Chemservice Manufacturing Company named after A.A. Zorin

25 years

CHEMSERVICE

1994

ANTICORROSION PROTECTION AS AN ART FORM

PRODUCT CATALOGUE

2019

CATHODIC PROTECTION
AGAINST CORROSION

CHEMSERVICE
1994

25 years

CHEMSERVICE MANUFACTURING COMPANY NAMED AFTER A.A. ZORIN

The company Chemservice is a Russian manufacturing factory that specializes on developing and producing the equipment for protection against corrosion of main pipelines and other underground construction.

The main products and spheres of activity of the company:

- anode groundbeds Mendeleevets;
- equipment for systems of protection against corrosion;
- devices and equipment for diagnostics of pipelines;
- diagnostics and certification of systems for protection against corrosion.

High skilled personnel of the company Chemservice has solid experience in developing and implementation the equipment and new technologies on the domestic market that have been successfully used in oil and gas industry in Russia for over 25 years.

The company is equipped with modern equipment and necessary machinery for the implementation of a full cycle of manufacturing products. The production of highly oriented on the use of Russian materials and components.

All products of CJSC Chemservice have the trademark Mendeleevets, are certified to meet the requirements of the Regulations of the Customs Union, INTERGAZCERT and GAZSERT and are registered in the list of the recommended equipment of PJSC Gazprom and PJSC Transneft.

The company Chemservice cooperates with the largest enterprises of oil and gas industry: Gazprom, Transneft, gas distribution organizations, design institutes, and enterprises of housing and communal services.

The company Chemservice guarantees its clients the timely delivered high-quality and modern equipment.

Galina Zorina,
Chairman of the Board of Management of the company Chemservice

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HISTORY OF THE COMPANY

Andrey ZORIN

The company was founded by Andrey Zorin in 1994. A team of young specialists began to develop the construction of the anode groundbed for systems of ECP (Electrochemical Protection) working in parallel on the diagnostics of underground pipelines condition.

The fast development of the company began in 1995 when the first series of silicon iron anodes Mendeleevets-MM was released. It was the first big achievement and commercial success of the company.

In 1998-1999 a great work was made and that helped to pass successfully a departmental test of Gazprom. As a result the anode groundbeds Mendeleevets-MM have received a formal recommendation for use on objects of Gazprom.

The next 2-3 years deep anodes Mendeleevets-MG, complete anodes Mendeleevets-MK and Mendeleevets-MKG and also a coke-mineral activator (KMA) were developed and intergrated for producing.

In 2003 a new department was created and it was oriented on the development and production of machinery and equipment for diagnostics of pipelines. Starting with relatively simple equipment, the specialists of the company gradually shifted to the development of multifunctional measuring devices such as Diacor, IR-1 Mendeleevets, IPP-1 Mendeleevets, etc.

It should be noted that the work on the equipment of brand name Mendeleevets is conducted in close cooperation with specialists of the Pipeline Diagnostics Department in the process of developing and testing devices in real conditions. The result of such cooperation is production of reliable devices with optimal functionality, easy in operating and maintenance.

For more than twenty years of work the Chemservice has won recognition among specialists of ECP not only in Russia but also abroad. The quality of goods and services of Chemservice is confirmed by certificates, prestigious industry diplomas and awards the special place among which takes the prize of Gazprom in the field of science and technology.

In May 2011 Andrey Zorin died. And Galina Zorina has taken the management of the company having headed the Board of Management of the company. In March 2012 according to the unanimous decision of the Board of Management the company was awarded the name of A. Zorin.

The Chairman of the Board of PJSC Gazprom Alexey Miller is presenting an award in the field of science and technology to the company Chemservice

Major efforts of the company are aimed at introducing high-tech solutions in the Russian production and satisfying the needs of domestic enterprises in high quality equipment of CP (corrosion protection) surpassing foreign analogues.

The company Chemservice aims to be a worthy representative of oil and gas industry in Russia, prouds of its history, huge experience and, what is the most important, of its team that is in fact not in word gaining the trust of its consumers.

MAIN PRINCIPLES OF ACTIVITY OF THE COMPANY

The company Chemservice initially set a course for permanent development and perfection that includes improvement of the products, product differentiation, implementation of the newest technologies, modernization of production capacity and infrastructure of the factory.

The main aim of the company is to provide high quality and modern equipment of CP (corrosion protection) which is equal to the abroad analogues to Russian enterprises.

The confirmation of the high quality of our products is good references of our customers and prestigious awards the special place among which takes the prize of Gazprom in the field of science and technology and the Gold Medal of Winner of Russia Exhibition Center.

Nowadays the Chemservice produces over 50 product names under the trademark Mendeleevets which is well-known in the field of protection against corrosion.

First of all they are our anode groundbeds Mendeleevets with long service lifetime. They have different constructions and are produced on the basis of silicon iron, magnetite and poorly soluble anodes and designed for different working conditions.

Along with the release of anodes Chemservice develops and produces equipment of ECP: stationary reference electrodes, corrosion detectors, control testing stations, joint protection units, etc., and also modern devices for diagnostics of underground pipelines: meters, loggers, pipeline finders, etc.

Professional competence is based on good knowledge of ECP equipment market.

When developing devices and equipment the company's specialists use as the latest achievements in the field of corrosion protection as well as their own experience gained over the years of using such equipment. As a result the market has the products with optimal characteristics and convenient in operation.

Practice shows that the equipment developed at our factory doesn't concede on quality to the best foreign analogs.

Our consumers can be sure that they receive high-quality products which best suits their needs.

The company Chemservice never ignores the opinion of the consumers. The management of the company considers very important feedback which allows to obtain objective information about products. For this purpose specialists of our company participate in annual industry exhibitions, conferences and meetings.

There is an official corporate website *www.ch-s.ru* reflecting all the information about the development of the company and its products. You can subscribe to the mailing list and send your opinion to our specialists (questions, feedback or suggestion), which will never be ignored.

PRODUCTS CERTIFICATION

In the course of development of the new equipment laboratory researches are carried out. And its purpose is search and elimination of discrepancies of a design. The next step is testing the samples in real environmental conditions in different regions.

By results of tests production is entered in the registers of the recommended equipment of Gazprom and Transneft.

The equipment of the company passes voluntary certification in the systems of the Eurasian Economic Union (EEU), INTERGAZCERT and GAZCERT.

All released measuring devices are tested for type of measuring instruments approval and entered in the Unified state register of measuring instruments.

Quality management system of the company is certified to meet the requirements of GOST R ISO 9001-2015 and Organization Standard STO Gazprom 9001-2018

CAUTION! AVOID COUNTERFEIT PRODUCTS!
CONFIRMATION OF PRODUCT QUALITY AND ORIGINALITY

CJSC Chemservice respects the choice of its customers and values its reputation. All its products undergo obligatory and strict quality assurance control during the entire production cycle.

Today, the Mendeleevets trademark is associated with the high-quality equipment that is in demand among our clients.

As a result, some companies offer counterfeit products under the Мendeleevets brand.

CJSC Chemservice, being the only producer of the Mendeleevets brand equipment, warns consumers about unfair companies and publishes the corresponding counterfeit black list on its website.

To confirm the quality and originality of its products, Chemservice uses some degrees of product protection against counterfeits.

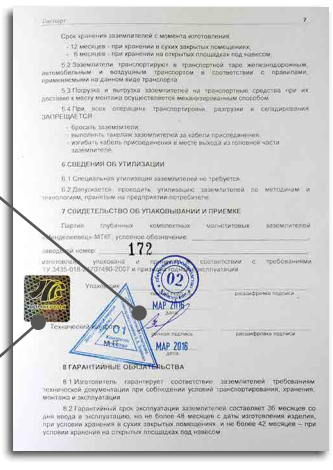
Relief golden press with the logo of the company Chemservice and sign Quality assurance

Triangle press of quality control Chemservice

Watermarks in the form of the logo of the company Chemservice

Mark about acceptance with the sign and press

Protective hologram with the logo of the company Chemservice



ANODE GROUNDBEDS

Chemservice produces various types of anode groundbeds, which differ both by an area of application and a material of working electrodes.

By an area of application, the anode groundbeds are divided into shallow, deep and also for internal and offshore corrosion protection.

For the convenience of selection of an optimum configuration and execution of anode groundbeds there is a special program for the calculation of their working parameters and also the reference book «Anode groundbeds Mendeleevets. Design, installation and operation» (see p. 50).

The material of the most popular in the market anode groundbeds Mendeleevets is an silicon iron alloy, which allows for 35 years of service life of corresponding anode groundbeds due to the low dissolution rate of the alloy. At the same time, the dissolution products of the silicon iron have high electrical conductivity, and, as a result, do not influence the value of transition «anode-ground» resistance.

Chemservice also offers magnetite anode groundbeds, characterized by high corrosion resistance in highly corrosive environments. The anodic dissolution rate of magnetite is 10 times less than that of silicon-iron, which allows to produce light weight and compact products.

In 2012 Chemservice mastered the production of extremely low soluble anode groundbeds on the basis of mixed metal oxides (MMO). The uniqueness of these products is the extremely low rate of their anodic dissolution. As a result, they are practically insoluble.

The mentioned anode groundbeds are recommended for application in highly aggressive mediums, including sea water.

Since 2017 the company also produces long-line flexible polymeric anode groundbeds.

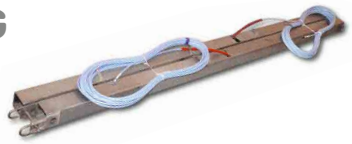
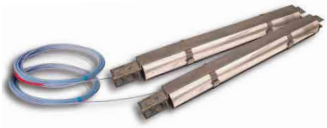
SHALLOW ANODE GROUNDBEDS

COMPLETE

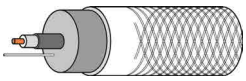
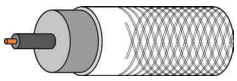
SILICON IRON	MAGNETITE	MMO
MM p. 12 	**MTP** p. 22 	**MRP** p. 32 
MK p. 14 	**MTKP** p. 24 	**MRKP** p. 34 

DEEP ANODE GROUNDBEDS

COMPLETE

SILICON IRON	MAGNETITE	MMO
MG p. 16 	**MTG** p. 26 	**MRG** p. 36 
MGB p. 18 		
MKG p. 20 	**MTKG** p. 28 	**MRKG** p. 38 

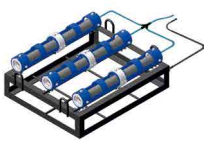
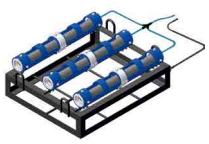
LONG-LINE FLEXIBLE ANODE GROUNDBEDS

MMO	POLYMERIC
MP p. 42 	**MPP** p. 44 

ANODE GROUNDBEDS FOR INTERNAL CORROSION PROTECTION

MAGNETITE	MMO
MTV p. 30 	**MRV** p. 40 

ANODE GROUNDBEDS FOR OFFSHORE CORROSION PROTECTION

MAGNETITE		MMO	
Bottom constr. p. 46 	Pile constr. p. 46 	Bottom constr. p. 46 	Pile constr. p. 46 

DESIGN FEATURES

The electrodes of the anodes are made of silicon iron, magnetite and alloy of mixed metal oxides (MMO). The main features of the alloys are bellow:

	Silicon iron	Magnetite	MMO	Graphite-filled polymer
Anode dissolution rate, (kg/A·year, no more)	0,3	0,03	0,00001	0,15
at current density (A/m^2, no more)	75	500	5000	1

As a result of permanent job over quality improvement the anode groundbeds Mendeleevets have a number of advantages over existing analogues.

Contact joint

A contact joint is a place of connection of the cable to the electrode of the anode groundbed. The electrodes of the anode groundbeds Mendeleevets have a specially designed internal construction of a contact joint.

An isolation of the contact joint is made of composition on the basis of polymeric compound and thermocontracting couplers which gives good protection against any damages and penetration of soil electrolyte.

Cable

The service time of the anodes depends not only on electrode dissolution rate but also on anode cable strength. Being in the same place as the electrode the cable is exposed to aggressive influence of soil in the hollow space around the anode. Gas that is formed while working of the anode can destroy the cable cover and lead to premature loss of its working capacity.

And this fact can be the reason of premature failure of the anode groundbed. To solve this problem the company has worked out strict specifications with adherence to which the cable for anodes is made.

To ensure operation in extreme conditions was developed cable PKZ-FF-ng(A), that does not support combustion.

The service life of cables corresponds to the service life of anode groundbeds.

KMA

Coke-mineral activator (KMA) is worked out and produced by Chemservice specially for fulfilling the hollow space around the anode during installation of the anode groundbeds in order to reduce spreading resistance of anodic current and to slow down anodic dissolution.

As the base of KMA are used the next elements: coke of two types, from 2 to 10 mm and from 10 to 25 mm, and mineralizer – a complex of mineral salts water solution of which has high conductivity. The presence of coke of two types provides the continuity of a stable filling and draining ability.

The presence of mineral salts in KMA increases noticeably conductivity of soil in hollow space around the anode. The KMA allows to increase the size of electrochemical capacity of the anode and to reduce transitional resistance anode-soil.

The anode groundbeds Mendeleevets are recommended to install together with the coke-mineral activator.

KMA is included in the delivery set with the complete anodes.

COMPLETE SET

Delivery of the anodes is carried out in standard sets or according to a certain order. In this edition there is a standard complete set. We can modify the complete set depending on the certain order of the client.

In the production of anode groundbeds Mendeleevets can be used different types of connection cables: VPP, VPPO, PKZ-PvP, PKZ-PvPp, PKZ-FF-ng(A).

There are all necessary consumables to joint cables and to isolate the joint. Cable joints can be done with the help of cable fasteners (KZ) or thermite welding (TS).

To make cable connections more reliable and isolated we use thermocontracting couplers not depending on the way of its production.

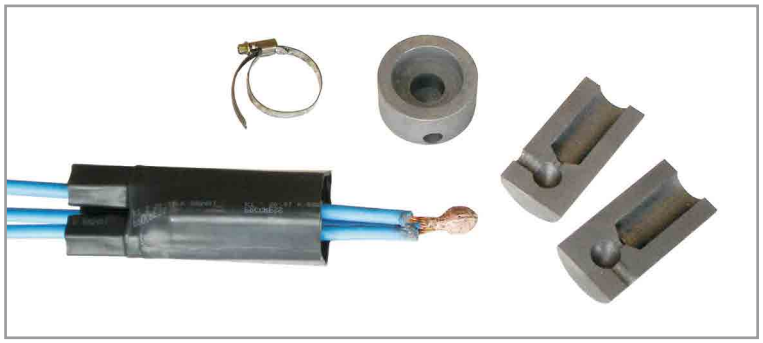
Installation accessories for the production and isolation of cable connections is calculated based on the number of ordered anode groundbeds (for the shallow anodes) or on the basis of the planned number of cable connections (for deep anodes).

When installing deep grounding the number of cable connections is determined by the method of connecting the anode cables to the Control Testing Station. If the anode is connected to the Control Testing Station near the hole, the cable connections are not needed. If the Control Testing Station is remote, the underground laying of main cable is carried out and anode cables are connected to it.

Serial release of the anodes Mendeleevets followed the experimental industrial tests. All the anodes Mendeleevets have successfully passed the tests and are recommended to application in the systems of corrosion protection.

Poorly soluble alloys used for production of the anodes Mendeleevets mixed with special materials and instruments provide the anode working capacity (service lifetime) for 30 and more years.

Technical data of the anodes is given in the corresponding sections of the catalogue.



Thermite welding of cables

Cable connection with the use of cable fasteners

Isolation of cable connection with thermocontracting couplers

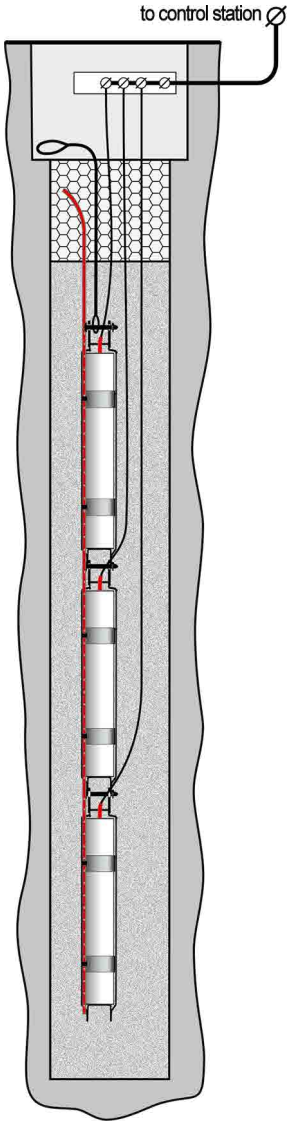
DESIGNING AND INSTALLATION

Designing and installation of the anodes Mendeleevets is necessary to carry out in accordance with the next documents:

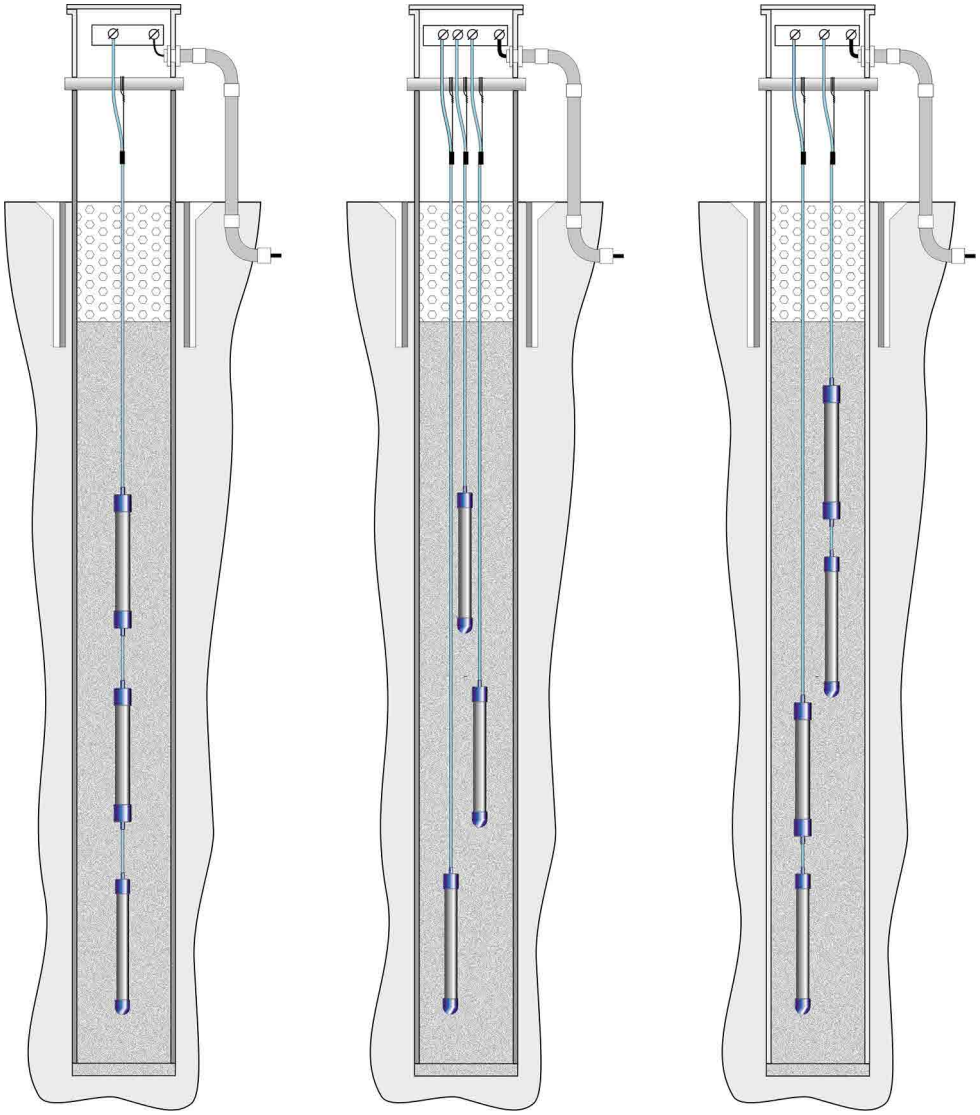
– typical project 327.T-AZ «Anode grounding from poorly soluble anodes type Mendeleevets-MM (shallow) and Mendeleevets-MG (deep)», (designers are VNIIST and Giprogazcenter);

– unified projects «Connections and details of the installations of ECP of underground communications against corrosion» (Gazproekt-engeneering);

– unified technical decisions «Capital repair of deep anodes with the use of magnetite anodes Mendeleevets-MT» (VNIPIgazdobycha).

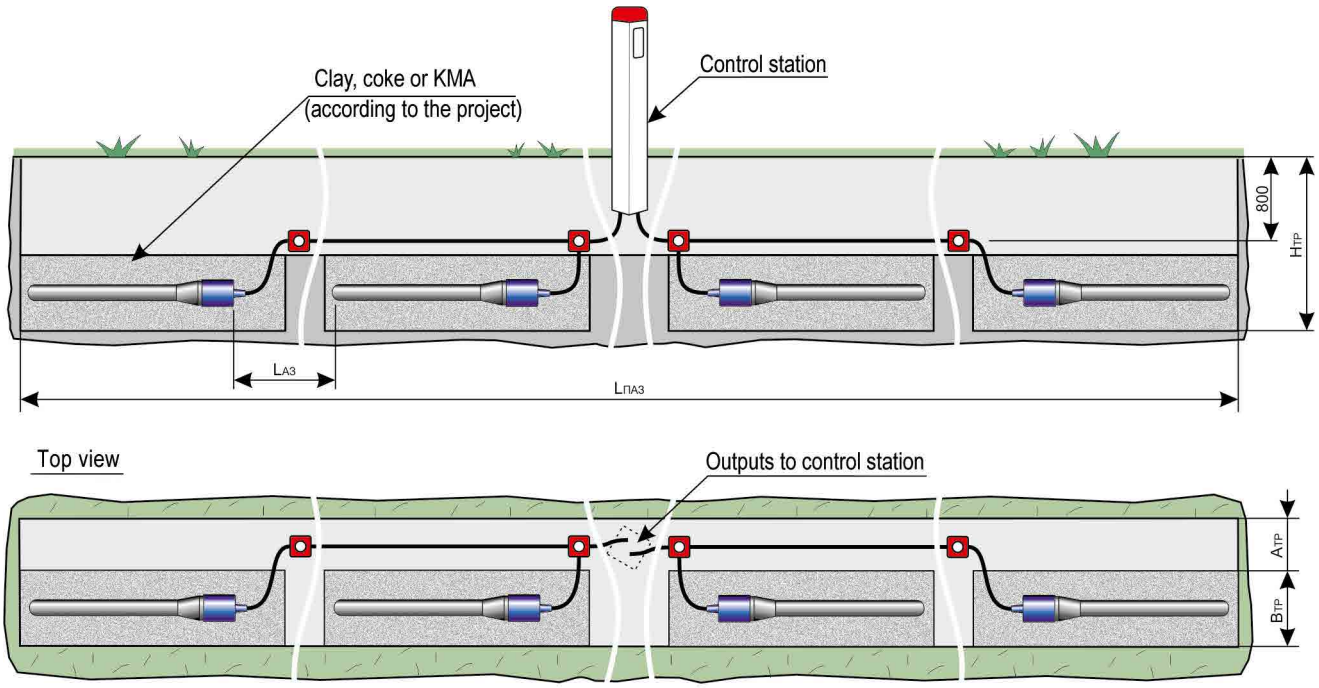


Installation scheme of deep anodes Mendeleevets



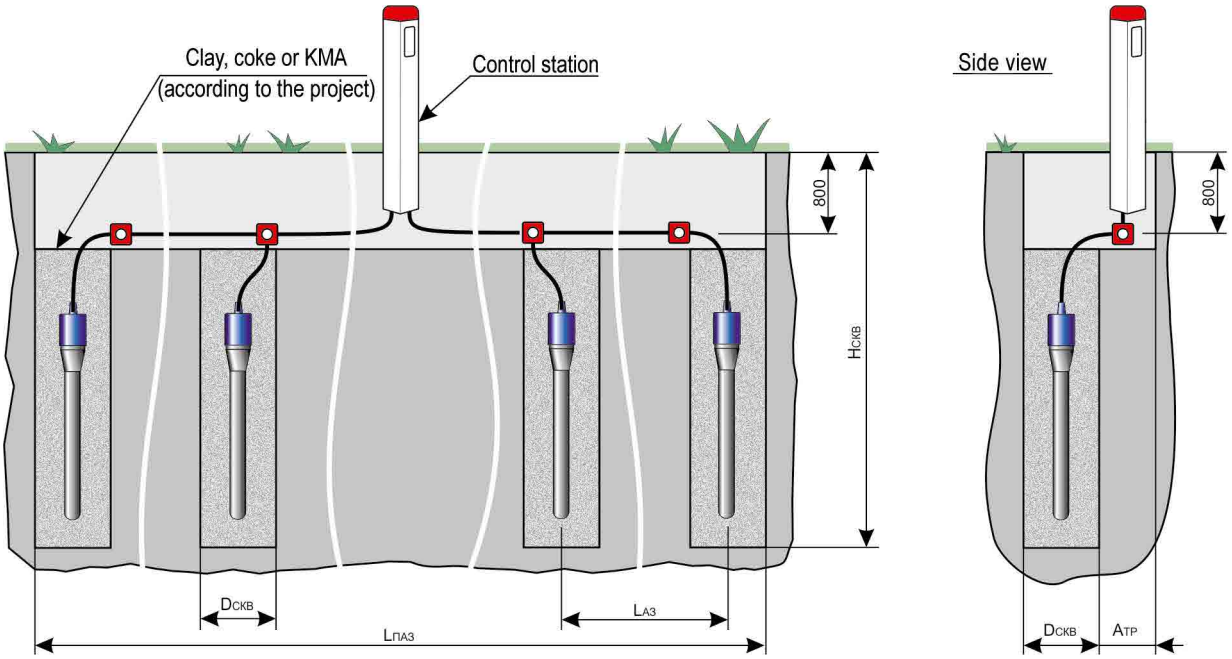
Anode chain | *Anode garland* | *Garland of two anode chains*

Installation scheme of deep magnetite or poorly soluble anodes Mendeleevets



Атр – width of the trench for laying the main cable;
Втр – width of the trench for laying the anodes;
Нтр – depth of the trench;
Lаз – distance between anodes;
Lпаз – anode ground field distance

Horizontal installation scheme of shallow anodes (in a trench)



Нскв – depth of the well for anode groundbed;
Dскв – diameter of the well for anode groundbed;
Атр – width of the trench for laying the main cable;
Lаз – distance between anodes;
Lпаз – anode ground field distance

Vertical installation scheme of shallow anodes (in a hole)

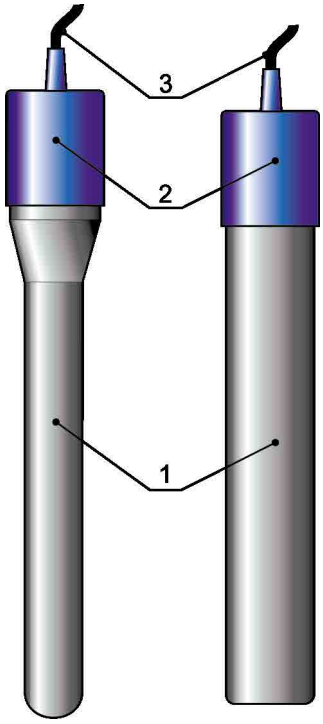
MENDELEEVETS-MM

Included in the Gazprom register
Included in the Transneft register

Certification: EEU, INTERGAZCERT, GAZCERT

Favourable decision of a sanitary-hygienic commission of experts

SHALLOW ANODE GROUNDBEDS



MM(23) *MM(43)*

1 – silicon iron electrode;
2 – thermocontracting coupler;
3 – connecting cable

Application area

Anodes Mendeleevets-MM are meant to be applied as poorly soluble elements of shallow anode groundbeds in the sets of cathodic protection from corrosion of pipelines and other underground metal constructions. Type of groundbed disposition may be horizontal or vertical.

Technical details

Anode groundbed is an electrode made from silicon iron (corrosion-resistant iron-siliceous alloy) with connecting cable. Length of the cable is 2 m in the standard option.

There are two modifications of groundbeds different in weight and dimensions: MM(23) and MM(43).

Electrodes have a core-sand mold and the molding is of circular section. In the head part of an electrode there is a contact junction filled with specially developed chemically-resistant solution on the base of polymeric compound and firmly isolated from the outside with thermocontracting couplers.

Quantity of anode groundbeds, distance between them and the type of disposition are determined by the project of cathodic protection.

Grounbeds are assembled into the electric circuit. Connection to the feeding cable of CP station is made through the monitor by means of backbone cable. Joining of anodic cable and backbone cable is carried out by using thermit welding or cord fasteners. We use thermocontracting couplers for isolation of cable joinings.

The hollow space around the anode should be filled with a coke-mineral activator (KMA) produced by Chemservice in order to reduce spreading resistance of anodic current and to slow down anodic dissolution.

Technical data

Parameter name	Meaning	
	MM(23)	MM(43)
Current load, A, no more than	3,9	7,3
Anodic dissolution rate, kg/(A·year), no more than	0,3	
Electrode working surface size (length x diameter), mm	1510x55	1385x85
Nominal electrode weight, kg	23	43
Assembled anode dimensions , mm, no more than: Length (height) x Diameter	1600x90	1500x90
Assembled anode weight (without cable), kg, no more than	25	46
Lifetime, years, no less than	35	

Delivery set

Standard delivery set includes 20 pcs. of anodic groundbeds with consumables necessary for their connection to the anodic pipeline cable. It is possible to change quantity of groundbeds according to the order.

Conventions

20MM(23)-2x10(PKZ-PvP)-200x16(VVGng)-KZ

1 2 3 4 5 6 7 8 9

TU 3435-001-24707490-99, OKPD2 27.12.31.000
TU 3435-040-24707490-2016

1	Number of anodes, pcs.: not restricted;
2	Nominal mass of an electrode, kg: 23 or 43;
3	Anode cable length, m;
4	Anode cable core section, mm²: 10, 16, 25;
5	Anode cable type: PKZ-PvP, on request: PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
6	Length of the main cable, m;
7	Main cable core section, mm²: 10, 16, 25;
8	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
9	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)

Parameters 6-9 can be omitted

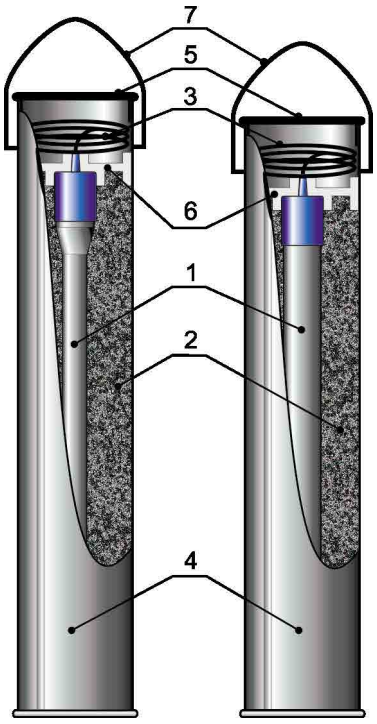
MENDELEEVETS-MK

COMPLETE ANODE GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEU, INTERGAZCERT, GAZCERT

Favourable decision of a sanitary-hygienic commission of experts



MK(23) *MK(43)*

1 – silicon iron electrode;
2 – coke-mineral activator (KMA);
3 – connecting cable;
4 – container;
5 – cover for tranportation;
6 – centralizer;
7 – clamp

Application area

Complete anode groundbeds are meant to be used as an element of a shallow anode groundbed for installation in soils with high resistivity.

It is possible both types of disposition: horizontal and vertical.

Technical details

Complete groundbed Mendeleevets-MK is a container with silicon iron electrode inside and the hollow space around it is filled with a coke-mineral activator (KMA).

There are two modifications of the groundbeds different in weight and dimensions: MK(23) and MK(43).

Container is a capacity for even spreading of KMA and also for comfort transportation and installation. Container is made of galvanized steel and it dissolves fast after installation. There is a clamp at the top of the groundbed to facilitate installation work.

Length of the connecting cable is 2m in the standard option.

Quantity of anode groundbeds, distance between them and the type of disposition are determined by the project of cathodic protection.

Joining of anodic cable and backbone cable is carried out by using thermit welding or cord fasteners. We use thermocontracting couplers for isolation of cable joinings.

Technical data

Parameter name	Meaning	
	MK(23)	MK(43)
Current load, A, no more than	4,7	8,8
Anodic dissolution rate, kg/(A·year), no more than	0,25	
Electrode working surface size (length x diameter), mm	1510x55	1385x85
Nominal anode weight, kg	23	43
Assembled anode dimensions , mm, no more than: Length (height) x Diameter	1800x235	1700x235
Assembled anode weight (without cable), kg, no more than	70	90
Lifetime, years, no less than	35	

Delivery set

Standard delivery set includes 20 pcs. of anodic groundbeds with consumables necessary for their connection to the anodic pipeline cable. It is possible to change quantity of groundbeds according to the order.

Conventions

24MK(43)-2x10(PKZ-PvP)-200x16(VVGng)-KZ TU 3435-004-24707490-2002, OKPD2 27.12.31.000
TU 3435-040-24707490-2016

1 **24** **MK** *2* **(43)** *3* **-2** *4* **x10** *5* **(PKZ-PvP)** *6* **-200** *7* **x16** *8* **(VVGng)** *9* **-KZ**

1	Number of anodes, pcs.: not restricted;
2	Nominal mass of an electrode, kg: 23 or 43;
3	Anode cable length, m;
4	Anode cable core section, mm²: 10, 16, 25;
5	Anode cable type: PKZ-PvP, on request: PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
6	Length of the main cable, m;
7	Main cable core section, mm²: 10, 16, 25;
8	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
9	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)

Parameters 6-9 can be omitted

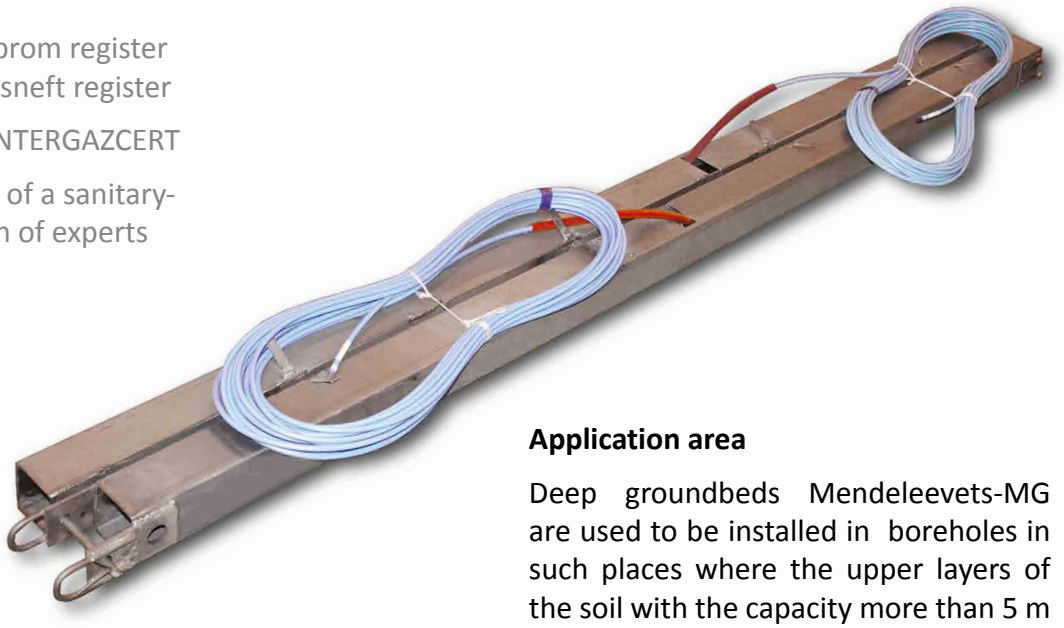
MENDELEEVETS-MG

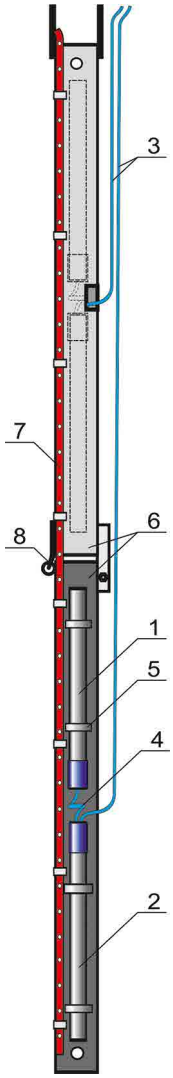
DEEP ANODE GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEU, INTERGAZCERT

Favourable decision of a sanitary-hygienic commission of experts





1, 2 – silicon iron electrodes;
3 – connecting cable;
4 – cable jumper;
5 – fixings;
6 – section case;
7 – gas outlet tube;
8 – hinge joint

Application area

Deep groundbeds Mendeleevets-MG are used to be installed in boreholes in such places where the upper layers of the soil with the capacity more than 5 m have electrical resistivity more than 100 Ohm·m and in areas with dense building or with limited access for anodic field.

Technical details

The block of the deep groundbed consists of two sections, both of them have two silicon iron electrodes interconnected electrically. So each groundbed block includes four electrodes.

Current distribution is provided through two connecting cables (one cable for each section). Connecting cables don't have any discontinuities along the length and they are drawn outside to the surface to be attached to the anodic cable line. Connecting cables are set in the factory. The length of each cable is determined by the depth of installation in the borehole.

Transportation of the block is realized in the folded way (see photo above). While installation the sections unfold and take coaxial position (see illustration).

The design provided for connection of blocks into the chain, that allows to raise current loading and to reduce transitional resistance. Maximum quantity of the deep groundbed blocks which can be installed into one borehole is 4 pieces.

Gas that is formed while working of deep groundbed is drawn outside to the surface through the gas outlet tube. The gas outlet tube has perforation along all the height of the chain and is delivered for the the concrete order on the basis of one tube for one chain of groundbeds installed in the borehole. The length of the gas outlet tube is equal to the depth of the borehole.

The hollow space around the anode should be filled with a coke-mineral activator (KMA) produced by Chemservice in order to reduce spreading resistance of anodic current and to slow down anodic dissolution.

Technical data

Parameter name	Value
Current load, A, not more than	29,2
Anodic dissolution rate, kg/(A·year), no more than	0,3
Number of electrodes in the groundbed, pcs.	4
Electrode working surface size (length x diameter), mm	1385x85
Nominal anode weight, kg	43
Assembled anode dimensions , mm, no more than: Length (unfolded / folded) Diameter	 6350/3250 205
Assembled anode weight (without cable), kg, no more than	250
Maximum (max) quantity of groundbed blocks in the hole, pcs., no more than	4
Service lifetime, years, no less than	35

Delivery set

The delivery set depends on the main order parameters: quantity of blocks and the depth of the borehole for the installation. The types of used cables may vary.

All consumables needed for the groundbed installation and their connection to the anodic line are included in the delivery set.

Conventions

4MG-70x10(PKZ-PvPp)-50x16(VVGng)-KZ.G
1 2 3 4 5 6 7 8 9

TU 3435-002-24707490-2001, OKPD2 27.12.31.000
TU 3435-040-24707490-2016

1	Number of anode groundbeds in the kit, pcs.: no more 4;
2	Depth of the borehole, m;
3	Anode cable core section, mm²: 10, 16, 25;
4	Anode cable type: PKZ-PvPp, on request: PKZ-PvP, PKZ-FF-ng(A), VPPO, VPP;
5	Length of the main cable, m;
6	Main cable core section, mm²: 10, 16, 25;
7	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
8	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)
9	Gas outlet tube included

Parameters 5-9 can be omitted

MENDELEEVETS-MGB

DEEP BLOCK ANODE GROUNBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEU, INTERGAZCERT, GAZCERT

Favourable decision of a sanitary-hygienic commission of experts

Application area

Deep block groundbeds Mendeleevets-MGB are used to be installed into boreholes in such areas where the upper layers of the soil with the capacity more than 5 m have electrical resistivity more than 100 Ohm·m and in areas with dense building or with limited access for anodic field.

Technical details

Deep block groundbeds Mendeleevets-MGB are worked out as an alternative to heavier and bigger deep groundbeds Mendeleevets-MG. The construction of the block groundbed was noticeably remade and simplified in order to unify the installation works. And at the same time the working element of the groundbed (silicon iron electrode) remained the same.

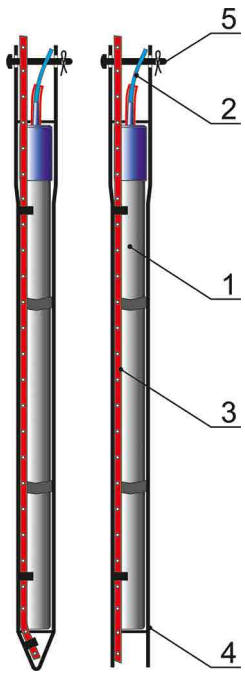
Each block of the groundbed includes one section with the silicon iron electrode inside. Current distribution to the block of the groundbed is provided through the connecting cable.

The kind of deep ground, consisting of groundbeds Mendeleevets-MGB (quantity of blocks in a borehole, quantity of boreholes, distance between boreholes, etc.) is determined by the project of cathodic protection.

The design provided for connection of blocks into the chain. It allows to raise current loading and to reduce transitional resistance. Connection of blocks into the chain is realized when installing groundbeds into the borehole and consists in attachment of blocks to each other with the help of a holder. Maximum quantity of the deep groundbed blocks of Mendeleevets-MGB which can be installed into a borehole is 20 pieces.

Gas that is formed while working of deep groundbed is drawn outside to the surface through the gas outlet tube. The gas outlet tube has perforation along all the height of the chain and is delivered for the the concrete order on the basis of one tube for one chain of groundbeds installed in the borehole. The length of the gas outlet tube is equal to the depth of the borehole.

The hollow space around the anode should be filled with a coke-mineral activator (KMA) produced by Chemservice in order to reduce spreading resistance of anodic current and to slow down anodic dissolution.



1 – silicon iron electrode;
2 – connecting cable;
3 – gas outlet tube;
4 – body of the block;
5 – a holder

Technical data

Parameter name	Value
Current load, A, not more than	7,3
Anodic dissolution rate, kg/(A·year), no more than	0,3
Electrode working surface size (length x diameter), mm	1385x85
Nominal anode weight, kg	43
Assembled anode dimensions , mm, no more than: Length (height) x Diameter	1750x130
Assembled anode weight (without cable), kg, no more than	55
Max quantity of groundbed blocks in the borehole, pieces, no more than	20
Service lifetime, years, no less than	35

Delivery set

The delivery set depends on the main order parameters: quantity of blocks and the depth of the borehole for the installation. The types of used cables may vary.

All consumables needed for the groundbed installation and their connection to the anodic line are included in the delivery set.

Conventions

20MGB-50x10(PKZ-PvPp)-50x16(VVGng)-KZ.G TU 3435-029-24707490-2011, OKPD2 27.12.31.000
1 2 3 4 5 6 7 8 9 TU 3435-040-24707490-2016

1	Number of anode groundbeds in the kit, pcs.: no more 20;
2	Depth of the borehole, m;
3	Anode cable core section, mm²: 10, 16, 25;
4	Anode cable type: PKZ-PvPp, on request: PKZ-PvP, PKZ-FF-ng(A), VPPO, VPP;
5	Length of the main cable, m;
6	Main cable core section, mm²: 10, 16, 25;
7	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
8	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)
9	Gas outlet tube included

Parameters 5-9 can be omitted

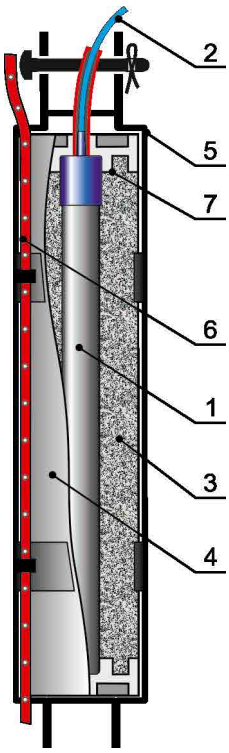
MENDELEEVETS-MKG

COMPLETE DEEP ANODE GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEU, INTERGAZCERT, GAZCERT

Favourable decision of a sanitary-hygienic commission of experts



1 – silicon iron electrode;
2 – connecting cable;
3 – coke-mineral activator (KMA);
4 – groundbed case;
5 – corbels;
6 – gas outlet tube;
7 – centralizer

Application area

Complete deep groundbeds Mendeleevets-MKG are used as elements of deep anode ground for installation in the soils with high specific resistance. Groundbeds are installed into boreholes in vertical position.

Technical details

Complete groundbed Mendeleevets-MKG is a container with silicon iron electrode inside, and the hollow space around it is filled with a coke-mineral activator (KMA). Container is a case for comfort transportation and installation. This case dissolves during exploitation.

The groundbed is fixed by means of directing corbels. It gives the possibility to assemble the blocks of complete deep groundbeds into the chain that allows to raise current loading and to reduce transitional resistance. Max block quantity in a chain is 16 pieces.

Gas that is formed while working of deep groundbed is drawn outside to the surface through the gas outlet tube. The gas outlet tube has perforation along all the height of the chain and is delivered for the the concrete order on the basis of one tube for one chain of groundbeds installed in the borehole. The length of the gas outlet tube is equal to the depth of the borehole.

The kind of deep ground, consisting of groundbeds Mendeleevets-MKG (quantity of blocks in a borehole, quantity of boreholes, distance between boreholes, etc.) is determined by the project of cathodic protection.

As exploitation experience shows complete groundbeds have minimum time period of going out to operating modes and low value of resistance to current spreading. High degree of factory readiness noticeably simplifies the technology of anode groundbeds installation.

Each block has a connecting cable. The length of the cable is determined by the depth of installation in the borehole, that's why the cable doesn't have any discontinuities along the length and they are drawn outside to the surface to be attached to the anodic cable line.

Technical data

Parameter name	Value
Current load, A, not more than	8,8
Anodic dissolution rate, kg/(A·year), no more than	0,25
Electrode working surface size (length x diameter), mm	1385x85
Nominal anode weight, kg	43
Assembled anode dimensions , mm, no more than: Length (height) x Diameter	1760x210
Assembled anode weight (without cable), kg, no more than	75
Max quantity of groundbed blocks in the borehole, pieces, no more than	20
Service lifetime, years, no less than	35

Delivery set

The delivery set depends on the main order parameters: quantity of blocks and the depth of the borehole for the installation. The types of used cables may vary.

All consumables needed for the groundbed installation and their connection to the anodic line are included in the delivery set.

Conventions

20MKG-60x10(PKZ-PvPp)-50x16(VVGng)-TM.G TU 3435-005-24707490-2003, OKPD2 27.12.31.000
1 2 3 4 5 6 7 8 9 TU 3435-040-24707490-2016

1	Number of anode groundbeds in the kit, pcs.: no more 20;
2	Depth of the borehole, m;
3	Anode cable core section, mm²: 10, 16, 25;
4	Anode cable type: PKZ-PvPp, on request: PKZ-PvP, PKZ-FF-ng(A), VPPO, VPP;
5	Length of the main cable, m;
6	Main cable core section, mm²: 10, 16, 25;
7	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
8	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)
9	Gas outlet tube included

Parameters 5-9 can be omitted

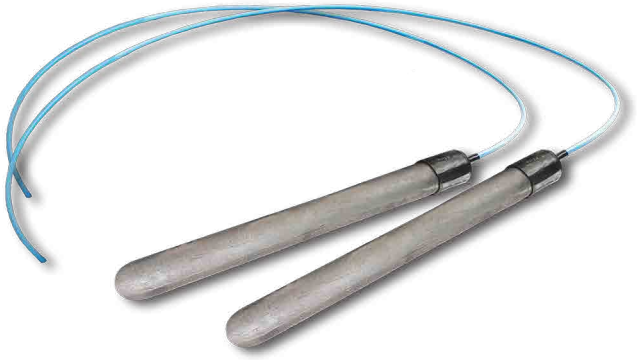
MENDELEEVETS-MTP

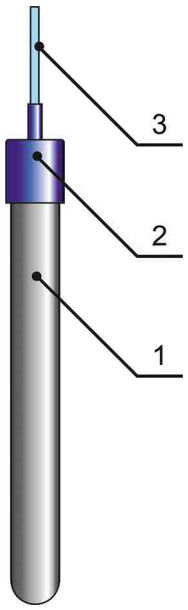
SHALLOW ANODE GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEC, INTERGAZCERT, GAZCERT

Favourable decision of a sanitary-hygienic commission of experts





1 – magnetite electrode;
2 – thermocontracting coupler;
3 – connecting cable

Application area

Shallow magnetite groundbed Mendeleevets–MT are meant to be used as poorly soluble elements of shallow anode groundbeds in the sets of cathodic protection from corrosion of pipelines and other underground metal constructions. Type of groundbed disposition may be horizontal or vertical.

Technical details

Shallow magnetite grounbed is an electrode with a corrosion-proof cable 2 m length.

Magnetite electrode of tube form is used as a working element. A contact between a cable and an internal surface of the electrode is carried out by means of a contact spring. For isolation of contact junction a specially developed chemically resistant solution on the basis of polymeric compound is used. An additional isolation of the place of cable outlet is made by thermocontracting couplers.

Quantity of anode groundbeds, distance between them and the type of disposition are determined by the project of cathodic protection.

Grounbeds are assembled into the electric circuit. Connection to the feeding cable of CP Station is made through the control equipment by means of main cable. Joining of an anodic cable to the main cable is carried out by using thermit welding or cord fasteners. We use thermocontracting couplers for isolation of cable joinings.

The hollow space around the anode should be filled with a coke-mineral activator (KMA) produced by Chemservice in order to reduce spreading resistance of anodic current and to slow down anodic dissolution.

Technical data

Parameter name	Value
Current load, A, not more than	3,0
Anodic dissolution rate, kg/(A·year), no more than	0,03
Electrode working surface size (length x diameter), mm	670x60
Nominal anode weight, kg	5,4
Assembled anode dimensions , mm, no more than: - length (height), - diameter	 780 66
Assembled anode weight (without cable), kg, no more than	8,0
Service lifetime, years, no less than	35

Delivery set

Standard delivery set includes 20 pcs. of anodic groundbeds with consumables necessary for their connection to the anodic pipeline cable. It is possible to change quantity of groundbeds and types of used cables according to the order.

Conventions

20MTP-2x10(PKZ-PvP)-200x16(VVGng)-KZ
1 2 3 4 5 6 7 8

TU 3435-006-24707490-2004, OKPD2 27.12.31.000
TU 3435-042-24707490-2016

1	Number of anodes, pcs.: not restricted;
2	Anode cable length, m;
3	Anode cable core section, mm²: 10, 16, 25;
4	Anode cable type: PKZ-PvP, on request: PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
5	Length of the main cable, m;
6	Main cable core section, mm²: 10, 16, 25;
7	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
8	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)

Parameters 5-8 can be omitted

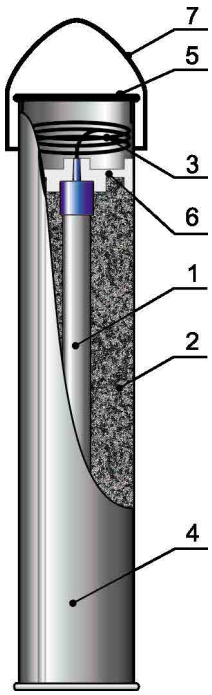
MENDELEEVETS-MTKP

COMPLETE ANODE GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEC, INTERGAZCERT, GAZCERT

Favourable decision of a sanitary-hygienic commission of experts



1 – magnetite electrode;
2 – container;
3 – coke-mineral activator (CMA);
4 – centralizer;
5 – cover for transportation;
6 – connecting cable;
7 – clamp

Application area

Complete anode groundbeds are meant to be used as an element of a shallow anode groundbed for installation in soils with high resistivity. Both types of disposition are possible: horizontal and vertical.

Technical details

Complete groundbed Mendeleevets-MTK is a container with magnetite electrode inside and the hollow space around it is filled with a coke-mineral activator (KMA).

Container is a case for even spreading of KMA and also for comfort transportation and installation. Container is made of galvanized steel and it dissolves fast after installation. There is a clamp at the top of the groundbed to facilitate installation work.

Length of a connecting cable in standard option is 2 m.

Quantity of anode groundbeds, distance between them and the type of disposition are determined by the project of cathodic protection.

Joining of an anodic cable to the main cable is carried out by using thermit welding or cord fasteners. We use thermocontracting couplers for isolation of cable joinings.

Technical data

Parameter name	Value
Current load, A, not more than	6,0
Anodic dissolution rate, kg/(A·year), no more than	0,03
Electrode working surface size (length x diameter), mm	670x60
Nominal anode weight, kg	5,4
Assembled anode dimensions , mm, no more than: - length (height), - diameter	 1800 235
Assembled anode weight (without cable), kg, no more than	56
Service lifetime, years, no less than	35

Delivery set

Standard delivery set includes 20 pcs. of anodic groundbeds with consumables necessary for their connection to the anodic pipeline cable. It is possible to change quantity of groundbeds and types of used cables according to the order.

Conventions

24MTKP-2x10(PKZ-PvP)-200x16(VVGng)-KZ
1 2 3 4 5 6 7 8

TU 3435-018-24707490-2007, OKPD2 27.12.31.000
TU 3435-042-24707490-2016

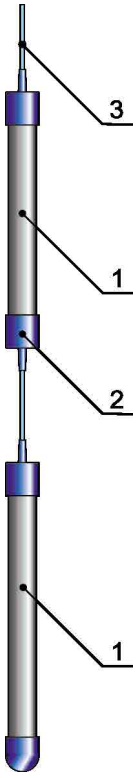
1	Number of anodes, pcs.: not restricted;
2	Anode cable length, m;
3	Anode cable core section, mm²: 10, 16, 25;
4	Anode cable type: PKZ-PvP, on request: PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
5	Length of the main cable, m;
6	Main cable core section, mm²: 10, 16, 25;
7	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
8	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)

Parameters 5-8 can be omitted

MENDELEEVETS-MTG

DEEP ANODE GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register
Certification: EEC, INTERGAZCERT, GAZCERT
Favourable decision of a sanitary-hygienic commission of experts



1 – magnetite electrode;
2 – thermocontracting coupler;
3 – cable

Application area

Deep magnetite groundbeds may be used for installation both in closed holes and in open ones (in such places where there is a static level of ground waters). Besides, this type of groundbeds can be used at reconstruction of overaged deep anode groundbeds (GAZ) made from steel pipes.

Installation of magnetite anode groundbeds into the hole is made manually and do not require any additional works.

Technical details

There are two types of magnetite grounding: a chain and a garland.

The **chain** is five magnetite anodes joined by a connecting cable. The cable goes through the internal cavity of the magnetite electrode and has an electric contact with it. The anodes are at a certain distance from each other. The intercenter distance between the electrodes in a chain is 1,7 or 3,4 m. The general length of the chain is equal to the length of the installation in a hole. Quantity of anodes in a chain may vary from one to five and it is mentioned in the order.

The **garland** is several chains of anodes in one hole, they are disposed one over another with definite distance which is mentioned in a project. Most often the garland consists of several chains from one magnetite anode.

If magnetite groundbeds are installed into closed boreholes the coke-mineral activator (KMA) must be used to fulfill the hollow space around.

For open holes polymeric perforated pipes are used. The length of the installation in open holes is determined by a season minimal level of ground waters as the electrodes must be placed below the water level. Big advantage of installation in open holes is opportunity to carry out examination, repair and replacement of groundbeds in use.

In the construction of deep magnetite groundbeds a connecting cable is a carrying element of the construction and it is used in the installation of the groundbed into the hole. You can see the schemes of installation of the deep magnetite anodes Mendeleevets-MT at the page 10.

Technical data

Parameter name	Pass type (type I)	End type (type II)
Max current load, A, no more than: - when installing in the ground - when installing in the water environment	3,0* 6,0*	
Anodic dissolution rate, kg/(A·year), no more than	0,03	
Electrode working surface size (length x diameter), mm	620x60	670x60
Nominal anode weight, kg	5,0*	5,4*
Assembled anode dimensions , mm, no more than: Length (height) x Diameter	730*x66	780*x66
Assembled anode weight (without cable), kg, no more than	7,4*	8,0*
Max quantity of groundbeds in a hole, pieces, no more than	no limits	
Service lifetime, years, no less than	35	

** The value is given for a chain of one magnetite anode*

Delivery set

Quantity of anodes in a set may be changed depending on the order. All consumables needed for the groundbed installation and their connection to the anodic line are included in the delivery set.

Cable captures included into the delivery set are intended for posing groundbeds in the mouth of the hole and the removal of load from a connecting cable. The types of used cables may vary.

Conventions

6MTG(5-1,7)-50x10(PKZ-PvPp)-50x16(VVGng)-KZ.G

1 2 3 4 5 6 7 8 9 10

TU 3435-006-24707490-2004
TU 3435-042-24707490-2016
OKPD2 27.12.31.000

1 | Number of anode groundbeds in the kit, pcs.: not restricted;

2 | N-S – Number of electrodes in the groundbed (N – no more 5 pcs.) and the distance between the centers of electrodes along the cable axis (S – 1,7; 3,4; 5 m or by agreement);

3 | Depth of the borehole, m;

4 | Anode cable core section, mm²: 10, 16, 25;

5 | Anode cable type: PKZ-PvPp,
on request: PKZ-PvP, PKZ-FF-ng(A), VPPO, VPP;

6 | Length of the main cable, m;

7 | Main cable core section, mm²: 10, 16, 25;

8 | Main cable type: VVGng,
on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;

9 | Cable joint kits:
cable clamps (KZ), thermit welding (TS), cable terminations (TM)
or their combinations (KZ+TM, TS+TM)

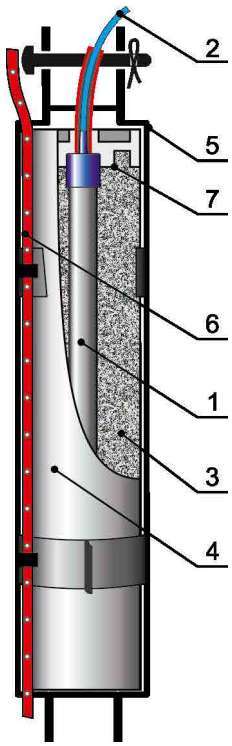
10 | Gas outlet tube included

Parameters 6-10 can be omitted

MENDELEEVETS-MTKG

COMPLETE DEEP GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register
Certification: EEC, INTERGAZCERT, GAZCERT
Favourable decision of a sanitary-hygienic commission of experts



1 – magnetite electrode;
2 – connecting cable;
3 – coke-mineral activator (CMA);
4 – container;
5 – corbels;
6 – gas outlet tube;
7 – centralizer

Application area

Complete deep groundbeds Mendeleevets-MTKG are used as an element of deep anode grounding for installation in soil with high specific resistance. The groundbeds are installed into holes vertically.

Technical details

Groundbed Mendeleevets-MTKG is a container with a magnetite electrode inside and hollow space around it is filled with coke-mineral activator (KMA). The container is a case of the groundbed and it serves for convenient transportation and installation. This case dissolves during exploitation.

The groundbed is fixed by means of directing corbels. It gives the possibility to assemble the blocks of complete deep groundbeds into the chain that allows to raise current loading and to reduce transitional resistance. Max block quantity in a chain is 24 pieces.

Gas that is formed while working of deep groundbed is drawn outside to the surface through the gas outlet tube. The gas outlet tube has perforation along all the height of the chain and is delivered for the concrete order on the basis of one tube for one chain of groundbeds installed in a borehole.

The kind of deep ground, consisting of groundbeds Mendeleevets-MTKG (quantity of blocks in a hole, quantity of boreholes, distance between boreholes, etc.) is determined by the project of cathodic protection.

As exploitation experience shows complete groundbeds have minimum time period of going out to operating modes and low value of resistance to current spreading. High degree of factory readiness noticeably simplifies the technology of anode groundbeds installation.

Each block has a connecting cable. The length of the cable is determined by the depth of the installation in a hole, that's why the cable doesn't have any discontinuities along the length and they are drawn outside to the surface to be attached to the anodic cable line.

Technical data

Parameter name	Value
Current load, A, not more than	6,0
Anodic dissolution rate, kg/(A·year), no more than	0,03
Electrode working surface size (length x diameter), mm	670x60
Nominal anode weight, kg	5,4
Assembled anode dimensions , mm, no more than: Length (height) x Diameter	1760x210
Assembled anode weight (without cable), kg, no more than	50
Max quantity of groundbeds in a hole, pieces, no more than	24
Service lifetime, years, no less than	35

Delivery set

The delivery set depends on the main order parameters: quantity of blocks and the depth of the hole for the installation. The types of used cables may vary.

All consumables needed for the groundbed installation and their connection to the anodic line are included in the delivery set.

Conventions

24MTKG-50x10(PKZ-PvPp)-50x16(VVGng)-KZ.G *TU 3435-018-24707490-2007, OKPD2 27.12.31.000*
1 2 3 4 5 6 7 8 9 *TU 3435-042-24707490-2016*

1 Number of anode groundbeds in the kit, pcs.: no more 24;

2 Depth of the borehole, m;

3 Anode cable core section, mm²: 10, 16, 25;

4 Anode cable type: PKZ-PvPp,
on request: PKZ-PvP, PKZ-FF-ng(A), VPPO, VPP;

5 Length of the main cable, m;

6 Main cable core section, mm²: 10, 16, 25;

7 Main cable type: VVGng,
on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;

8 Cable joint kits:
cable clamps (KZ), thermit welding (TS), cable terminations (TM)
or their combinations (KZ+TM, TS+TM)

9 Gas outlet tube included

Parameters 5-9 can be omitted

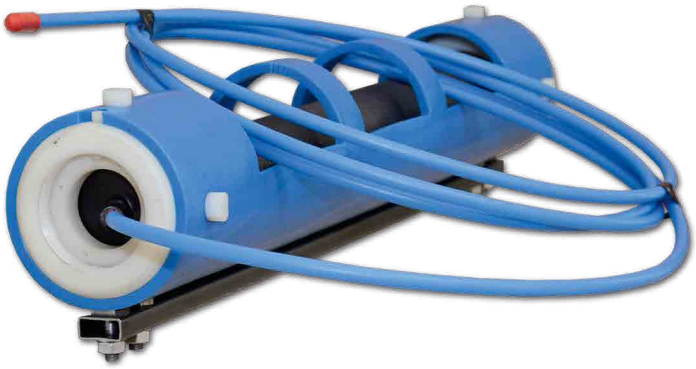
MENDELEEVETS-MTV

AN INTERNAL ANODE GROUNDBEDS

Magnetite anodes for corrosion protection of internal surfaces of pipelines and tanks, and also underwater metal constructions

Included in the Gazprom register
Included in the Transneft register

Certification: EEC, INTERGAZCERT, GAZCERT



Application area

An internal anodes are intended for application as low soluble working elements of electrochemical corrosion protection systems of internal surfaces of pipelines and tanks.

These anodes are installed inside of protected constructions. The position of the anodes is determined by the design of the protected constructions and can be horizontal or vertical.

Technical details

The internal anodes represent themselves magnetite electrodes equipped with corrosion-resistant cables and located in special perforated cylindrical dielectric shells.

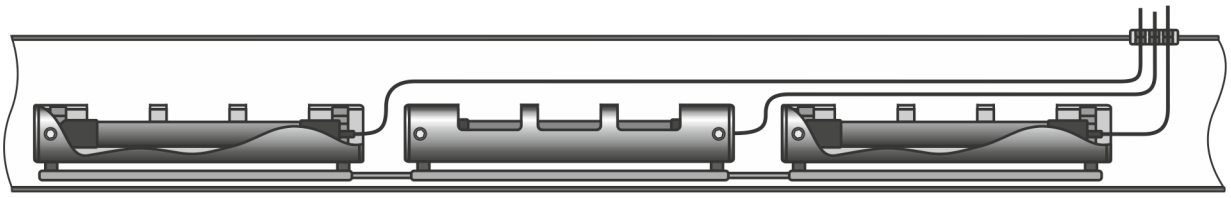
The design of the anodes provides uniform distribution of the protective potential over the protected construction surface and eliminates the possibility of electric contact of the protecting electrode with protected metal constructions, ensuring reliable fixation of the anodes at their installation places.

Installation of the internal anodes in tanks and pipelines is carried out in places with a constant level of electrolyte, as well as in places of the liquid phase with the lowest value of specific electric resistance.

Installation of the internal anodes is carried out manually, without the use of special equipment and devices/tools.

Insulation of cable joints of anode lines of the electrochemical protection system is carried out by heat shrink materials.

The main cable of anode lines from the inner space of protected constructions is output through a special cable tube and connected to control equipment.



Corrosion protection of the internal surface of the pipeline with an electrically conductive liquid

Technical data

Parameter name	Value
Current load when installed in an aqueous medium, A, not more than	6,0
Anodic dissolution rate, kg/(A·year), no more than	0,03
Electrode working surface size (length x diameter), mm	670x60
Assembled anode dimensions (Length x Diameter), mm, no more than	900x145
Assembled anode weight (without cable), kg, no more than	11
Service lifetime, years, no less than	35

Conventions

3MTV-60x10(PKZ-PvPp)-50x16(VVGng)-TM.BM.MD2

1 2 3 4 5 6 7 8 9

TU 3435-042-24707490-2016
OKPD2 27.12.31.000

1	Number of anodes, pcs.: not restricted;
2	Anode cable length, m;
3	Anode cable core section, mm²: 10, 16, 25;
4	Anode cable type: PKZ-PvPp, on request: PKZ-PvP, PKZ-FF-ng(A), VPPO, VPP;
5	Length of the main cable, m;
6	Main cable core section, mm²: 10, 16, 25;
7	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
8	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM);
9	Optional equipment (if multiple, specify via dots): BM – Buoy module; Weighting accessories (for the underwater equipment): - MD1 (block 2310x750 mm under one or two anodes), - MD2 (construction 3x3 from blocks 500x500 mm), - MD3 (construction from one block 2310x750 mm and 10 blocks 500x500 mm)

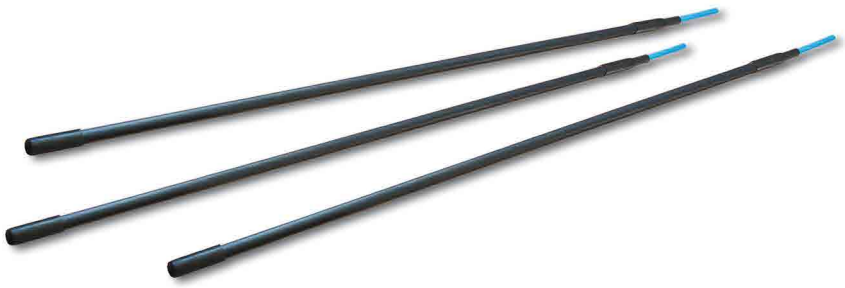
Parameters 5-9 can be omitted

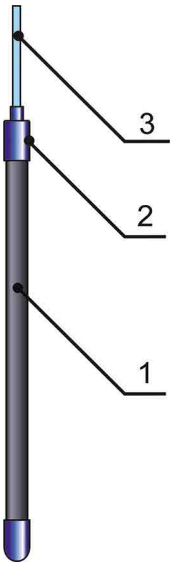
MENDELEEVETS-MRP

SHALLOW ANODE GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEC, INTERGAZCERT





1 – MMO titanium electrode;
2 – thermocontracting coupler;
3 – connecting cable

Application area

Shallow MMO titanium anodes are appropriate for high aggressive soil. Poorly soluble anodes can be installed horizontally in trenches or vertically in holes.

Technical details

Shallow anode is MMO titanium electrode with corrosion resistant connecting cable 2 m long.

Working element is a tubular electrode made of mixed metallic oxide. Contact with the cable is inside the electrode. For isolation of contact joining a specially developed chemically resistant solution on the basis of polymeric compound is used. An additional isolation of the place of cable outlet is made with thermocontracting couplers.

Quantity of anodes in a grounding, distance between them, type of disposition of anodes are determined by the project of cathodic protection.

Grounbeds are assembled into the electric circuit. Connection to the feeding cable of CP Station is made through the control equipment by means of main cable. Joining of an anodic cable to the main cable is carried out by using thermit welding or cord fasteners. We use thermocontracting couplers for isolation of cable joinings.

The hollow space around the anode should be filled with a coke-mineral activator (KMA) produced by Chemservice in order to reduce spreading resistance of anodic current and to slow down anodic dissolution.

Technical data

Parameter name	Value
Current load, A, not more than	14
Anodic dissolution rate, kg/(A·year), no more than	0,01
Electrode working surface size (length x diameter), mm	1350x25
Assembled anode dimensions , mm, no more than: Length x Diameter	1600x35
Assembled anode weight (without cable), kg, no more than	1,9
Service lifetime, years, no less than	30

Delivery set

Standard delivery set includes 20 pcs. of anodic groundbeds with consumables necessary for their connection to the anodic pipeline cable. It is possible to change quantity of groundbeds according to the order.

Conventions

20MRP(1,5x25xTi)-2x10(PKZ-PvP)-200x16(VVGng)-KZ
1 2 3 4 5 6 7 8 9

TU 3435-031-24707490-2012, OKPD2 27.12.31.000

1	Number of anodes, pcs.: not restricted;
2	LxdxM – Length (L, m) and diameter of electrodes (d, mm); substrate material (M);
3	Anode cable length, m;
4	Anode cable core section, mm²: 10, 16, 25;
5	Anode cable type: PKZ-PvP, on request: PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
6	Length of the main cable, m;
7	Main cable core section, mm²: 10, 16, 25;
8	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
9	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)

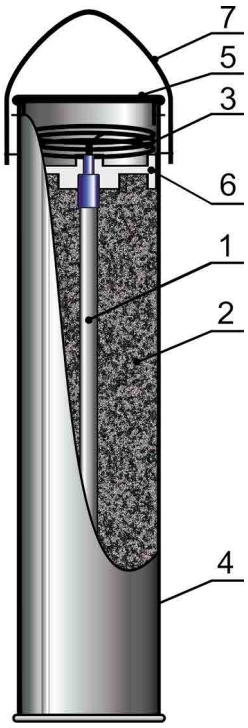
Parameters 6-9 can be omitted

MENDELEEVETS-MRKP

COMPLETE ANODE GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEC, INTERGAZCERT



1 – MMO titanium electrode;
2 - coke-mineral activator (KMA);
3 - connecting cable;
4 – body;
5 – cover for transportation;
6 – centralizer;
7 – clamp

Application area

MMO titanium complete anodes are meant to be used as elements of shallow anode grounding for installation in soil with a high specific resistance.

Technical details

Complete groundbed Mendeleevets-MRKP is a container with a MMO titanium electrode inside and the hollow space around it is filled with a coke-mineral activator (KMA).

Container is a case for even spreading of KMA and also for comfort transportation and installation. Container is made of galvanized steel and it dissolves fast after installation. There is a clamp at the top of the groundbed to facilitate installation work.

Length of a connecting cable in standard option is 2 m.

Quantity of anode groundbeds, distance between them and the type of disposition are determined by the project of cathodic protection. Both types of disposition are possible: horizontal and vertical.

Joining of an anodic cable to the main cable is carried out by using thermit welding or cord fasteners. We use thermocontracting couplers for isolation of cable joinings.

Technical data

Parameter name	Value
Current load, A, not more than	14
Anodic dissolution rate, kg/(A·year), no more than	0,01
Electrode working surface size (length x diameter), mm	1350x25
Assembled anode dimensions , mm, no more than: Length (height) x Diameter	1800x235
Assembled anode weight (without cable), kg, no more than	50
Service lifetime, years, no less than	30

Delivery set

Standard delivery set includes 20 pcs. of anodic groundbeds with consumables necessary for their connection to the anodic pipeline cable. It is possible to change quantity of groundbeds according to the order.

Conventions

24MRKP(1,5x25xTi)-2x10(PKZ-PvP)-200x16(VVGng)-KZ *TU 3435-031-24707490-2012*
1 2 3 4 5 6 7 8 9 *OKPD2 27.12.31.000*

1	Number of anodes, pcs.: not restricted;
2	LxdxM – Length (L, m) and diameter of electrodes (d, mm); substrate material (M);
3	Anode cable length, m;
4	Anode cable core section, mm²: 10, 16, 25;
5	Anode cable type: PKZ-PvP, on request: PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
6	Length of the main cable, m;
7	Main cable core section, mm²: 10, 16, 25;
8	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
9	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)

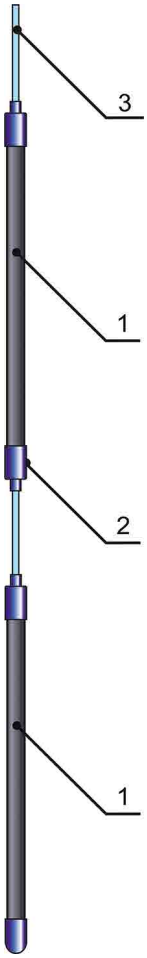
Parameters 6-9 can be omitted

MENDELEEVETS-MRG

DEEP ANODE GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEC, INTERGAZCERT



1 – MMO titanium electrode;
2 – thermocontracting coupler;
3 – cable

Application area

Deep MMO titanium groundbeds may be used for installation both in closed holes and in open ones (in such places where there is a static level of ground waters). Besides, this type of groundbeds can be used at reconstruction of overaged deep anode groundbeds (DAG) made from steel pipes.

Installation of MMO titanium anode groundbeds into the hole is made manually and do not require any additional works.

Technical details

There are two types of MMO titanium groundbeds: a chain and a garland.

The chain is five MMO titanium anodes joined by a connecting cable. The cable goes through the internal cavity of the electrode and has an electric contact with it. The anodes are at a certain distance from each other which is 1,7 or 3,4 m. The general length of the chain is equal to the length of the installation in a hole. Quantity of anodes in a chain may vary from one to five and it is mentioned in the order.

The garland is several chains of anodes in one hole, they are disposed one over another with definite distance which is mentioned in a project. Most often the garland consists of several chains from one MMO titanium anode.

If MMO titanium groundbeds are installed into closed holes the coke-mineral activator (KMA) must be used to fulfill the hollow space around.

For open holes polymeric perforated pipes are used. The length of the installation in open holes is determined by a season minimal level of ground waters as the electrodes must be placed below the water level. Big advantage of the installation in the open holes is opportunity to carry out examination, repair and replacement of groundbeds in use.

In the construction of MMO titanium groundbeds a connecting cable is a carrying element of the construction and it is used in the installation of the groundbed into the hole. You can see the schemes of installation of the deep MMO titanium anodes Mendeleevets-MRG at the page 10, they are equal to the schemes of installation of magnetite anodes.

Technical data

Parameter name	Value
Current load, A, no more than	11*
Anodic dissolution rate, kg/(A·year), no more than	0,01
Electrode working surface size (length x diameter), mm	1050*x25
Assembled anode dimensions , mm, no more than: Length (height) x Diameter	1300*x35
Assembled anode weight (without cable), kg, no more than	1,6*
Max quantity of groundbeds in a hole, pieces, no more than	no limits
Service lifetime, years, no less than	30

** The value is given for a chain of one MMO anode*

Delivery set

Quantity of anodes in a set may be changed depending on the order. All consumables needed for the groundbed installation and their connection to the anodic line are included in the delivery set.

Cable captures included into the delivery set are intended for posing groundbeds in the mouth of the hole and the removal of load from a connecting cable. The types of used cables may vary.

Conventions

6MRG(1,2x25xTi-5-1,7)-50x10(PKZ-PvPp)-50x16(VVGng)-KZ.G *TU 3435-031-24707490-2012*
OKPD2 27.12.31.000

1 2 3 4 5 6 7 8 9 10

1	Number of anode groundbeds in the kit, pcs.: not restricted;
2	LxdxM-N-S – Length (L, m) and diameter of electrodes (d, mm); substrate material (M); Number of electrodes in the groundbed (N – no more 5 pcs.) and the distance between the centers of electrodes along the cable axis (S – 1,7; 3,4; 5 m or by agreement);
3	Depth of the borehole, m;
4	Anode cable core section, mm²: 10, 16, 25;
5	Anode cable type: PKZ-PvPp, on request: PKZ-PvP, PKZ-FF-ng(A), VPPO, VPP;
6	Length of the main cable, m;
7	Main cable core section, mm²: 10, 16, 25;
8	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
9	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)
10	Gas outlet tube included

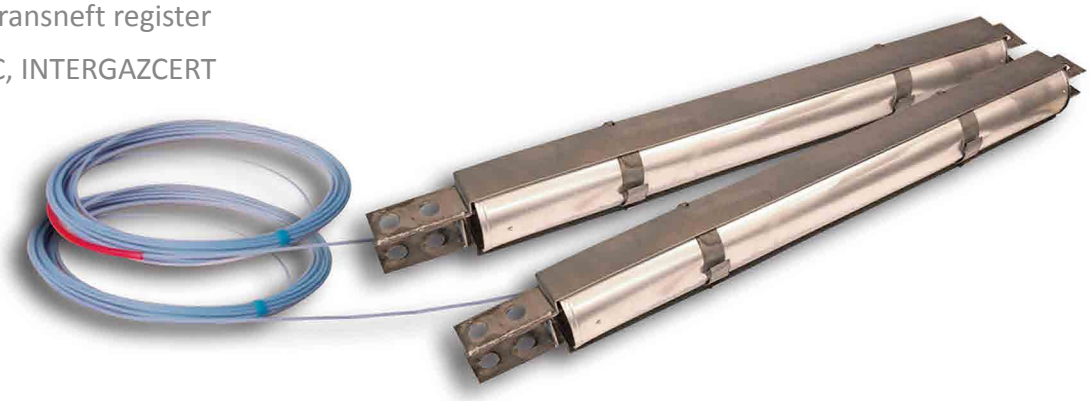
Parameters 6-10 can be omitted

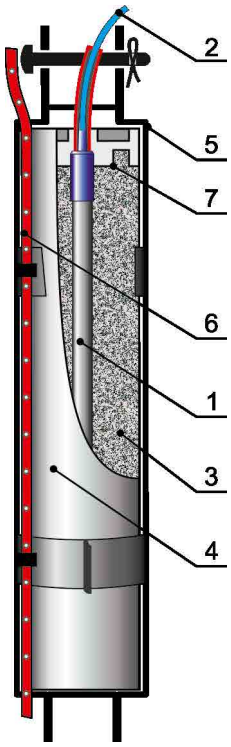
MENDELEEVETS-MRKG

COMPLETE DEEP GROUNDBEDS

Included in the Gazprom register
Included in the Transneft register

Certification: EEC, INTERGAZCERT





1 – MMO titanium electrode;
2 – connecting cable;
3 – coke-mineral activator (KMA);
4 – body;
5 – corbels;
6 – gas outlet tube;
7 – centralizer

Application area

MMO titanium complete deep anodes Mendeleevets-MRKG are used as elements of deep anode grounding for installation in soil with a high specific resistance. The anodes are installed into the holes vertically.

Technical details

Groundbed Mendeleevets-MRKG is a container with a MMO titanium electrode inside and hollow space around it is filled with coke-mineral activator (KMA). The container is a case of the groundbed and it serves for convenient transportation and installation. This case dissolves during exploitation.

The groundbed is fixed by means of directing corbels. It gives the possibility to assemble the blocks of complete deep groundbeds into the chain that allows to raise current loading and to reduce transitional resistance. Max block quantity in a chain is 24 pieces.

Gas that is formed while working of deep groundbed is drawn outside to the surface through the gas outlet tube. The gas outlet tube has perforation along all the height of the chain and is delivered for the concrete order on the basis of one tube for one chain of groundbeds installed in a hole.

The kind of deep grounding, consisting of groundbeds Mendeleevets-MRKG (quantity of blocks, the connecting cable length and the drainage tube length) is determined by the Consumer according to the project of cathodic protection.

As exploitation experience shows complete groundbeds have minimum time period of going out to operating modes and low value of resistance to current spreading. High degree of factory readiness noticeably simplifies the technology of anode groundbeds installation.

Each block has a connecting cable. The length of the cable is determined by the depth of the installation in a hole, that's why the cable doesn't have any discontinuities along the length and they are drawn outside to the surface to be attached to the anodic cable line.

Technical data

Parameter name	Value
Current load, A, not more than	11
Anodic dissolution rate, kg/(A·year), no more than	0,01
Electrode working surface size (length x diameter), mm	1050x25
Assembled anode dimensions , mm, no more than: Length (height) x Diameter	1760x210
Assembled anode weight (without cable), kg, no more than	55
Max quantity of groundbeds in a hole, pieces, no more than	24
Service lifetime, years, no less than	30

Delivery set

The delivery set depends on the main order parameters: quantity of blocks and the depth of the hole for the installation. The types of used cables may vary.

All consumables needed for the groundbed installation and their connection to the anodic line are included in the delivery set.

Conventions

24MRKG(1,2x25xTi)-50x10(PKZ-PvPp)-50x16(VVGng)-KZ.G *TU 3435-031-24707490-2012*
1 2 3 4 5 6 7 8 9 10 *OKPD2 27.12.31.000*

1	Number of anode groundbeds in the kit, pcs.: no more 24;
2	LxdxM – Length (L, m) and diameter of electrodes (d, mm); substrate material (M);
3	Depth of the borehole, m;
4	Anode cable core section, mm²: 10, 16, 25;
5	Anode cable type: PKZ-PvPp, on request: PKZ-PvP, PKZ-FF-ng(A), VPPO, VPP;
6	Length of the main cable, m;
7	Main cable core section, mm²: 10, 16, 25;
8	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
9	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM)
10	Gas outlet tube included

Parameters 6-10 can be omitted

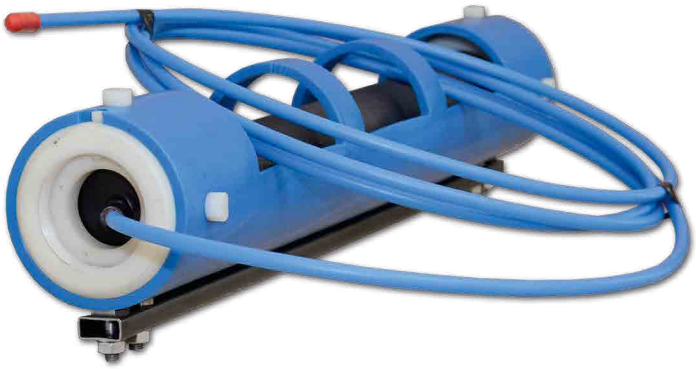
MENDELEEVETS-MRV

AN INTERNAL ANODE GROUNDBEDS

MMO anodes for corrosion protection of internal surfaces of pipelines and tanks, and also underwater metal constructions

Included in the Gazprom register
Included in the Transneft register

Certification: EEC, INTERGAZCERT



Application area

An internal anodes are intended for application as low soluble working elements of electrochemical corrosion protection systems of internal surfaces of pipelines and tanks.

These anodes are installed inside of protected constructions. The position of the anodes is determined by the design of the protected constructions and can be horizontal or vertical.

Technical details

The internal anodes represent themselves MMO electrodes equipped with corrosion-resistant cables and located in special perforated cylindrical dielectric shells.

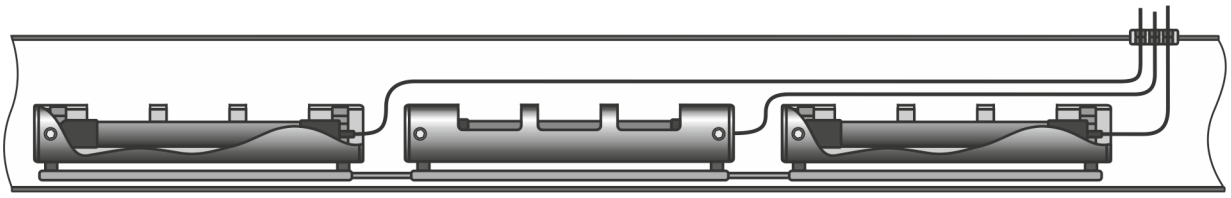
The design of the anodes provides uniform distribution of the protective potential over the protected construction surface and eliminates the possibility of electric contact of the protecting electrode with protected metal constructions, ensuring reliable fixation of the anodes at their installation places.

Installation of the internal anodes in tanks and pipelines is carried out in places with a constant level of electrolyte, as well as in places of the liquid phase with the lowest value of specific electric resistance.

Installation of the internal anodes is carried out manually, without the use of special equipment and devices/tools.

Insulation of cable joints of anode lines of the electrochemical protection system is carried out by heat shrink materials.

The main cable of anode lines from the inner space of protected constructions is output through a special cable tube and connected to control equipment.



Corrosion protection of the internal surface of the pipeline with an electrically conductive liquid

Technical data

Наименование параметров	MPB-1.2	MPB-1.5
Current load, A, not more than	11	
Anodic dissolution rate, kg/(A·year), no more than	0,01	
Electrode working surface size (length x diameter), mm	1050x25	1350x25
Assembled anode dimensions (Length x Diameter), mm, no more than	1300x145	1600x145
Assembled anode weight (without cable), kg, no more than	7	8
Service lifetime, years, no less than	30	

Conventions

3MRV(1,5x32xTi)-60x10(PKZ-PvPp)-50x16(VVGng)-TM.BM.MD2

1 2 3 4 5 6 7 8 9 10

TU 3435-031-24707490-2012
OKPD2 27.12.31.000

1	Number of anodes, pcs.: not restricted;
2	LxdxM – Length (L, m) and diameter of electrodes (d, mm); substrate material (M);
3	Anode cable length, m;
4	Anode cable core section, mm²: 10, 16, 25;
5	Anode cable type: PKZ-PvPp, on request: PKZ-PvP, PKZ-FF-ng(A), VPPO, VPP;
6	Length of the main cable, m;
7	Main cable core section, mm²: 10, 16, 25;
8	Main cable type: VVGng, on request: PKZ PvP, PKZ-PvPp, PKZ-FF-ng(A), VPPO, VPP;
9	Cable joint kits: cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM);
10	Optional equipment (if multiple, specify via dots): BM – Buoy module; Weighting accessories (for the underwater equipment): - MD1 (block 2310x750 mm under one or two anodes), - MD2 (construction 3x3 from blocks 500x500 mm), - MD3 (construction from one block 2310x750 mm and 10 blocks 500x500 mm)

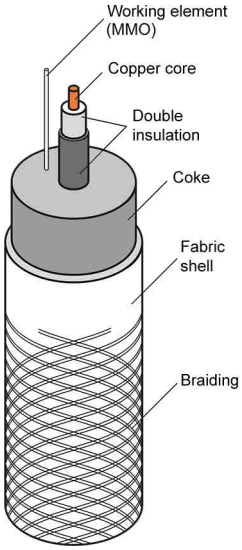
Parameters 6-10 can be omitted

MENDELEEVETS-MP

Included in the Gazprom register
Included in the Transneft register

Certification: EEC, INTERGAZCERT

FLEXIBLE LONG-LINE ANODES



Application area

Long-line flexible anode groundbeds Mendeleevets-MP are meant to be used as poorly soluble elements of shallow extended anode grounding in installations of cathodic protection against corrosion of main pipelines and other underground metal constructions.

Laying of the long-line flexible anode groundbed is carried out along the protected construction.

Long-line flexible anode groundbeds are used for:
- main, commercial and other pipelines in any soil, including high resistance (permafrost, rocky, sandy);
- communications of compressor and gas-distributing stations, and other industrial platforms;
- underground parts of tanks.

Technical details

The working element of the groundbed is a current-carrying cable with a MMO titanium electrode in a protective cover inside.

A special cable worked out by the company Chemservice and having chemically resistant isolation cover is used as a current-carrying cable.

The MMO titanium electrode is made of corrosion-resistant material with electrochemical active metal-oxide covering. The electrode has a distributed shunt all the length of the groundbed. Construction length of the groundbed is defined by the requirements of the Customer.

The anode design provides laying of the groundbed in wells of the horizontal directed drilling.

Length of winding of extended anodes on drums

Drum type	Anode diameter	
	50 mm	60 mm
Drum 10	80 m	60 m
Drum 10a	120 m	100 m
Drum 12a	185 m	150 m

Technical data

Parameter name	Value		
Cross section of a current-carrying cable, mm^2	10	16	25
Nominal diameter, mm		36, 50, 60	
Current capacity, mA/running meter		50; 150; 300	
Maximum voltage, V		12	
Maximum current load on the groundbed, A	75	100	130
Completed length, m		due to the order	
Service lifetime, years, no less than		30	

Delivery set

Name of items for delivery set	Quantity
Long-line flexible anode groundbed Mendeleevets-MP, running meters	due to the order
Installation set, pcs.	1 (due to the order)
Passport, pcs.	1
Installation guidance, pcs.	1
Package box / reel, pcs.	1

Conventions

MP.300-150x16-5/155x10(PKZ-PvPp)-36-TM
1 2 3 4 5 6 7 8 9

TU 3435-030-24707490-2011
OKPD2 27.12.31.000

1 | Current capacity, mA/running meter: 50, 150, 300;

2 | Conditional length of the extended working element, m;

3 | Cross section of a core of the working element, mm^2: 10, 16, 25;

4 | Connecting cable length (Outlet A), m;

5 | Connecting cable length (Outlet B), m;
If a loopback is required, put here «К»;

6 | Cross section of a current-carrying cable, mm^2: 10, 16, 25,
by agreement 35, 50;

7 | Cable type: PKZ-FF-ng(A), PKZ-PvP, PKZ-PvPp, VPPO, VPP
or another on request;

8 | Nominal outer diameter of the electrode, mm: 36, 50, 60;

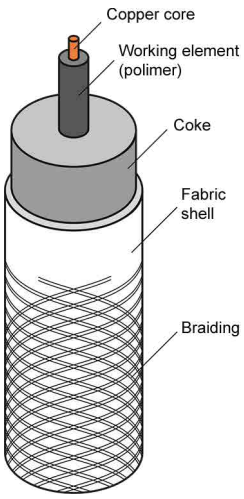
9 | Cable joint kits:
cable clamps (KZ), thermit welding (TS), cable terminations (TM)
or their combinations (KZ+TM, TS+TM);

MENDELEEVETS-MPP

POLYMERIC FLEXIBLE ANODES

NEW

Certification: EEC



Application area

Polymeric long-line flexible anodes Mendeleevets-MPP are meant to be used as poorly soluble elements of shallow extended anode grounding in installations of cathodic protection against corrosion of main pipelines and other underground metal constructions.

Laying of the long-line flexible anode groundbed is carried out along the protected construction.

Long-line flexible anode groundbeds are used for:
- main, commercial and other pipelines in any soil, including high resistance (permafrost, rocky, sandy);
- communications of compressor and gas-distributing stations, and other industrial platforms;
- underground parts of tanks.

Technical details

The working element of the anode represents itself a current-carrying cable with a polymeric current-conducting shell in an electrically conductive backfill covered by a fabric protective shell.

The polymeric current-conducting shell is made on the basis of a polymeric binding material with a filler from electrically conductive materials.

Length of winding of extended anodes on drums

Drum type	Anode diameter	
	50 mm	60 mm
Drum 10	80 m	60 m
Drum 10a	120 m	100 m
Drum 12a	185 m	150 m

Technical data

Parameter name	Value				
Cross section of a current-carrying cable, mm²	10	16	25	35	50
Nominal current capacity, mA/running meter	25				
Maximum current capacity, mA/running meter	50				
Maximum voltage, V	96				
Maximum current load on the groundbed, A	75	100	130	160	200
Nominal diameter, mm	36, 50, 60				
Completed length, m	due to the order				
Specific weight of the groundbed, kg/running meter, no more	3,5				
Service lifetime, years, no less	30				

Delivery set

Name of items for delivery set	Quantity
Long-line flexible anode groundbed Mendeleevets-MPP, running meters	due to the order
Installation set, pcs.	1 (due to the order)
Passport, pcs.	1
Installation guidance, pcs.	1
Package box / reel, pcs.	1

Conventions

MPP.50-100x35-10/110x16(PKZ-PvPp)-50-KZ

1 2 3 4 5 6 7 8 9

TU 3435-041-24707490-2016
OKPD2 27.12.31.000

1 | Current capacity, mA/running meter: 50;

2 | Conditional length of the extended working element, m;

3 | Cross section of a core of the working element, mm²: 10, 16, 25, 35, by agreement 50;

4 | Connecting cable length (Outlet A), m;

5 | Connecting cable length (Outlet B), m;
If a loopback is required, put here «К»;

6 | Cross section of a current-carrying cable, mm²: 16, 25, 35, by agreement 50;

7 | Cable type: PKZ-FF-ng(A), PKZ-PvP, PKZ-PvPp, VPPO, VPP or another on request;

8 | Nominal outer diameter of the electrode, mm: 36, 50, 60;

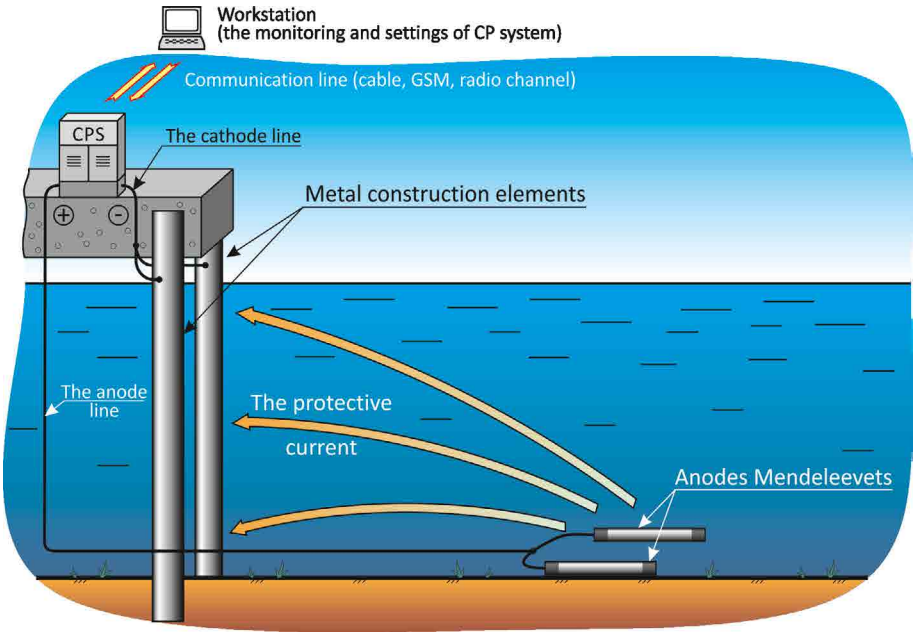
9 | Cable joint kits:
cable clamps (KZ), thermit welding (TS), cable terminations (TM) or their combinations (KZ+TM, TS+TM);

CORROSION PROTECTION OF OFFSHORE CONSTRUCTIONS

NEW

Anode groundbeds on the basis of magnetite and MMO anodes for cathodic protection of underwater metal constructions

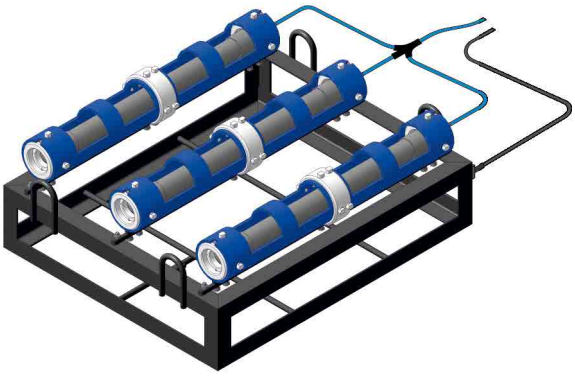
New foreign systems for cathodic protection of offshore constructions are designed basically in the form of systems with the superimposed current



Chemservice offers specially developed devices for underwater anode corrosion protection of offshore constructions: berths, stationary platforms, bridges, etc.

The design of underwater anode corrosion protection systems is based on internal anodes Mendeleevets from magnetite (MTV) and metal oxide (MRV).

The location of underwater anode corrosion protection elements is determined by the design features of protected constructions, and can imply direct installation of anode kits both on the constructions and on the seabed at the required distance from the protected constructions. The position of anode kits at places of their installation is determined by a particular project of electrochemical protection of constructions and can be horizontal or vertical.



Bottom execution of the underwater anodes

Buoy module of the underwater anodes

Technical description

Underwater anodes represent themselves special metal constructions with perforated dielectric shields in which there are magnetite or low soluble electrodes equipped with corrosion resistant cables.

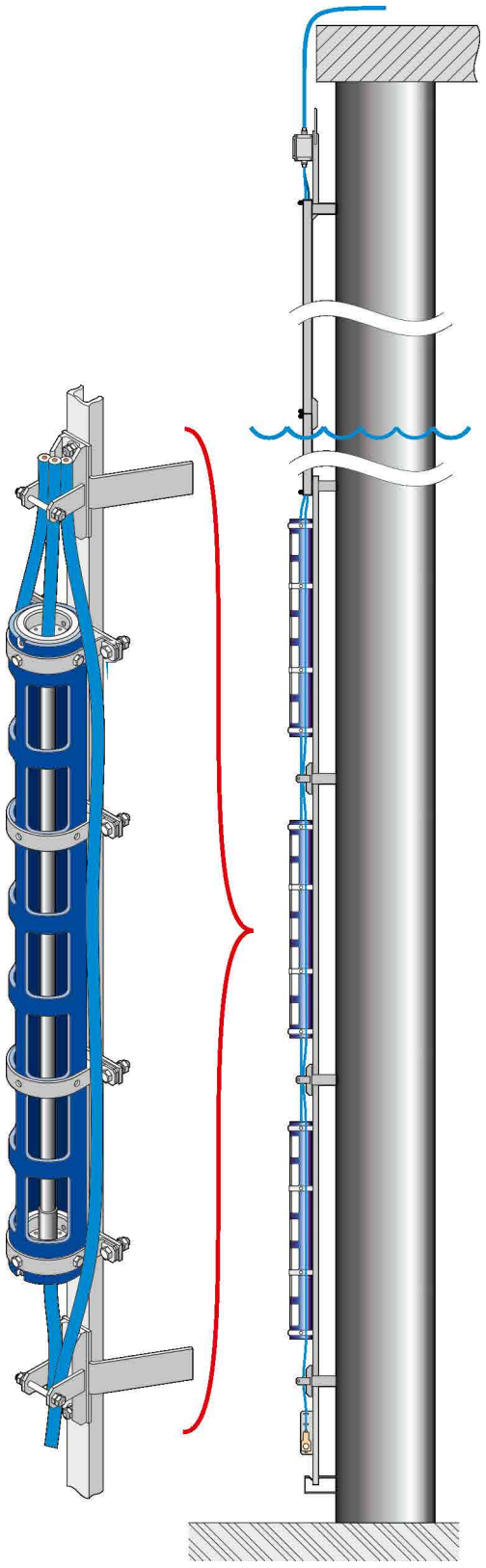
The metal part of the constructions provides reliable fixation of corresponding electrodes in places (determined by the design solution) of their installation during the entire service life of the corrosion protection system. It implies electric connection to the cathode line of the cathodic protection station (CPS) and eliminates the possibility of electric contact of protection system electrodes with metal constructions.

There are several executions of the design of underwater anodes: bottom, pile and buoy module.

The design of the dielectric shield of the corrosion protection system provides protection of electrodes from mechanical damages and uniform distribution of the protective potential over the protected construction surface.

At installation of underwater anodes it is necessary to select places in which the most efficient operation of the electrochemical protection system will be provided, eliminating the risk of mechanical damage of electrodes.

The main cable of anode lines is laid in special cable channels excluding the possibility of its mechanical damage. The cable goes to the water surface and is connected to control equipment.



Pile construction for installation of anodes on the mooring structure

CABLES FOR CORROSION PROTECTION SYSTEMS

For reliable operation of CP systems Chemservice supplements the produced equipment with the cables presented in the following table.

NEW

Technical data	Cable type					
	VVG	VPP	VPPO	PKZ-PvP	PKZ-PvPp	PKZ-FF-ng(A)
Area of application	Main cable	Anode cable or main cable				
Core class (according to GOST 22483)	1	2	2	2	2	2
Outer diameter of a cable, mm, no more:						
- with a core section of 10 mm^2	–	8,6	10,3	8,6	8,6	7,2
- with a core section of 16 mm^2	-10,3	10,4	11,3	9,7	9,7	8,2
Mechanical strength	low	below average	above average	average	above average	high
Chemical resistance of a shell and insulation to:						
- products of a reaction of anode dissolution, including chlorine compounds	low	average	average	above average	above average	high
- artesian, drinking and ground water	low	average	average	above average	above average	high
- msea water with a salt content of no more than 39 ‰	low	average	average	above average	above average	high
- diluted solutions of acids and alkalis	low	average	average	above average	above average	high
- industrial solutions of oil and oil products	low	average	average	above average	above average	high
Do not spread burning at group laying	only with the index ng(A)	–	–	–	–	+
Operation temperature, °C	от -50 до +50	от -40 до +80	от -60 до +110	от -60 до +80	от -55 до +100	от -70 до +155
Installation temperature, °C, not less than	minus 15	minus 40	minus 15	minus 40	minus 35	minus 70
Allowable bending radius at installation, diameters, not less than	10,0	10,0	10,0	7,5	10,0	6,0

The special cable PKZ-FF-ng(A), which does not support burning, has been developed for operation in extreme working conditions.

The presented cables are waterproof and resistant to the harmful influence of sea, ground, drinking and artesian water, and also to dilute solutions of acids and alkalis, oil and oil products, to products of anode dissolution reactions, including chlorine compounds.

KMA

COKE-MINERAL ACTIVATOR

Included in the Gazprom register

Certification: Russian Federal Standard, INTERGAZCERT

Favourable decision of a sanitary-hygienic commission of experts

Application area

Coke-mineral activator KMA is used at installation of anode groundbeds into soil.

The use of KMA around the anode groundbeds allows to retain moisture in the process of their work, thereby allowing to maintain a fairly stable value of the resistance to current spreading all year round.

It is required to use KMA when installing anode groundbeds in arid soils, because of its unique properties allows to ensure the efficiency of anodic groundbeds even during dry periods.

The KMA is especially recommended to be used at installation of groundbeds in high-resistant soil (ρ_{soil} > 30 Ohm·m). Efficiency of application of KMA is confirmed with stability of work of CP systems in real conditions of operation.

Application of the KMA provides:
- reducing of transition resistance anode-soil;
- drainage of space around the anode;
- reducing of dissolution rate of electrodes;
- extension of space of electrochemical capacity by means of a coke activator existence and soil mineralization of space around the anode;
- reducing the soil electroosmotic drying effect.

Technical details

The KMA consists of mix of small-sized coke the size of up to 10 mm and coke the size of 1–25 mm and mineral activator without halide.

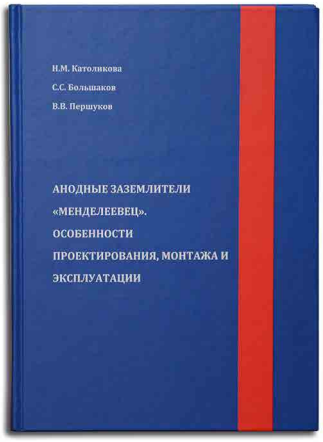
The composition of the KMA is patented. It is produced only by Chemservice.

The KMA is delivered packed in pockets of 40 kg (0,05 m3).

There are following conventions for ordering the coke-mineral activator:

KMA – *TU 2458-003-24707490-2001, OKPD2 20.59.54.190*

PROGRAM OF CALCULATION OF ANODE GROUNDBEDS



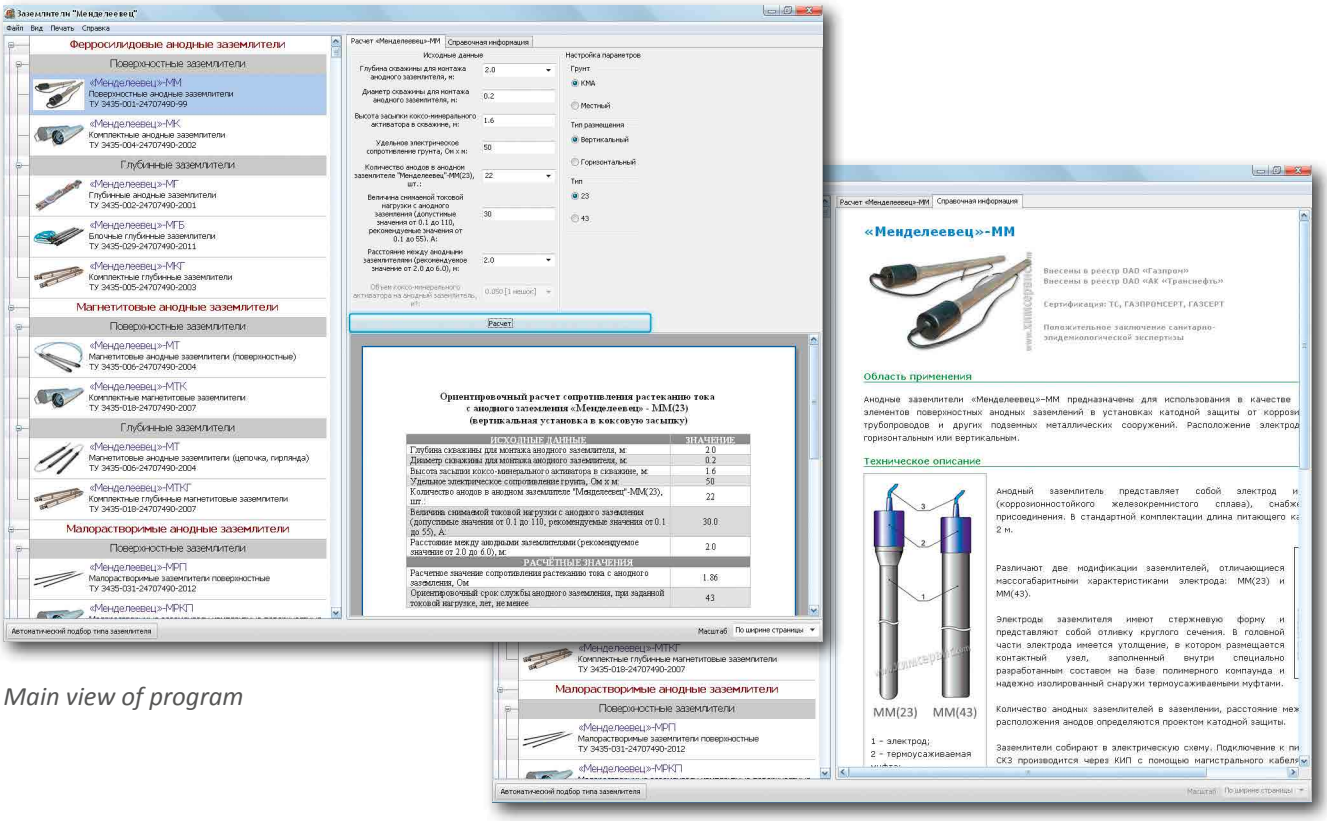
Book «Mendeleevets anode groundbeds. Features of design, installation and operation»

The company Chemservice released the book «Mendeleevets anode groundbeds. Features of design, installation and operation», as well as a new version of the program for calculating the parameters of anode groundbeds, which will help to quickly and easily select the most optimal type and number of anode groundbeds Mendeleevets required to ensure reliable operation of CP systems of underground pipelines.

The initial data for the calculation are: the resistance of the soil, the number of wells or groundbeds, the distance between the groundbeds or wells, the type of groundbeds, the presence of KMA. The calculation is performed in accordance with the recommendations of regulatory documents, in particular STO Gazprom 9.2-003-2009.

The program on the basis of the input data provides a recommendation on the choice of the type of groundbed to achieve the optimal value of the resistance to the spreading current from the anode groundbed.

The latest version of the program can be downloaded from the corporate website of the company Chemservice.



Main view of program

EQUIPMENT FOR ECP SYSTEMS

As one of the biggest producers of equipment for systems of ECP (electrochemical protection) the company Chemservice attaches great value to development of new types of reliable and good-quality equipment satisfying the requirements of modern standards and the enterprises using underground communications.

Our specialists have developed the comparison electrodes, sensors of corrosion speed and counters of operating time. All that allows to control work operation of means of ECP. We have control stations for monitoring and setting of ECP parameters with terminal boards, convenient for installation, and unique cathode junction boxes for adjusting or balancing the flow of protective current between the protected structures.

All process of development and testing of new ECP equipment is carried out in collaboration with specialists of oil and gas industry in order to take into account all necessary details of further operation of the construction. We also pay much attention to usability of our equipment to simplify work of maintenance staff.

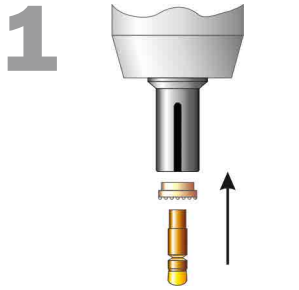
Our company keeps up with the times and proposes high technology items made from modern materials. Implementation of advanced foreign technologies allows to produce on the Russian market unique equipment that is not inferior to the world analogues. The best example is our compact stud welding unit PKV Mendeleevets created on the basis of technology which made a great break in the world practice of creation of high-quality and safe cable joints.

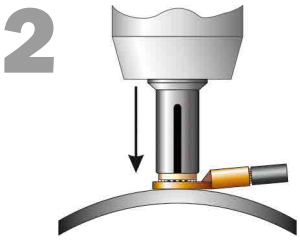
PKV MENDELEEVETS

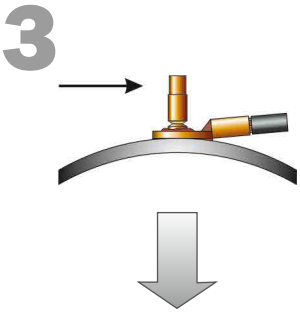
PIN BRAZING UNIT

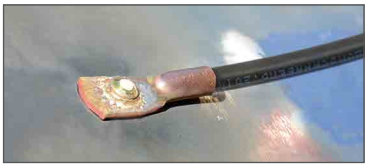
Included in the Gazprom register

Sertification: National Welding Control Agency of Russia, EEU









Three easy steps for reliable connection

Application area

The unit is used to braze cathodic, drainage or measuring fasteners to the pipeline as an alternative to the thermit welding. Thanks to automatic control of the process of pin brazing the result is a strength joint of cable and metal construction.

Pin brazing may be realized on the constructions with wall thickness of 2 mm without decrease in working pressure. The staff is not required to have any special skills for this kind of work, the device practically excludes a human factor and allows to work in any weather conditions. It is used with electrodes of EVP Mendeleevets (page 49).

Advantages

– more technological production in comparison with other types of connections;
– there is no destruction of material to which pin brazing of the outlet is carried out;
– allowed wall thickness of the base is less in comparison with other types of connections;
– the process is maximum automated;
– it doesn't require high qualification of the operator;
– the low voltage of the battery provides safety of the operator;
– possibility of pin brazing in any position of the holder of electrodes

Technical details

The installation consists of the battery, the control unit and the electrode holder. The battery and the control unit are in one sealed plastic case.

The fire and explosion safe elements that have a large number of charge-discharge cycles and low internal resistance are used for the battery.

Technical data

Parameter name	Value
Nominal pipe diameter for pin brazing (certified in VNIIGAZ*)	от DN80 до DN1400
Nominal pipe thickness for pin brazing, mm (certified in VNIIGAZ**)	от 4 до 42
Pin brazing strength***, kN, no more than	5
Number of brazes from one charge of the battery under environment temperature 25 °C, no more than	40
Charging time, hours, no more than	5
Environment temperature for good working, °C	от минус 20 до плюс 40
Relative air humidity under the temperature +25 °C, %, no more than	95
Dimensions (LxWxH), mm, no more than	440x250x350
Weight, kg, no more than	16

** It is possible to pin braze on the pipes with diameter from DN15;*
*** It is possible to pin braze on the pipes with thickness from 2 mm;*
**** Only for recommended for using electrodes EVP Mendeleevets*

The base delivery set

Name of items for delivery set	Quantity
PKV Mendeleevets, pcs.	1
Gun, pcs.	1
Pin holder D8, pcs.	1
Ring holder D8, pcs.	1
Ground magnet, pcs.	1
Cable set, set	1
Battery charger, pcs.	1
Device for adjusting the electrode separation distance, set.	1
Application guidance, pcs.	1
Transport tool case, pcs.	1

The delivery set of PKV Mendeleevets with additional equipment

Name of items for delivery set	Quantity
Base set of PKV Mendeleevets, set	1
Pin holder M8, pcs.	1
Pin holder M10, pcs.	1
Ring holder D12, pcs.	1
Grinding machine, pcs.	1
Battery charger for grinding machine batteries, pcs.	1
Carbide burr, pcs.	1
Abrasive stripper of pin brazing places, pcs.	1
Instruments: – open ended spanner, pcs. – hammer, pcs. – pliers, pcs. – metal broom, pcs.	 5 1 1 1
Consumables: – electrode (pin) EVP-D8, pcs. – electrode (pin) EVP-M8, pcs. – electrode (pin) EVP-M10, pcs. – cable lug TM 10-8-5-KO (with inspection hole), pcs. – cable lug TM 16-8-6-KO (with inspection hole), pcs. – ceramic ferrule Ø8, pcs. – ceramic ferrule Ø12, pcs.	 20 10 10 10 10 20 20
Transport case with lodgement, pcs.	1

There are follow conventions for order the pin brazing unit PKV Mendeleevets:

PKV Mendeleevets, the base set;
PKV Mendeleevets, the set with additional equipment

TU 3441-032-24707490-2013, OKPD2 27.90.31.110

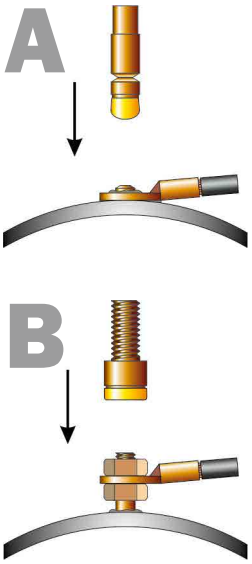
EVP MENDELEEVETS

PINS FOR PIN BRAZING

Included in the Gazprom register

Sertification: National Welding Control Agency of Russia

TU 3449–034–24707490–2013
OKPD2 32.12.14.111



Application area

Pins EVP Mendeleevets are intended for pin brazing to a steel construction. The pin brazing is made by the pin brazing unit PKV Mendeleevets or equal.

Technical details

There are two types of pins depending on construction design:

EVP-D8 – for pin brazing of copper cable lugs (Federal Standard 7386) without protective metal cover with inspection hole for contact bar of 8mm in diameter. (See picture A);

EVP-M8 (M10) – for threaded connection of copper (Federal Standard 7386) and aluminum-copper (Federal Standard 9581) cable lugs for contact bar of 8 (10) mm in diameter. (See picture B).

Delivery set for pin brazing of copper cable lugs, type TM X-8-X-KO with control hole

Name of items for delivery set	Quantity
Pin EVP-D8	100
Ceramic ferrule Ø8	100
A can with silica-gel	1
Cable lug*	100

**Cable lugs are supplied on request for cable section 10, 16, 25, 35 mm²*

Delivery set for threaded connection of copper cable lugs type TM(L)-X-8(10)-X or aluminum-copper cable lugs type TAM-X-8(10)-X

Name of items for delivery set	Quantity
Pin EVP-M8(M10)	50
Ceramic ferrule Ø12	50
A can with silica-gel	1

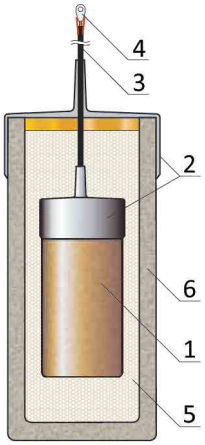
SMES MENDELEEVETS

REFERENCE ELECTRODE OF LONG OPERATION

Included in the Gazprom register

Certification: Federal Standard of Russia, INTERGAZCERT

Favourable decision of a sanitary-hygienic commission of experts



1 – internal body;
2 – thermocontracting coupler;
3 – measuring cable;
4 – cable tip;
5 – bentonite mix;
6 – external body

Application area

Copper-sulphate comparison electrodes Mendeleevets are used in electrochemical systems of protection against corrosion and to measure the capacity of underground metallic structures.

Reference electrodes are stationary and installed in the soil to a depth of laying pipelines below the freezing depth of the soil. Measurements of potential are carried out in accordance with the requirements of GOST (Federal Standard) 9.602-2005. The reference electrodes are manufactured in climatic design U category 1 GOST (Federal Standard) 15150.

Technical details

The body of the reference electrode is made of special porous ceramic that provides a low contact resistance and a stable potential value.

The internal body of the reference electrode filled with copper sulfate. Inside the copper sulfate there is a copper electrode of spiral shape to increase the contact area.

The reference electrode is equipped with measuring wires, mark VPP 1x6.

The reference electrode body is filled with the water-holding filler based on the bentonite to provide more stable operation and longer life in various soil conditions (dry soils, flooded soils, saline soils, etc.).

Using the reference electrodes SMES-2 with the auxiliary electrode (VE) allows to measure polarization potential by disabling the auxiliary sample polarization current according to Federal Standard (GOST) 9.602.

To make service easier the cable outlets are marked and equipped with terminals for connection to Control Testing machine. The measuring cable is a load-carrying element in the structure of the reference electrode SMES and it is used in the installation of the electrode.

Stationary copper-sulfate electrodes SMES Mendeleevets have stable value of their own potential in different conditions of environment.

Technical data

Parameter name	Value
Potential, mV	100 ± 15
Transient electrical resistance, Ohm, no more than	3000
Dimensions, mm: - height - diameter	 390 160
Weght, kg	9
Service lifetime, years, no less than	10

VE MENDELEEVETS

AUXILIARY ELECTRODE

Application area

Auxiliary electrodes VE Mendeleevets are designed for using in the systems of electrochemical protection against corrosion and applied for measuring polarization potential of underground metal construction according to Federal Standard (GOST) 9.602 (method of switching off the auxiliary electrode).

Technical details

Auxiliary electrodes are used together with copper sulphate reference electrodes of long operation SMES-2.

Auxiliary electrode is a steel electrode 6 with measuring cable 3 installed in the plastic body 5 and sealed with compound.

Measuring cable 4 is equipped with cable tip 1 for connection to the control testing station or station of cathodic protection.

Auxiliary electrodes are produced in the factory and delivered ready for installation.

There are 4 types of auxiliary electrodes depending on construction:

VE1250 – electrode square 1250 mm²;
VE625 – electrode square 625 mm²;
VE312 – electrode square 312 mm²;
VE156 – electrode square 156 mm².

Conventions

SMES-2(VEx)-7 *TU 3435-016-24707490-2007, OKPD2 28.99.39.190*

- **Measuring cable length:** 7, 10 or 13 m (more – according to the order in coordination);
- **Type of the auxiliary electrode (marked just for the set with auxiliary electrode):** x – working surface square: 156, 312, 625 or 1250 mm²;
- **Type of the reference electrode:** 2 – two-bodied copper sulphate reference electrode;
- **Type of the product:** stationary copper sulphate reference electrode SMES

Conventions if you order only VE (separately)

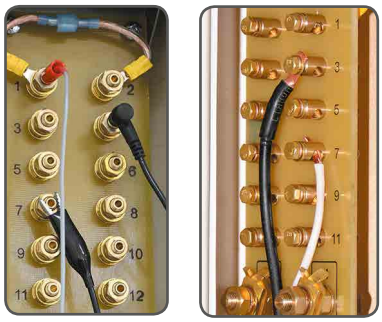
VE1250-7 *TU 3435-016-24707490-2007, OKPD2 28.99.39.190*

- **Measuring cable length:** 7, 10 or 13 m (more – according to the order in coordination);
- **Steel electrode square:** 156, 312, 625 or 1250 mm²;
- **Type of the product:** VE – auxiliary reference electrode

CONTROL AND MEASURING COLUMNS MENDELEEVETS

KIP HS

Included in the Gazprom register
Certification: EEU, INTERGAZCERT



The board of KIP HS at the side of diagnostic and monting windows

KIP HS.TN

Certification: EEU

Application area

The control and measuring column CMC HS is intended for switching the power and measuring circuits of systems of electrochemical protection and control of corresponding working parameters.

KIP are installed along underground pipelines, and also in places of their intersection with other communications, roads, etc. KIP equipped with distance caps, are used to designate pipelines.

The execution KIP HS.TN is intended for main pipeline objects, technological pipelines of oil pumping stations (OPS) and tank farms, and also separate tanks, for control of parameters of electrochemical protection, switching separate elements of such systems, designation of underground pipelines according to RD 91.020.00-KTN-170-17.

Technical description

KIP consists of a column with the information about a particular object, a terminal panel and, if required, a distance sign.

If necessary, KIP can be equipped with built-in BSZ, BPP, UKT, UZZ, UZT, or other additional components of the cathodic protection system.

The KIP column is made of a polymeric nonflammable material and has a low weight at standard dimensions. The column profile is developed so that to minimize the possibility of KIP deformation under the influence of external factors.

The KIP terminal panel is equipped with the required number of measuring and power clamps, according to customer's requests.

Power and measuring clamps are made of brass and provide reliable fastening of measuring cables with a cross section of up to 6 mm^2 and power cables with a cross section of up to 35 mm^2.

To ease installation of cables and wires, KIP has two cable access windows: the terminal window – to measure working parameters, and the mounting window – for installation and maintenance works.

Conventions KIP HS

KIP HS.2.1.12-4.K300x400 *TU 3435-027-24707490-2010, OKPD2 27.12.31.000*

Distance mark:
K – is delivered with cover of distance mark (not marked for KIP without distance mark):
300x400 mm or 400x500 mm;

Number of measuring and power clamps*:
0, 4, 6, 8, 12, 16, 24, 32 – measuring clamps;
0, 4, 6, 8, 16 – power clamps

Digital notation of the stand type:
1 – triangled (plane 180mm, height 2.7m), white;
12 – triangled (plane 180 mm, height 2.7 m), yellow;
2 – square (plane 200 mm, height 2.7 m), white;
22 – square (plane 200 mm, height 2.7 m), yellow;

Digital notation of colour of a signal cap:
1 – blue (pipelines of objects of production);
2 – yellow (main pipeline);
3 – green (pipelines of underground storage);
4 – red (gas-distributing pipeline)

** The main design variants of KIP HS are given on our website*

Conventions KIP HS.TN

KIP HS.TN-P01-0-3(C)-0-K-U1 *TU 27.12.31 044 24707490 2018, OKPD2 27.12.31.000*

Climatic execution: according to GOST 15150;

Types of covers:
K – cover (signal cap); KP – cover (information plate);
KZ – cover of distance mark;

Additional equipment*:
- BSZ – joint protection unit (diode-resistor unit);
- BPP – CP parameters transfer block;
- UKT – current control unit for anode groundbeds;
- UZZ – protection ground unit;
- UZT – unit for pipeline protection from induced currents;

Color of power clamps:
K – red; S – blue;

Number of power clamps;

Number of measuring clamps;

KIP type:
- P01 – plastic column;
- P02 – plastic column with a lifting-sliding mechanism

** KIP can include the additional equipment. For this purpose it is necessary to specify the required parameters, for example, for BSZ: nominal current and number of channels (BSZ.10.1). If the additional equipment is not required, the KIP code position should include the symbol «0».*

JOINT PROTECTION UNIT (BSZ)

for KIP HS and KIP HS.TN

BUILT-IN EQUIPMENT

Application area

Joint protection units (BSZ) are designed for embedding in KIP HS and KIP HS.TN and used for joint cathodic protection of several underground metal constructions from one converter of cathodic protection, adjustment of the cathodic current flowing into each underground construction and also as the polarized drainage at small drainage currents.

Technical data

Parameter name	Value	
Type of built-in BSZ	BSZ-10	BSZ-1
Max channel number of BSZ	2	4
Nominal rms current, A	10*	1
Nominal resistance of resistors, Ohm	1±10%	10±10%
Allowed back voltage, V	1000	
Method of resistance regulation	Slide control/regulation	
Protection degree	IP 34 to GOST 14254	
Range of working temperatures, °C	from -45 to +45	
Weight of KIP with BSZ assembled, kg, no more than	18	

Conventions

KIP XXXXXX-BSZ-10-1 *TU 3435-027-24707490-2010, OKPD2 27.12.31.000*

Number of channels of BSZ:
1 or 2 – for BSZ-10;
2 or 4 – for BSZ-1;

Nominal current of joint protection unit:
10 – for BSZ-10;
1 – for BSZ-1;

Built-in unit:
BSZ – joint protection unit;

Conventional value KIP HS (see p. 59)

PROTECTION GROUND UNIT (UZZ)

for KIP HS and KIP HS.TN

BUILT-IN EQUIPMENT

Application area

Protection ground unit (UZZ) are designed for embedding in KIP HS and KIP HS.TN and used for lightning protection of pipelines and other metal constructions.

KIP with UZZ is a plastic column with built-in board with the device of protection against impulse overvoltage and noises.

Technical data

Parameter name	Value	
	UZZ.50 L	UZZ.100 L.VZ
Kind of plastic stand	triangular	square
Class of pulse current according to GOST IEC 62561-3	N	H
Pulse current, kA	50	100
Explosion-proof device of protection against pulse overvoltage and noise	no	yes
Insulation resistance, MOhm, not less	100	
Protection degree	IP 34 to GOST 14254	
Range of working temperatures, °C	from -40 to +45	from -60 to +60
Weight of KIP with UZZ assembled, kg, no more than	18	
Grounding	Galvanized strip 5x50xL, where L – length of strip	

Conventions

KIP XXXXXX-UZZ-100-20.VZ *TU 3435-027-24707490-2010, OKPD2 27.12.31.000*

- **The discharger execution:** B3 – explosion-proof;
- **Length of the grounding conductor, m;**
- **Pulse current of the discharger, kA;**
- **Built-in unit**: UZZ – protection ground unit;
- **Conventional value KIP HS** (see p. 59)

CURRENT CONTROL UNIT (UKT)

for KIP HS and KIP HS.TN

BUILT-IN EQUIPMENT

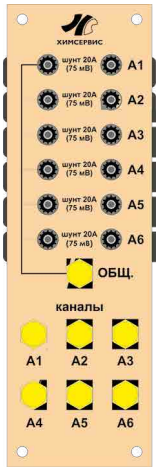
Application area

Current control unit (UKT) are designed for embedding in KIP HS and KIP HS.TN and used for measurement of the current of anode groundbeds and protectors.

KIP can be equipped with 1-4 UKT units.

UKT board has special stationary interchangeable instrument shunts (4 or 6 pcs), and also measuring and power terminals. UKT board with six shunts is presented in the following figure.

Ratings of instrument shunts: 1A/75mV or 20A/75mV (on request it is possible to install other shunts, with a rated current of no more than 50 A).



Technical data

Parameter name	Value	
Type of instrument shunts	1 A/75 mV	20 A/75 mV
Accuracy of instrument shunts, %, no more than	0,5	
Protection degree	IP 34 to GOST 14254	
Range of operation temperatures, °C	from -40 to +50	
Weight of KIP with UKT assembled, kg, no more than	18	

Conventions

KIP XXXXXX-UKT-20-4 *TU 3435-027-24707490-2010, OKPD2 27.12.31.000*

Number of instrument shunts in UKT:
4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 pcs.;

Nominal current of measuring shunt UKT:
1, 20 A;

Built-in unit:
UKT – current control unit;

Conventional value KIP HS (see p. 59)

ZIP MENDELEEVETS

CONSUMABLES, INSTRUMENTS AND SPARE PARTS

for KIP HS and KIP HS.TN

ZIP1 – Consumables and spare parts for KIP HS

Name of included items	Quantity
1. Marker, pcs.	2
2. Key for cover, pcs.	2
3. Triangular marking labels, pcs.	100
4. Quadrangular marking labels, pcs.	100
5. Plastic clamps, pcs.	200
6. Joint for measuring terminal, pcs.	50
7. Joint for power terminal, pcs.	50

Name of included items	Quantity
8. Measuring terminal, pcs.	20
9. Power terminal, pcs.	20
10. Sticker «W-08», pcs.	10
11. Label «Power and measuring terminals», pcs.	10
Packing sheet, pcs.	1

ZIP2.X – Consumables and spare parts for KIP HS

Name of included items	Quantity
1. Consumables and spare parts ZIP1 for KIP HS, sets	2
2. Board (12-4) (without terminals), pcs.	2
3. Board (0-8) (without terminals), pcs.	2
4. Cover, pcs.	5
5. Air diffuser, pcs.	5
6. Triangular cap, pcs.	4
7. Square cap, pcs.	4

Name of included items	Quantity
8. Bottle of paint (20 ml), pcs.	2
9. Cushion (sponge) for paint, pcs.	2
10. Stencil plate of numbers, pcs.	4
11. Agriculture textile (9 m²), pcs.	4
12. Spanner 13x17, pcs.	1
13. Spanner 10x12, pcs.	1
Packing sheet, pcs.	1

Modifications of ZIP2

Name	Color of cover	Caps
ZIP2.1	white	Triangular blue – 1 piece, Triangular green – 1 piece, Triangular yellow – 1 piece, Triangular red – 1 piece, Square blue – 1 piece, Square green – 1 piece, Square yellow – 1 piece, Square red – 1 piece

Name	Color of cover	Caps
ZIP2.2	yellow	Triangular red – 4 pcs., Square red – 4 pcs.
ZIP2.3	red	Triangular red – 4 pcs., Square red – 4 pcs.

Note – It is possible to change variants of modifications on request of the customer

ZIP3 – Consumables and spare parts for KIP HS with BSZ

Name of included items	Quantity
1. Diode for BSZ 10 A, pcs.	10
2. Diode for BSZ 1 A, pcs.	10
3. Varistor, pcs.	10
4. Measuring shunt resistor for BSZ 10 A, pcs.	2
5. Measuring shunt resistor for BSZ 1 A, pcs.	2
6. Variable resistor for BSZ 10 A, pcs.	2
7. Variable resistor for BSZ 1 A, pcs.	2
8. Finger grip of resistor for BSZ 10 A, pcs.	2

Name of included items	Quantity
9. Finger grip of resistor for BSZ 1 A, pcs.	2
10. Board BSZ 10 A (without components), pcs.	1
11. Board BSZ 1 A (without components), pcs.	1
12. Measuring terminal, pcs.	6
13. Power terminal, pcs.	2
14. Measuring terminal of the shunt resistor, pcs.	2
Packing sheet, pcs.	1

IPZ MENDELEEVETS

INFORMATIVE-WARNING SIGNS

Application area

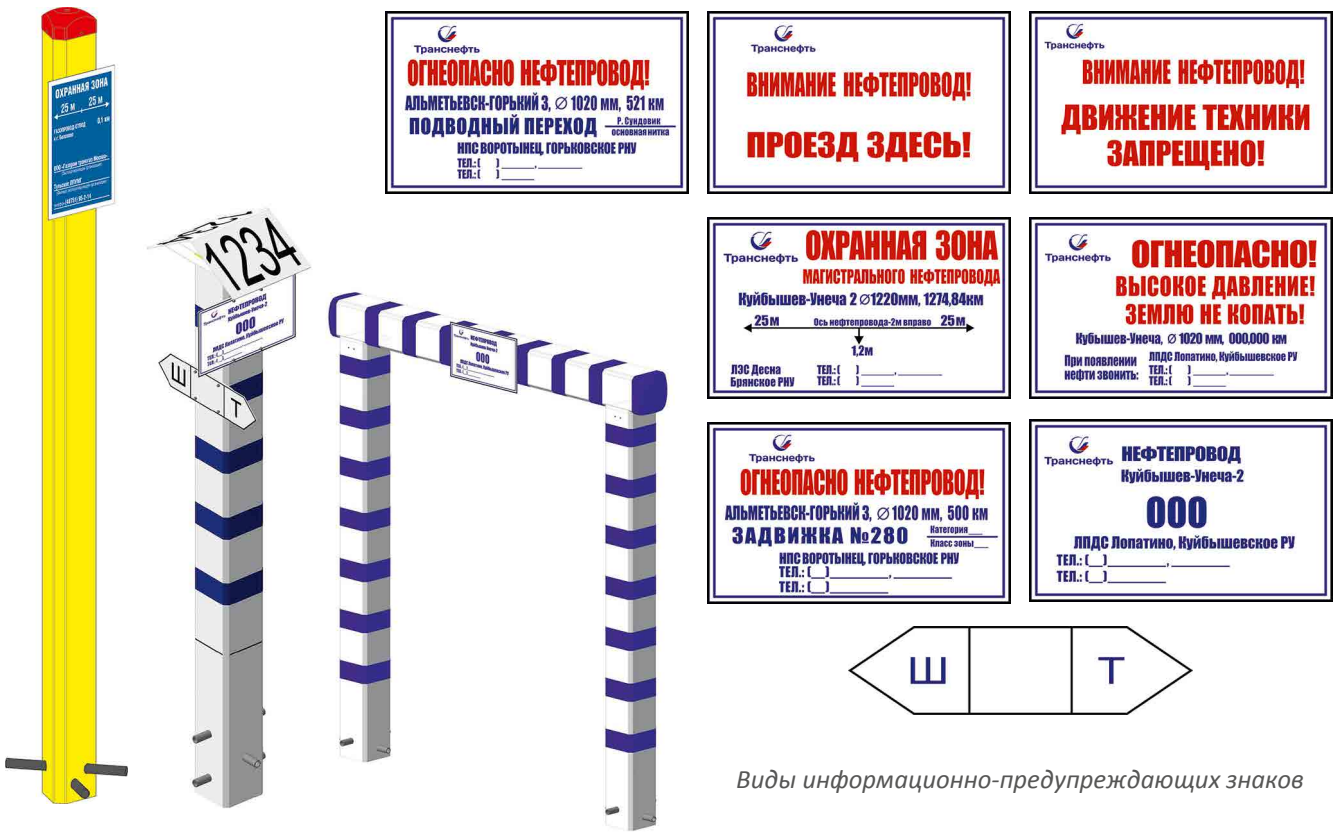
Informative-warning signs are intended to indicate protective zones, routes, tracks, crosses, to separate zones of responsibility, names of oil-and-gas pipelines and other marks on the routes of pipelines.

To control routes from the air the informative-warning signs may be equipped with distance marks (head covers).

The informative-warning signs are installed on the triangular or square stands or on the U-shaped stands.

Advantages:

- modern design and aesthetic appearance;
- the use of plastic provides:
  - light weight products;
  - resistance to the surrounding environments;
  - the application of information in the factory;
  - reduced maintenance costs;
  - long service lifetime;
- bright marking;
- this material does not sustain combustion.



Виды информационно-предупреждающих знаков

Conventions

IPZ stands, informative-warning signs and distance marks are ordered separately. To order IPZ stand use the following convention:

IPZ HS.1.2.3

Variant of color scheme:
determined by the questionnaire;

Stand type:
1 – triangular (face 180 mm, height up to 4400 mm), white,
12 – triangular (face 180 mm, height up to 4400 mm), yellow,
2 – square (face 200 mm, height up to 4400 mm), white,
22 – square (face 200 mm, height up to 4400 mm), yellow,
3 – U-shaped information sign(face 200 mm, height 2500 mm), white,
32 – U-shaped information sign(face 200 mm, height 2500 mm), yellow,
4 – Stand for technological scheme (face 180 mm, height 2500 mm), white,
42 – Stand for technological scheme (face 180 mm, height 2500 mm), yellow;

Signal cap color:
1 – blue (pipelines of production facilities);
2 – yellow (main pipelines);
3 – green (underground storage pipelines);
4 – red (gas distribution pipelines);

Product type: informative-warning sign IPZ HS

To order informative-warning signs use the following convention:

IPZ HS.AL.XX

Number of color scheme:
determined by the questionnaire;

Size of informative-warning sign:
determined by the questionnaire;

Designation of informative-warning sign:
UT – triangular sign,
UTP – warning triangular sign,
SCHU – shield-sign (rectangular),
UPD – two-way turn sign

To order distance marks use the following convention:

IPZ HS.KZL.Y.XX

Method of applying color information:
1 – paint with stencil,
2 – adhesive film;

Designation of the column on which the distance mark is mounted:
1 – triangular,
2 – square;

Size of the distance mark

DSK-1 MENDELEEVETS

CORROSION RATE SENSOR

Certification: EEU,
Russian Maritime Register
of Shipping

Application area

Corrosion rate sensor DSK-1 Mendeleevets is used for measurement of the depth and the rate of corrosion of underground steel pipelines. The sensors give the opportunity to estimate efficiency of electrochemical protection of underground metal construction and to detect the degree of corrosion danger.

The sensors are installed stationary in the ground in close proximity the underground steel construction.

Advantages

- Precision and stability of measurements do not depend on the measuring device, it is provided with the sensor by means of built-in measuring scheme;
- Built-in permanent (nonvolatile) memory for storage of data;
- It's not needed any special display instrument;
- Digital communication interface can be connected to laptops, pads, telemetry systems and so on;
- Built-in scheme of temperature compensation of measures.

Technical details

Type of the sensor is resistive. The working principle is based on measuring the resistance of steel active element and recording the changes of its thickness in time as a result of corrosion. The sensor allows to determine the depth of corrosion and the rate of corrosion of underground metal construction.

Measuring scheme and permanent (nonvolatile) memory are built in the sensor and this construction provides precision and stability of measurements.

Depending on the construction there are two types of sensors:

DSK-1-1.5 – are intended for zones with high corrosion with corrosion rate more than 0.3 mm/year;

DSK-1-0.7 – are intended for zones with raised corrosion with corrosion rate from 0.1 to 0.3 mm/year, and for zones with moderate corrosion with corrosion rate less than 0.1 mm/year.

Technical data

Parameter name	Value	
	DSK-1-0.7-XX	DSK-1-1.5-XX
Useful life, mm, no less than	0,5	1,1
Measurement resolution of corrosion, mcm, no more than	4	5
Limits of allowed absolute deviation of corrosion measurement, mcm, no more than	±3,5	±10
Limits of allowed additional deviation caused by change of ambient temperature by each 10 °C in the working limits of temperatures, mcm, no more than	±0,4	±1
Working range of supply voltage, V	from 4,25 to 5,25	
Useful current, mA, no more than	270	
Volume of internal non-volatile memory of the sensor provides measurements data storage, no less than	150	
Communication interface	RS232*	
Climatic modification of the sensor	UHL 5	
Limits of working temperatures, °C	from minus 20 to plus 45	
Dimensions not including cable (LxWxH), mm, no more than	130x55x25	
Weight of the sensor with cable and connector, kg, no more than	2	
Service lifetime in conditions of effective ECP, years, no less than	5	

**Attention! For connecting to a PC the USB cable is required.*
You should include USB cable into your order at the first purchase of DSK-1.

Conventions

DSK-1-X.X-XX *TU 3435-036-24707490-2015, OKPD2 28.99.39.190*

Nominal cable length:
7, 10 or 13 m;

The thickness of the active element:
0.7 or 1.5 mm;

Type of the sensor:
corrosion rate sensor

ESZ MENDELEEVETS

ZINC REFERENCE ELECTRODE

NEW

ESZ-1

ESZ-2

Application area

Zinc reference electrode ESZ Mendeleevets is used in the electrochemical protection systems for measuring construction potential relative to the environment. The electrodes have 2 modifications – ESZ-1 and ESZ-2.

Electrodes ESZ-1 and ESZ-2 are installed direct in water, including sea water.

Electrodes ESZ-2 are also intended for installation in water electrolyte solutions – commercial water from watery oil, naphtha, diesel fuel, gas condensate, black oil, vacuum gas-oil.

Technical details

ESZ-1 represents itself a zinc electrode electrically connected to a measuring cable, installed in a plastic casing and sealed with a compound.

ESZ-2 represents itself a zinc electrode installed in a fluoropolymer casing and sealed by cable entries.

For connection to a terminal block, the measuring cable of electrodes is equipped with a cable termination. The joint of the measuring cable and the cable termination is insulated by a heat shrink tube.

Technical data

Parameter name	ESZ-1	ESZ-2
Potential relative to silver chloride electrode, mV	970±15	
Resistance to spreading, Ohm, no more than	100	
Dimensions not including cable (LxWxH), mm, no more than	130 x 55 x 25	215 x 35 x 35
Weight without cable, kg, no more than	0,3	0,4
Service lifetime, years, not less than	15	

Conventions

ESZ-1-7-VPPO

TU 28.99.39-039-24707490-2017 (instead TU 3435-039-24707490-2016), OKPD2 28.99.39.190

Measuring cable type: VPPO or PKZ-FF-ng(A);

Measuring cable lenght: 7, 10 or 13 m (more – if required);

Reference electrode type: ESZ – zinc reference electrode

SVNE-1 MENDELEEVETS

ELECTRONIC OPERATING TIME COUNTER

Application area

The counter is used for recordkeeping of operating time of equipment (cathodic protection stations, machines, devices, etc.). It can be built in the new equipment and used at repair for replacement of failed electromechanical and other counters of operating time.

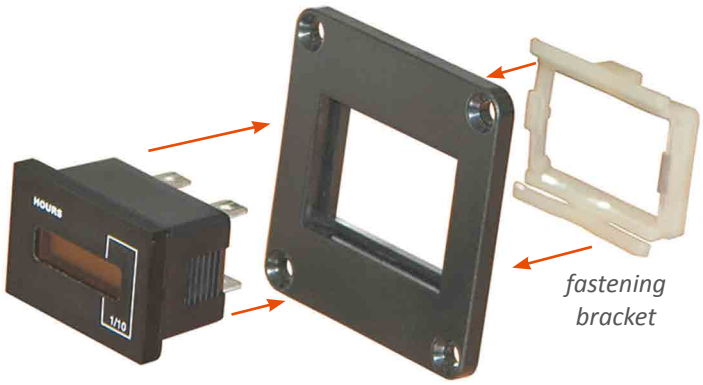
Technical details

Operating time counter is a module in a tight case. At the back side of the counter there are clamps for connecting it to the equipment.

A transition plate is used in order to match the counters SVNE-1 and SVN2-01, SVN2-02 or equal. The counter is fastened with a fastening bracket.

The counters are produced in two modifications: SVNE-1-1 and SVNE-1-2, the difference is in the nominal current resistance. Counting of operating time begins at the moment of supplying power to the counter and continues until the moment of turning off the power.

The counters have built-in permanent (nonvolatile) memory EEPROM, that gives the opportunity to store the data about operating time more than 10 years without supplying any power. Operating time value is shown on the LCD (6 digits).



Counter SVNE-1 *transition plate*

Advantages:

- possibility to fit with models SVN2-01, SVN2-02 or some equal counters with the help of transition plate;
- a continuous range of operating voltages for both DC and AC;
- high reliability because of the absence of mechanical parts.

Technical data

Parameter name	SVNE-1-1	SVNE-1-2
Supply voltage, V*		
DC	12...48	48...150
AC	20...60	100...230
Current consumption, no more than, mA	0,8 (12 V)	2,0 (230 V)
Display time step, hour	0,1	
Max value of accounted time, hours	99 999,9 (11,4 years)	
Weight of the counter with fastening bracket, kg, no more than	0,03	
Weight of the set in a pack, kg, no more than	0,05	
Dimensions (L×W×H), mm, no more than	60×60×35	
Oprating temperature range, °C	from minus 45 to plus 80	
Service lifetime, years, not less than	10	

** It is possible to deliver counters with other supply voltage range*

Conventions

SVNE-1-1 or **SVNE-1-2** *TU 4282-012-24707490-2006, OKPD2 26.52.28.110*

SVNE-2 MENDELEEVETS

ELECTRONIC OPERATING TIME COUNTER

Application area

The counter is used for recordkeeping of operating time of cathodic protection stations. It can be built in the new equipment and used at repair for replacement of failed electromechanical and other counters of operating time.

Technical details

The operating time counter SVNE-2 is made in plastic case designed for mounting on DIN lath 35 mm wide in accordance with GOST of R IEC 60715 or on the mounting board.

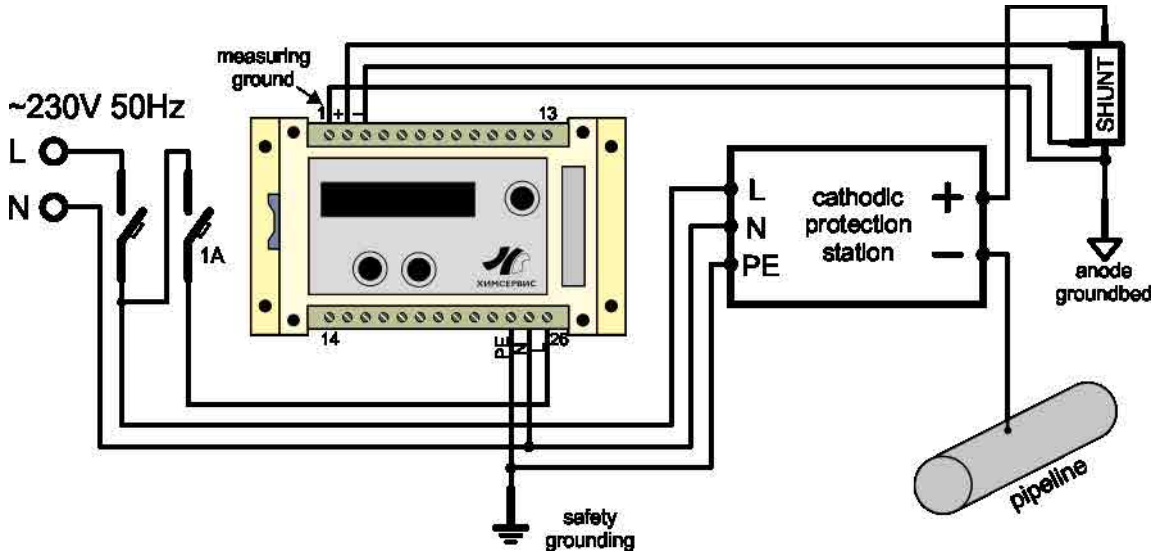
On the front panel of the counter there are:

– display;
– control buttons K1 and K2;
–USB connector for PC.

At the top and at the bottom there are terminals for connecting power supply and shunt.

The basis of the counter is the quartz resonator of the stabilized electric fluctuations. The signal from the resonator arrives on the microcontroller which carries out the accounting of time and information output on the LED display in the form of decimal number with one category after a comma.

Operation hours are stored in the built-ferroelectric RAM.



Typical connection scheme of SVNE-2

Advantages:

– the accounting of operating time on two channels: voltage and output current cathodic protection station;
– possibility to connect external operating time counter on current;
– saving of counting values, facts of switching on and off in the permanent (nonvolatile) memory;
– protection against overvoltage and impulse noise;
– galvanic isolation of measuring circuit;
– powered by USB in order to take readings with the power off

Technical data

Parameter name	Value
Allowed counting time error, %, no more than	0,2
Range of time tracking, hours	0 ÷ 99 999,9
Step, hour	0,1
Setpoints of a threshold for current counting, mV	0,1; 0,2; 0,3; 0,4; 0,5; 0,6; 0,7*
Current consumption from battery, mcA, no more than	4,5
The breakdown voltage of insulation of galvanic isolation of the measuring circuit, V, not less than	1000
Running time	No limits
Protection degree provided with the cover	IP34
Running temperature, °C	from minus 40 to plus 40
Relative humidity at a temperature + 25 °C, %, no more than	95
Average service lifetime, years, not less than	10
Dimensions (LxWxH), mm, no more than	160x100x50
Weight, g, no more than	400

** For shunt 75 mV/150 A – 200 mA; 400 mA; 600 mA; 800 mA; 1000 mA; 1200 mA; 1400 mA*

Delivery set

Name of items for delivery set	Quantity
Electronic operating time counter SVNE-2	1
Battery CR2032	1
USB cable (A)	according to the order
Operation manual	1
Packaging	1

Conventions

SVNE-2 *TU 4282-037-24707490-2014, OKPD2 26.52.28.110*

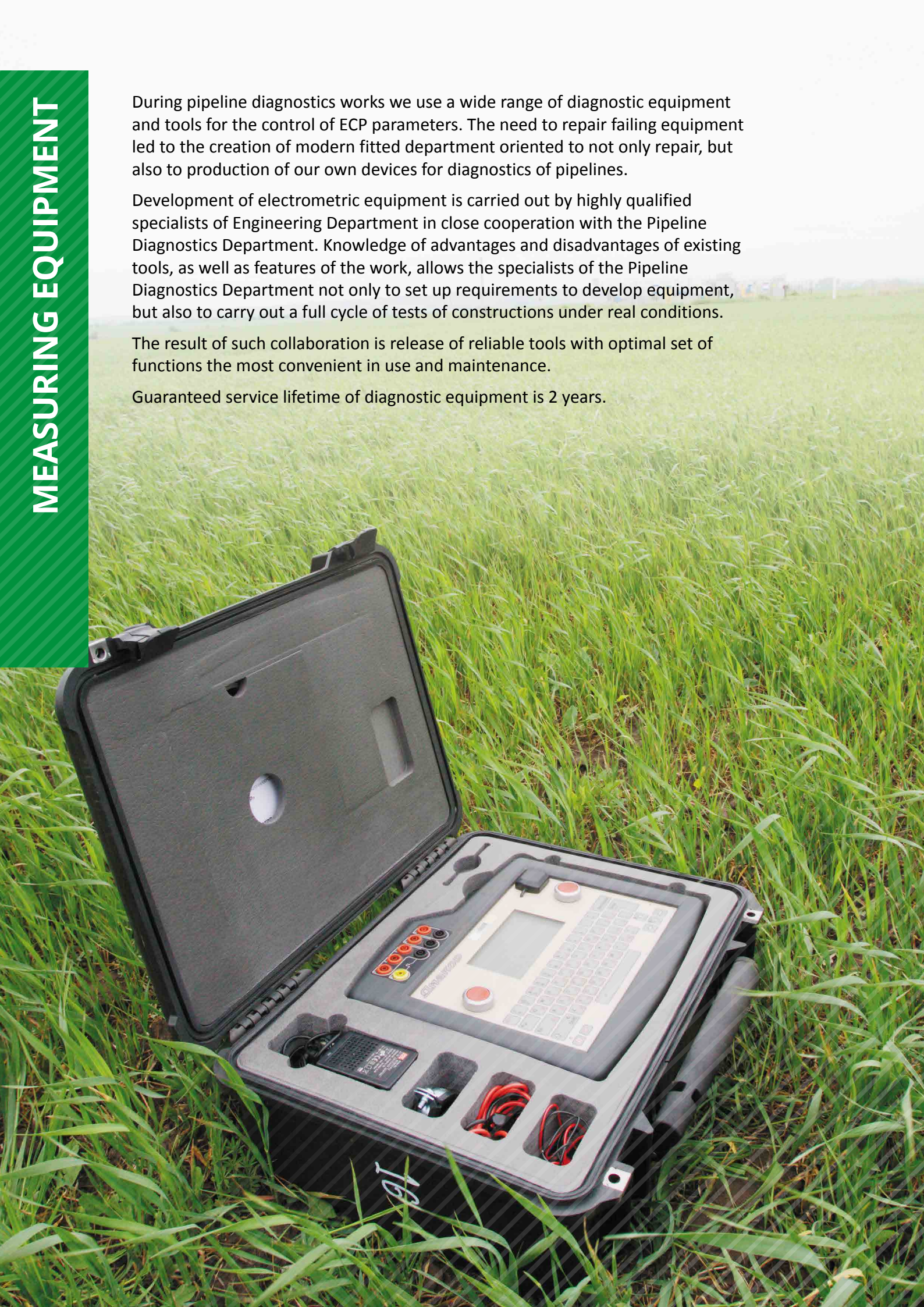
MEASURING EQUIPMENT

During pipeline diagnostics works we use a wide range of diagnostic equipment and tools for the control of ECP parameters. The need to repair failing equipment led to the creation of modern fitted department oriented to not only repair, but also to production of our own devices for diagnostics of pipelines.

Development of electrometric equipment is carried out by highly qualified specialists of Engineering Department in close cooperation with the Pipeline Diagnostics Department. Knowledge of advantages and disadvantages of existing tools, as well as features of the work, allows the specialists of the Pipeline Diagnostics Department not only to set up requirements to develop equipment, but also to carry out a full cycle of tests of constructions under real conditions.

The result of such collaboration is release of reliable tools with optimal set of functions the most convenient in use and maintenance.

Guaranteed service lifetime of diagnostic equipment is 2 years.



DIACOR

UNIVERSAL DIAGNOSTIC METER

Registered in the State Register of approved measuring instruments of Russian Federation, Republic of Kazakhstan, Republic of Belarus, Republic of Kyrgyzstan

Recommended to use at the objects of Gazprom

Sertification: EEU

ЛУЧШИХ ТОВАРОВ РОССИИ 2016

Application area

Universal diagnostic meter Diacor is designed for diagnostics of state of underground pipelines isolating coverings and control of the CP systems.

Capabilities

– control of the cathodic protection working system:
  • measurement of pipe-ground potentials (intensive measurements),
  • measurement of the gradients of the AC voltage in the ground (method of IDD (insulation damage detection)),
  • study of signal forms of the cathodic protection system;
– measurement of polarization potential with the method of switching off of the auxiliary electrode;
– detection of the pipeline axis;
– detection of the depth of the pipeline and non-contact measurement of the variable component of the current in the pipeline;
– recording of stray currents;
– determination of absolute coordinates in GPS system;
– recording of all measured parameters in the built-in memory;
– data transfer to the stationary or mobile computer.

Advantages:

– display and full-sized keyboard for convenient usage;
– the dust- and waterproof body for working in the field;
– intuitive interface;
– convenient program of data processing.

Intensive measurements

The method of intensive measurements is the closely spaced measurements of enable potentials, disable potentials and their gradients at fixed modes of cathodic protection installations affecting the protection of the surveyed section of the pipeline, and further computer processing of the measurement results.

Intensive measurements with the use of current interrupters for measurement of the switch-off potential (polarization potential) may be taken by following methods:
– two-electrode method;
– three-electrode method;
– additive method.

It should be noted that it is possible to measure the side gradient simultaneously on DC and AC that significantly reduces labor costs at intensive measurements.

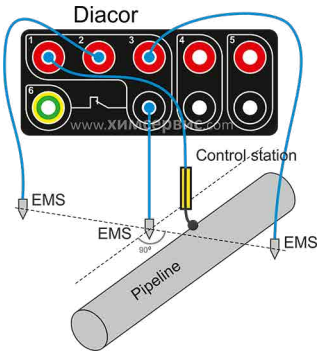
In the mode of measurements on the AC it is possible to use two types of filters: bandpass and rejection. A bandpass filter passes a narrow frequency range. All other frequencies, below or above the narrow bandwidth, are significantly suppressed. A rejection filter suppresses or eliminates signals frequencies of which fall into a narrow range with the specified frequency.

A distinctive feature of Diacor is the advanced measurement capabilities of the polarization potential by the method of disconnecting the auxiliary electrode (in accordance with GOST 9.602). In this mode, program will register more than 1000 values, so you can view the device screen and record a graph of measurements for further analysis.

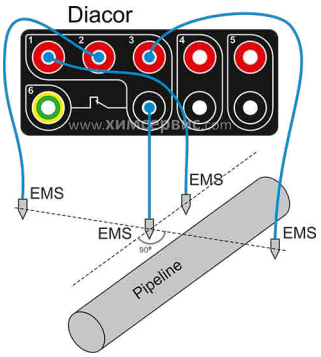
Technical data

Parameter name		Value
Number of measuring channels		6
Measuring ranges DC voltage:	channel 1, 2, 3, V channel 4, V channel 5, mV	from -100 to +100 from -360 to +360 from -100 to +100
Measuring ranges AC voltage:	channel 2, mV channel 4, V	from 0 to 1000 from 0 to 250
Frequency range of the measured AC voltage 2, 4 channel, Hz		40 ÷ 2000
Measurement range DC, channel 6, mA		from -10 to +10
Limits of allowed measurement deviation, %: – measurement of DC voltage: – measurement of AC voltage: – DC measurement:	 channel 1, 2, 3 and 5 channel 4 channels 2, 4 channel 6	 ±0,3 ±1 ±1 ±1
Level of suppression of industrial interference with a frequency of 50 and 100 Hz on channels 1 DC, 2 DC, 3 DC and 5, dB, not less than		40
Limits of allowed additional deviation caused by change of ambient temperature by each 10 °C in the working limits of temperatures, %, no more than		±0,5
Input resistance, channels 1, 2 and 3 DC, MOhm, not less than		10
Input resistance, channel 2 AC, MOhm, not less than		1,87
Input resistance, channel 4, MOhm, not less than		10
Input resistance, channel 5, kOhm, not less than		200
Input resistance, channel 6, Ohm, no more than		10
Installed flash memory volume, Mb		32
Graphic display, pixels		240×128
Full-sized keyboard		59 keys
Built-in battery		Li-Ion 9600 mA·h
Power adapter voltage, V		12
Operation time without recharging the battery, h, not less than		15
Interface of connection with PC		USB
Working temperature range, °C		from -10 to +50
Dimensions of a device (length, width, height), mm, no more than		340×290×85
Dimensions of a standard set (length, width, height), mm, no more than		500×470×200
Weight of a device, kg, no more than		3
Weight of a standard set in assembly, kg, no more than		10
Dust- and waterproof body		IP65
Service lifetime, years, not less than		5

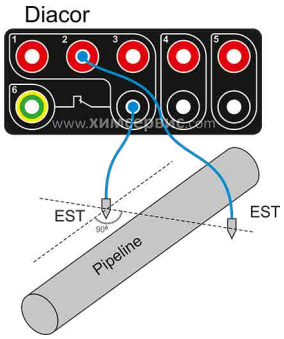
Typical schemes of the device connection



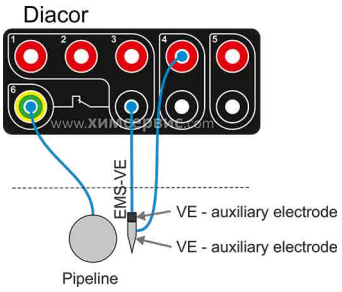
Intensive measurements by three-electrode method



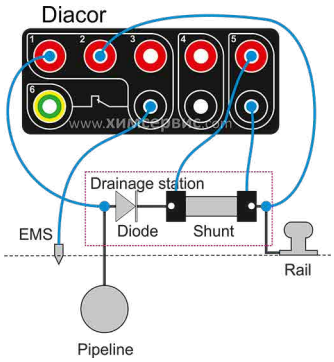
Intensive measurements by additive three-electrode method



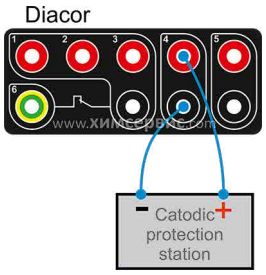
Measuring of the gradients of the AC in the ground (method IPI)



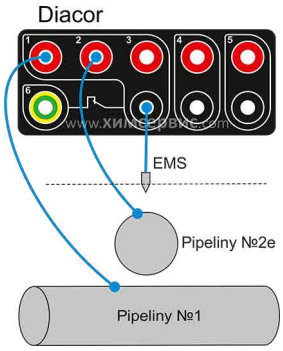
Polarization potential measurement



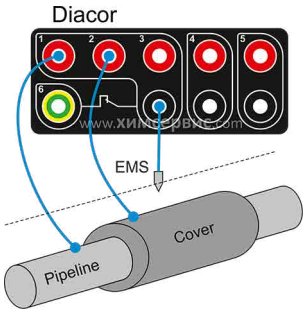
Measurements at the drainage protection station



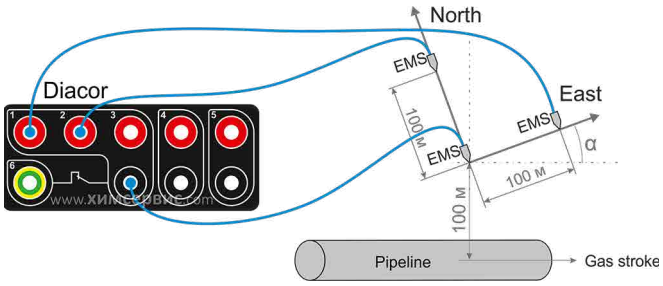
Recording of oscillogram of cathode protection station



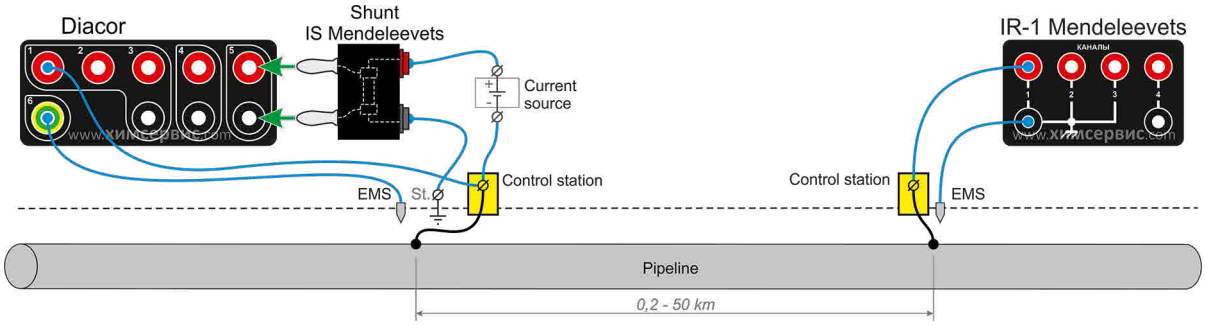
Measurements on crossing of pipelines



Measurements at road crossing



Detection of stray currents vector in the ground



Cathodic polarization of the pipeline at the stage of construction completion

Standard delivery set of Diacor

Name of items for delivery set	Quantity
Universal diagnostic meter Diacor	1
Power adapter	1
Car adapter	1
Measuring wires	set
Auxiliary cables	set
Regular belt	1
Certificate of checking	1
Operation manual	1
Software	set
Carry case	1

Diacor delivery set with search module

Name of items for delivery set	Quantity
Standard delivery set of Diacor	1
Search module in the carry case	1

Diacor delivery set with search module, additional and auxiliary equipment

Name of items for delivery set	Quantity
Standard delivery set of Diacor with search module	1
Additional equipment:	
Cable drum with sliding contacts KSK−1 Mendeleevets with the cable GUSP-141 the length of 1000 m	1
Anatomic back frame ST−1	1
Copper-sulphate depolarized portable electrode: - EMS−1,2 Mendeleevets with cable of the length 5 m - EMS−0,4 Mendeleevets with cable of the length 2 m - EMS−VE Mendeleevets with cable of the length 5 m	 3 1 1
Steel portable electrode EST Mendeleevets with cable of the length 5 m	2
Case for electrodes	1
Auxiliary equipment:	
Current interrupters PT-1	4

Conventions *TU 4276-022-24707490-2008, OKPD2 26.51.66.127*

– Standard delivery set of Diacor;
– Diacor delivery set with search module;
– Diacor delivery set with search module, additional and auxiliary equipment

IR-1 MENDELEEVETS

MULTI-CHANNEL VOLTAGE METER-LOGGER

Registered in the State Register of approved measuring instruments of Russian Federation, Republic of Kazakhstan, Republic of Belarus, Republic of Kyrgyzstan

Recommended to use at the objects of Gazprom

Sertification: EEU

Application area

Multy-channel voltage meter-logger IR-1 Mendeleevets is designed for measuring and recording of parameters of ECP and stray currents.

Advantages

– four measuring channels (see typical connection schemes);
– LCD display and keyboard for programming and visual control of measuring;
– two modes of measuring: manual and automatic;
– isolated channel for measuring current at 75 mV shunt;
– possibility to comment;
– shock-resistant and moisture proof case;
– convenient data processing;
– possibility of small currents registration in process of cathodic polarization with the use of a shunt SHI Mendeleevets (p. 93).

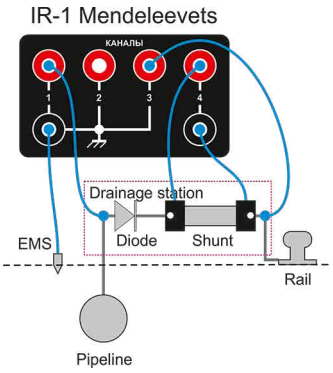
Technical data

Parameter name	Value
General number of measuring channels	4
Measuring range: Channel 1 and 2, V Channel 3, V Channel 4, mV	 ±1/±10 ±10/±100 ±100
Measuring deviation, %	0,3
Additional deviation caused by change of ambient temperature by each 10 °C in the working limits of temperatures, %, no more than	± 0,5
Level of suppression of industrial interference with a frequency of 50 and 100 Hz, dB, not less than	40
Input resistance, channels 1, 2 and 3, MOhm, not less than	10
Input resistance, channel 4, kOhm, not less than	200
Installed flash memory volume, Mb	4
Built-in battery: – type of battery – capacity, mA·h	 Li-Ion 4800
Operation time without recharging the battery, h, not less than	24
Interface of connection with PC	USB
Working temperature range, °C	from minus 10 to plus 50
Dimensions of a device (LxWxH), mm	210x165x91
Weight of the logger, kg, no more than	1,5
Weight of a set in a package, kg, no more than	4,0
Service lifetime, years, not less than	5

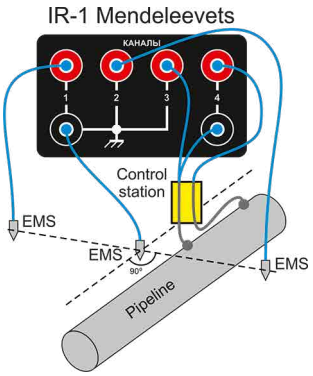
Delivery set

Name of items for delivery set	Quantity
Multi-channel meter-logger IR–1 Mendeleevets	1
Power adapter	1
Car adapter	1
Measuring wires	set
USB cable for connecting with PC	1
Certificate of checking	1
Operation manual	1
Software	set
Carry case	1

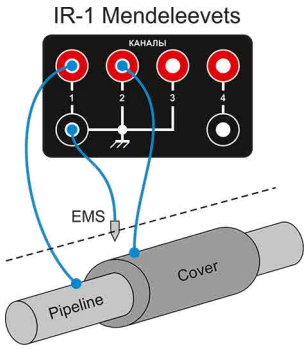
Typical schemes of the device connection



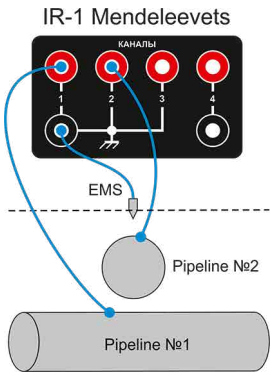
Measurements at the drainage protection station



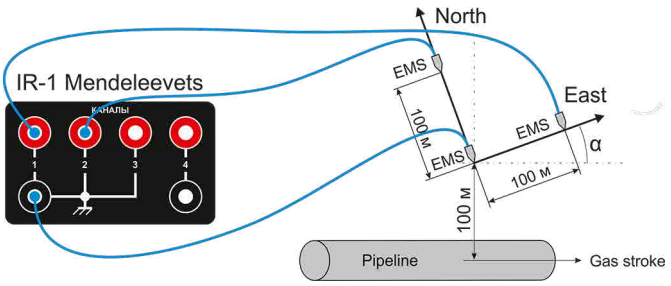
Measurements of current in the pipeline, potential and gradients of the land of stray currents



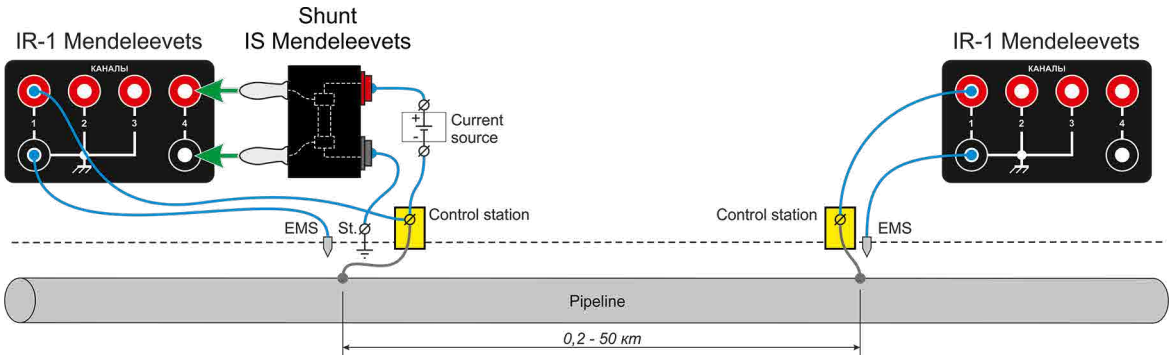
Measurements at road crossing



Measurements on crossing of pipelines



Detection of stray currents vector in the ground



Cathodic polarization of the pipeline at the stage of construction completion

Conventions

IR-1 *TU 4318-009-24707490-2016 (instead TU 4318-009-24707490-2005), OKPD2 28.99.39.190*

IR-2M MENDELEEVETS

3-CHANNEL VOLTAGE METER-LOGGER

NEW

Registered in the State Register of approved measuring instruments of Russian Federation

Application area

Voltage meter-logger IR-2M Mendeleevets is designed for measuring and recording of parameters of ECP and stray currents.

Logger IR-2M Mendeleevets provides:
– measurement of DC voltage on 3 channels;
– recording the values of the measured voltages in the internal non-volatile memory with a programmed frequency;
– galvanic isolation of the third channel;
– autonomous work for more than 2 days with power supply from the built-in accumulator;
– work from an external power supply with a voltage of 5 V.

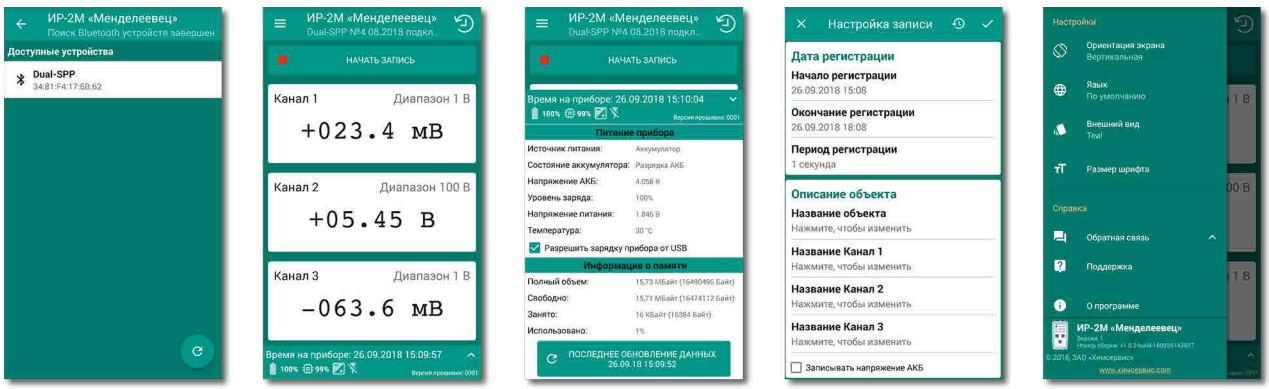
IR-2M is equipped with a Bluetooth module that provides wireless information exchange with Android smartphones. The special application «IR-2M Mendeleevets» displays current values of voltage and allows to configure registration parameters. The application is free and available on GooglePlay and the official company website.

The meter-recorder has compact dimensions which allow to place it almost anywhere, for example, inside control station (KIP HS).

The instrument casing provides the protection degree IP65 (according to GOST 14254).

The casing is equipped with terminals for connection to a measured circuit, USB connectors and power (charging) connectors, as well as the block of three functional buttons:
- power ON/OFF,
- Bluetooth ON/OFF,
- start/stop of measurements.

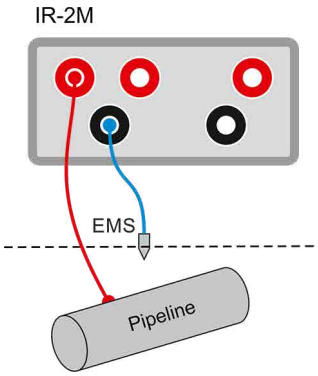
The recorder also provides connection to a personal computer via its USB-interface for displaying the values of measured voltages, settings of registered parameters, transferring the recorded data from the internal non-volatile memory to the personal computer.



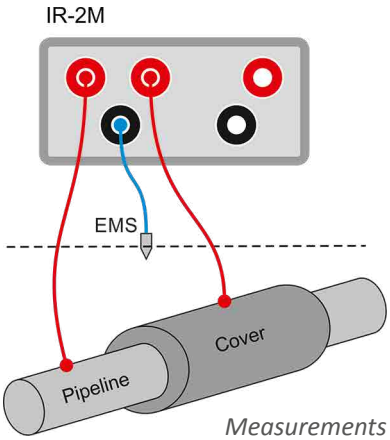
Windows of the mobile application for smartphones «IR-2M Mendeleevets»

Technical data

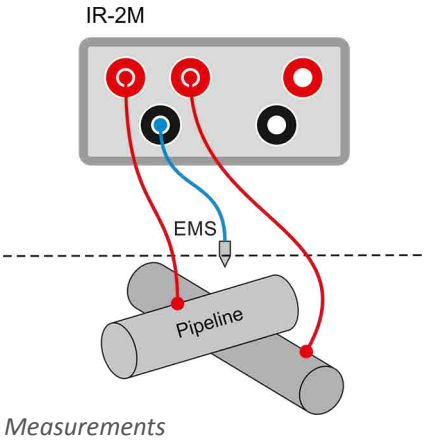
Parameter name	Value
Number of measuring channels	3
Measuring range: Channel 1, V Channel 2, V Channel 3, mV	±1; ±10; ±100 ±1; ±10 ±100; ±1000
The periods of record of measured voltages	0,25; 0,5; 1; 2; 5; 10; 20; 30 second; 1; 2; 10; 30; 60 minut
Input resistance, channels 1, 2 and 3, MOhm, not less than - all channels, except range of 100 V on channel 1 - range of 100 V on channel 1	 400 10
Power supply	Li-Pol battery
Operation time without recharging the battery, h, not less than	48
The volume of internal non-volatile memory, MB	16
Dimensions of a device (LxWxH), mm	140x80x30
Weight of the logger, kg, no more than	0,25
Working temperature range, °C	from minus 20 to plus 55
Service lifetime, years, not less than	5



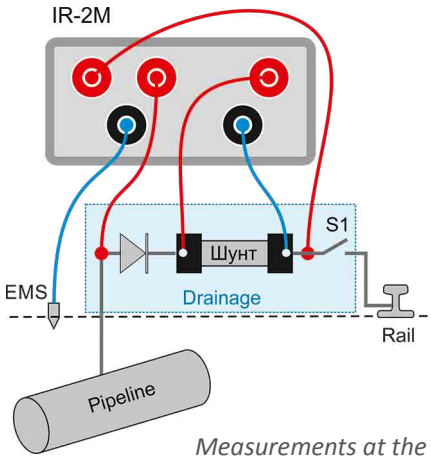
Pipeline measurements



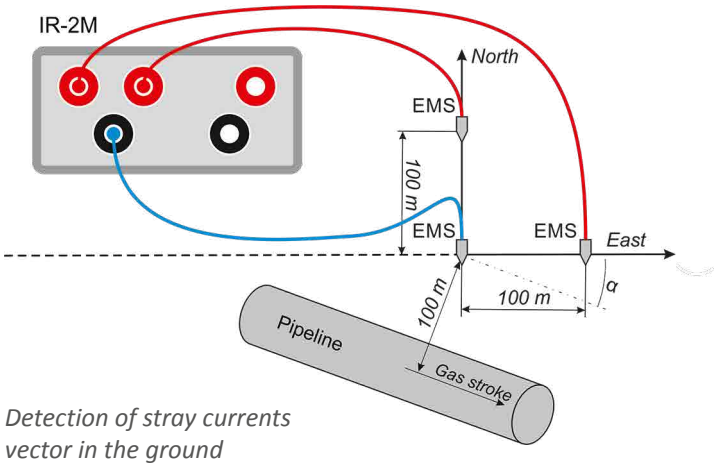
Measurements at road crossing



Measurements on crossing of pipelines



Measurements at the drainage protection station



Detection of stray currents vector in the ground

Conventions: **IR-2M** *TU 28.99.39-048-24707490-2018, OKPD2 28.99.39.190*

IPP-1 MENDELEEVETS

POLARIZATION POTENTIAL METER

Registered in the State Register of approved measuring instruments of Russian Federation, Republic of Kazakhstan, Republic of Belarus, Republic of Kyrgyzstan

Recommended to use at the objects of Gazprom

Sertification: EEU

Application area

Polarization potential meter IPP-1 Mendeleevets is designed to measure the protective (with a resistive component) and polarization (without resistive component) potential of underground construction under the action of cathodic protection.

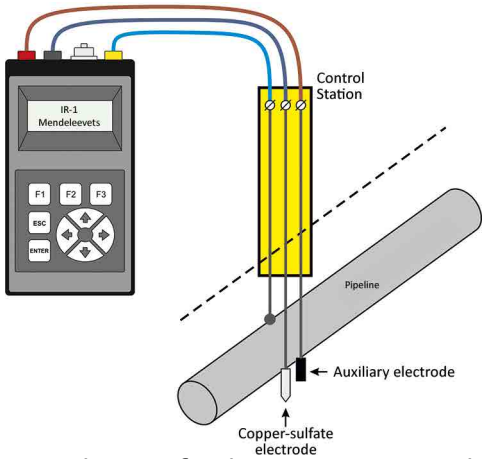
The method of measuring the polarization potential is switching off (OFF) the auxiliary electrode in accordance with GOST 9.602-2016.

Capabilities

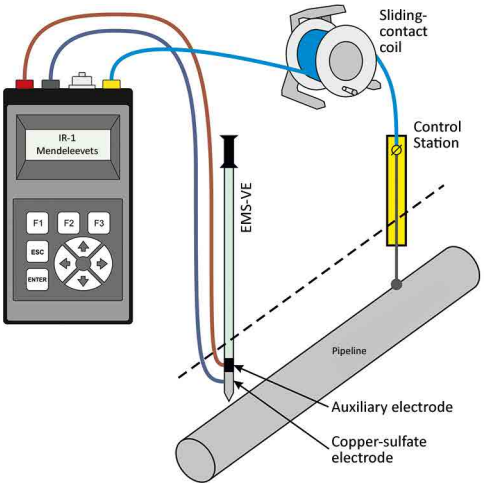
IPP-1 allows to measure polarization potentials:

– at specially equipped control-testing points with installed copper sulphate reference electrode and auxiliary electrode (pic. 1);

– at any place using the copper sulphate reference electrode with the auxiliary electrode EMS-VE Mendeleevets (pic. 2).



Pic. 1. Scheme of polarization potential measurement at the equipped control-testing point



Pic. 2. Scheme of polarization potential measurement using the EMS-VE Mendeleevets

Advantages:
– available to record the parameters automatically with the period from 10 to 24 hours;
– measurement of the variable component of protective current;
– measurement of current of the reference electrode polarization;
– possibility of measurement with different delays;
– interpolation of measurements at a zero moment according to a special algorithm for more accurate measurement of polarization potential.

Technical data

Parameter name	Value
Measurement range: – of polarization potential, V – of potential pipe-ground, V – of voltage, V – of the reference electrode polarization current, mA	 ±2,0 ±10 ±0,2/±2/±10/±100 ±5
Input resistence, MOhm, not less than	10
Quantity of the results stored in the nonvolatile memory, units	5000
Interface of connection with PC	USB
Type of the power source	2 batteries AAA of 1,5 V
Operating temperature range, °C	from minus 10 to plus 50
Dimensions (LxWxH), mm	150x80x38
Weight, kg, no more than	0,2
Service lifetime, years, not less than	5

Delivery set

Name of items for delivery set	Quantity
Polarization potential meter IPP–1 Mendeleevets	1
Measuring wires	set
USB cable for connecting with PC	1
Certificate of checking	1
Operation manual	1
Software	set
Carry case	1

Conventions

IPP-1 *TU 4318-014-24707490-2014 (instead TU 4318-014-24707490-2006), OKPD2 28.99.39.190*

KIT OF THE EQUIPMENT FOR SEARCHING DEFECTS OF PIPELINE INSULATION (IPI)

NEW

Pipeline finder UT-1

Generator GP-1

Electrodes EST

A-frame

Bag for UT-1 with straps

Application area

The kit is intended to search for damages of the insulation of underground metal constructions by the contact method based on alternating current.

Technical details

The kit includes a selective millivoltmeter, a generator, two steel electrodes and an A-frame.

The selective millivoltmeter represents itself a receiving module of the pipeline finder «UT-1 Mendeleevets».

The receiving module has high selectivity and sensitivity allowing to detect even small damages of the insulation of deep-laying metal constructions. Storage of measurement results in a non-volatile memory and displaying the ratio of current measurements to previous ones simplifies localization of damages and data processing.

The mentioned A-frame or steel electrodes of «EST Mendeleevets» are used as working contact electrodes. The A-frame has a fixed distance between electrodes (1 meter, which is convenient for measuring distances) and allows to search for insulation damages by one operator.

Electrodes «EST Mendeleevets» can be separated by a long enough distance, which allows to improve the accuracy of localization of defects and to reveal even the smallest damages at significant depths of laying of metal constructions.

The used signal source: generator «GP-1 Mendeleevets». Its high output power allows to carry out defectoscopy even at a significant distance from the point of connection of the generator to inspected metal constructions.

Delivery set

Name of items for delivery set	Quantity
Receiving module of UT-1 Mendeleevets	1
Bag with straps	1
A-frame	1
Electrodes EST	2
Generator GP-1 Mendeleevets	1
Connecting wires	set

To place the order, please use the following identification code:

Kit of the equipment for searching defects of pipeline insulation (IPI)

UT-1 MENDELEEVETS

UNIVERSAL PIPELINE FINDER

Recommended to use at the objects of Gazprom

Application area

Universal pipeline finder with function of searching of pipeline insulation defects UT-1 Mendeleevets is designed for performance of the following operations:

1) detection of the pipeline axis of underground metal constructions;
2) detection of the depth of metal constructions laying;
3) searching of defects of pipeline insulation (method IPI);
4) integral assessment of protective coverings condition with a non-contact method.

Advantages:

– high sensitivity;
– possibility to change working frequencies on demand of the customer;
– recording of all changed values in the nonvolatile memory;
– direct measurement of the depth of metal constructions;
– non-contact metal construction current measurement;
– searching of pipeline insulation defects (method IPI);
– output of the search signal to the graphic display (in the form of arrows, «analog scale» and digital information) and to the earphone.

Technical details

A search module is used to determine the axis and depth of metal structures. The search module contains three inductive magnetic field sensors, which allows you to simultaneously find the axis of the metal structure and determine its depth.

For searching of insulation damage are used steel electrodes EST Mendeleevets or A-frame. A-frame has a fixed distance between the electrodes and allows one operator to search for insulation damages. Electrodes EST Mendeleevets can be spaced over a long distance, that improves the accuracy of the localization of defects. High selectivity and sensitivity allow to find even small damages at the big depths of occurrence of metal constructions. Storing the results of previous measurements in non-volatile memory and displaying the ratio of current measurements to previous ones, simplify the localization of damage.

Built-in microprocessor allows to calculate the current in the metal structure on the move. Current values can be stored in non-volatile memory and transferred to a computer for information processing. Integral assessment of protective coatings state of metal structures is determined by the decreasing of the current.

Universal pipeline finder UT-1 Mendeleevets allows to search for underground metal structures and insulation damages both on industrial frequency signals (50 and 100 Hz) and signals from the generator GP-1 Mendeleevets.

Technical data

Parameter name	Value
Working frequencies, Hz	50, 100, 128, 1075, 1100*
The minimum strength of the induced AC current in the metal underground construction, necessary to determine the axis of this construction, mA	3**
Measurement ranges of AC voltage, mV	1,0 мВ; 10 мВ; 100 мВ; 1,0 В
Deviation of AC voltage measurement, %	1
Input resistance at measuring of AC voltage for all ranges, MOhm, not less than	2
Volume of nonvolatile memory, Mb	4
Type of the power source – type of battery – capacity, mA·h	 Li-Ion 4800
Operation time without recharging the battery, h, not less than	24
Interface of connection with PC	USB
Working temperature range, °C	from minus 5 to plus 50
Dimensions (LxWxH), mm, no more than – receiving module – search module	 190x110x80 690x140x46
Weight, g, no more than – receiving module – search module	 550 1000
Service lifetime, years, no less than	5

**It is possible to change frequencies on demand of the customer. Choosing of additional frequencies is possible only at the period of ordering the device.*
***At max point of receiving signal and with a distance to the axis of underground metal construction of 1m.*

Delivery set

Name of items for delivery set	Quantity
Receiving module	1
Search module	1
Power adapter	1
Car adapter	1
Measuring wires	set
USB cable for connecting with PC	1
Earphone mono	1
Operation manual	1
Carry case, pcs.	1

Conventions

UT-1 *TU 4276-015-24707490-2007, OKPD2 26.51.66.129*

GP-1 MENDELEEVETS

GENERATOR FOR FINDING PIPELINES

Recommended to use at the objects of Gazprom

Application area

Generator for finding pipelines GP-1 Mendeleevets is designed for direct approach of signal frequency on the metal construction. It is used with the universal pipeline finder UT-1 Mendeleevets or some equal.

Advantages:

– high output power;
– possibility to change working frequencies on demand of the customer;
– sinusoidal waveform of output signal;
– work in a wide range of load resistances;
– protection of output against overload and short circuit;
– easy in use;
– shock-resistant and waterproof case.

Technical data

Parameter name	Value
Main working frequencies, Hz	50, 100, 128, 1075, 1100
Additional working frequencies, Hz	16, 273, 491, 526*
Waveform of output signal	sinusoidal
Max output power, W	60
Max output current, A	2
Load resistance, Ohm	1 ÷ 1000**
Voltage of DC, V	12, 24
Working temperatures range, °C	from minus 10 to plus 45
Dimensions (LxWxH), mm	295x340x150
Service lifetime, years, not less than	5

** It is possible to change frequencies on demand of the customer.*
*** Operates under conditions beyond the specified limits.*

Conventions

GP-1 *TU 4276-023-24707490-2008, OKPD2 26.51.66.129*

PT-1 MENDELEEVETS

CURRENT INTERRUPTER

Application area

Current interrupter PT-1 Mendeleevets is designed for short-term outages of means of underground communications cathodic protection during the measurement of the polarization potential. The interrupter is used together with a universal diagnostic meter Diacor or other devices that support measurement in current interrupt mode.

Technical details

Current interrupter PT-1 Mendelevets includes two modules:
– control module (for control of interrupter work and synchronizing from GPS/GLONASS);
– power module (for switching power circuits).

Both modules are in separate cases with connectors for switching.

Interrupter PT-1 provides:
– enabling and disabling of current of underground communications cathodic protection on the temporary step synchronized by signals of the satellite GPS/GLONASS system;
– the built-in clock synchronization, at loss of signal GPS/GLONASS;
– digital display of all parameters on LCD display;
– programmable operating time.

Technical data

Parameter name	Value
Time steps of the interrupter, sec.	4/1, 4/2, 8/2, 12/3 and one step programmed by the user
Max switching current, A	50
Max switching voltage, V	250
Dimensions (LxWxH), mm, no more than: – control module – power module	 210x165x91 240x165x91
Weight, kg, no more than: – control module – power module	 1,3 2,0

Conventions

PT-1 *TU 3435-028-24707490-2011, OKPD2 27.12.31.000*

SHI MENDELEEVETS

NEW

INSTRUMENT SHUNT

Application area

The instrument shunt is intended to measure direct current (DC) at the use of a special measuring instrument – DC millivoltmeter.

Technical details

Compatibility of the instrument shunt with the meter-recorder IR-1 Mendeleevets and the universal diagnostic meter «Diakor» is provided by its design.

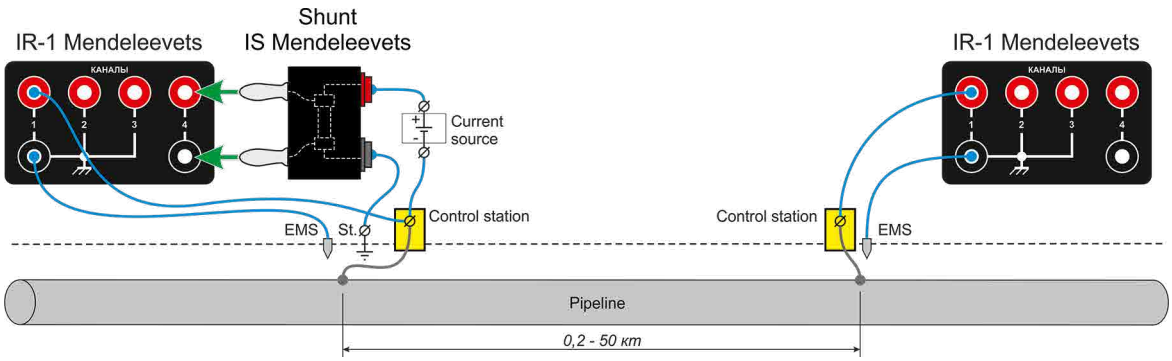
The shunt provides current to voltage transformation.

The shunt is installed at the corresponding gap of the measured circuit.

The shunt is connected to the measured circuit using standard test leads with banana-type connectors with a diameter of 4 mm. To connect the shunt to the millivoltmeter it is necessary to use built into the shunt banana-type terminals with a diameter of 4 mm. The nominal distance between the terminals: 19 mm, according to GOST 7396.1.

Technical data

Parameter name	SHI-75-7,5-0,5	SHI-75-7,5-0,5	SHI-75-150-0,5
Instrument shunt rated voltage, mV	75	75	75
Instrument shunt rated current, mA	7,5	75	150
The limit of allowable basic relative error of the shunt, %		± 0,5	
Weight, kg, no more than		0,04	
Dimensions (LxWxH), mm, no more than		63x41x14	
Service lifetime, years		5	



Cathodic polarization of the pipeline at the stage of construction completion

Conventions

SHI-75-75-0,5 *OKPD2 26.51.82.140*

- Accuracy class;
- Rated current, mA;
- Rated voltage of shunt, mV

KSK-1 MENDELEEVETS

SLIDING-CONTACT COIL

Application area

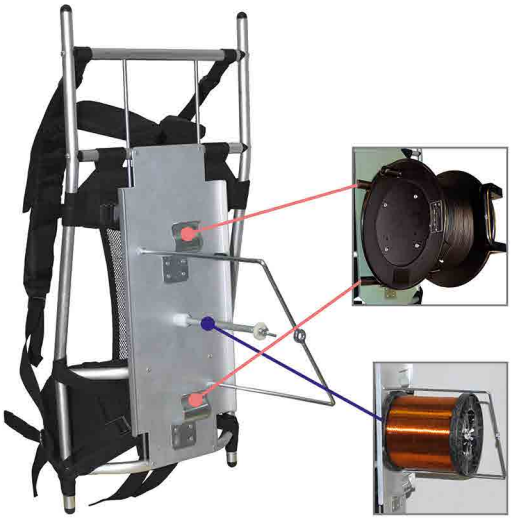
A sliding-contact coil KSK-1 Mendeleevets is designed for electrometric measurements and land surveying. It is used as the extender at consecutive measurements without twisting of a cable.

Technical details

The body of the coil with a sliding contact is made of a dielectric plastic. The rotation of the drum spool relative to the base is performed by two rolling bearings. Input terminal contact with a wound cable is carried out via a sliding contact consisting of graphite brush and copper shaft of the contact. To reduce the delay and providing the possibility to lock the unwinding of the cable during transportation, the coil is equipped with brake mechanism.

For convenience of carrying the coil can be equipped with anatomic back frame. Anatomic back frame can be made in two versions: regular (ST-1, Fig. 1A), which is used only for carrying coils of KSK-1, or universal (ST-2M, Fig. 1B), intended for sharing with the KSK-1 and coil with one-time enamel wire. The coil can be equipped with the following types of geophysical cables: GUSP-141, GUSP-142 in.

Back frame ST-1



Back frame ST-2 (universal)

Technical data

Parameter name	Value	
Type of contact	Sliding with graphite brushes	
Transition resistance of the contact, Ohm, no more than	0,1	
Type of the cable*	GUSP-141	GUSP-142
Max cable length, m*	1000	1000
Cable resistance per 1000 m length, Ohm, no more than	272	165
Weight of the coil with the cable and the anatomic back frame, kg, more than	7,7	7,8
Weight of the cable, kg, no more than	3,4	3,5
Weight of the coil without cable, kg, no more than	2,3	
Weight of the back frame, kg, no more than	2,0	
Dimensions of the coil (width x height x depth), mm, no more than	310 x 370 x 230	
Dimensions of the frame	370 x 155 x 850	
Service lifetime, years, not less than	2	

** Type and length of the measuring cable are determined by the requirements of the customer*

Conventions

KSK–1-GUSP141-1000-ST1

TU 4318-017-24707490-2016 (instead TU 4318-017-24707490-2007), OKPD2 28.99.39.190

- Type of the anatomic back frame (ST-1 regular, ST-2M – universal)
- Length of the wound cable, m
- Type of the wound cable
- Sliding-contact coil KSK-1 Mendeleevets

EMS / EMS-VE MENDELEEVETS

PORTABLE COPPER-SULPHATE ELECTRODE

Recommended to use at the objects of Gazprom

EMS Mendeleevets

EMS-VE Mendeleevets

Application area

The copper-sulfate electrodes for electrometric measurements EMS and EMS-VE Mendeleevets are intended for use as a portable reference electrode when measuring the potential difference between an underground construction protected by the cathodic polarization, and ground.

A copper-sulfate electrode with an auxiliary electrode EMS-VE Mendeleevets in addition is used as a portable reference electrode for measurements of the protective (total) and polarization (in accordance with GOST 9.602-2016) potentials of underground construction which is under the action of cathodic protection.

The electrodes are designed for operation in all climatic conditions with ambient temperature from -5 to +45 °C.

Technical details

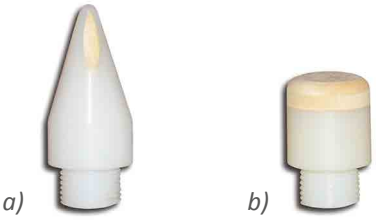
The EMS electrodes are produced of two types: with a short handle (is used as a stationary electrode); with a full-sized handle (for intensive measurements).

For simplification of a design and convenience of operation the handle of the EMS electrode is made of dural tube ending with a rubber handle.

An auxiliary electrode of ring form (electrodes EMS-VE) is fixed on the measuring body of a copper-sulfate electrode and equipped with own conductor.

The measuring wire is brought from the reference electrode to the plug located on the handle under the rubber handle.

The EMS electrodes are completed with two types of tips:
– in a form of a cone – for measurements in soft grounds (Pic. 1a);
– in the form of a flat plug – for measurements in solid grounds (Pic. 1b).



a) *b)*

Pic. 1. Types of tips: a – cone; b – plug

Technical data

Parameter name	Value	
	1,2	0,4
Electrode height, mm:		
- EMS	1150±10	400±10
- EMS-VE	1180±10	430±10
Electrode weight, kg, no more than:		
- EMS	0,5	0,3
- EMS-VE	0,6	0,3
Wire length, m	5*	2*
Transient electrical resistance, kOhm, no more than	2	
Potential relative to silver chloride electrode, mV	118±10	
Square of an auxiliary electrode EMS-VE, mm^2	625	
Material of an auxiliary electrode EMS-VE	steel	
Service lifetime, years, not less than	3	

** Length of the measuring wire is determined by the customer*

Delivery set

Name of items for delivery set	Quantity
The copper-sulfate electrode EMS Mendeleevets, pcs.	1
Replaceable tip Cone, pcs.	1
Replaceable tip Plug, pcs.	1
Protective cap, pcs.	1
Measuring wire, pcs.	2
Passport, pcs.	1 per a batch

Conventions

EMS-VE-1,2-5 *TU 4318-011-24707490-2014, OKPD2 28.99.39.190*

- Measuring wire length, m
- Reference electrode height: 1,2 or 0,4 m;
- Type of the copper-sulfate electrode: EMS or EMS-VE Mendeleevets

EST MENDELEEVETS

PORTABLE STEEL ELECTRODE

Application area

A steel electrode EST Mendeleevets is intended for use as a portable reference electrode for measurements of the AC voltage gradient in the ground by the method of Insulation Damage Detection. The electrode is designed for operation in all climatic conditions with ambient temperature from -10 to +45 °C.

Technical details

For simplification of a design and convenience of operation the handle of the EST electrode is made of dural tube ending with a rubber handle. The measuring wire is brought from the reference electrode to the plug located on the handle under the rubber handle. The EST electrode has a steel tip. It can be used with such devices as UT-1, Diacor and others.

Technical data

Parameter name	Value	
Modification	EST-1,2	EST-0,4
Steel tip length, mm	100	100
Electrode height, mm	1130±10	380±10
Wire length, m	5*	2*
Electrode weight, kg, no more than	0,5	0,3

**Length of the measuring wire is determined by the customer*

Delivery set

Name of items for delivery set	Quantity
Steel electrode EST Mendeleevets, pcs.	1
Measuring wire, pcs.	1
Passport, pcs.	1 per a batch

Conventions

EST-1,2-5 *TU 4318-038-24707490-2014, OKPD2 28.99.39.190*

- Measuring wire length, m
- Reference electrode height: 1,2 or 0,4 m;
- Type of steel electrode: EST Mendeleevets

KM-1 MENDELEEVETS

MAGNET CONTACT

Application area

A magnet contact is used to provide a continuous electric contact of measuring equipment and a metal construction. It is used for electrometric measurements:

– in prospect holes;
– outside the control-measuring points;
– at compressor stations and underground gas storage;
– on the objects having an exit to the earth surface.

Advantages:

– compactness;
– reliable contact;
– convenience in operation;
– universality of application.

Technical details

A magnet contact is a device the working surface of which is made of non-ferrous metal and connected to the terminal for connection of the measuring wire. The contact part of the device is made in the form of a disc with the diameter of 25 mm that provides sufficient contact surface with metal construction of any form.

Super strong magnet securely holds the contact KM-1 on the steel construction. In the design of the magnet contact we use the universal terminal which allows to connect the measuring wire both without strand termination and with the use of different connectors.

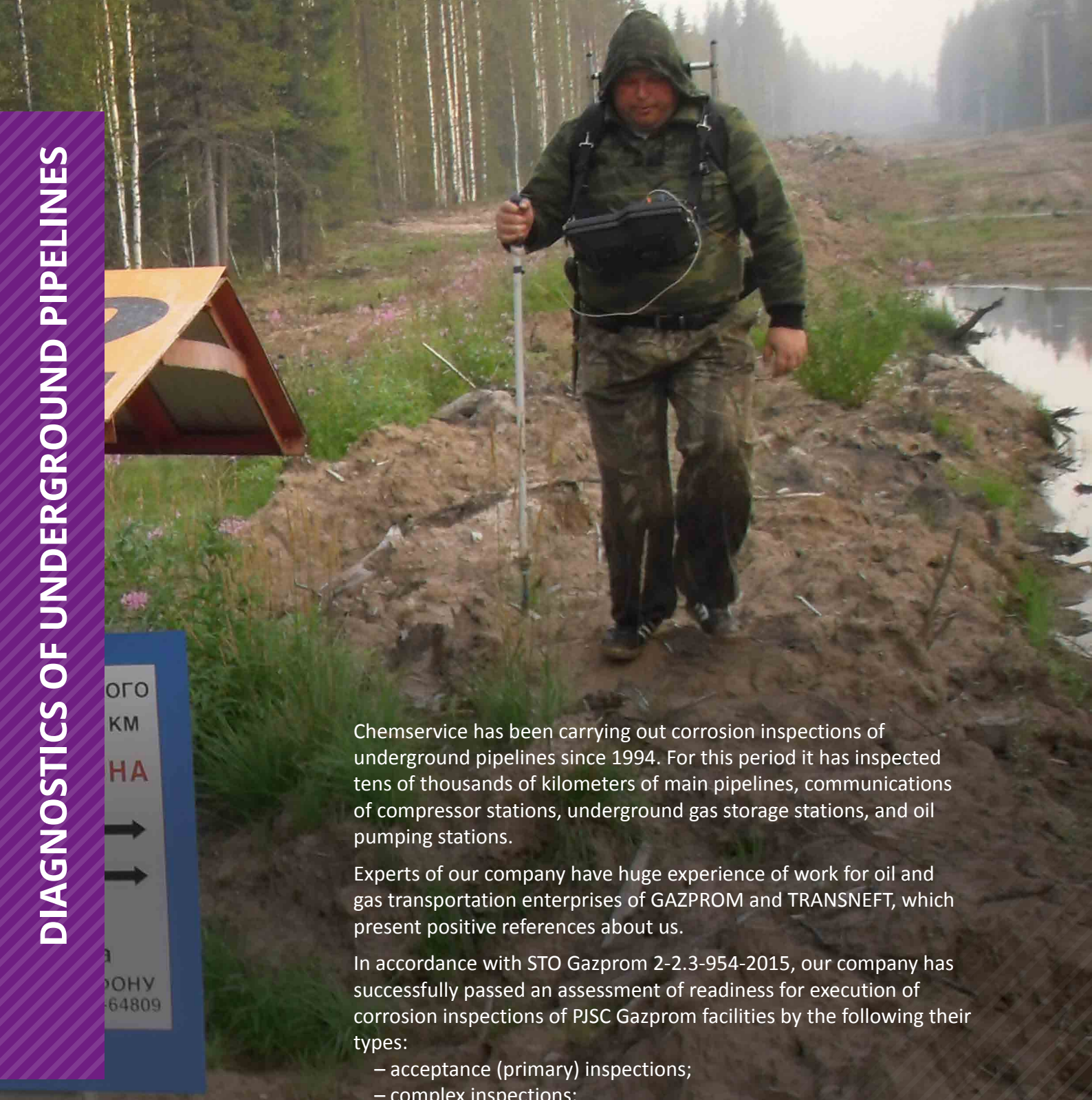
Technical data

Parameter name	Value
Pullout force from flat surface of steel 20, kg, not less than	2
Current passed at a contact over the entire area, A, no more than	5
Dimensions, mm: – diameter – height	 26 40
Weight, kg, no more than	0,04
Service lifetime, years, not less than	10

Conventions

KM-1 *TU 4276-026-24707490-2009, OKPD2 26.51.85.120*

DIAGNOSTICS OF UNDERGROUND PIPELINES



Chemservice has been carrying out corrosion inspections of underground pipelines since 1994. For this period it has inspected tens of thousands of kilometers of main pipelines, communications of compressor stations, underground gas storage stations, and oil pumping stations.

Experts of our company have huge experience of work for oil and gas transportation enterprises of GAZPROM and TRANSNEFT, which present positive references about us.

In accordance with STO Gazprom 2-2.3-954-2015, our company has successfully passed an assessment of readiness for execution of corrosion inspections of PJSC Gazprom facilities by the following their types:

– acceptance (primary) inspections;
– complex inspections;
– detailed complex inspection.

The list of corresponding works is determined by STO Gazprom 9.4-052-2016 and technical specifications detailing the scope of inspections.

Chemservice is included in the Register of organizations that meet the preliminary competitive selection requirements for carrying out corrosion inspections of main oil pipelines and oil product pipelines, technological pipelines and tanks of the following PJSC Transneft facilities: main oil pipelines and oil product pipelines, technological pipelines and tanks.

CORROSION DIAGNOSTICS OF UNDERGRIUND COMMUNICATIONS

At the pipeline diagnostics department there are three functioning laboratories:

– electrochemical protection (ECP) testing laboratory;
– non-destructive inspections laboratory;
– electrotechnical laboratory.

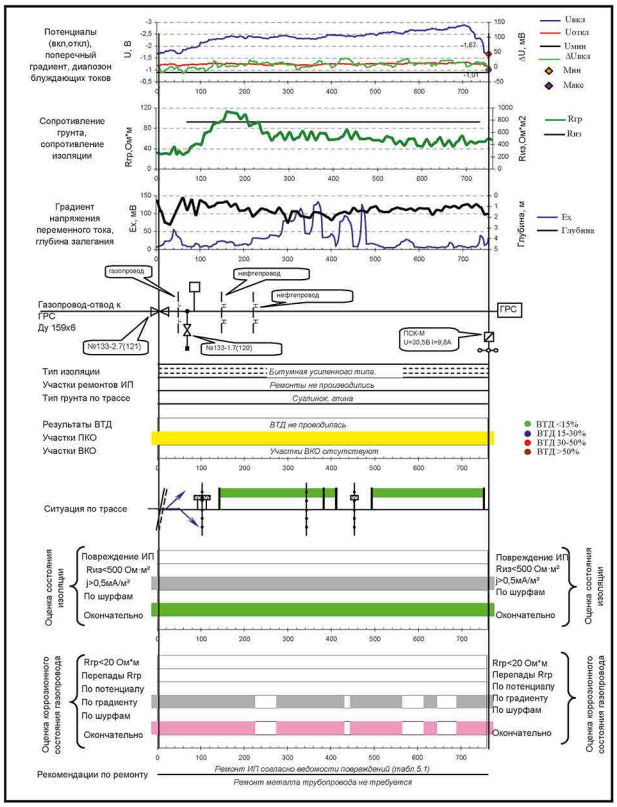
The ECP testing laboratory certified in INTERGASCERT, has the right to test elements of corrosion protection systems (in the terminology of STO Gazprom 9.4-052-2016 – acceptance (primary) corrosion inspections) for subsequent certification of corrosion protection systems according to the requirements of Item 3.9 of GOST R 51164-98.

The laboratory of nondestructive inspections carries out works at oil and gas industry facilities (Items 6.4, 6.5, 6.6) by the following types of inspections:

– ultrasound control;
– visual and measuring control;
– control with the method of metal magnetic memory (MMM);
– electric control (control of insulation coatings, control of ECP devices).

The electrotechnical laboratory registered by Rostehnadzor, allows the following forms of independent testing of electrotechnical devices (up to 1000 V):

– resistance measurement of the loop phase-zero in the electrical equipment with the voltage of up to 1000 V with the deadly earthed or insulated neutral (systems TN-C, TN-C-S, TN-S);
– measurement of insulation resistance (anode and cathode cable lines of cathodic protection stations, cable of an electric drainage unit of a drainage protection station, and also electric wiring of supply, distribution and group networks and cable lines in buildings);
– measurement of resistance of grounding devices when testing electrical equipment (up to 1000 V);
– inspection of the connection between grounding devices and grounded elements;
– measurement of ground resistivity.



Corrosion map

Examination results

After having results of corrosion protection examination our specialists develop technical reports for each pipeline section.

They provide corrosion maps with potential graphics, potential gradients, soil resistance, depth of pipeline laying, information about the situation on the route of the pipeline, zones of high corrosion danger and increased corrosion danger, sections with bad protection, type of soil, the turns of the pipeline, the presence and characteristics of ECP, crossings under highways and railways, air passages, including their exits to the surface, isolation defects, the locations of possible corrosion damage, the zones of influence of stray currents, etc.

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