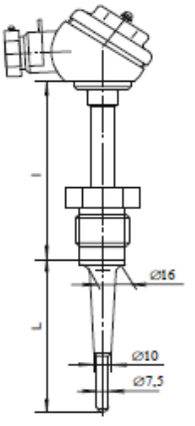


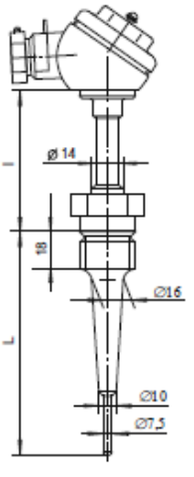
Fig. 1



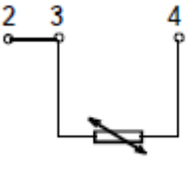
The rest - see Fig. 1
Fig. 2



The rest - see Fig. 1
Fig. 3



The rest - see Fig.1
Fig.4



Schematic Diagram of Connections

THERMOCOUPLE OF RESISTANCE
ТСП-8040Р (ТУ У 33.2-04850451-069-2003)

Designed to measure the temperature of air, fresh and sea water, boiler water, condensate, fuel, steam, gas, oxygen, hydrogen, nitrogen, carbon dioxide, hydrocarbon, hydrogen tube, sulfuric acid mist, electrolyte, aqueous solution of carbonate and bicarbonate, special alloy, distillate, bidistillate and the like.

Used on ships with unlimited navigation area.

Range of measured temperatures, °C: for Fig. 1, 3, 4	**from minus 200 to 500**
for Fig. 2.	**from minus 50 to 400**
for Fig. 5	**from minus 50 to 200**
Designation of NSC	**2х50П.50П,100П, 2хPt50, Pt50, Ptl00, гр.21, 2хгр.21**
Tolerance class	**B**
Material of thermocouple head	**steel 12Х18Н10Т**
Material of protective reinforcement (armature)	**stainless steel 08Х18Н10Т, alloy 3М, ПТ-7М, bronze БрАЖНМц 9-4-4-1**
Degree of protection from dust and water penetration	
for Fig. 1, 2, 3, 4	**IP65**
for Fig. 5	**IP00**
Diameter d, mm	**6,5; 7.5 for bronze**
Length of mounting part, mm	**from 50 to 3550**
Cable length (Fig. 5), mm	**from 1000 to 10000**

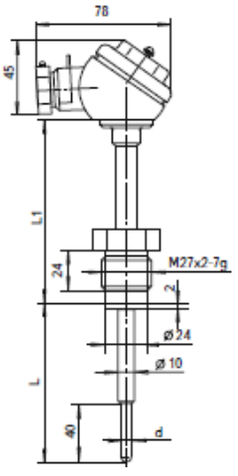
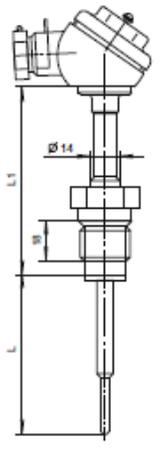
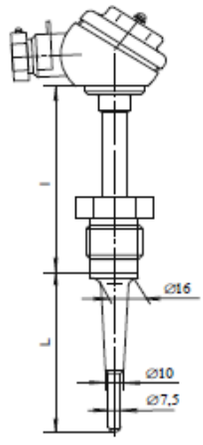


Fig. 1



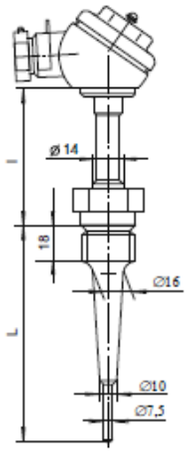
The rest - see Fig. 1

Fig. 2



The rest - see Fig. 1

Fig. 3



The rest – see Fig.1

Fig.4

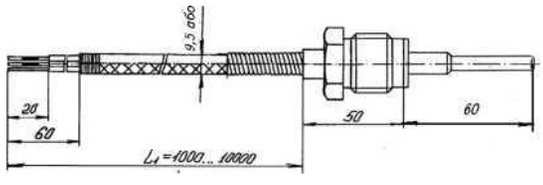
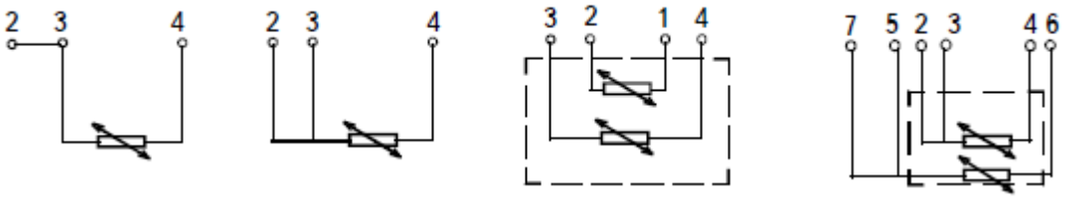


Fig. 5



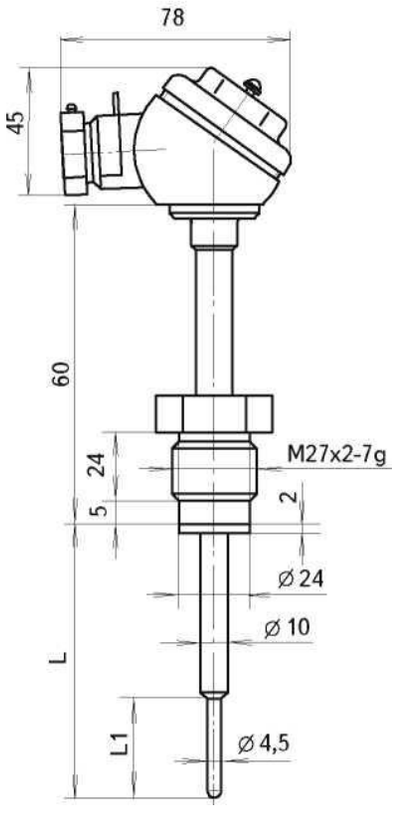
Schematic Diagram of Connections

THERMOCOUPLE OF RESISTANCE
ТСП-8041Р (ТУ У 33.2-04850451-069-2003)

Designed to measure the temperature of air, fresh and sea water, boiler water, distillate, bidistillate, analyte, lubricants, fuel, steam, condensate, gas, electrolyte (aqueous alkali solution), oxygen, carbon dioxide with vapors "МЗЗДА", aqueous solution of carbonate, hydrogen, electrolysis 15 % aqueous solution "МЗЗДА" , etc.

Used on ships with unlimited navigation area.

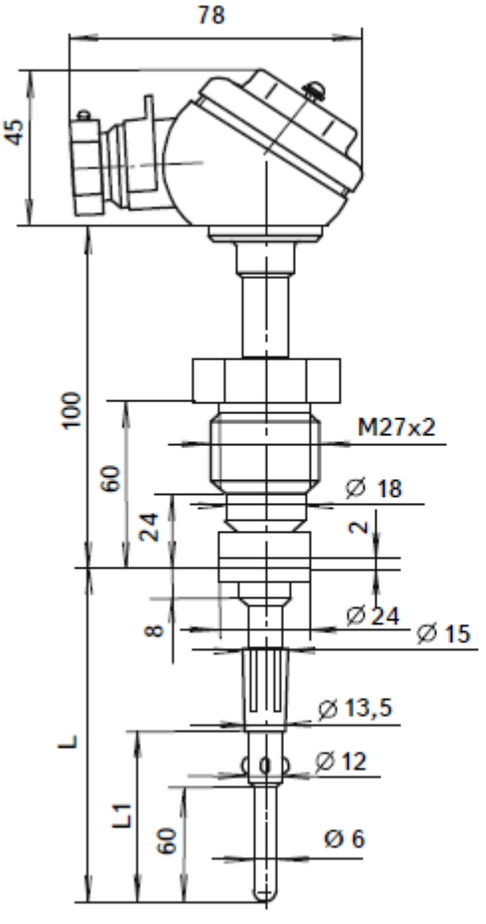
Operational range of measured temperatures, °C	**from minus 50 to 300**
Designation of NSC	**50П, Pt50, гр.21**
Tolerance class	**B**
Material of thermocouple head	**steel 12Х18Н10Т**
Material of protective reinforcement (armature)	**stainless steel 08Х18Н10Т, alloy 3М, ПТ-7М**
Degree of protection from dust and water penetration	**IP65**
Length of mounting part, mm	**from 32 to 1000**

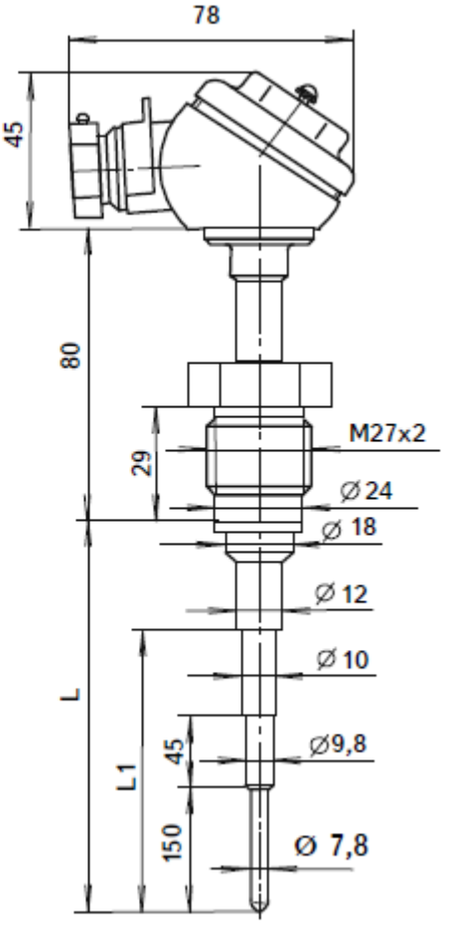


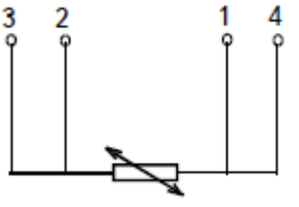
Schematic Diagram of Connections

THERMOCOUPLE OF RESISTANCE
ТСП-8042Р (ТУ У 33.2-04850451-069-2003)

Operational range of measured temperatures, °C	**from minus 50 to 400**
Designation of NSC	**50П, 100П Pt50, Pt100**
Tolerance class	**A, B**
Nominal pressure of the measured medium, MPa:	
for Fig. 1	**25**
for Fig. 2.	**0.40**
Material of thermocouple head	**stainless steel 12X18H10T**
Material of protective reinforcement (armature)	**stainless steel 08X18H10T**
Degree of protection from dust and water penetration	**IP65**
Length of mounting part, mm	**from 500 to 2526**





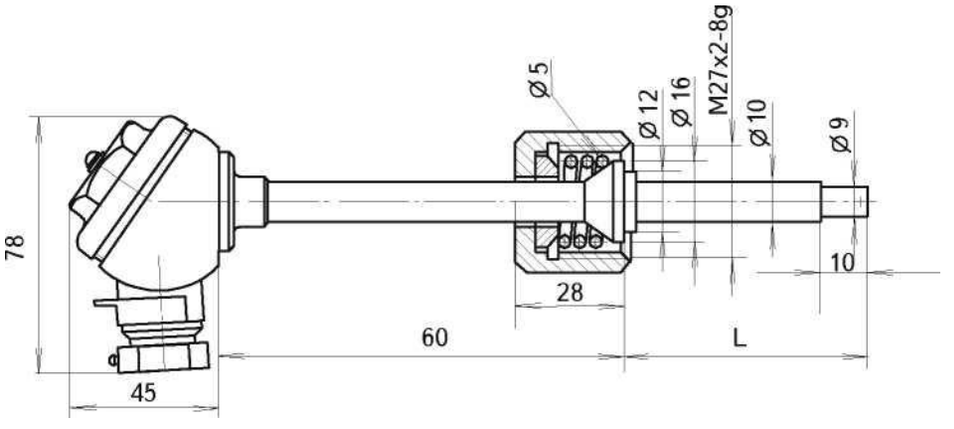


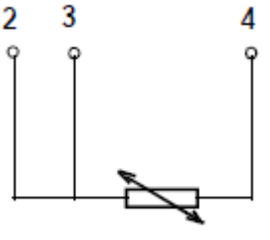
Schematic Diagram of Connections

THERMOCOUPLE OF RESISTANCE
ТСМ-8043Р (ТУ У 33.2-04850451-069-2003)

Designed to measure the temperature of bearings and oil in them. Used on ships with unlimited navigation area.

Operational range of measured temperatures, °C	**from minus 50 to 100**
Designation of NSC	**50M**
Tolerance class	**C**
Nominal pressure of the measured medium, MPa	**0.63**
Material of protective reinforcement (armature)	**steel 12X18H10T**
Material of head	**steel 12X18H10T**
Degree of protection from dust and water penetration	**IP65**
Length of mounting part, mm	**from 20 to 500**





Schematic Diagram of Connections

THERMOCOUPLE OF RESISTANCE
ТСП-8043Р, ТСП-8044Р (ТУ У 33.2-04850451-069-2003)

Designed to measure the temperature of bearings and oil in them, as well as the walls of pipelines.

Used on ships with unlimited navigation area.

Operational range of measured temperatures, °C:	
for ТСП-8043Р (Fig. 1)	**from minus 50 to 120**
for ТСП-8044Р (Fig. 2)	**from minus 50 to 400**
Designation of NSC	
for ТСП-8043Р	**50П, 100П Pt50, Pt100, гр.21**
for ТСП-8044Р	**50П, Pt50, гр.21**
Tolerance class:	
for ТСП-8043Р	**C**
for ТСП-8044Р	**B**
Nominal pressure of the measured medium, MPa:	
for ТСП-8043Р	**0.63**
for ТСП-8044Р	**0.40**
Material of thermocouple head	**stainless steel 12Х18Н10Т**
Material of protective reinforcement (armature)	
for ТСП-8043Р	**stainless steel 12Х18Н10Т**
for ТСП-8044Р	**stainless steel 08Х18Н10Т**
Degree of protection from dust and water penetration	**IP65**
Length of mounting part, mm	
for ТСП-8043Р	**from 20 to 1250**
for ТСП- 8044Р	**from 80 to 200**

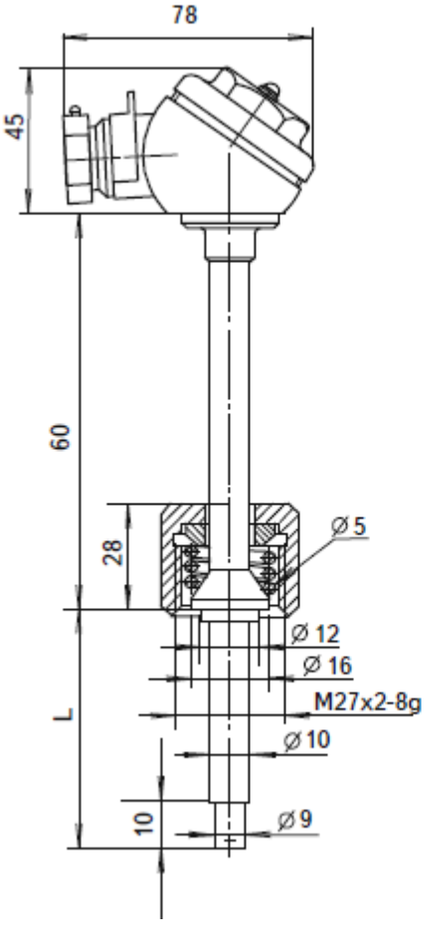


Fig. 1

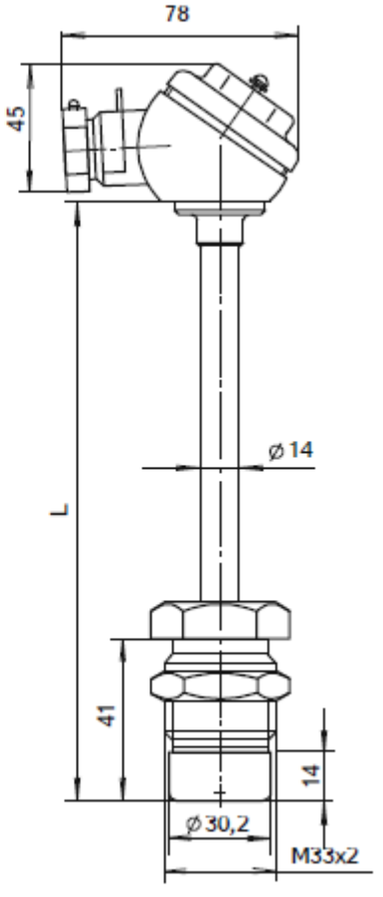
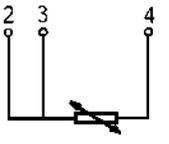
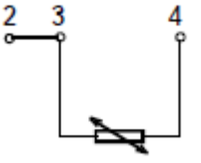


Fig. 2



Schematic Diagram of ТСП-8043Р Connection

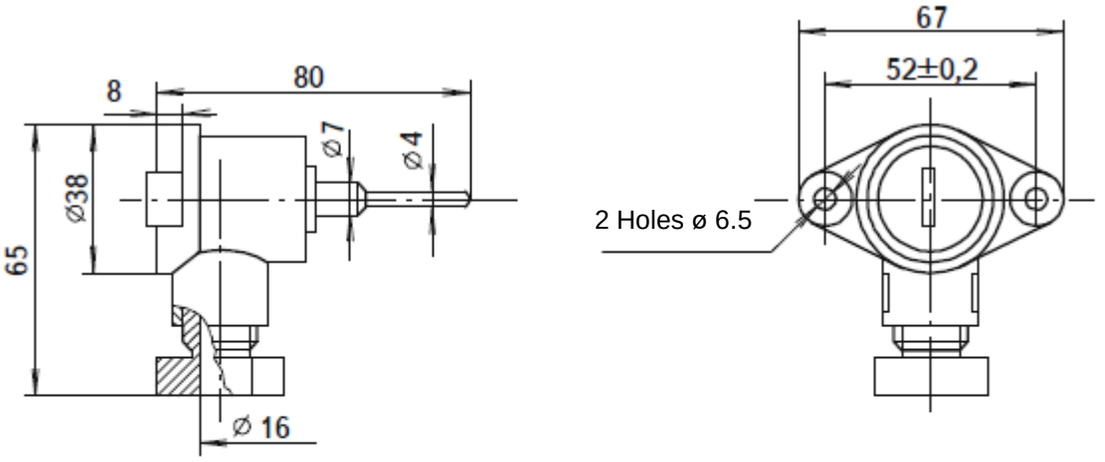


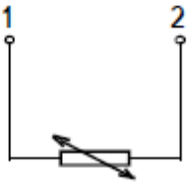
Schematic Diagram of ТСП-8044Р Connections

THERMOCOUPLE OF RESISTANCE
ТСП-8045Р, ТСМ-8045Р (ТУ У 33.2-04850451-069-2003)

Designed to measure the temperature of air, oils vapor and sea water. Used on ships with unlimited navigation area.

Operational range of measured temperatures, °C	**from minus 50 to 75**
Designation:	
for ТСП-8045Р	**50П, 100П, Pt50, Pt100, гр.21**
for ТСМ-8045Р	**50М**
Tolerance class:	
for ТСП-8045Р	**B, C**
for ТСМ-8045Р	**C**
Material of protective reinforcement (armature)	**steel 12Х18Н10Т**
Material of thermocouple head	**pressmaterial АГ-4В**
Degree of protection from dust and water penetration	**IP65**





Schematic Diagram of Connection

THERMOELECTRIC COUPLES

ТХА-1172Р (ТУ У 33.2-04850451-071-2003)

Designed to measure the temperature of water, steam and exhaust gases. Used on ships with unlimited navigation area.

Operational range of measured temperatures, °C:

for Fig. 1, 3, 7	**from 0 to 600**
for Fig. 2, 4, 5, 8	**from 0 to 800**
for Fig. 6	**from minus 40 to 600**
Designation of NSC	**K**
Class	**1 or 2**
Indicator of thermal inertia, sec., not more:	
for Fig. 1-4, 7, 8	**60**
for Fig. 5	**5**
for Fig. 6	**2**
Material of thermocouple head	
for Fig. 1, 2, 7, 8	**pressmaterial АГ-4В**
for Fig. 3, 4, 5, 6	**stainless steel 12Х18Н10Т**
Material of protective reinforcement (armature)	**12Х18Н10Т, 10Х17Н13М2Т, stainless steel**
Degree of protection from dust and water penetration	**IP65**
Length L, mm	**from 80 to 400**
Nominal pressure of the measured medium, MPa:	
for Fig. 1, 3, 7	**2.5**
for Fig. 2, 4, 8	**10.0**
for Fig. 5	**0.25**
for Fig. 6	**32**

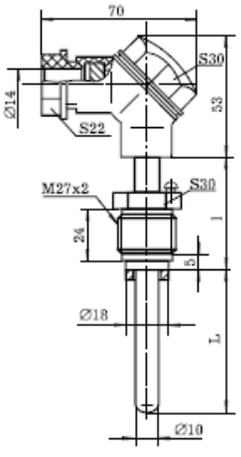


Fig. 1

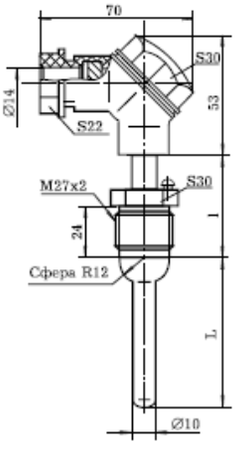


Fig. 2

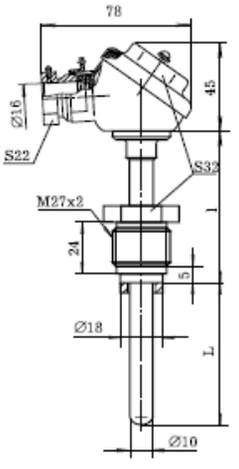


Fig. 3

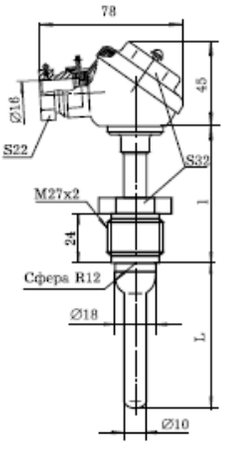


Fig. 4

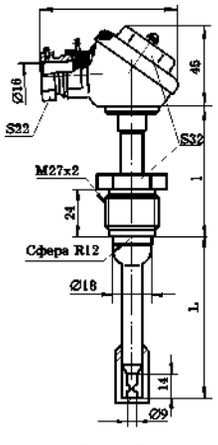


Fig. 5

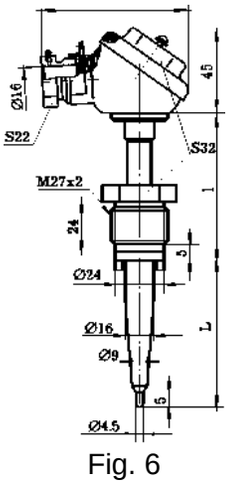


Fig. 6

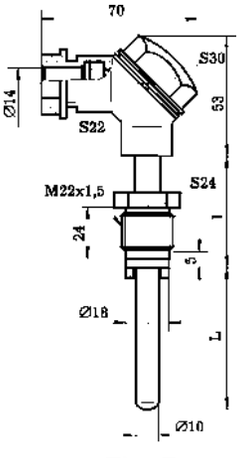


Fig. 7

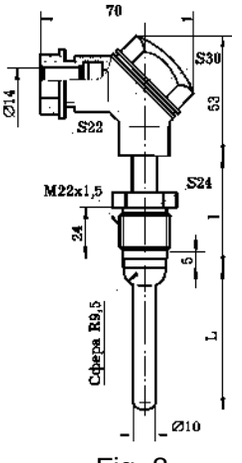


Fig. 8

THERMOELECTRIC COUPLES
ТХК-1172Р (ТУ У 33.2-04850451-071-2003)

Designed to measure the temperature of gas, water, steam , exhaust gases.. Used on ships with unlimited navigation area. Range of measured temperature, °C:

for Fig. 1-4, 7, 8	**from 0 to 600**
for Fig. 6	**from minus 40 to 500**
Designation of NSC	**L**
Class	**2**
Index of thermal inertia, c, no more than:	
for Fig. 1-4, 7, 8	**60**
for Fig. 6	**2**
Nominal pressure of the measured medium, MPa:	
for Fig.1, 3, 7	**2.5**
for Fig. 2, 4, 8	**10**
for Fig. 6	**32**
Material of thermocouple head	
for Fig. 1, 2, 7, 8	**pressmaterial АГ-4В**
for Fig. 3, 4, 5, 6	**stainless steel 12Х18Н10Т**
Material of protective reinforcement (armature)	**12Х18Н10Т, stainless steel**
Degree of protection from dust and water penetration	**IP65**
Length L, mm	**from 80 to 400**

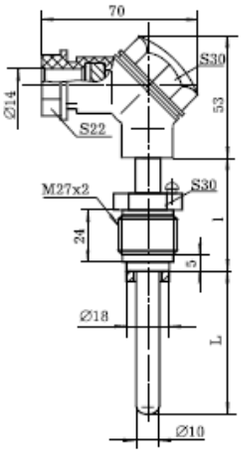


Fig. 1

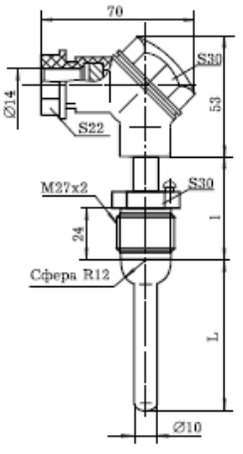


Fig. 2

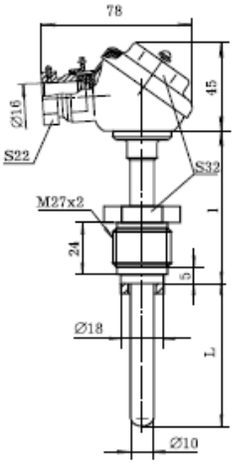


Fig. 3

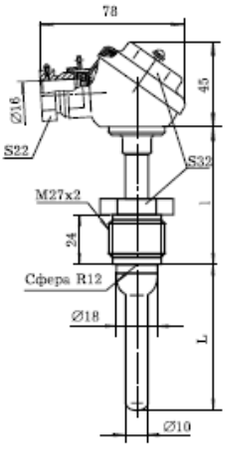


Fig. 4

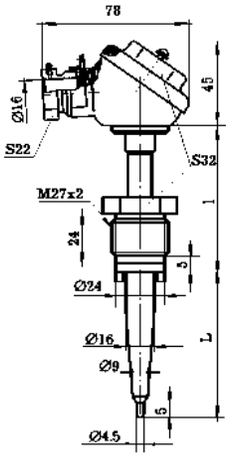


Fig. 6

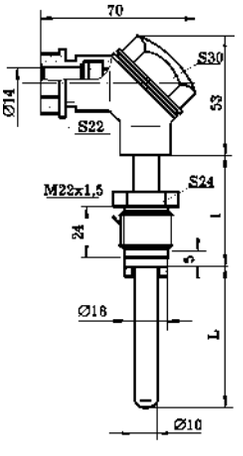


Fig. 7

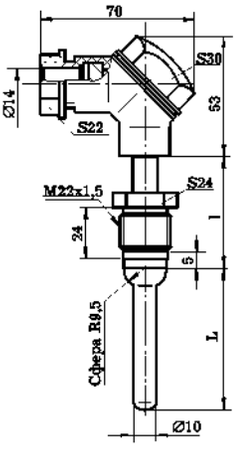
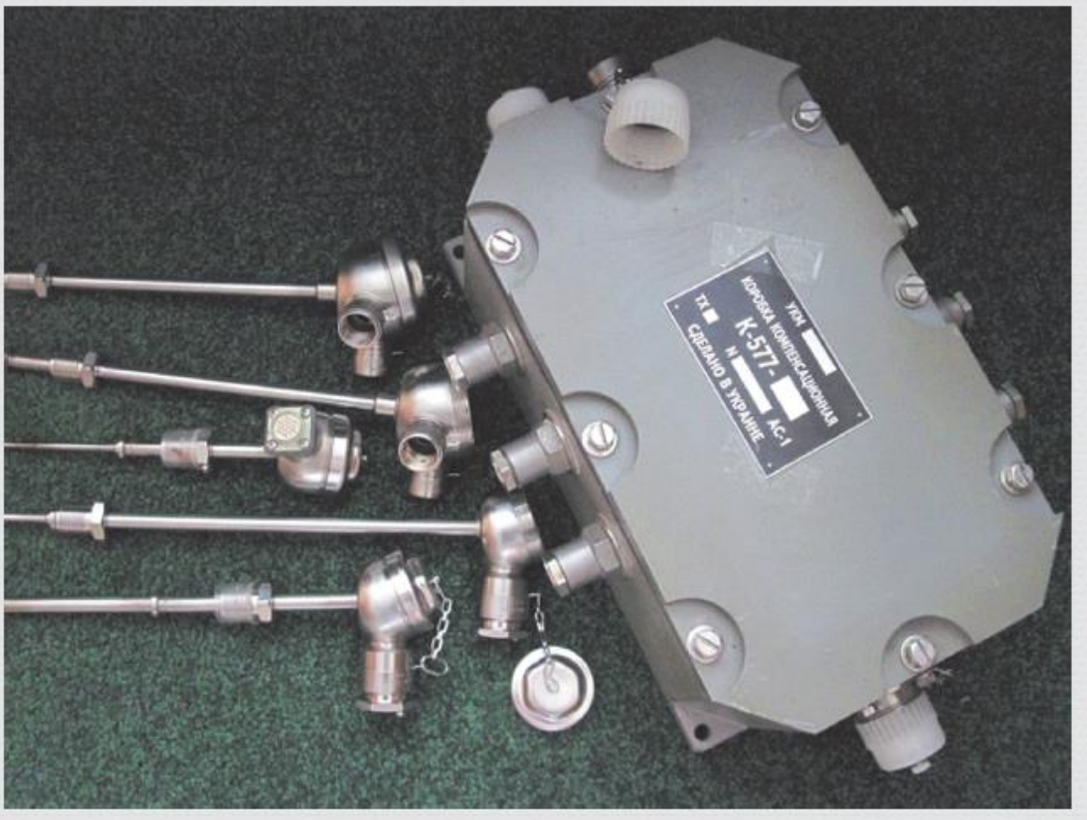


Fig. 8

THERMOCOUPLES, COMPENSATING DEVICES, JUNCTION BOXES FOR NUCLEAR POWER FACILITIES



Dear users !

Scientific and Manufacturing Association "Thermoprylad" named after V. Lakh since 1956 has been developing, manufacturing and supplying to nuclear power facilities (NPF) the technical means of temperature measurement - THERMOELECTRIC COUPLES, THERMOCOUPLE OF RESISTANCE and compensation devices. SMA "Thermoprylad" was the main enterprise of former USSR Ministry of Instrument-Making on technical means of temperature control for nuclear power.

In 1997 - 1999 SMA “Thermoprylad” named after V. Lakh has carried out the modernization of devices for nuclear power and currently supplies only modernized devices, including individual technical requirements of nuclear power plants.

Thermocouples for nuclear power have passed state acceptance tests for measuring equipment included in the state register of measuring equipment, included in the state register of measuring equipment of Ukraine and the Russian Federation, are periodically subject to state control tests with the issuance of Certificates of Conformity of the approved type by the State Standard of Ukraine.

Mechanical, climatic and metrological tests of thermocouples, compensating devices, checking integrity of the protective reinforcement (armature) is carried out by the laboratories of SMA “Thermoprylad” named after V. Lakh, accredited by the State standard of Ukraine.

The quality of products for nuclear power is ensured by:

- performing of input control of materials and semi-finished products;
- compliance with the requirements of regulatory, design and technological documentation;
- performing of climatic, mechanical and metrological tests according to the requirements of technical specifications;
- special technical reception of products which is carried out by the Conformity Assessment Body “SERTATOM”;
- organization of quality assurance system according to ISO 9001.

Delivery of technical means of temperature control is carried out on nuclear power plants in Ukraine, Russia, Czech Republic, Slovakia and Bulgaria, India, China.

This section presents only the main technical characteristics of devices for NPF. Additional information can be found in the special catalogue of devices for NPF.

TYPES AND TECHNICAL CHARACTERISTICS OF THERMOCOUPLES OF RESISTANCE, THERMOELECTRIC COUPLES AND COMPENSATION DEVICES FOR NPF

Device Type and ТУ	Purpose and Technical Characteristics
THERMOCOUPLE OF RESISTANCE ТСП-1390, ТСП-1790 ТУ У3.48-04850451-051-1999	Measure the temperature of the coolant, steam, water, boric acid, concrete, metal structures, grease, decontamination solution, metal
THERMOCOUPLE OF RESISTANCE ТСП-0690 ТУ У3.48-04850451-054-1999	Measure the temperature of water, oil, air, metal structures, bearings; equipment of nuclear power plants. Designed for installation in the premises of technological equipment
THERMOCOUPLE OF RESISTANCE ТСП 1290, ТСМ-1290 ТУ У3.48-04850451-059-1999	Measure the air temperature in room, premises of nuclear power plants. Installed in the technological premises of controlled access area, which are not serviced
THERMOCOUPLE OF RESISTANCE ТСМ-0890 ТУ У3.48-04850451-060-1999	Measure the temperature of water, oil, air, metal structures, bearings, equipment of nuclear power plants. Designed for installation in the premises of technological equipment
THERMOELECTRIC COUPLES ТХА-1590, ТХК-1590, ТХА-1690, ТХК-1690 ТУ У3.48-04850451-050-1999	Measure the coolant temperature. Designed for operation in "dry" and "wet" channels of the reactor. Individual versions can operate in conditions of loss-of-coolant accidents - LOCA and severe accident
THERMOELECTRIC COUPLES ТХА-1090,ТХК-1090, ТУ У3.48-04850451-055-1999	Measure the temperature of water, oil, air, metal structures, bearings, equipment of nuclear power plants. Designed for installation in controlled access area that are not technologically serviced
Multi-channel compensation devices УКМ3-УКМ8 ТУ У 33.2-04850451-065-2003	Designed for connection (from one to twelve) of THERMOELECTRIC COUPLES ТХА/ТХК-1590 and automatic compensation of temperature changes of free ends of these THERMOELECTRIC COUPLES. Consist of power supply unit and compensation box К-577
Compensation devices УК-82, УТ-0186 ТУ У 33.2-04850451-067-2003	Designed to connect of free ends of seven THERMOELECTRIC COUPLES ТХА/ТХК-1590, equalizing the temperature of the free ends and issuing information about this temperature
Junction boxes КС-513М1, КС-535, КС-545 ТУ У 33.2-04850451-066-2003	КС-513М1 are designed to connect the free ends of eighteen THERMOELECTRIC COUPLES ТХА-1590. КС-535 are designed to connect the free ends of twenty-six THERMOELECTRIC COUPLES ТХА/ТХК-1590. КС-545 are designed to connect the free ends of eight THERMOELECTRIC COUPLES ТХА-1590. All junction boxes are designed to equalize the temperature of the free ends of THERMOELECTRIC COUPLES and provide information about their temperature

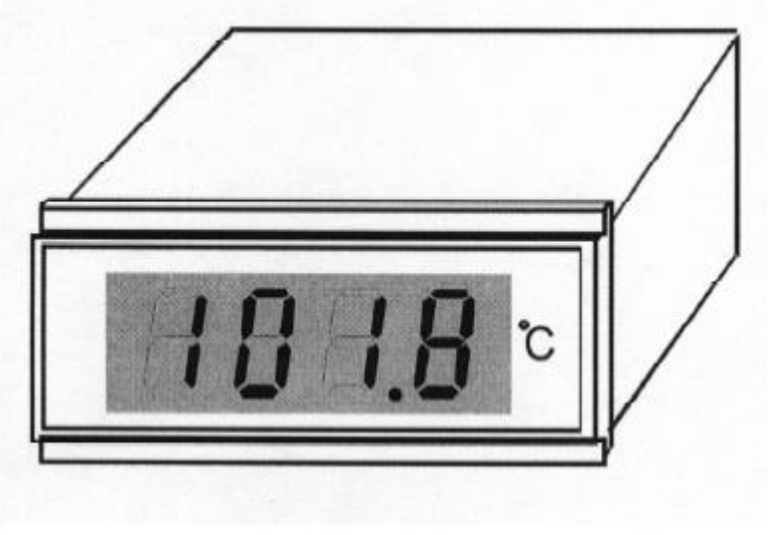
Device Type and ТУ	Purpose and Technical Characteristics
Rack БАУИ.301421.002	Designated to fix of working ends of THERMOELECTRIC COUPLES TXA-1590 (Fig. 5) and for sealing the TC channels in places of THERMOELECTRIC COUPLES exit from them
Junction boxes КС-567-01 КС-567-02 ТУ 25-02.792120-80	Designed for connection of electric wires of electric motors CEP in thermal area of nuclear power plants
Thermoelectric level indicators ТІР-1509 БАУИ(Тр.1.0039.1809) ТЗ	Designed to create a signal (indication) about the appearance of the vapor phase in the coolant of water-water power reactors of type ВВЕР, which is a prerequisite for determining the reduction of the coolant level in the reactor.
Measuring converter ПВ-21 АС ТУ У 26.5-04850451-90:2015	Designed for: - measurement and signal conversion of the primary transmitters, namely, THERMOELECTRIC COUPLES, transducers with unified output signal of direct current and voltage into a unified DC signals; - indication of the current value of the measured value in physical units; - multi-position control of the measured value; - supply external measuring converters with unified signal and other devices from the built-in power supply; - transmission of measurement results via RS-485 interface MODBUS Protocol.
Harnesses for reactors of type ВВЕР (thermal control (TC) harnesses, energy release (ER) harnesses ТУ У 33.2-04850451-091:2012	TC harnesses are designed to transmit signals from the sensors of temperature control of the coolant, ER harnesses are designed to transmit signals from the sensors of energy measurement in nuclear instrumentation systems and can be used for the manufacture of communication lines in internal reactor control systems or in coolant level control systems

THERMOCOUPLES WITH UNIFIED OUTPUT SIGNAL, DIGITAL THERMOMETERS, CONTROLLERS, TEMPERATURE ALARMS, SYSTEMS

DIGITAL THERMOMETERS ТНЦ-011

Designed to measure temperature or other physical values previously converted into an electrical signal. Work in complete with thermocouples with NSC K, L, S, R, 50M, 100M, 50П, 100П, Pt50, Pt 100, or signals in the range 0 - 1 V, 0 - 5 mA, 4 - 20 mA, 0 - 20 mA.

Range of measured temperature(display range), °C:	
50M, 100M	**from minus 50 to 200**
50П, 100П, Pt50, Pt100	**from minus 200 to 600**
K	**from minus 50 to 1200**
L	**from minus 50 to 800**
S, R	**from 0 to 180**
0 - 1V,0 - 5 mA, 4 - 20 mA, 0 - 20 mA	**from minus 199.9 to 1999**
Number of display digits	**3; 5**
Supply voltage, V	**220**
Power consumption, VA	**3**
Weight, kg, no more	**0.15**
Overall dimensions, mm	**80x40x95**
Window size for mounting on the panel, mm	**34,5x75,5**



DIGITAL THERMOELECTRIC THERMOMETERS

ТТ-Ц016, ТТ-Ц016-01 (ТУ У3.48.04850451-057-98)

Designed for rapid temperature measurement of metal surfaces, as well as non-corrosive liquid, gaseous and viscous substances.

Thermometers consist of a digital measuring device and a set of THERMOELECTRIC COUPLES .

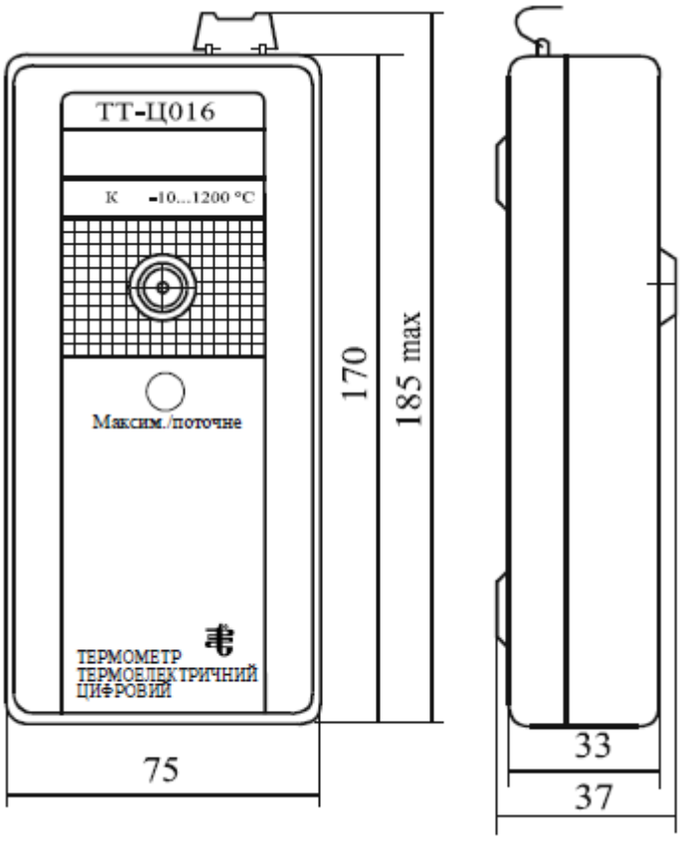
Included in the State register of measuring equipment at number 1196-05.

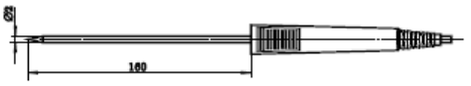
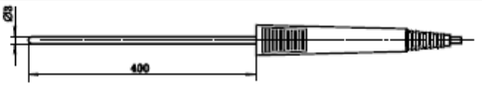
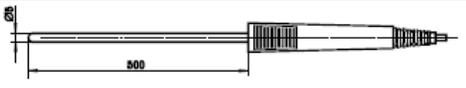
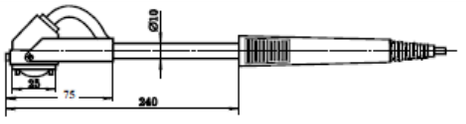
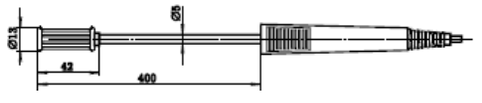
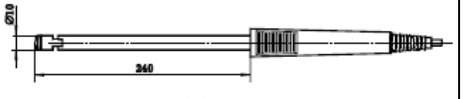
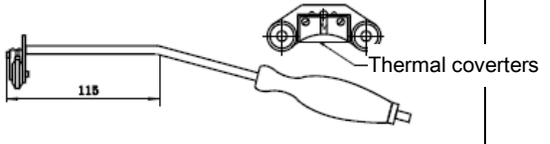
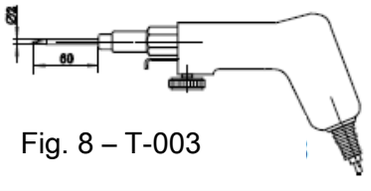
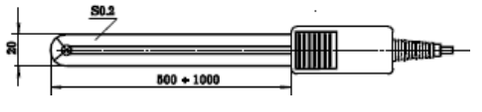
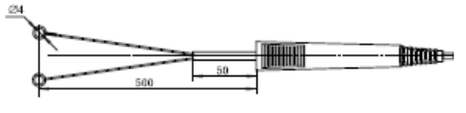
Technical characteristics of digital measuring device

Characteristics	**ТТ-Ц016**	**ТТ-Ц016-01**
Range of measuring, °C	**minus 10 - 1200**	**minus 60 - 199.9**
Minimum grade value	**1.0**	**0.1**
Absolute error, °C	**±3**	**±0,5**
Weight, g	**200**	
Overall dimensions, mm	**170x75x37**	
Supply voltage, V	**9 (battery of type "Krona")**	
Ambient temperature during operation,°C at customer request	**-10 - 50 minus 20 - 50**	

Additional Functions

- *Memorizing of measured value **max** and **min** .*
- *Battery discharge indication*
- *Automatic poewr disable in 2-3 min*
- *Ability to remember the measured values and its manually review with an indication on the device display (according to the order)*
- *Possible changes os technical specifications (range, NSC, deviation, etc.), as well competing the other designs with the converters*



Thermocouples	Measured Medium	Range, °C	*$_{98^0C}$
 Fig. 1 – T911-01	Viscous substances	minus 0 - 200	3
 Fig. 2 – T911-03	Liquid, loose, viscous substances	minus 60 - 600	5
 Fig. 3 – T911-04	Liquid, bulk substances	minus 0 - 800	10
 Fig. 4 – T912	Flat, smooth, metal surfaces	50 - 500	10
 Fig. 5 – T919	Gaseous medium	minus 60 - 500	40
 Fig. 6 – T921	Flat, smooth, metal surfaces	20 - 200	3
 Fig. 7 – T922	Rotating surfaces	0 - 250	10
 Fig. 8 – T-003	Semi-solid, rubber-technical substances	0 - 200	10
 Fig. 9 – T930	Multilayer relief materials	0 - 180	3
 Fig. 10 - Connector	For connection of stationary thermocouples with NSC K	minus 60 - 1200	-

Thermal coverters

Nomenclature and quantity of thermocouples is defined by the customer

Thermometer error, no more, °C

for TT-Ц016 **±4 at t < 300°C;**

±[4+0,01(t - 300)] at t > 300°C;

for TT-Ц016-01 **±2,5**

MICROPROCESSOR THERMOELECTRIC THERMOMETER

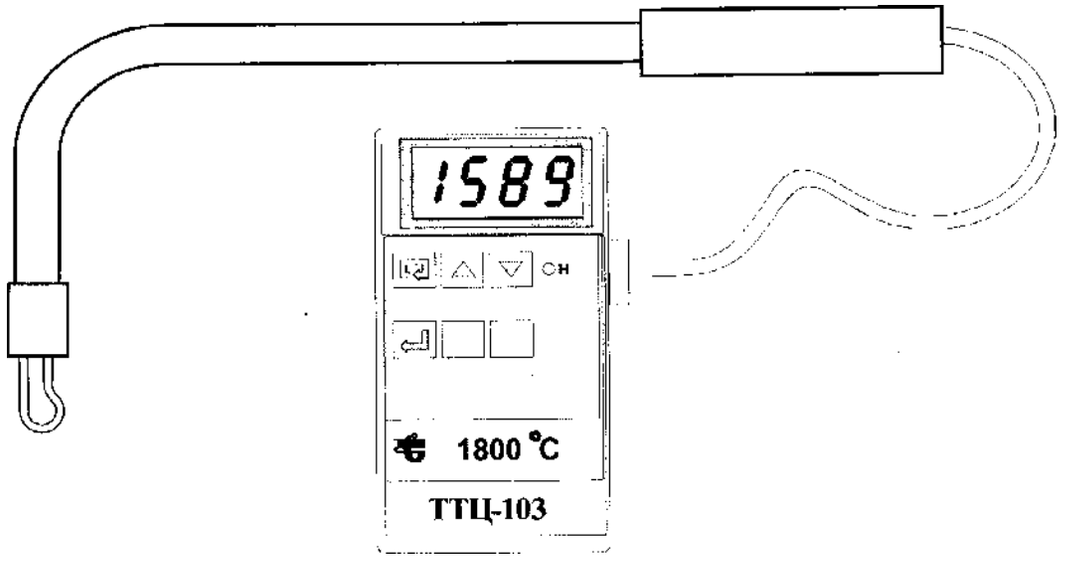
ТТЦ-103 (ТУ 25.5Ц2.828.018-89)

Designed to measure the temperature of molten metal. Consists of a digital measuring device and a package of THERMOELECTRIC COUPLES of type ПТВР, mounted in a special holder-handle of type "rod".

Measurement process consists in ПТВР package immersing into the molten metal and counting the values on the digital display after the end of the measurement process.

After the end of the measurement process, sound and light signals are given, and the measured temperature value (up to 32 values) is automatically stored in the memory and can be read.

Operational range of controlled temperatures, °C	**from 0 to 1800**
Limit permissible value of the basic error, %, no more	**1**
Minimum grade value, °C	**1**
Ambient temperature, °C	**from 5 to 60**
Supply voltage, V	**3.6**
Power consumption, W, no more	**0.012**
Overall dimensions, mm:	
measuring device	**125x70x25**
thermal converter body	**1200x400**



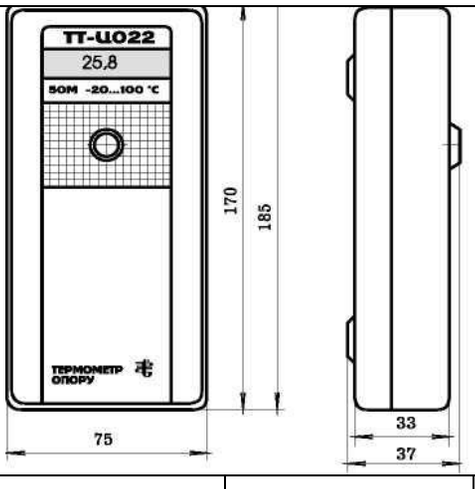
MICROPROCESSOR THERMOELECTRICAL THERMOMETER TO-Ц022, TO-Ц022-01

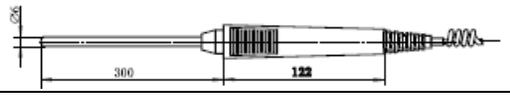
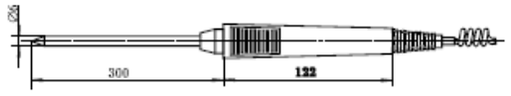
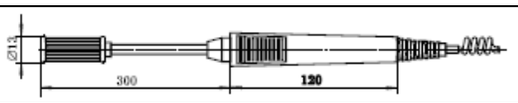
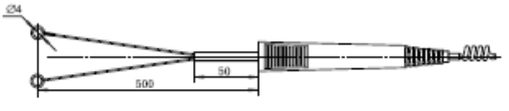
Designed for stationary and operational temperature measurement of grain, bran, flour and other agricultural products. Can be used in other sectors of the economy. Thermometer consists of a digital measuring device and resistance thermal transducers.

The package includes a battery of type "Krona".

Operational range of measured temperatures, °C:	
for TO-Ц022	**from minus 20 to 100**
for TO-Ц022-01	**from minus 50 to 150**
Least significant digit value of device (OMP), °C:	
for TO-Ц022	**0.1**
for TO-Ц022-01	**1.0**
Limit permissible value of the basic error, °C:	
TO-Ц022 with:	
thermocouples of tolerance class B	**±(1,0+0,004/t/)±01 OMP**
thermocouples of tolerance class C	**±(1,2+0,007/t/)±01 OMP**
TO-Ц022-01 with:	
thermocouples of tolerance class B	**±2±1 OMP**
thermocouples of tolerance class C	**±3±1 OMP**
Supply	**autonomous**
Weight, kg:	
of digital device	**0.2**
of thermocouples TO-010, TO-010-01, TO-011	**from 0.15 to 0.22**
Overall dimensions of the digital device, mm	**170x75x37**

Nomenclature and quantity of thermocouples is defined by the customer Other versions are possible.



Designation	Design Versions, Overall Dimensions	Measured Medium	Range, °C	$t_{98°C}$
TOM-0591	**Design versions and overall dimensions-according to specifications 405 212 005 ТУ**	**Bulk substances (grain, bran, flour)**	**minus 60 - 1200**	**240**
TO-010		**Liquid, bulk substances**	**minus 50 - 150**	**180**
TO-010-01		**Liquid, bulk, viscous substances**	**minus 50 - 150**	**180**
TO-011		**Gaseous medium**	**minus 50 - 150**	**180**
Connector		**For connection of stationary thermocouples with NSC 50M**		

RESISTANCE THERMOMETER DIGITAL ТО-Ц022-3

Designed for operative simultaneous measurement at three points the grain, granular and viscous substances temperature.

Measuring range	**from minus 30 °C to 60 °C**
Basic absolute error	**±0.5 °C**
Supply	**battery of type „Krona”**
Device design	**portable**

Device is calibrated according to NSC Pt1000.
Certificate of metrological certification is provided.

On the front panel of the device there are buttons for switching the measurement zones of the 3-zone ТО-010-3М (nominal static characteristic (hereinafter — NSC) Pt 1000) and power on/off button.

Fig. 1 External View of ТОЦ-022-3 with thermoelectric couple ТО-010-3М

Thermoelectric couple ТО-010-3М is made in the form of a probe with head and handle. Inside the metal fittings there are three sensing elements NSC Pt 1000 in the places indicated in Fig. 2- "1st zone", "2nd zone", "3rd zone". Connect with digital device ТО-010-3М with flexible cable.

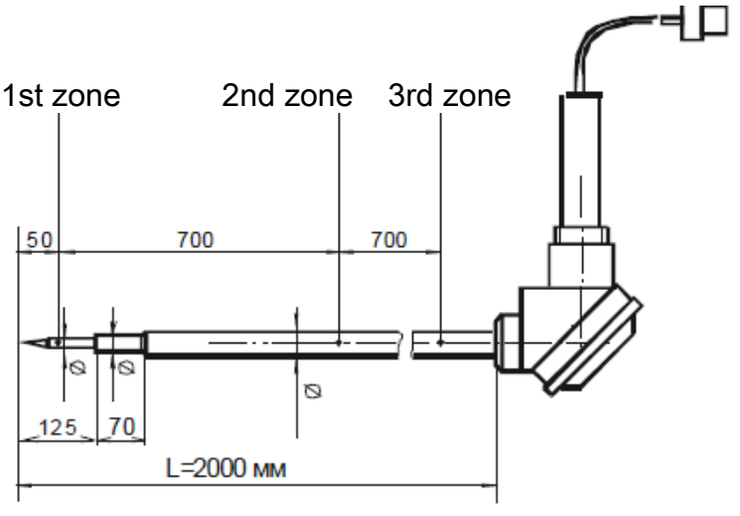


Fig. 2 thermoelectric couple of 3 Zones ТО-010-3М *

*Design changes are possible upon customer request.

MEASURING CONVERTERS WITH UNIFIED OUTPUT SIGNAL OF TYPE ПВУ-0197

(ТУ У 33.2-04850451-072:2006)

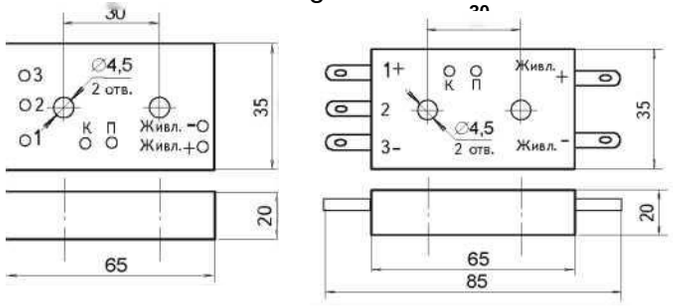
Designed to convert signals from THERMOCOUPLE OF RESISTANCE, THERMOELECTRIC COUPLES or DC and DC voltage sources into unified DC output signal in the range from 4 to 20 mA (possibly from 0 to 5 mA). Included in the State register of measuring equipment at number У 22.72-06.

Supply voltage	**from 12 to 36 V (DC))**
(for designs 2 and 4 also	**from 220 V (AC)**
Load resistance, kOhm	**up to 1,2**
Ambient temperature, °C	**from minus 40 to 60**
(for converters without galvanic connection	**from minus 20 to 60)**

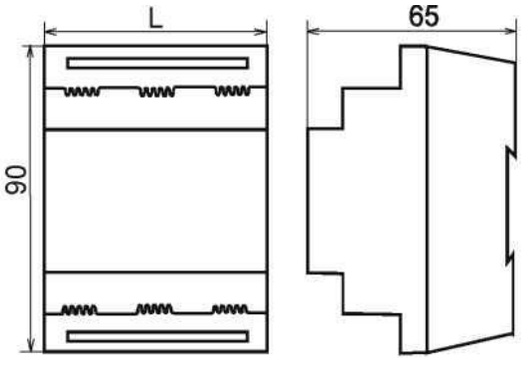
Designation of NSC	Type of Input Signal	Basic Conversion Range		Minimum Conversion Range	Limit Permissible Basic Reduced Error, %
ПВУ-0197/50 М, ПВУ-0197/100 М	50М,100М	minus 50°С;	150 °С	100 °С	±0,25
ПВУ-0197/50 П, ПВУ-0197/10 0 П	50П,100П	minus 200°С;	600 °С		
ПВУ-0197/К	К	minus 50°С;	1200 °С	200 °С	±0,4
ПВУ-0197/L	L	minus 50°С;	800 °С		
ПВУ-0197/S	S	0°С	1300 °С		
ПВУ-0197/В	В	300 °С	1600 °С		
ПВУ-0197/А-1	А-1	0°С	2000 °С		
ПВУ-0197/J	J	minus 100°С;	700 °С		
ПВУ-0197/Т	Т	minus 200°С;	300 °С		
ПВУ-0197/0,005А	DIRECT Current	0 mA	5 mA	-	±0,15
ПВУ-0197/0,02А		0 mA	2 0 mA		
ПВУ-0197/0,016А		4 mA	2 0 mA		
ПВУ-0197/0,01 В	voltage of permanent current	0 mV	10 mV	-	±0,4
ПВУ-0197/0,1 В		mV	100 mV		±0,25
ПВУ-0197/1 В		0 V	1 V		±0,15
ПВУ-0197/5 В		0 V	5 V		
ПВУ-0197/10 В		0 V	5 V		

Note - At customer request, the conversion range may be less than the minimum, while the limit of permissible basic reduced error is increased.

Converters have four design versions.



a - standard design b - vibration resistant design Fig. 1 - Modular Converters



a - L=35mm b - L=70mm Fig. 2 - DIN Rail Mounted Converters

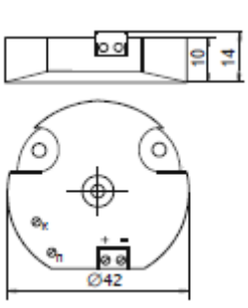
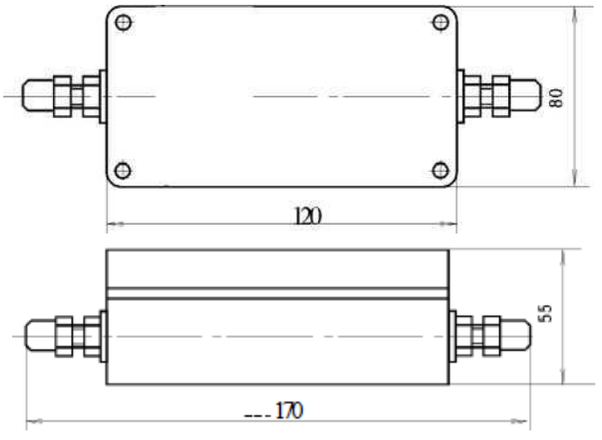


Fig. 3 Converters for mounting in the head of the thermal converter



Converters with constant voltage supply can work complete with regulator RT-0102 internal power supply.

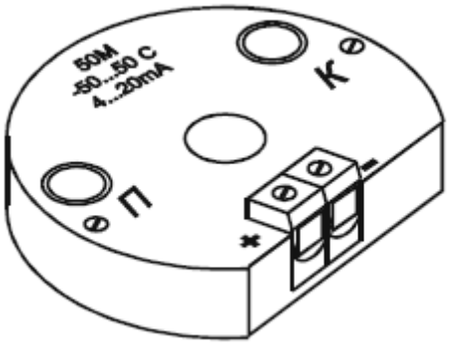
Fig. 4 - Sealed Converters

MEASURING CONVERTER ПВ-0013

Designed to convert signals from primary thermocouples into a unified output signal in the range of 4 - 20 mA, 0 - 5 mA.

Mounted in the head of thermocouples.

Supply voltage, V	**from 12 to 36**
Limit permissible value of the basic error, %: for THERMOCOUPLE OF RESISTANCE for thermocouples	**from 0.1 to 0.25** **from 0.5 to 1**
Temperature dependence of the output current: for THERMOCOUPLE OF RESISTANCE for thermocouples	**linear** **nonlinear**
Load resistance, kOhm: with signal output 4-20 mA with signal output 0-5 mA	**from 1.2 to 3**
Ambient temperature, °C	**from minus 40 to 80**
Overall dimensions, mm	**diameter 40x9**



Designation of NSC	Range of Temperatures, °C
50М, 100М	minus 50 - 50 minus 25 - 25 0 - 50 0 - 100 0 - 150 0 - 200
50П, 100П	minus 50 - 50 minus 25 - 25 0 - 50 0 - 100 0 - 200 0 - 400
К	0 - 200 0 - 400 0 - 600 0 - 800

MEASURING CONVERTERS PROGRAMMABLE
ПВП-0105, ПВП-0205, ПВП-0305

Converters measuring programmable ПВП-0105, ПВП-0205, ПВП-0305 include a 16-bit analog-to-digital converter and microcontroller for digital signal processing. Inputs and outputs are galvanically separated. Converters can be installed on a standard DIN rail, electrical connections are made by means of screw clamps. Measurement converters can be programmed in user conditions through a SETUP — program. The following parameters are available for programming:

- sensor type (thermistor, thermocouple, voltage)
- input signal range (°C, mV);
- sensor connection diagram (two -, three -, four-wire for thermistors);
- sensor connection line resistance (for two-wire connection);
- compensation of free ends (inner or outer 50M or Pt100 for thermocouples);
- digital filter time constant from 0 ...100 s;
- current of measurement range beginning within the range;
- current of measurement range end within the range;
- current error is within the range;
- type of output signal (4 - 20 mA or 20 - 4 mA).

Programming of input parameters of the consumer.
Input for THERMOCOUPLE OF RESISTANCE **50П, 100П, Pt100, Pt1000, 50M 100M**
Input for THERMOELECTRIC COUPLES **K, L, S, J, B. mV**
Compensation of free ends of thermal converter - internal or external (50M or Pt 100 only for ПВП-0105).
Output 4 - 20 mA, two-wire connection scheme (ПВП-0105)
0-5mA, 0-20mA, 4-20 mA three-wire wiring diagram (ПВП-0205)
0-10 V three-wire connection scheme (ПВП-0305)
Supply voltage **12 - 36 V**
Linearization of primary thermocouples characteristics
Galvanic separation between input and output circuits

Nominal (Letter) Designation of NSC, Input Signal	Measuring Range	Limit of Basic Reduced Error, %
50M,100M, ТСМ гр.23	from minus 50 to 200 °C	0.25
50П,100П, Pt100, Pt1000	from minus 200 to 800 °C	0.25
ТХА(К)	from minus 200 to 1300 °C	0.5
ТХК(L_)	from minus 200 to 800 °C	0.5
ТЖК(Д	from minus 200 to 1100 °C	0.5
Тпп(S)	from 0 to 1700 °C	0.5
ТПР(В)	from 300 to 1800	
Voltage from minus 200 - 1000 mV	from 0 to 100%	0.5

Current through Thermocouples of resistance (TO), mA	**about 0.5**
Resistance of connecting conductors	**less than 25 Ohm / wire**
Influence of connecting conductors resistance change	**less than 0.01 % / Ohm**
Additional error from free ends compensation	**0.5 °C / 10 °C**
Minimum grade value, °C	**0.1**
Minimum input sygnal sub-range	**20 °C (5 mV for type of input - mV)**
Time constant of the digital filter, s	**0 - 100**

Output signal:	
for ПВП-0105	**4 - 20 mA (2-pov.)**
for ПВП-0205	**0/4 - 5/20 mA**
for ПВП-0305	**0...2/10 V**
Output resolution, bit	**12**
Minimum output signal sub-range	**2 mA (2 V)**
Additional error from supply voltage changes	
from 12 to 36 V, %, no more	**0.1**
Additional error from load voltage changes	
from 0 to 1 kOhm, %, no more	**0.1**
Galvanic insulation	
Input - output, V	**1500**
Input-connector for SETAP cable	**absent**
Operating conditions	
Ambient temperature, °C	**from minus 10 to 60**
Relative humidity of the environment	
at 25 °C, %, no more	**98**

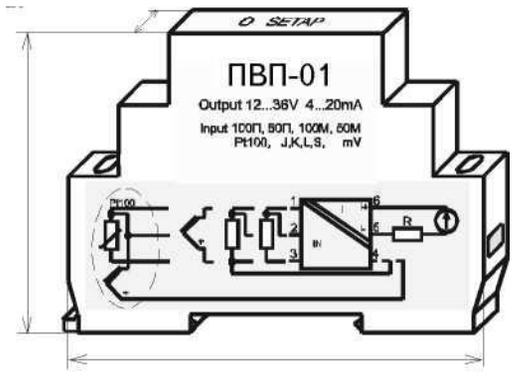


Fig. 1 - ПВП-01

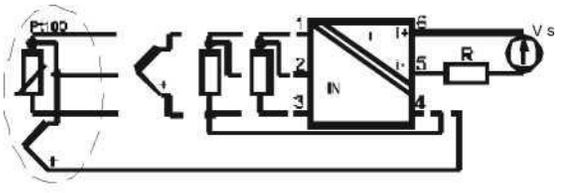


Fig. 2 - ПВП-0105

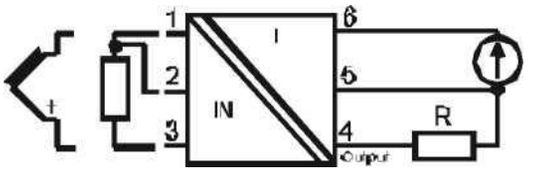


Fig. 3 - ПВП-0205, ПВП-0305

THERMOCOUPLES WITH UNIFIED OUTPUT SIGNAL OF TYPE
ТСПУ /ТСМУ/ТХАУ-0288, ТСПУ /ТСМУ /ТХАУ-0289

Designed to temperature measurement by temperature converting into unified DC output signal of 4 - 20 mA or 0 - 5 mA.

Consist of primary thermal converter in the reinforcement (armature), with mounted measuring transducer ПВУ-0197 in head, which can be supplied as a separate product.

Versions explosion-proof (IExdIICT6 X) and conventional.

Supply voltage, V	**12 - 36**
Load resistance, kOhm	
with output signal 4-20mA	**UP TO 1,2**
with output signal 0-5mA	**up to 3**
Limit permissible value of the basic error, %	**0,5 - 1,0**
Ambient temperature, °C	**from minus 40 to 70**

Type of thermoelectric couples	Nominal (Letter) Designation of NSC	Range of Measured Temperatures, °C	Error, %
ТСПУ-0289 ТСПУ-0288	50П 100П	from minus 50 to 50 from minus 25 to 25 from 0 to 50 from 0 to 100 from 0 to 200 from 0 to 400 for order	0,50; 0,25
ТСМУ-0289 ТСМУ-0288	50М 100М	from minus 50 to 50 from minus 25 to 25 from 0 to 50 from 0 to 100 from 0 to 150	0,50; 0,25
ТХАУ-0289 ТХАУ-0288	ХА	from 0 to 400 from 0 to 600 from 0 to 800 on order	1.00

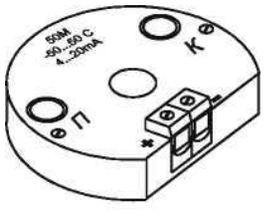


Fig. 1 -
Converter ПВУ-0197

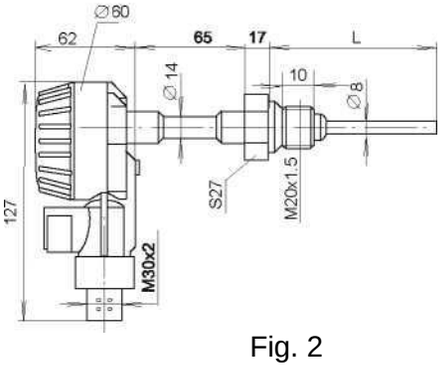


Fig. 2
Thermal Converter
ТХХУ-0289

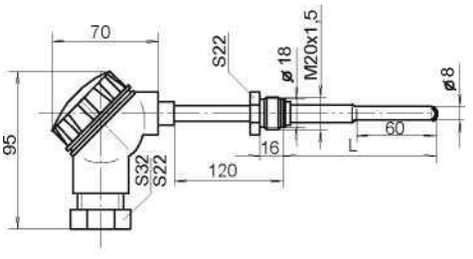


Fig. 1 -
Thermal Converter
ТХХУ-0288

THERMOCOUPLES WITH UNIFIED OUTPUT SIGNAL OF TYPE
ТСМУ-0198, ТСПУ- 0198, ТХАУ- 0198

Designed to convert the temperature into unified DC output signal of 4 - 20 mA or 0 - 5 mA.

Supply voltage, V **from 12 to 36**

Load resistance, kOhm
with output signal 4 **-** 20mA **to 1.2**
with output signal 0 **-** 5mA **to 5**

Ambient temperature, °C **from minus 40 to 60 (70)**

Type of Thermal Converter	Nominal or Letter Designation of NSC	Range of Converted Temperatures, °C	Limits of Permissible Basic Reduced Error, %
ТСПУ	50П, 100П	from minus 50 to 50 from minus 50 to 100 from 0 to 100 from 0 to 200 from 0 to 400 from 0 to 600 for order	±0,5 or others on order
ТСМУ	50М, 100М	from minus 50 to 50 from 0 to 100 from 0 to 150 on order	±0,5 or others on order
ТХАУ	К	from 0 to 400 from 0 to 600 from 0 to 800 on order	±1,0 or others on order

Converter ПВУ-0197 is built in the head of thermocouples, which can be supplied as a separate product.

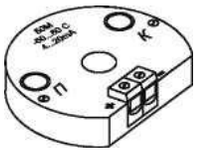
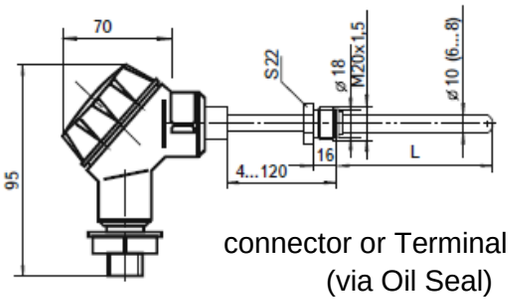


Fig. 1- ПВУ-0197

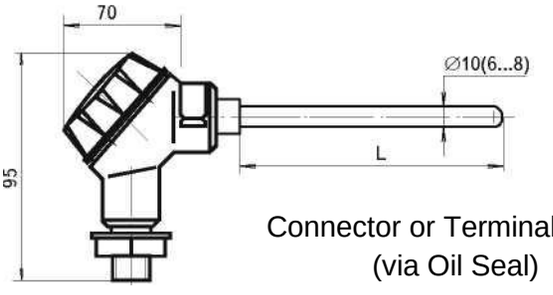
Thermocouples can be powered from power supplies БЖ-24, БЖ-24-2, БЖ-18 or internal power supply regulator РТ-0102.



connector or Terminal Block
(via Oil Seal)

Fig. 2 - Option with Fitting

L = 80 - 2000mm



Connector or Terminal Block
(via Oil Seal)

Fig. 3 - Option without Fitting

CONTROLLERS OF PT-0102 SERIES (ТУ У 33.2-04850451-068-2003)

Designed for automatic control, indication, signaling and archiving of temperature, pressure and other physical values converted into a unified signal in various technological processes.

Included in the State register of measuring equipment at number У2454-07.

Provide: - two-position, three-position or proportional-integral-differential (PID) regulation, dampers control, regulation using a timer;

- high-precision measurement and control;
- software regulation of the technological process, which can be approximated by piecewise linear dependence (to 100 pieces for one program or to 50 pieces for each program of 4-programmes option) for PT-0102Щ2-1-...-П;
- communication with a personal computer (PC) via RS232 or RS485 interface and archiving of nonvolatile memory up to 10000 measured values with a specified period from 1 to 250 min. for PT-0102Щ2-...-К;
- visualization program displays both measured and archived values;
- 24 V power supply for thermocouples with unified output signal (single channel option only);
- when using the spark protection barrier work with converters located in an explosive zone.

Number of input channels: **1, 2 or 8**

Work in the complete with: - **THERMOCOUPLE OF RESISTANCE ТО**: 50М; 100М; 50П; 100П; Pt100; Pt500; Pt 1000; гр..21, 23, NTC and oth., (range from minus 50 (200) to 600°С)

- **THERMOELECTRIC COUPLES ПТ**: ХА(К); ХК(L); ПП(S,R); ПР(В); ЖК(Д); (Т); ВР(А-1), (range from minus 50 to 2000°С);
- **measuring converters VP of various physical values with unified output signal:** 0-5mA; 4-20mA; 0-20mA; 0-0.1 V; 0 - 1V; 0-10V;0-1kHz; 0-10kHz, **optical pyrometers** (for example, ТЕРА-50)

Absolute measurement error : **0.1...1°С PT-0102 ТО;**
1...3Т for PT-0102 ПТ;
0,25 % for PT-0102 ВП;
0.05°С (0.05 %) for high-precision regulators.

Number of outputs: **1, 2, 3 or up to 10 for 8-channel**

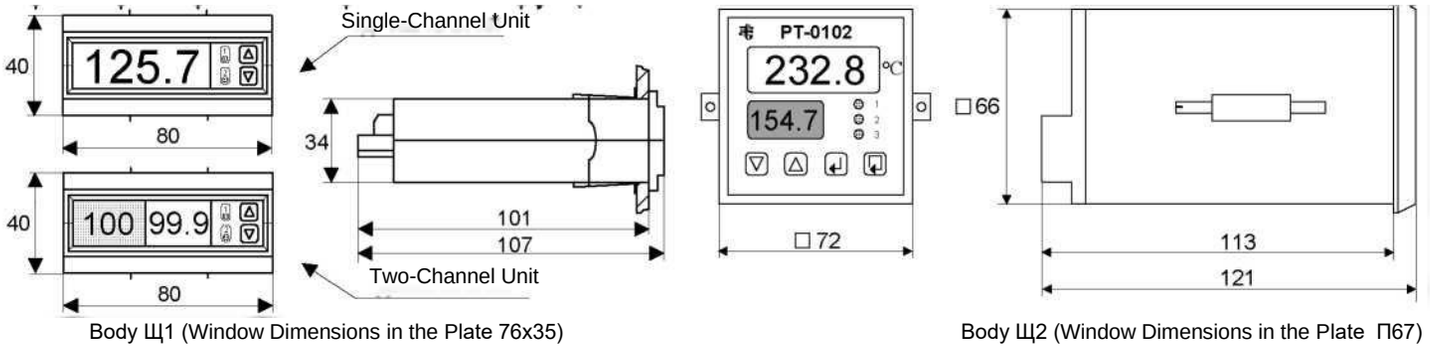
Outputs:
- **electromagnetic relay PE (for switching 1 A (up to 8A) at 220V);**
- **Triac-output photocoupler OC (for switching up to 1 amp at 600 (800) V);**
- **three phase triac-output photocoupler;**
- **transistor key ТК (for switching 50 (150) mA at 50 (300)V DC);**
- **analog output: 0(4)...20mA - АВ20; 0...5mA - АВ5**

Supply: **220 (9..24)АС or 12..36V DC**

Front panel protection degree **IP 54**

Overall dimensions, mm:
- **in body Щ1 — 80x40x107 (1- and 2 - channel)**
- **in body Щ2 — 72x72x121 (1-, 2- and 8 - channel)**

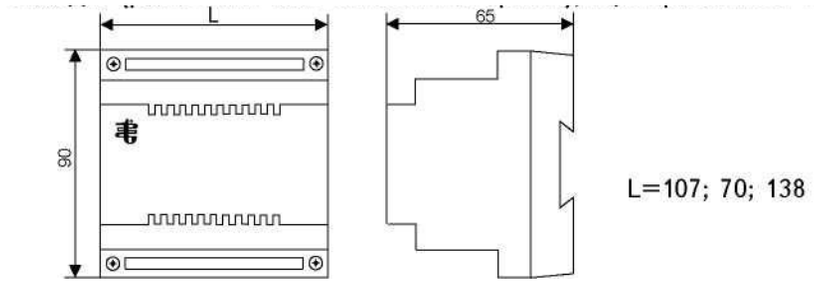
Warning! Possible changes of technical characteristics (range, NSC, error, etc.), complete with thermocouples of various designs.



Body Щ1 (Window Dimensions in the Plate 76x35)

Body Щ2 (Window Dimensions in the Plate П67)

For 8-channel version are provided switching unit (for connecting thermocouples) and block output unit (relay or triac-output photocoupler) mounted on DIN-rail



L=107; 70; 138

Selection of Regulator-Meter PT-0102

PT-0102 — X — X — XX — X — X — XX

Designation of the Output Signal

PE - relay (number of relays; relay on circuit or switching; relay power);
OS - triac-output photocoupler or three-phase triac-output photocoupler (and it is possible to order triac blocks optionally);
TK - transistor key;
KV - active switched OUTPUT (0..20mV),
AB - analog output (0-5;0-20; 4-20mA))

Designation of Additional Service Functions (T; K)

T - with timer; **K**- PC connection — body Щ2)

Designation of Operating Mode (P; B; C; П)

P- measurement and stabilization (regulation);
B- measurement; **C** - with stopwatches;
П - programmable — body Щ2;

Designation of Primary thermocouples Type (ТО; ПТ; ВП)

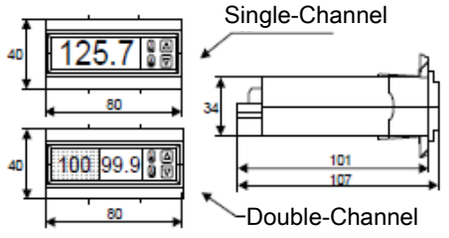
ТО - Thermocouples of resistance (50П;100П;РИ00; 50М; 100М or Pt500 or Pt1000)
or **ПТ** - THERMOELECTRIC COUPLES (K,L,S,B,J or oth.)
or **ВП** - measuring converter with unified output signal (4..20мА; 0..5мА; 0..20мА or 0..0,1 V; 0..10V and oth.

Designation of Input Signals Quantity

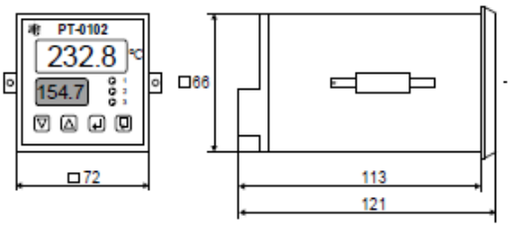
-(1; 2; 8 - body Щ2)

Designation of Body Type (Щ1, Щ2, Л, С, БК, DIN)

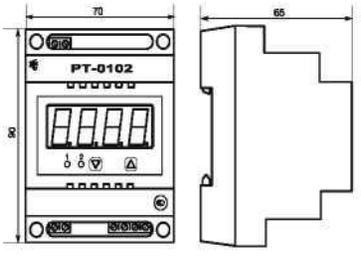
Л-table; БК — for other devices competing



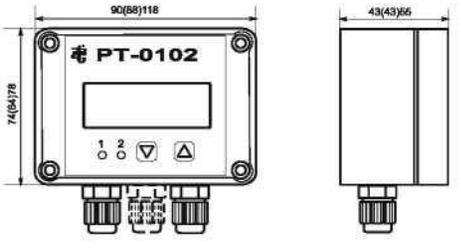
Body Щ1



Body Щ2



Body DIN



Body C

CONTROLLER (REGULATORS) OF TYPE PT-0102
(ТУ У33.2-04850451-068:2007)
PT-0102C (Wall Variant), **PT-0102DIN** (on DIN-Rail)

Designed for automatic control, indication, signaling of temperature, pressure and other physical values converted into a unified signal in various technological processes.

Included in the State register of measuring equipment at number У2454-07. Provide: - two-position, three-position or proportional-integral-differential (PID) regulation, regulation using a timer;

- high-precision measurement and control;
- when using the spark protection barrier work with thermocouples located in an explosive zone.

Number of input channels: **1**

Work in the complete with: - **THERMOCOUPLE OF RESISTANCE ТО**:50М; 100М; 50П; 100П; Pt100; Pt500; Pt1000; гр..21, 23, NTC and oth., (range from minus 50 (200) to 600°C)
- **THERMOELECTRIC COUPLES ПТ**: ХА(К); ХК(I_); ПП(S,R); ПР(В); ЖК(Д; МК(Т); ВР(А-1), (range from minus 50 to 2000°C);
- **measuring converters VP of various physical values with unified output signal**: 0-5mA; 4-20mA; 0-20mA; 0-0.1 V; 0 - 1V;0-10V;0-1kHz; 0-10kHz, **optical pyrometers** (for example, ТЕРА-50)

Absolute measurement error : **0.1...1°C PT-0102 ТО;**
1...3°C for PT-0102 ПТ;
0,25 % for PT-0102 ВП;
0.05°C (0.05 %) for high-precision regulators.

Number of outputs: **1, 2**

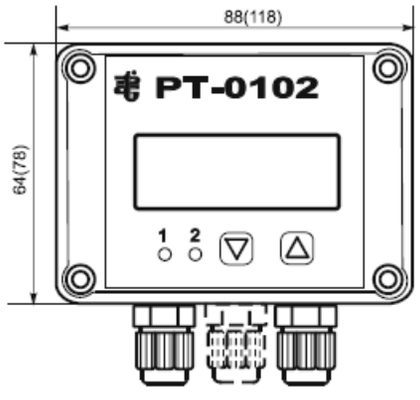
Outputs: **- electromagnetic relay PE (for switching of 1 A (up to 8A) at 220V);**
- **Triac-output photocoupler OC (for switching up to 1 amp at 600 (800) V);**
- **three phase triac-output photocoupler (remote unit);**
- **transistor key ТК (for switching 50 (150) mA at 50 (300)V DC);**
- **analog output: 0(4)...20mA - АВ20; 0...5mA - АВ5 (remote unit)**

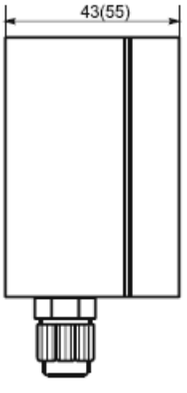
Supply: **220 (9..24)AC or 12..36V DC (24V - with special order)**

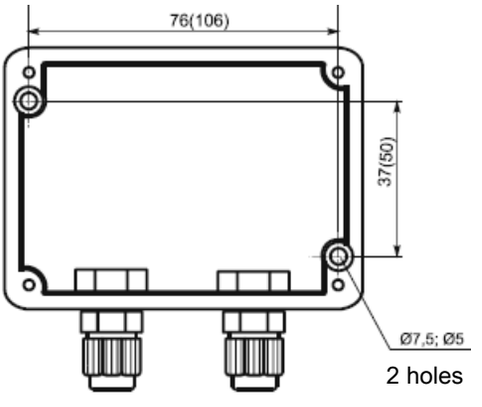
Degree of protection **IP65 for wall-mounted version**

Overall dimensions, mm:
PT-0102C **90x74x43 or 118x78x55**
PT-0102DIN **90x70x65**

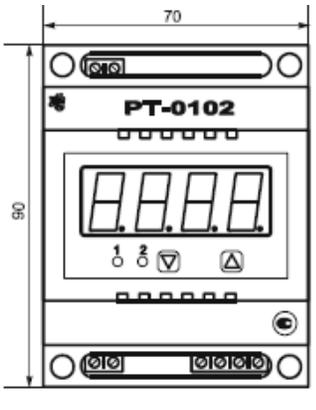
Warning! Possible changes of technical characteristics (range, NSC, error, etc.), complete with thermocouples.

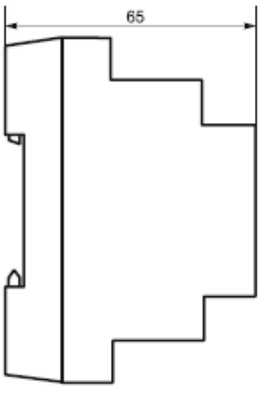






Overall Dimensions





View with the Top Cap Mounting Distances

TWO-CHANNEL MICROPROCESSOR TEMPERATURE CONTROLLERS

RE-202 (ТУ У3.48-04850451-028-96)

Designed for automatic control of temperature or other physical quantities, pre-converted into an electrical signal: voltage 0-1 V or current 0 - 5 mA; 4 – 20 mA; 0 - 20 mA. Communication with computer - RS485 (RS232). Work in complete with thermocouples of type ТХА (K), ТХК (L), ТПП (S, R), ТСМ (50М, 100М), ТСП (Pt50, Pt100)

Range of controlled temperatures, respectively, to NSC °C:	
50M, 100M	**from minus 50 to 200**
50П, 100П	**from minus 200 to 600**
K	**from minus 180 to 1300**
L	**from minus 180 to 800**
S	**from 0 to 1800**
0 - 1V,0 - 5 mA, 4 - 20 mA, 0 - 20 mA	**from minus 199,9 to 999,9**
Law of regulation	**PID - proportional-integral-differential, two-or three-position**
Load control	**pulse-width (for PID - reg.)**
Two regulation output (relay or triac-output photocoupler)	**Relay - 7A, 240 VAC**
Switching on the load at the moment of transition through “zero”	**Triac-output photocoupler 0.1 A, 240V**
Over-temperature alarm	**Relay - 7A, 240 VAC**
Resolution of temperature setting ,°C	**0.1**
Range of proportionality coefficient change, °C	**0 - 200**
Range of integration time constant changes, s	**1 - 3600**
Range of differentiation time constant changes, s	**0 - 1000**

FOUR-CHANNEL MICROPROCESSOR
TEMPERATURE REGULATOR RE-202-4 (ТУ У3.48-04850451-028-96)

Designed for automatic temperature control or other physical quantities previously converted into an electrical signal: voltage 0 - 1 V or current 0 - 5 mA, 4 - 20 mA, 0 - 20 mA. Communication with computer - RS485 (RS232). Work in complete with thermocouples of type (with NSC) ТХА (K), ТХК (L), ТПП (S, R), ТСМ (50М, 100М), ТСП (Pt50, Pt100).

Range of controlled temperatures, respectively, for NSC °C:	
50М, 100М	**from minus 50 to 200**
50П, 100П	**from minus 200 to 600**
K	**from minus 180 to 1300**
L	**from minus 180 to 800**
S	**from 0 to 1800**
0 - 1V, 0 - 5 mA, 4 - 20 mA, 0 - 20 mA	**from minus 199,9 to 999,9**
Law of regulation	**three-level**
Load control	**pulse-width**
Four regulation output (relay or triac-output photocoupler)	**Relay - 7A, 240 VAC**
Switching on the load at the moment of transition through “zero”	**Triac-output photocoupler 0.1 A, 240V**
Regulator supply	**90 - 260 V, 50 Hz**
Weight, kg, no more	**0.25**
Overall dimensions, mm	**96x48x110**
Window size for mounting on the panel, mm	**91x43**

MICROPROCESSOR TEMPERATURE CONTROLLERS RE-204
(ТУ У3.48-04850451-028-56)

Designed for automatic temperature control or other physical quantities previously converted into an electrical signal: voltage 0 - 1 V or current 0 - 5 mA, 4 - 20 mA, 0 - 20 mA. Communication with computer - RS485 (RS232). Work in complete with thermocouples of type ТХА (K), ТХК (L), ТПП (S, R), ТСМ (50М, 100М), ТСП (Pt50, Pt100)

Range of controlled temperatures, respectively, to NSC °C:

50М, 100М	**from minus 50 to 200**
50П, 100П	**from minus 200 to 600**
K	**from minus 180 to 1300**
L	**from minus 180 to 800**
S	**from 0 to 1800**
0 - 1V,0 - 5 mA, 4 - 20 mA, 0 - 20 mA	**from minus 199,9 to 999,9**
Law of regulation	**PID - proportional-integral-differential, two-or three-position**
Load control	**pulse-width (for PID-reg.)**
Quick access to setpoint change	
Output (relay or triac-output photocoupler)	**Relay - 7A, 240 VAC**
Switching on the load at the moment of transition through “zero”	**Triac-output photocoupler 0.1 A, 240V**
Current output	**0 - 5 mA or 4 - 20 mA**
Over-temperature alarm	**Relay - 7 A, 240 VAC**
Resolution of temperature setting ,°C	**0.1**
Range of proportionality coefficient change, °C	**0 - 200**
Range of integration time constant changes, s	**1 - 3600**
Range of differentiation time constant changes, s	**0 - 3600**
Adjustable parameter acceleration rate, °C/hour.	**0 - 999**

TEMPERATURE CONTROLLER (REGULATORS) OF TYPE PT-0102 Щ2-8 (multi-channel)
(ТУ У 33.2-04850451-068-2003)

Designed for automatic and continuous signaling of temperature or other physical value reach the set level (independent level setting for each channel), as well as indication of the current measurement value in the controlled channels. The device can operate in the mode of two-position or PID regulation. To carry out the regulation for each channel separately, it is necessary to additionally order a block of channel outputs. Output options - "dry" relay contacts for a short, or triac-output photocoupler or triac-output transistors (open collectors).

The device works in complete with primary temperature converters: THERMOCOUPLE OF RESISTANCE with nominal static characteristics of conversion (NSC) 50M, 100M, 50ї, 100П, Pt100, etc., or THERMOELECTRIC COUPLES with NSC K, L, J, etc., or with primary converters of other physical quantities with output signal 4-20 mA, 0-20 mA, 0-5 mA, 0-1 V, 0-5 V, 0-10 V, and the like. Converter connection is carried out through the switching unit (БКТО - for THERMOCOUPLE OF RESISTANCE, БКПТ - for THERMOELECTRIC COUPLES , БКВП - for measuring converters with unified output signal), which is included in the package.

The device provides communication with a personal computer (PC) via RS232 or RS485 interface. Communication is carried out by a three-wire line, galvanically isolated from the input circuits and power supply circuits of the device. In addition, the device provides the possibility of measured data archives formation with its subsequent output to PC. Devices are easily integrated into a computer network.

Number of input channels	**EIGHT**
Range of measured temperatures, °C	**from minus 50 to 1800 (depending on the type of thermocouples)**
Minimum grade value, °C	**0.1 (1 for THERMOELECTRIC COUPLES)**
Number of decimal places to display	**4**
Limit of permissible main consolidated error of measurement, %	**0,05...0,5**
Duration of the measured value indication on one channel (programmable), s	**from 1 to 4**
Number of archive points for measured values on each channel, no less	**1500**
Archiving period, min.	**from 1 to 180**
Supply voltage, V, Hz	**220 $^{-33}_{+22}$, 50 ± 1 (or oth.)**
Power consumption, no more than, W	**3**
Overall device dimensions	**72x72x121**
mounting	**panelboard**
mounting depth	**113**
Overall dimensions of the switching units: БКТО	**90x107x65**
БКПТ,БКВП	**90x70x65**
channel output units	**90x138x62**
mounting	**on DIN rail**

PROGRAMMABLE CONTROLLER-METTER OF TYPE PT-0102П

(ТУ У 33.2-04850451-068-2003)

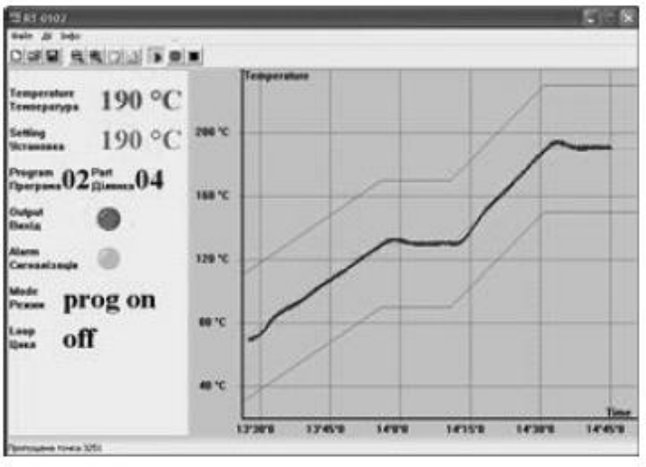
Designed to control a multistage temperature in the furnaces, cryo-freezers, brewing (pasterization) and other technological processes (4 programs in 60 steps (sections) each).

Adjustment: PID, two, three-position, gate valves and three-way valves.

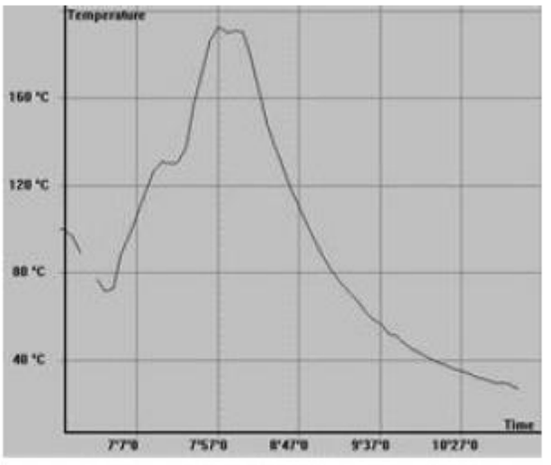
Service: alarm function for deviations beyond the set limits and end the program. Continuation of the unfinished process after the supply stop. Interfaces RS232L, RS485 (allow to connect 32 devices into a network). Archiving of measurement results in its own energy-independent network (up to 10...20 thousand results). Work with graphic touch panel.

Software:

For Real-Time Mode



For Data Archiving



Remote control of program number setting and program start/ stop.

Possibility of inclusion in SKADA system.

Inputs: THERMOCOUPLE OF RESISTANCE , thermocouples, DC signals or voltage signals.

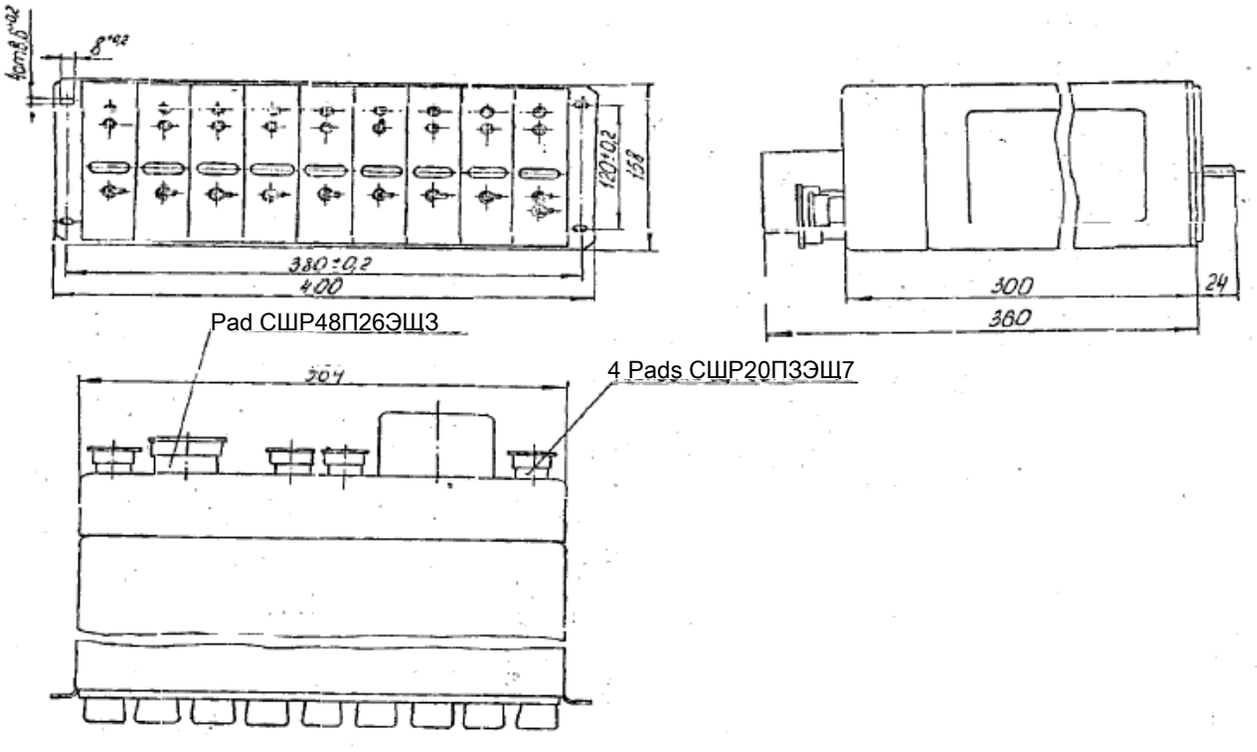
Outputs: relays, triacs (thyristors) single or three phase, analog, alarm relays and the end of the program.

Examples of application: crucible furnace, muffle furnace, cryo-freezer, pasteurizer.

TEMPERATURE SIGNALING DEVICE (ALARM)
СТ-136М (ТУ 25-7558.003-87)

Designated to monitoring and signaling the bearing temperature of the pump unit and oil in the pump housing at eight points. Working in set with THERMOCOUPLE OF RESISTANCE .

Operational range of controlled temperatures, °C	**From 30 to 180**
Designation of NSC	**50П, 100П, 50М**
Limit permissible value of the basic error, %, no more	**±1**
Response time, s, no more	**1**
Number of discrete alarm setpoints, no more	**8**
Temperature difference between the knobs, °C, no less	**4**
Alarm power supply: - voltage, V frequency, Hz	220 $^{+22}$ 50±1^{-33}
Output signal - in the form of contact output of the signal relay with switching capacity at voltage, V	**20 VA** **220 V; 50 Hz**
Input electrical circles - intrinsic safety with level of explosion protection "ів"	
Weight, kg, no more	**25**



TEMPERATURE SIGNALING DEVICE (ALARM)

CTC-0189M (ТУ 25.7363.073-90)

Designed for automatic temperature control in eight channels and output temperature values beyond the permissible limits.

Range of controlled temperatures, respectively, for NSC °C:	
50M, 100M	**from minus 50 to 200**
50П, 100П, Pt50, Pt100	**from minus 60 to 600**
K	**from 0 to 1200**
L	**from 0 to 800**
S, R	**from 0 to 1500**
гр. 21	**from minus 180 to 600**
гр. 23	**from minus 50 to 200**

Mode of alarm device operation:

Individual values of alarm and alarm temperature settings for each channel, sensor type, hysteresis

RS-485 interface;

Switching capacity of relay output contacts ("Warning", "Accident", "Open circuit/Short circuit")	**0,1 A, 220 V**
Over-temperature alarm	
Resolution of temperature setting ,°C	**0.1**
Range of hysteresis coefficient variation, °C	**from 0 to 200**
Alarm power supply, V	**from 90 to 250**
Weight, kg, no more	**0.5**
Overall dimensions, mm	**96x96x110**

TEMPERATURE CONTROL SYSTEM OF MOLTEN METALS CKTP-0597

Designed to measure the temperature of molten metals by contact method with the help of immersed thermocouple and alarm about the progress of the measurement process. Measurement process control is carried out by microprocessor.

Designation of NSC if thermoelectric converter	**B, S, R, A and K**
Range of measured temperatures, °C	**from 800 to 1800**
Measurement error of the digital device, no more, °C	**1**
Number of decimal places to display	**4 (digit height 40 mm)**
Supply	**220^{+22}_{-33} V, 47 - 63 Hz**
Ambient temperature, °C	**from 0 to 50 (from minus 40 to 50 °C - individual design)**
Weight of digital device, kg, not more	**5**

CKTP-0597 system is easy to use.

After connecting the thermoelectric couples green light is lit, which indicates the readiness for measurement. The temperature close to the set value is indicated by a yellow lamp (measurement) when the temperature transmitter reaches the set value.

After the end of the measurement process, which lasts a few seconds, the red warning lamp and, briefly, an audible alarm are activated. The digital display shows the measured value of the molten metal temperature, which is stored until the next measurement.

System CKTP-0597 provides archiving of measurement results and time of their carrying out in nonvolatile memory. Archived data can be output to the indicator or to a PC via RS232 or RS485 line.

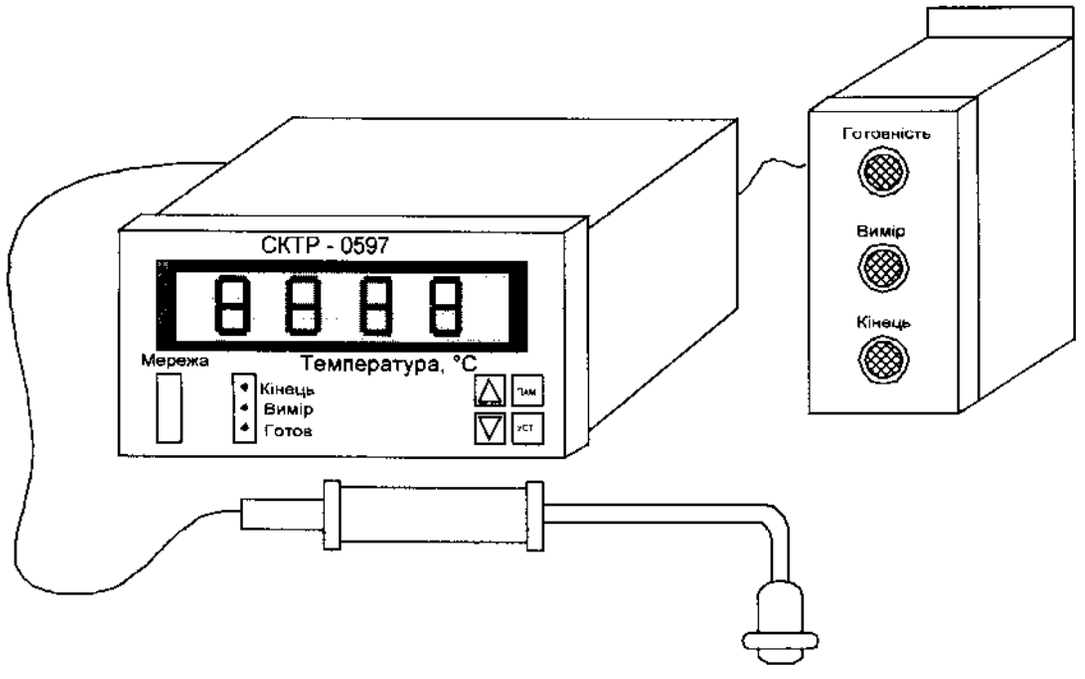


Fig. 1 - External View of CKTP-0597

INFRARED THERMOMETERS (PYROMETERS)

STATIONARY PARTIAL RADIATION PYROMETERS
«СМОТРИЧ-8» (ТУ У 33.2-04850451-038:2006)

Designed for non-contact temperature measurement in various industrial processes. Also provide a wide range of service functions that help to control product quality, reduce energy costs.

Stationary pyrometers consist of pyrometric (ПП) and measuring (ПВ-6) converters connected by with electric cable.

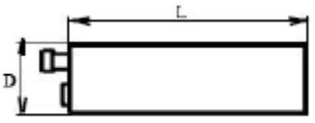
Stationary pyrometer provides the following service functions:

- measurement and digital display of the current, maximum, minimum or average temperature, measured for a given period of time t;
- digital display of maximum or minimum or the difference between the maximum and minimum temperature value, measured from the turn on the pyrometer;
- installation and digital control of the emissivity value of the object from 0.1 to 1.0 with a resolution of 0.01;
- availability of integrator with variable integration time from 0 to 100 s;
- availability of detector of maximum values with a set time of information update from 0 to 100 seconds;
- possibility of increasing the resolution of temperature measurement by narrowing the boundaries of the temperature range.
- three-position relay controller with setting values "less" - "zone" - "more" with permissible electrical loads of 220 V, 50 Hz, 0.5 A.
- digital output to computer via RS-232 or RS-485 interface;
- analog output - current 0-5 mA or 4-20 mA at the operator's choice.

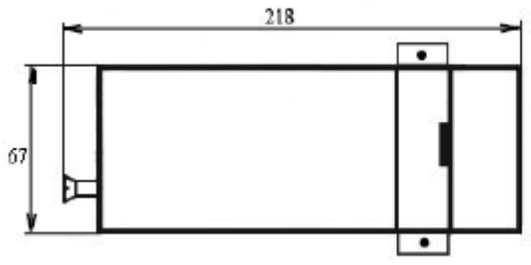
Technical characteristics of stationary pyrometers can be changed according to the requirements of a customer.

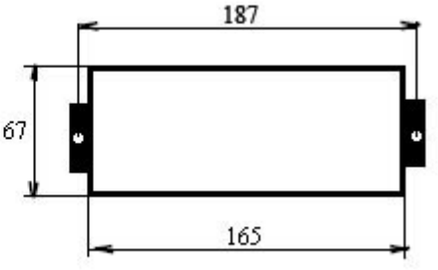
ПП Type and Execution	Operational Range of Measured Temperatures, °C	Operating Spectral Range, µm	Limit of Permissible Basic Error, %	Visual Index, Nominal Value	Working Distance, mm	Indicator Type	ППП Dimension L/D**
ПЧД-131							
00	800 ... 1300	0,7 - 1,1		1/100			
01	1000 ... 2000	0,7 - 1,1		1/200			
02	1500 ... 2500	0,7 - 1,1	± 1,0 %*	1/300	1000±20	Optical	250/50
03	450 ... 750	0,8 - 1,8		1/50			
05	600 ... 1300	0,8 - 1,8		1/200			
06	1100 ... 1700	0,8 - 1,8		1/300			
ПППТ-131							
00	100 ... 400	0,4 - 9,0	+ 6°C	1/20		Laser	180/50
01	300 ... 600	0,4 - 9,0	± 8°C	1/25	1000±20	Laser	255/50
03	400 ... 1500	0,4 - 4,0	± 1,0 %*	1/50		Optical	305/50
05	900 ... 2000	0,4 - 4,0	± 1,0 %*	1/100		Optical	305/50
07	1000 ... 2500	0,4 - 2,5	± 1,0 %*	1/100		Optical	305/50
ПЧР-161	250 ... 700	1,8 - 3,8	± 1,0 %*	1/150	600 - 10000	Optical	303/63

* - Deviation is calculated in percents of the maximum value of the temperature range.
** - L - sensor length; D - sensor diameter.



Pyrometric Converter (ППП)





Measuring Converter (ПВ-6)
Overall Dimensions, mm - 162 x 67 x 200.

When the ambient temperature is above 40 °C for pyrometric converter is necessary to use the cooling device with slip stream (water or air). Ordered separately, depending on ПП performance.

PORTABLE PARTIAL RADIATION PYROMETERS
«СМОТРИЧ-4ПМ1», «СМОТРИЧ-5ПМ1»
(ТУ У33.2-04850451 -068-2001)

Designed for non-contact measurement and temperature control in various processes in metallurgy, glassmaking, foundry, chemical, paint, mining industries, to control the heating temperature of high-voltage contact joints, insulators, control of rotary furnaces lining, heat leakage of buildings and heating mains, in agriculture, in the food industry and everyday life.

Portable pyrometers provide the following functions:

- measurement of current and maximum temperature values;
- temperature indication on the display in digital form;
- determination of the object emissivity by a known value of its temperature;
- laser or optical guidance on the object;
- adjustable emissivity.

Overall dimensions 70x210x260 mm.

Weight, no more, 1,4 kg.

Durable metal body.

The order of such additional service functions is possible:

- digital output to computer via RS-232 interface;
- memory of 250 temperature values.

Model	Operational Range of Measured Temperatures, °C	Operating Spectral Range, µm	Limit of Permissible Basic Error	Indicator Visualizing, Nominal Value	Working Distance, m	Time of Indicators Determination, s	Indicator Type
Смотрич-4ПМ 1 -							
-02	30 ... 1100		±1,5 %*	1:25	0,6 ... 15,0	1.0	
-06	100 ... 1300		±1,5 %*	1:25	0,6 ... 15,0	1.0	Laser
-07	300 ... 1400		±1,5 %*	1:25(1:50)	0,6 ... 15,0	1.0	
Смотрич-5 ПМ1 -							
-01	900 ... 2400			1:250	2,0 ... 15,0	1.0	
-02	1000 ... 1500			1:150	1,0 ... 15,0	1.0	
-03	600 ... 1500		±1.0 %*	1:250	2,0 ... 15,0	1.0	Optical
-04	700 ... 1700			1:250	2,0 ... 15,0	1.0	
-05	800 ... 2000			1:250	2,0 ... 15,0	1.0	

* - Deviation is calculated in percents of the maximum value of the temperature range.

Смотрич-4ПМ1

Смотрич-5ПМ1

PORTABLE INFRARED THERMOMETERS PYROMETERS «СМОТРИЧ-4ПМ1-08», «СМОТРИЧ-4ПМ1-09» (ТУ У33.2-04850451-068-2001)

Designed for non-contact measurement of bodies temperature in the range from minus 30 to 900 °C. Manufactured in a compact, durable and ergonomic plastic case. Designed for use in microclimatic areas with a temperate climate; resistant to ambient temperatures from 0 to 50 °C and relative humidity up to 80 % at 35 °C and lower without condensation; withstand vibration at a frequency of 25 Hz amplitude of not more than 0.1 mm.

Pyrometers are equipped with a liquid crystal indicator and provide memorization of the maximum temperature value in the last measurement cycle, in addition, the model «Смотрич-4ПМ1-09» has the memorization of the minimum temperature value in the last measurement cycle, displaying the average temperature for the measurement cycle, the temperature difference between the set value and the current and provides alarm when exceeding the specified temperature levels (high temperature alarm, low temperature alarm).

Pyrometer «Смотрич-4ПМ1-08» has a fixed coefficient of emissivity of the material: 0.95.

Pyrometer «Смотрич-4ПМ1-09» has an adjustable coefficient of emissivity of the material in the range from 0.1 to 1.00, and also provides storage in the internal non-volatile memory up to 12 temperature values.

Pyrometers are equipped with a laser pointer with a power of less than 1 mW.

Technical Specifications	Смотрич	
	4ПМ1-08	4ПМ1-09
Operational range of measured temperatures, °C	-30...+400	-30...+900
Operating spectral range, μm	5,0 ... 14,0	8,0 ... 14,0
Basic error limit (from measured): minus 30 ... 0 °C 0 ... 400 °C 0 ... 900 °C	 ±3 °C ±2°C or ±2%	 ±3 °C ±1°C or ±1,5%
Value of the lowest temperature digit, °C	0.1	0.1
Nominal index of vizualizing	1:10	
Working distance, m	0,3 ... 1,5	
Time of indicators determination, s, no more	0.5	
Emissivity of the measurement object	0.95	0,1 ... 1,0
Non-volatile memory, values	–	12
Minimum dimensions of the measured object, mm, at which the basic error of the pyrometer does not exceed the limits of the permissible value for operating distances:		
0.3 m ⌀ 38	0.9 m ⌀ 75	1.5 m ⌀ 132
Laser pointer power, mW, no more	1	
Calibration interval, years, no more	1	
Battery (quantity, type)	1 x 6F22, 9V	
Time of continuous operation with the laser pointer off, hour.	16	22
Dimensions, mm, no more	152 x 130 x 39	170 x 130 x 50
Weight with battery, g, no more	145	230

Смотрич-4ПМ1-08

Смотрич-4ПМ1-09

PYROMETRIC CONVERTER WITH UNIFIED ANALOG OUTPUT ПП-У

Pyrometric converter ПП-У is used as an infrared sensor with unified analog output 4...20 mA and digital RS-485 for non-contact measurement of surface temperature of solids (including bulk) bodies and melts of various materials and in various industrial processes by their own thermal radiation.

Total range of measured temperatures, °C	**from minus 30 to 2400**
Visualizing indicator	**from 1:20 to 1:250**
Distance to the measurement object (with guidance), m	**from 0,6 to 15 m**
Setting range of emissivity coefficient	**from 0,1 to 1,0**
Error from the upper value of the measured temperature	**1-2 %**
Supply	**24V**
Functionality:	
Analog output	**4...20 mA**

PC communication interface for data transmission and instrument setup (RS-485).

SPECIAL PURPOSE DEVICES

Special purpose devices

Device Type and ТУ	Purpose and Technical Characteristics
Thermocouples of resistance ТСП-037ДМ1 ТУ В 25-7363.047-89	Designed to measure the temperature of liquid of brand "40" and "65" water with anti-corrosion additive, oil of type МТ-8П, ТС3П-8, М16ИХП-3, М8В2С. Designation of NSC 100П. Range of measurements, °С from minus 220 to 200. Material of protective reinforcement (armature) steel 12 Х18 Н9 Т
Thermocouples of resistance ТСП-772-02 ТУВ .25-04111-82	Designated to measure the temperature of gaseous and liquid media in hazardous areas. Range of measurement temperatures, °С: (depending on design) from minus 200 to 200; from minus 50 to 75. Designation for NSC 50 П гр. 21. Material of protective reinforcement (armature): 08Х18Н10Т, 12Х18Н10Т
Thermocouples of resistance ТСП-5480 ТУ В 311-4850458.080-90	Designed to measure fuel temperature, with three sensing elements in one zone. Range of measurements, °С from 0 to 50. Designation for NSC 100 П. Material of protective reinforcement (armature) steel 12Х18Н10Т
Thermocouples of resistance ТСП-6099 ТУ В 25-7558.010-87	Designed to measure the temperature of air and sea water. Range of measured temperatures, °С: air temperature minus 40 to 50; water temperature minus 2 to 35. Designation for NSC 50П гр. 21. Material of protective reinforcement (armature) steel 12Х18Н10Т
Thermocouples of resistance ТСП-6288 ТУ В 25-7363.072-90	Designed to measure air temperature. Range of measurement temperatures, °С from minus 50 to 50. Designation for NSC 50 П. Material of protective reinforcement (armature) steel
Thermocouples of resistance ТСП-8040 ТУ В 25-04.4110-84	Designed to measure the temperature of distillate, bidestilate of fresh and sea water, oil, steam, air, fuel, special alloys, polymer glycerin paste, halocarbon 12, 22, 502, freon and FNGI, oxygen, carbon dioxide with vapors of М33ДА, sulphuric acid mist, analyte, exhausts. Designation of NSC - 50 П, 100 П. Range of measurements, ° С from minus 200 to 500 (depending on design). Material of protective reinforcement (armature) steel 08 Х18Н10Т, alloy 3М, 7М, bronze БрАЖНМц 9-4-4-1 (depending on the version).

Device Type and ТУ	Purpose and Technical Characteristics
Thermocouples of resistance ТСП-8041 ТУ В 25-04.4110-84	Designed to measure the temperature of fresh water, air, condensate, gas, electrolyte, carbon dioxide with vapors of МЗЗДА, aqueous solution of carbonate and bicarbonate, sea water. Designation of NSC 50П. Range of measurements, °C from minus 50 to 300. Material of protective reinforcement (armature) steel 08 Х18Н10Т, alloy 3М, 7М.
Thermocouples of resistance ТСП-8042	Designed to measure the temperature of high purity water, distillate, protective covers of special devices, solid bodies. Designation of NSC 50П, 100П. Range of measurements, °C from minus 50 to 400. Material of protective reinforcement (armature) steel 08Х18Н10Т, steel 12Х18Н10Т (depending on the version).
Thermocouples of resistance ТСП-8043	Designed to measure the temperature of bearings and oil in them. Designation of NSC 50П, 100П. Range of measurements, °C from minus 50 to 120. Material of protective reinforcement (armature) steel
Thermocouples of resistance ТСП-8044	Designed to measure the temperature of pipeline walls. Designation of NSC 50П. Range of measurements, °C from minus 50 to 400. Material of protective reinforcement (armature) steel 08Х18Н10Т.
Thermocouples of resistance ТСП-8045	Designed to measure the temperature of air, steam, oil and sea water. Designation of NSC 50П. Range of measurements, °C from minus 50 to 100. Material of protective reinforcement (armature) steel
Thermocouples of resistance ТСП-8050 ТУ В 25-7558.010-87	Designed to measure the temperature of air and sea water (shet-term). Range of measured temperatures, °C: air temperature minus 40 to 40; water temperature minus 2 to 35. Designation for NSC 50П гр. 21. Material of protective reinforcement (armature) steel 12Х18Н10Т, alloy 3М.

Device Type and ТУ	Purpose and Technical Characteristics
Thermoelectric Couples ТХА-0384 ТУ В 25-04.4112-84	Designed to measure air temperature, argon in process connectors, immersed in special media. Range of measured temperatures, °С from 0 to 600; Designation of NSC - K. Material of protective reinforcement (armature) steel 12Х18Н10Т.
Thermoelectric Couples ТХА-0394 ТУ В 25-04.4112-84	Designed to measure air temperature, argon in process connectors, immersed in special media. Range of measured temperatures, °С from 0 to 600; Designation of NSC - K. Material of protective reinforcement (armature) steel 12Х18Н10Т.
Thermoelectric Couples ТХА-0404 ТУ В 25-04.4112-84	Designed to measure air temperature, argon in process connectors, immersed in special media. Range of measured temperatures, °С from 0 to 600; Designation of NSC - K. Material of protective reinforcement (armature) steel 12Х18Н10Т.
Thermoelectric Couples ТХА-742, ТХК-742 ТУ В 25-04.4112-84	Designed to measure the temperature of air, argon, liquid metal alloys in one, two or three zones. Letter Designation of NSC: ТХА-742 K ТХК-742 L Operational range of measured temperatures, °С: ТХА-742 from 0 to 600 ТХК-742 from 0 to 500 Material of protective reinforcement (armature) steel 1Х15Н9С3Б1(ЗП- 302), 12Х18Н10Т.
Thermoelectric Couples ТХА -1072, ТХК -1072 ТУ В 25-04.4112-84	Designed to measure the water temperature, high purity water, distillate, bidistillate, protective covers in power plants for special purposes. Range of measurements, ° С from 0 to 500 (depending on design). Letter designation of NSC ТХА-1072 - К; ТХК-1072 - L.

Device Type and ТУ	Purpose and Technical Characteristics
Thermoelectric Couples ТХА -1172, ТХК -1172 ТУ В 25-04.4112-84	Designed to measure the temperature of water, steam, vapor, gas, helium, argon, exhaust gases. Range of measured temperatures, ° С ТХА-1172 from 0 to 700 ТХК-1172 from 0 to 500 Letter designation of NSC ТХА -1172 - К; ТХК -1172 - L. Material of protective reinforcement (armature) steel 10Х17Н13М2Т, 12Х18 Н10 Т, 12 Х18Н9Т.
Thermoelectric Couples ТХА-1874, ТХК -1874 ТУ В 25-04.4112-84	Designed to measure air temperature. Designation of NSC: ТХА -1874 - К; ТХК -1874 - L. Range of measurements, ° С from 0 to 600 (depending on design). Material of protective reinforcement (armature) steel
ПКТ-40 С, ПКТ-40 Т ТУ В25-04(5 Ц2.827.001)-84	Temperature control devices are designated to convert the signals of THERMOCOUPLE OF RESISTANCE (ПКТ-40 С) and THERMOELECTRIC COUPLES (ПКТ-40 Т) into unified DC output signal with a voltage (0-5) V, or (0-10) V.
ИПС-1, ИПС-1К, ИПТ-1, ИПТ-1К ТУ В 25-04(5Ц0.203.023)-84	Measuring converter ИПС-1 (device in casing) and ИПС -1 К (cassette) are designed to convert the signal of Thermocouples of resistance of NSC-50 П. in unified DC output signal with voltage (0-5) V or (0-10). In the range - 50 to 600 °С with a measurement error of ±1 % . Measuring Converter ИПТ -1 (device in casing) and ИПС -1К (cassette) are designed to convert the signal of THERMOELECTRIC COUPLES - ТХА or ТХК (NSC К or L) in a unified DC output signal with voltage (0-5) or (0-10) In the range of 0-800 ° С with a measurement error of ±1%.
П С -052-01Р ÷ 04 Р, ПС-062-01Р ÷ 04 Р ТУ 25-02.1826-75	Measuring converters are designated to convert the value of thermoelectric couple with NSC 50П into unified DC signal (0-50) mV at load resistance a) 50 ^300 KOhm b) 300kOhm ÷ ∞

Device Type and ТУ	Purpose and Technical Characteristics
ПЭН-022Р, ПЭН-022-01Р ТУ 25-02.1828-75	Measuring converters are designated to convert signals of THERMOELECTRIC COUPLES with NSC K in unifies DC output signal with voltage (0-5) V or (0-10) V with load resistance (3 - 10) kOhm. ПЗН-022Р works with КС-419, ПЗН-02201Р with КС-501.
ИПС-2К ТУ В.25-7558.015-87	Measuring converter is designated to convert signals from resistance thermal convertors (NSC 50П or R_o=46 Ohms) into unified output DC signal with voltage (0-5) V or (010).Power supply of ИПС-2К 220V, 400Hz.
ПКТ-04С, ПКТ-04Т ТУ В25-04(5Ц2.827.001)-84	Temperature control devices of ПКТ-04С and ПКТ-04Т are designated for continuous operation alarm of exceeded or decrease in temperature relative to the preset at the control points. Range of alarm from minus ЗО to 500 °С (ПКТ-04С) and from 0 to 900 °С (ПКТ-04Т)
СТС-1, СТС-1К, СТТ-1, СТТ1К ТУ В25-04(5Ц0.299.020)-84	Alarm devices are designated for continuous one-position signaling of exceeding or decreasing the temperature relative to the set in the control points by switching the contacts of the output relays of the signaling devices included in the external electric circle. Range of alarm from minus ЗО °С to 500 °С (СТС-1 і СТС-1 К) and from 0 °С to 900 °С (for СТТ-1, СТТ-1 К)
ТСТП-071М1 ТУ В311.4850458.082-91	Thermo kit ТСТП-071М1 consists of alarm СТП-082М1, junction box КС-429М1 and 3 displaying devices М1618, designated to control the uniformity of temperature field, control the average temperature field and sample temperature control IN EACH of the 3 control points. Range of controlled temperatures from 0 °С to 1100 °С. Thermo kit works along with THERMOELECTRIC COUPLES NSC - K

Device Type and ТУ	Purpose and Technical Characteristics
СТ-042 ТУ 25-02.1886-75	Alarm average temperatures kit СТ-042 consists of alarm СТ-642, junction box КС-212 2 displaying devices - milliampermeters М1618. Kit is designated to measure and alarm (warning and emergency) the average temperature values at one point. Kit works with four THERMOELECTRIC COUPLES NSC-K. Measurement limits from 0 to 1100 °С, supply voltage - 24±2,4 V.
СТ-201 ТУ 25-02.1714-74	Temperature alarm СТ-201 is designated to: - alarm of controlled medium temperature rise by converter of fire alarm system ППС-01К when it reaches the value of thermo e.p.c. (К0±5) mV; - activation of fire extinguishing control system; - alarms about the presence of breakage or short circuit in the converter circuits. Basic error of the alarm ±5 mV
РТИ-012 ТУ 25-02.19К5-76	Kit of object temperature field regulator consists of a temperature controller РТИ-012, coupling device УС-491 and 2 displaying devices - milliampermeters М1618. Regulator is designated to regulate and measure the temperature of the object in the range from 0 to 900 °С. Regulator works with THERMOELECTRIC COUPLES NSC-K.
РТ-016М ТУ 25-02.902-7К	Temperature regulator РТ-016М designated for air temperature control (stabilization) with accuracy of ±0.1 °С at the installation location of the sensing element in the objects with a time constant of from 50 to 200 min in the temperature range from 5 to 40 °С. Regulator is complete with Thermocouples of resistance ТСП-5082М. Range of controlled temperature from 20 to 60 °С.
КСИ-01-615 ТУ 25-02.792121-80	Kit of alarms and voltage, temperatures measurement and metering КСИ-01-615 consists of alarm МСП-01-6155, junction box КС-567, 2 displaying devices - milliampermeters М1618 - 1 - with scale 0-5V, 2 - with scale 0-100 °С and 4 THERMOCOUPLE OF RESISTANCE ТСП-288М. Kit is designated to alarm of voltage deviation and temperature excess from the set values of the four controlled elements of the battery

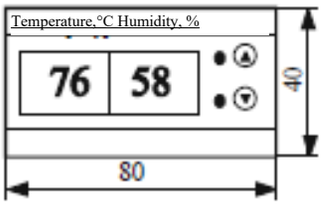
Device Type and ТУ	Purpose and Technical Characteristics
СВР-018 ТУ У33.2-04850451 -075-2004 (to replace ТУ 25-02-1176-73)	Kit CBPR-018 consists of multi-level temperature alarm СТ-198, time meter ИВ-108 and junction box КС-418. Remaining life summator instrument СВР-018 is designated to summarize the time of gas turbine operation in different temperature conditions. Summator instrument works along with THERMOELECTRIC COUPLES NSC - K
ДТИ-014Р ТУ 25-02.1734-74	Angular velocity converter ДТИ-014Р is designated for the continuous conversion of mechanism shafts angular speed in an electric AC signal with frequency proportional to the angular velocity in the range from 0 to 15 000 rpm. The output signal on frequency range is from 0 to 500 Hz. Range of output signals by e. p. s. is from 0 V to 30 V, on frequency - from 0 to 600 Hz.
ДТЕМ-024Р ТУ 25-02.1733-74	Angular velocity converter ДГЕМ-024Р is designated for the continuous conversion of mechanism shafts angular speed in an electric AC signal with frequency proportional to the angular velocity in the range from 0 to 4 000 rpm. The output signal on frequency range is from 0 to 66.7 Hz. The output signal on electromotive force is from 0 to 15V.
ДТЕ-042Р ТУ 25-02.1732-74	Angular velocity converter ДГЕ-042Р is designated for the continuous conversion of mechanism shafts angular speed in an electric AC signal with frequency proportional to the angular velocity in the range from 0 to 5 000 rpm. The output signal on frequency range is from 0 to 416.7 Hz. The output signal on electromotive force is from 0 to 220V.

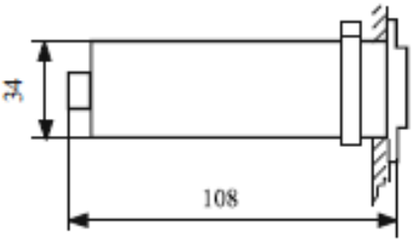
OTHER DEVICES

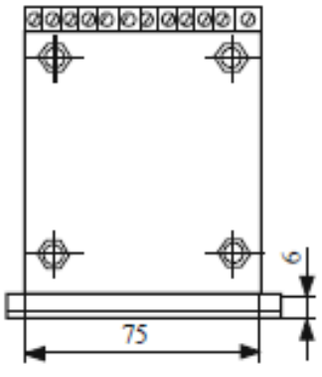
DEVICE FOR HUMIDITY AND AIR TEMPERATURE MEASURING (REGULATING)

Designated for operational measurement of temperature, relative air humidity. Completeness: regulator of type PT-0102 and air humidity and temperature thermoelectric couples.

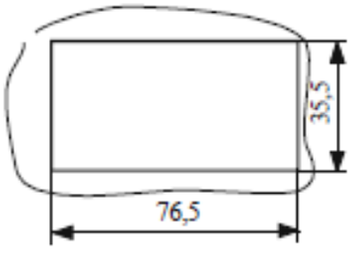
Range of measured relative humidity, %	**from 0 to 99 (without condensation)**
Range of measured temperatures, °C	**from minus 10 to 65** **from minus 19 to 85 (depending on converter body material)**
Limit permissible absolute error of measured relative humidity, %	**±3**
Limit permissible absolute error of measured air temperature,°C	**±(1+0,011 T |), T- air temperature**
Supply voltage, V	
from DC power supply	**24(12)**
from AC network with frequency 50 Hz	**220(36)**



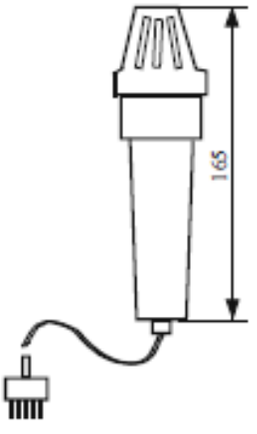




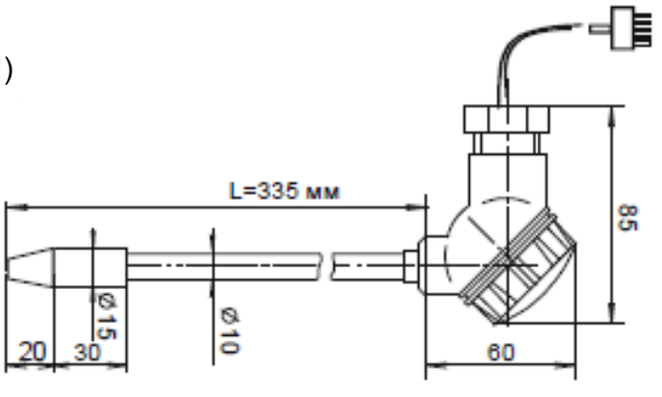
Regulator of type PT-0102 (Щ1)



Window marking on the panel



Humidity and temperature converter (-40...65°C)



Humidity and temperature converter (-40...120°C)*

* Dimensions are subject to change

THERMOHYGROMETER BT-1

Designated for operational measurement of temperature, relative air humidity. Thermohygrometer consists of a digital instrument, temperature and humidity converter and (or) thermoelectric couple of characteristics Pt 1000.

Measuring range of digital device

for relative air humidity	**from 0 to 100%**
for temperature	**from minus 50 to 600 °C**

Operating range of temperature converter and relative air humidity*

* depending on body material	**from minus 40 to 85 °C**

Value of the lowest digit (discreteness):

for relative air humidity for temperature:	**1 %**
in the range from minus 50 °C to 199,9 °C	**0.1 °C**
in the range from 200 °C to 600 °C	**1 °C**

Kit error when measuring relative humidity	**±(3...5) %**

Kit error when measuring temperature

in the range from minus 50 °C to 199,9 °C	**±1 °C**
in the range from 200 °C to 600 °C	**±0,011 T |°C** **T - air temperature**

Supply voltage, V	**7...11, galvanic battery of type «Krona»**

Design and characteristics are subjects to change.

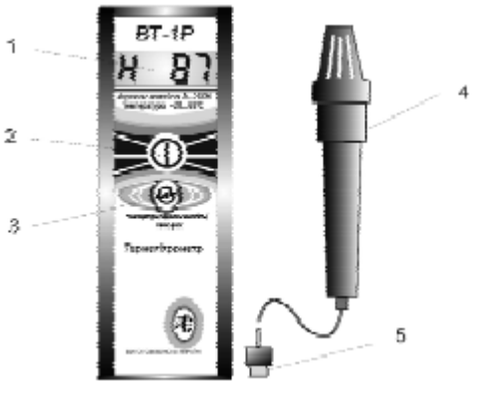
1 - indicator BT-1;
2 - power on / off button;
3 - mode switch button (temperature, relative humidity);
4 - temperature and relative humidity converter;
5 - converter connector.

THERMOHYGROMETER BT-1P

Designated for operational measurement of temperature, relative air humidity and dew point determination. Thermohygrometer consists of a digital device ПВТ - temperature relative air humidity converter (hereinafter converter). Can work with a separate thermal converter of type ТО-010 (NSC Pt 1000 (W=1,385)).

Range of measured humidity, %	**from 0 to 100***
Range of measured temperatures, °C	**from minus 40 to 85**
Range of dew determination, °C	**from 0 to 60**
Basic error of humidity measurement, %	**±(3+CNR)**
Basic error of temperature measurement, °C	**±(0.5+CNR)**
Error of dew point determination, °C	**±0,8**
Value of the lowest humidity digit, %	**1**
Value of the lowest temperature digit, °C	**0.1**
Value of the lowest temperature digit, °C	**0.1**
Supply voltage, V	**from 7 to 11 , galvanic battery of type «Krona»**
Overall dimensions of the digital device, mm	**37x75x170**
Average service life, years	**8**

*Design and characteristics are subjects to change.



1 - indicator BT-1P;
2 - power on / off button;
3 - mode switching button (temperature, relative humidity, dew point);
4 - relative humidity and temperature converter;
5 - converter connector.

REGULATORS-METERS PT-0102ST (for Heat Generator Control)
(ТУ У 33.2-04850451-068-2003)

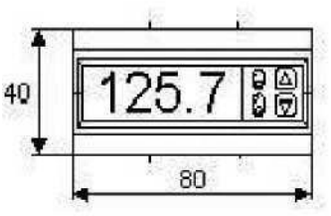
Designated to automatic control of the heat generator (sawdust, chopped straw, etc. heater) by adjusting the feed rate (screw) and blower (fan). Alarm system is provided.
Included in the State register of measuring equipment at number У2454-07.

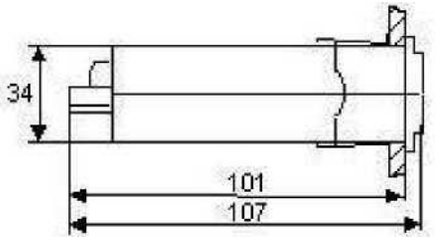
Number of input channels	**1**
Works in complete with TO THERMOCOUPLE OF RESISTANCE .	**100П; 50П; 100М; 50М; Pt100**
Absolute measurement error	**1°C**
Number of outputs	**3**
Outputs:	**electromagnetic relay PE (for switching 1A (up to 8A) at 220 V); other options are possible**
Supply	**220 (9..24)AC or 12..36V DC**
Degree of protection	**on front panel IP 54**
Overall dimensions, mm	**80x40x107**

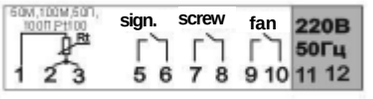
Combustion Process Control Scheme

	T < To	T > To	
t_1	t_2	t_3	t_4
screw is activated	screw is disactivated	screw is activated	screw is disactivated
fan is activated	fan is activated	fan is activated	fan is disactivated

T_o — value of temperature to be maintained;
t_1 and t_2 — duration of screw (feed) on and off at $T < T_o$;
t_3 and t_4 — duration of screw (feed) on and off at $T > T_o$.
Values of t_1, t_2, t_3, t_4 are selected in the range of 0..200 seconds.
tsHi — alarm upper set point;
tslo — alarm lower set point.
Output "screw" (7, 8) — relay contacts are closed for a time t_1 and t_3 Simultaneously lights up the top led.
Output "fan" (9,10) — relay contacts are closed for time t_1 , t_2 and t_3 . At the same time the lower led lights up.
"Alarm" output (5,6) — relay contacts closed at t<tslo and t>tsHi. At the same time, the decimal point in least significant bit lights up.





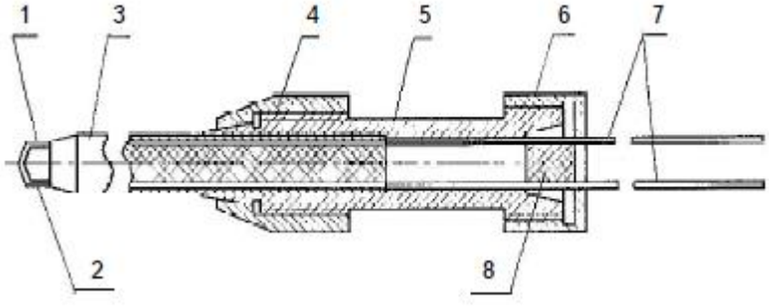


Case Щ1 (window size on panel 76x35}

REFERENCE THERMOELECTRIC COUPLES OF TYPE ППЕ

Reference thermoelectric couples platinum-rhodium-platinum of type ППЕ of 1, 2, 3 bits is designated to use as a reference for calibration works, as well as for accurate measurements of temperature in the air or in neutral medium in the laboratory conditions.

Operational range of measured temperatures, °C	**from 300 to 1200**
Limit permissible error, °C (at temperature 1084.62 °C)	
1 b.	**0.6**
2 b.	**0.9**
3 b.	**1.8**
Length of thermoelectrodes, mm	**1000; 1250; 1600**

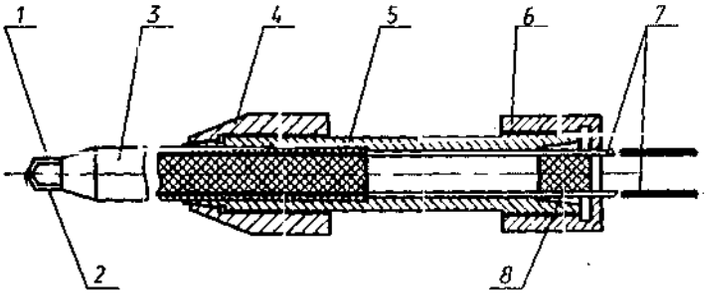


1. Platinum thermoelectrode
2. Platinum - rhodium thermoelectrode
3. Reinforcing tube 0 5±1 mm
4. Nut
5. Collet
6. Cap
7. Electrical insulation tube
8. Adapter

REFERENCE THERMOELECTRIC COUPLES OF TYPE ПРЕ

Reference thermoelectric couples thermoelectric platinum-rhodium-platinum-rhodium of type ПРЕ of 1, 2, 3 bits is designated to use as a reference for calibration works, as well as for accurate measurements of temperature in the air or in neutral medium in the laboratory conditions.

Operational range of measured temperatures, °C	**from 600 to 1800**
Limit value of the confidence error with a confidence probability of 0.95 is, K	
1 b.	**2.5**
2 b.	**4**
3 b.	**10**
Length of thermoelectrodes, mm	**1250; 1600**



1. Negative thermoelectrode (platinum-rhodium wire ПР / 6 0,5)
2. Positive thermoelectrode (platinum-rhodium wire ПР-30 0,5)
3. Reinforcing tube 0 5±1 mm
4. Nut
5. Collet
6. Cap
7. Electrical insulation tube
8. Adapter

INTRINSIC SAFETY BARRIER ТФ-3388

Designated to ensure intrinsic safety of electrical circuits of various converters and current sources that are in an explosive zone.

Limits of permissible parameters in the explosive zone (terminals 3, 4):

inductance, Henry , no more	**5×10^{-3}**
capacity, mF, of no more	**7**

Absence of own non-intrinsically safe current sources

Rated fuse current, mA	**20**
Leakage current between input (output) terminals at a voltage of 1 V, mA , no more	**10**
Permissible short-circuit current between terminals 3-6 and 4-6, A, no more	**0.11**
Barrier trip voltage, V, no more	**6,5 (26)**
Degree of protection from solid bodies penetration	**IP20**

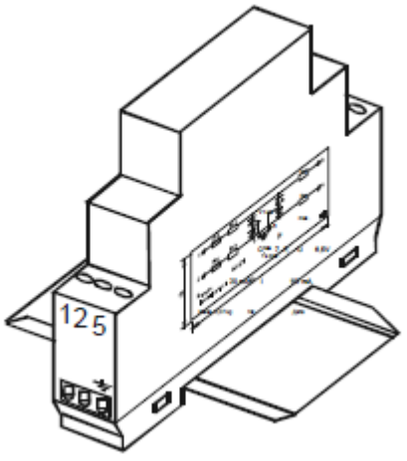


Fig. 1 - External View

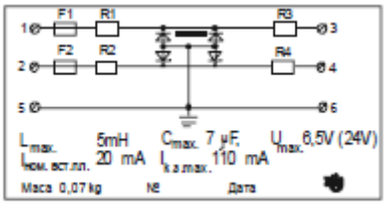


Fig. 2 - Electrical Diagram

ELECTRONIC SENSORS OF WHEEL PAIRS PASSAGE FIXATION ДЕ-96

Sensors are designated to generate a pulse of electric current at the time of fixing the moving unit wheel passage.

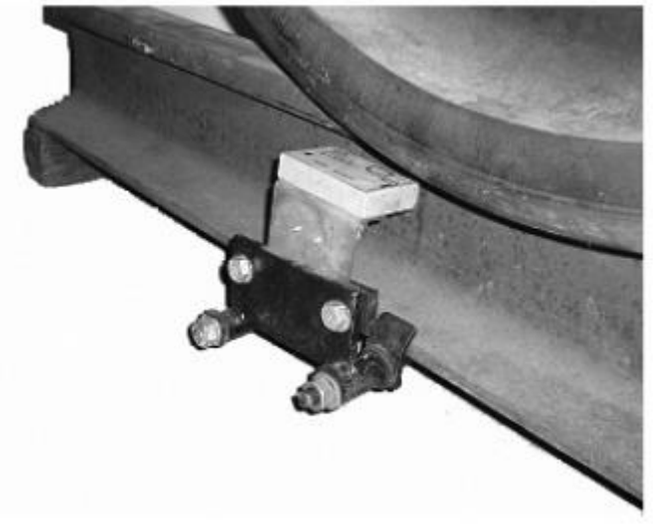
Sensors are designated to use in devices “ПОНАБ” , “ДИСК”, “ГАЦ” etc.

Sensor Operating Conditions:

ambient temperature - from minus 40 to 60 °C air relative humidity - up to 100 %

atmospheric pressure - from 66 to 106.7 kPa (495 - 800 mm Hg) mechanical loads - according to the group МС5 РД32 ЦШ 03.07-90

Nominal supply voltage of sensors, V	**12 ± 1**
Output signal of the sensor of mobile unit wheel fixing, mA	**3,5 ± 1**
Insulation resistance between sensor body and electrical terminals at a temperature of 20 °C and relative humidity 80 %, MOhm, no less	**40**
Overall dimensions of the sensor (without bracket), mm, no more,	**80x58x25**
Sensor weight (without bracket and mounting elements), kg, no more	**0.15**



TEMPERATURE CONTROL SYSTEM «РОСЬ-1 М1»

Provides reliable and high-quality storage of grain, bran and other agricultural products in granaries and elevators.

System composition:

Structurally, the system is made in two versions:

- option 1: the system consists of thermal resistance transducers with a pulse output signal TOMI-0591, network adapter AM-01 and personal computer;
- option 2: the system consists of thermal resistance TOM-0591, temperature control devices ПКТ-01, network adapter AM-01 and a personal computer.

Thermocouples TOMI-0591, TOM-0591 have 6 or 12 sensing elements, mounted with a certain step in the armored shielded cable. Cable length - from 10 to 28 m. Cable diameter - no more than 21 mm. Thermocouples withstand the action of breaking force up to 3000 kg.

Technical specifications:	
Operational range of measured temperatures, °C:	**from minus 30 to 60**
- minimum grade value, °C	**0.1**
Designation of NSC * convert of thermocouples TOMI-0591, TOM-0591	**50M**
Basic error of measurement, °C	**±1,0**
- the system is set to one set point of the maximum temperature value for all thermocouples with installation discreteness, °C	**0.1**
- the system is provided with an alarm when the measured temperature is exceeded from the set point, no more than °C	**0.1**
- the system provides temperature measurement for a time that does not exceed, s	**10**
- electrical power system - AC, V, Hz	**220, 50**

TEMPERATURE CONTROL SYSTEM ON THE BASIS OF PT-102-8

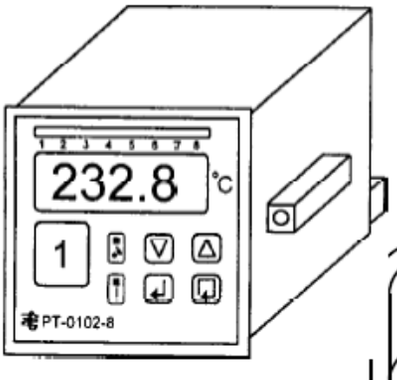
Designated for temperature control in large tanks, granaries, elevators, etc.

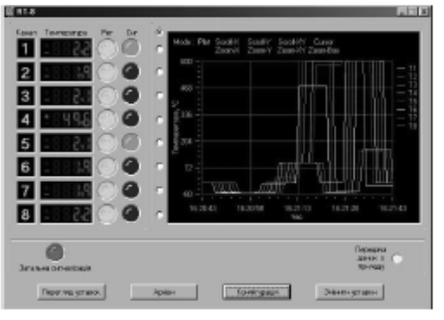
System composition:

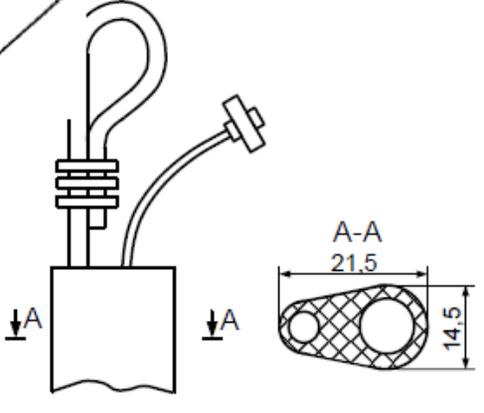
- measuring eight-channel device PT-0102-8 , which measures, archives the temperature, signals the excess temperature on each channel separately, provides communication with the computer via RS232 or RS485 interface;
- multipoint temperature transmitter of type ТОМ-0591-8, where in the cable of type ПТ-8,5-1,2 sensing elements Pt 1000 (up to eight pieces) and the cable for mountingare placed at different distances, can withstand the breaking force of 2000 kg;

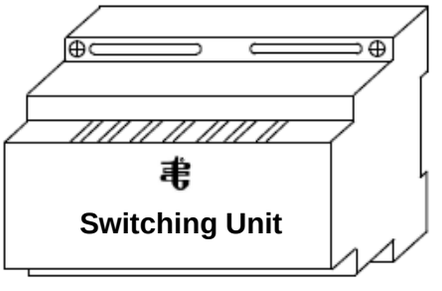
Depending on the volume of the controlled environment , it is possible to use several such systems, that is, increase the number of controlled points to 16, 24, 32, 40, etc. Program of work with a personal computer allows to exchange with a PC up to 256 PT-0102-8 with communication numbers from 0 to 255. It is possible to change the settings and control parameters of the device from a personal computer.

Number of input channels:		**up to 8**
Sensor elements:		**Pt1000**
Absolute measurement error:		**1°C; 0.1°C**
Number of archive points		**1500 per channel**
Archive period		**1 — 255 min**
Number of outputs:		**10**
Outputs:		**electromagnetic relay PE (for switching 1A (up to 8A) at 220 V)**
Supply:		**220 V, 50 Hz**
Front panel protection degree		**IP 54**
Overall dimensions, mm: device		**72x72x121**
	switching unit	**90x70x65**
	output block	**90x138x65**
	multipoint temperature transmitter	**21.5 x 14.5 x L (depending on the order)**





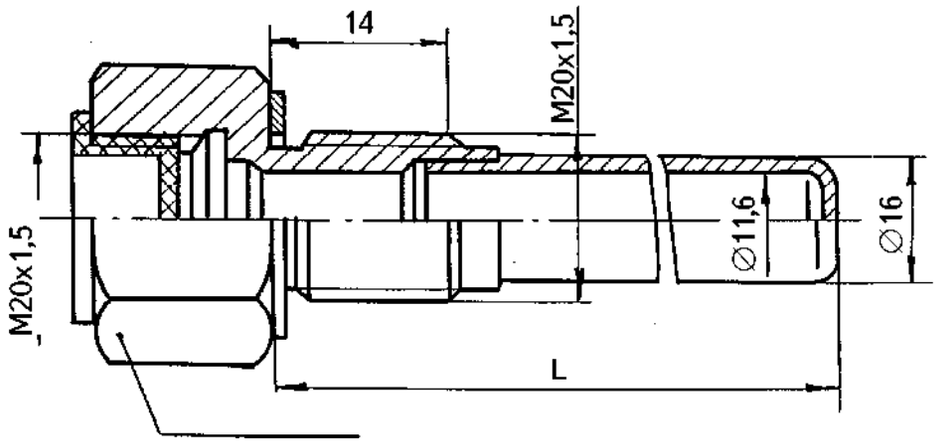




PROTECTIVE CARTRIDGES AND CONNECTORS

PROTECTIVE CARTRIDGE 4.819.015

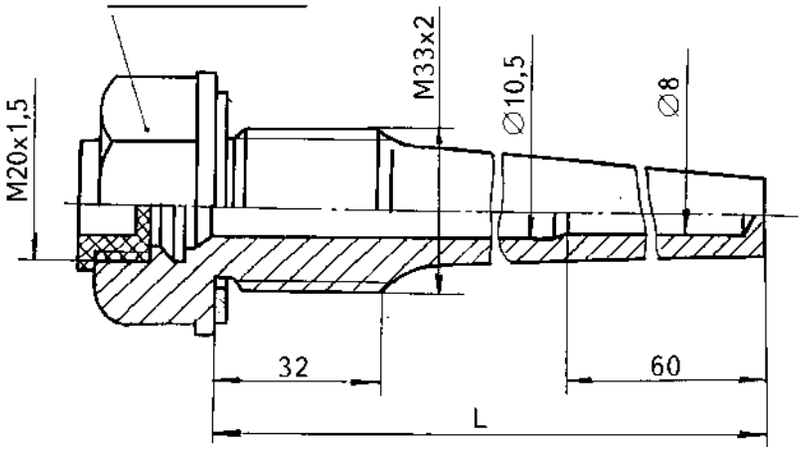
Used when installing thermocouples at facilities.



Material			L, mm	Weight, kg	Py, MPa	Maximum Flow Rate, m/s	
Steel 08X13	Steel 12X18H10T	Steel 08X20H14C2					
Designation	Designation	Designation				Steam	Water
4.819.015	4.819.015-13	4.819.015-26	120	0.27		40	4.0
-01	-14	-27	160	0.36			
-02	-15	-28	200	0.39		25	2.5
-03	-16	-29	250	0.44			
-04	-17	-30	320	0.51			
-05	-18	-31	400	0.59			0.5
-06	-19	-32	500	0.69			
-07	-20	-33	630	0.72	25		
-08	-21	-34	800	0.99			
-09	-22	-35	1000	1.10			
-10	-23	-36	1250	1.45			0.2
-11	-24	-37	1600	1.79			
-12	-25	-38	2000	2.19			
-39	-41		80	0.23		40	4.0
-40	-42		100	0.25			

PROTECTIVE CARTRIDGE 4.819.016

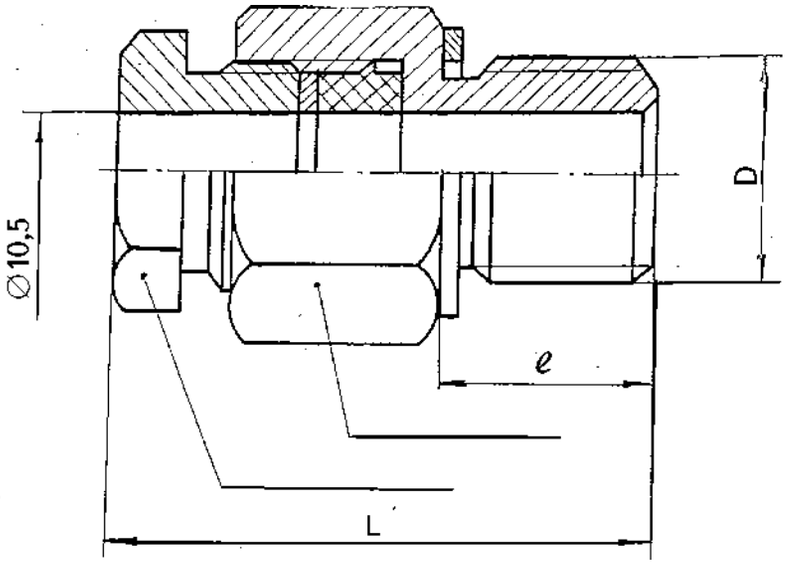
Used when installing thermocouples at facilities.



Material			L, mm	Weight, kg	Py, MPa	Maximum Flow Rate, m/s	
Steel 08X13	Steel 12X18H10T	Steel 08X17H13M2T					
Designation	Designation	Designation				Steam	Water
4.819.016	4.819.016-05	4.819.016-10	120	0.95	50	120	10
-01	-06	-11	160	1.03			
-02	-07	-12	200	1.25		100	7.5
-03	-08	-13	250	1.63			
-04	-09	-14	320	2.15			

MOVABLE CONNECTOR 4.473.002

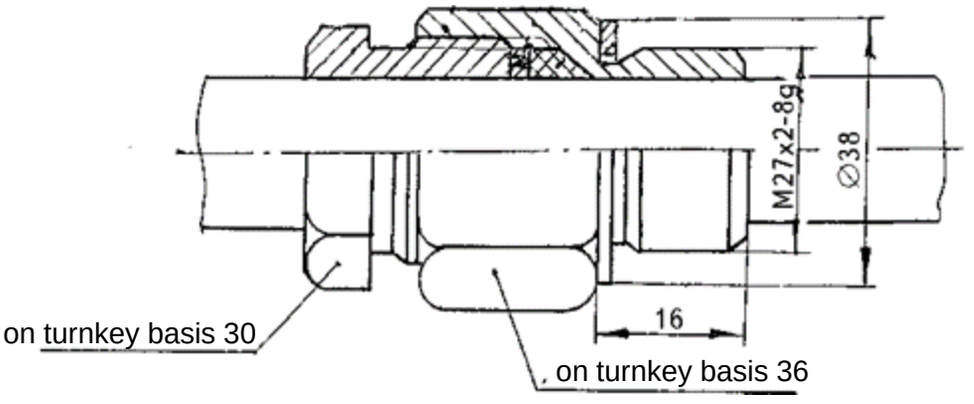
Used when installing thermocouples at facilities.



Designation	D, mm	S, mm	Material	Weight not more, g	L, mm	l, mm
4.473.002	M20x1,5	27	Steel 20X3	135	44	14
-01			Steel12X18H9T			
-02	M27x2	36	Steel 20X13	240	46	16
-03			Steel12X18H9T			

MOVABLE CONNECTOR 4.473.003

Used when installing thermocouples at facilities.



Designation	Material	Weight not more, g
4.473.003	Steel 12X18H10T	236

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