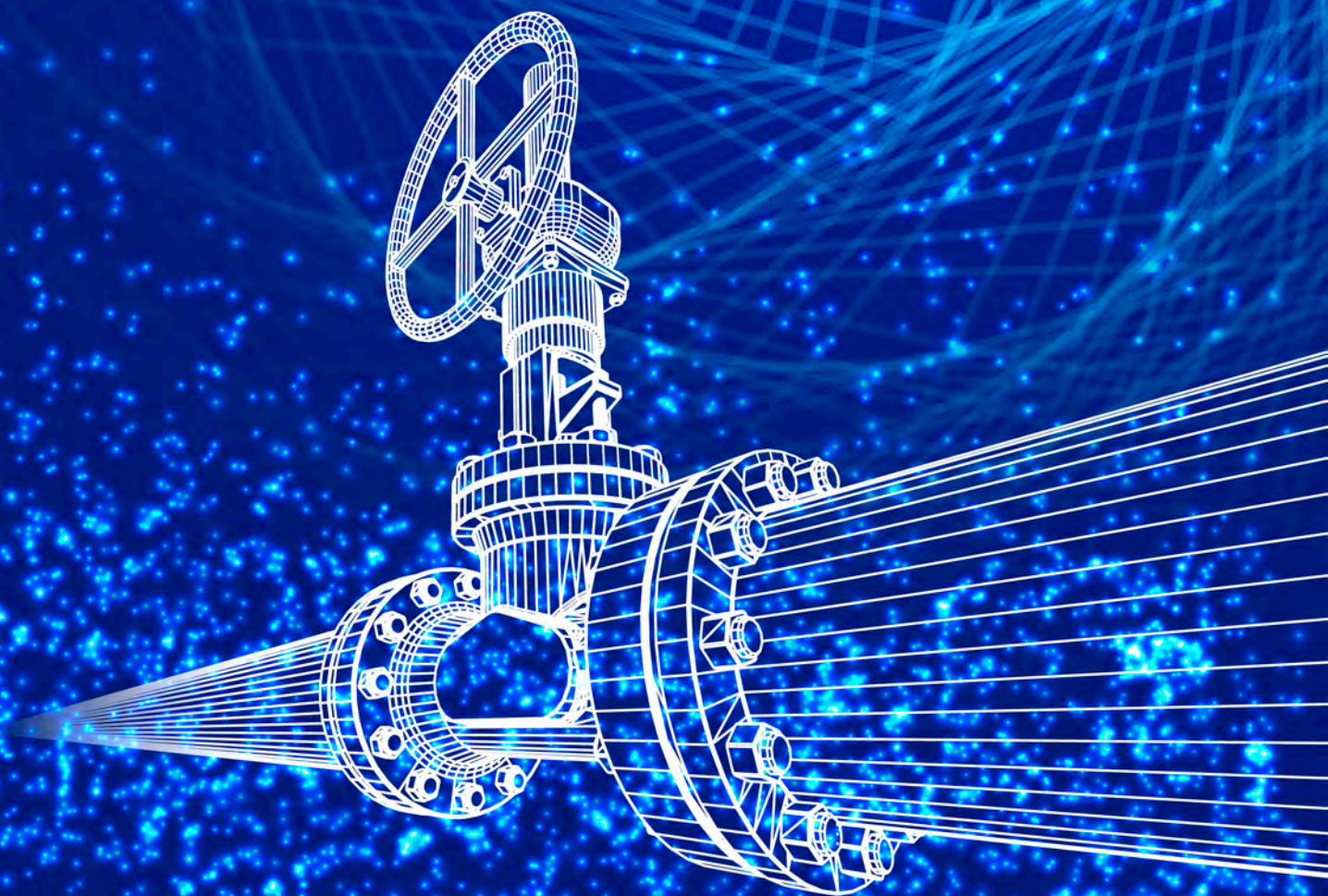




**СОЮЗ
КОМПЛЕКТ**



“SoyuzKomplekt LTD”

is an industrial company
working in oil and gas industry,
energy and telecommunication
services markets



«SoyuzKomplekt LTD» is an industrial company working in oil and gas industry, energy and telecommunication services markets.

The process of applying of innovative technologies and cutting-edge materials has become the main feature of this company. Designing new equipment «SoyuzKomplekt LTD» pays great attention to its operational characteristics which gives an opportunity to use it quite effectively.

The conformance of the equipment is certified by various certifications as well as proved by applying in real conditions. The cathode protection equipment was included into the General Register of such natural monopolies as PJSC "Gazprom" and PJSC "Transneft". Quality Management System ISO 9001:2015 within Voluntary Certification System ISO 9001:2015 within GOST R System was integrated into the company itself.

«SOYUZKOMPLEKT LTD» RANGE OF EQUIPMENT INCLUDES:

THE CATHODE PROTECTION EQUIPMENT:

- cathode protection stations;
- alternate current-drainage systems;
- power protection units;
- current control devices;
- terminal-block cabinet;
- iron silicon anode bed;
- magnesium anode protectors;
- reference electrodes;
- metering operation centers (test-stations);
- corrosion monitoring system.

AN UNDERGROUND COMMUNICATIONS CROSSOVER AND PROCESSING AREAS MARKING EQUIPMENT::

- pipelines and oil product pipelines;
- tank batteries
- gaslines;
- flowing plants;
- underground storage facilities;
- oil and gas field pipelines;
- cable communication lines;
- power cable line etc...

The equipment designed by «SoyuzComplekt LTD» is used in such places as "Port Ust'-Luga", "Shesharris" Tranfer, "Kuyumba-Taishet", transfer pipeline systems "VSTO" and "VSTO - II", the Baltic Pipeline System "BTS", "South" project and "North" project, "Kuibyshev-Lisichansk", "Tihoretsk-Novorossiysk-1,2", "Tihoretsk- Lisichansk", "Groznyi-Baku", "Yaroslavl-Kirishi", "Vtorovo-Primorsk", "Palkino- Primorsk", transfer pipeline systems "Bovanenkovo-Ukhta" and "Southern Gas Corridor", for realization of the project "The Power of Siberia", according to the Reagional Gasification Programme of the Russian Federation in Perm Kray, Nizhniy Novgorod Region, Orenburg Region, Penza Region, Kaluga Region and the Republic Mary-El".

CATHODE PROTECTION STATIONS

CPS.SK TU 3415-017-09890805-2014

FUNCTION • Cathode Protection Stations (CPS.SK) are designed for the process of cathode protection of steel pipelines and other underground metal communications from the process of underground corrosion as well as for the process of collecting, processing and transmitting of the information on the matter of the protection of the pipelines and communications through digital interfaces to telemetry systems and remote control of signal detection.

GENERAL CHARACTERISTICS:

- Module structure of the Station gives an opportunity to set up the configuration of the Station according to the Customer's request.
- An ability of the Station to operate on several independent loads.
- Operating in one of the following modes:
 - the process of regulation of the set up protective potential on the protected communication unit;
 - the process of regulation of the set up output current;
 - the process of regulation of the set up output voltage.
- Automatic transition to the regulation output current mode from the regulation potential mode in case of the problem in the reference electrode circuit.
- Automatic protection switch in case of breakdown (operation breakdown) of general modules (with parts identification with 100% change-over).
- High Station efficiency, if the Station operates in wide dynamic loads rate.
- The process of operating of the Station in 1-96 V rate without additional setting up (or switches); automatic power output only.
- Excess voltage protection through input and output circuits (in specification).
- The process of collecting, processing and transmitting of the information on the matter of operating characteristics and cathode protection ones.
- The process of integration into Smart Integrated Corrosion Monitoring System "Atlantic"

TWO MAIN HARDWARE VERSIONS WITH AN ABILITY TO OPERATE FROM POWER DRILLING TONGS:

- The process of an automatic cut-in in case of power supply absence
- Individual power accumulation block outfit for each cell of the CPS-M.SK
- Built-in algorithms of the power drilling tongs which allow them to make their operation time longer.
- Smart Discharge System utilization for power drilling tongs for getting the highest charging rate and for increasing the operating period

GENERAL CHARACTERISTICS

CPS-M

CPS-M
(CU Version)

CPS-I

CPS module structure	+	+	-
Nominal output power, kW	0,25 ÷ 5	0,5 ÷ 3	2 ÷ 4
Out voltage rating, V	1 ÷ 96	1 ÷ 96	1 ÷ 96
Power supply voltage of the alternate one-phase current frequency 50 Hz (± 3 Hz), V	230 $\pm$ 10%	230 $\pm$ 10%	230 $\pm$ 10%
Safe stress of the grid, V	150 ÷ 264	150 ÷ 264	150 ÷ 264
Outgoing current sliding control limits, %	5 ÷ 100	5 ÷ 100	5 ÷ 100
Out voltage sliding control limits, %	5 ÷ 100	5 ÷ 100	5 ÷ 100
Total potential monitoring rate, V	-4,5 ÷ -0,5	-4,5 ÷ -0,5	-4,5 ÷ -0,5
Polarization potential monitoring rate, V	-2,5 ÷ -0,5	-2,5 ÷ -0,5	-2,5 ÷ -0,5
Polarization potential and total potential maintenance standards not more than, %	1	1	1
Current ripple out of the station not more than, %	2	2	2
Efficiency rate und nominal load	0,9	0,9	0,9
Powerfactor, not less than	0,95	0,95	0,95
Horsepower rating of the power modules, kW	0,25, 0,5, 1, 1,5, 2,0	0,5, 1	1, 1,5, 2,0
Total current discharge of automatic drilling tongs not more than, A	-	10, 20	-
Operating time of the station from the set up automatic drilling tongs for 0,5 output powers if we take the depth of discharge of automatic power drilling tongs not more than 25 %, not less than, hours	-	6	-
Automatic drilling tongs quantity for one power cell, items	-	4	-
Power modules quantity for one monitoring system	до 6	До 6	До 2
Operating temperature while working, °C for U1	-45 ÷ +45	-45 ÷ +45	-45 ÷ +45
for MCL1	-60 ÷ +45	-60 ÷ +45	-60 ÷ +45
Cooling type	air, natural		
Relative humidity range (upper value) under t = +25 °C, %	98	98	98
Normal pleasure, kPa (mm Mercury)	84 ÷ 106,7 (630 ÷ 800)	84 ÷ 106,7 (630 ÷ 800)	84 ÷ 106,7 (630 ÷ 800)
Operating conditions	continuous		
Total size (LxWxH), mm	700x600x1650	may be defined by the configuration of the Station *	600x300x750
Mass, not more than, kg	250	may be defined by the configuration of the Station й*	60

* - For the Stations design with an ability to operate from automatic drilling tongs general technical characteristics may be defined by the configuration of the Station.

CATHODE PROTECTION STATIONS

CPS.SK meets the requirements of BR-91.020.00-DR-170-17 "Main pipelines Transportation of Oil and Oil Products. Electric Protection System of the Objects of the Main Pipeline. Design regulations", GR-75.180.00-DR-016-19 "The Main Pipeline Transportation of Oil an Oil Products. Electric Protection System. Cathode Protection Stations and Cathode Drainage Stations. General Rules and Regulations", as well as GR-29.100.99-DR-035-19 "Main pipelines Transportation of Oil and Oil Products. High-Voltage Cathode Protection Stations and Low-Voltage Cathode Protection Stations General Rules and Regulations".

GENERAL IMAGE CPS-I.SK.3-2. U1.T2



REQUEST FORM:

CPS-X. SK. X - X. X. X. X. X

T1 - use standardized signals (digital signals and signals 4-20 mA) to set up telemechanics;

T2 - use GSM/GPRS) to set up telemechanics;

T3 - use RS-485 interface and protocol MODBUS RTU to set up telemechanics.

Climatic discharge (possible values - U1, MCL1)

EPS (Electric Power Storage) – an ability to operate on electric power batteries (in case of lack of the batteries it is not indicated) It is applied for CPS-M only.

R - 100 % reserving (in case of lack it is not indicated). It is applied for CPS-M only.

Independent loads quantity (possible values - according to technical characteristics table)

Rated-power output of the station, kW (possible values - according to technical characteristics table)

Producer «SoyuzKomplekt LTD»

Hardware version (possible values - M – a module-type cathode protection station with reversible converters, I – a block cathode protection station with reversible converters)

Cathode protection stations

GENERAL IMAGE CPS-M.SK.4-4.U1.T3



GENERAL IMAGE CPS -M.SK.2-4.EPS.U1.T1



TERMINAL-BLOCK CABINETS

TBS.SK TU 3435-016-09890805-2015

FUNCTION • Terminal-block cabinets (TBC.SK) are used in Electric Protection System for the process of protection of the plug of the reservoirs and technological pipelines of the tank batteries. They are designed for the process of overlapping of the drainage cable of the protected unit and a negative polar extension of CPS, connecting of continuous anode protection electrode to the positive extension. Moreover, TBC.SK permanent measuring reference electrodes, bimetal reference electrodes and corrosion sensors can be set up.

GENERAL CHARACTERISTICS:

- Lack of inner electric power supply.
- Current shunt in each measuring channel.
- Current measuring and current indication for each channel (for TBC2.SK only).
- Current-drainage integration rate set up for each channel – from 24 to 240 hours (for TBC2.SK only).
- Protective potential measuring and Protective potential indication (for TBC2.SK only).
- Protective potential integration rate set up for each channel – from 24 to 240 hours (for TBC2.SK only).
- Voltage input measuring and Voltage input indication for TBC2.SK only).
- An ability to integrate into the Smart Integrated Corrosion Monitoring System "Atlantic"

TWO GENERAL VERSIONS OF TERMINAL-BLOCK CABINETS (TBC.SK):

- TBC1.SK – is a cabinet made up of terminal-block connectors and current measuring shunts;
- TBC2.SK – TBC made up of multilink electronic measuring units.

This equipment allows to guarantee the process of joint protection of several objects from corrosion according to the scheme given in BR 29.240.00-TRR-163-16 "Service Electric Power Transmission Lines and Cathode Protection Units. Maintenance Rules and Regulations", BR 91.020.00-TRR-170-17 "The Main Pipelines Transportation of Oil and Oil Products. Cathode Protection System of the Objects of the Main Pipeline. Design Rules and Regulations".

The equipment may be completed with a package header of necessary height in order to make up the best placement during the process of assembling (according to the Customer's request).

Terminal-block cabinets (TBC1.SK and TBC2.SK) maybe additionally combined with CPS TU 3415-017-09890805-2014.

GENERAL TECHNICAL CHARACTERISTICS TBC1.SK

GENERAL CHARACTERISTICS	TBC1.SK-10	TBC1.SK-20	TBC1.SK-30
Quantity of set up anodes, items	10	20	30
Total current for one channel, A		10	
Total potential current of the anode circuit, not more than, A	50	100	
Quantity of set up corrosion sensors, not more than		6	
Quantity of set up bimetal reference electrodes not more than		4	
Quantity of set up reference electrodes not more than	8	10	10
Connectors cross-station, not more than, mm ² - from the reservoir, minus terminal and plus terminal CPS - from the anodes - from the reference electrodes and regulation cable		1x35 или 2x25 10 6	
Terminal-block cabinet type		One-side service cabinet	
Mass, not more than, kg*	45	55	
Size (WxHxD), mm*	600x600x300	800x600x300	1000x600x300
Protection degree, not less than		IP34	
Operating temperatures rate, °C		-60 ÷ +45	
Relative humidity upper range value +25 °C, %		98%	

GENERAL TECHNICAL CHARACTERISTICS TBC2.SK

GENERAL CHARACTERISTICS	TBC2.SK-10	TBC2.SK-20	TBC2.SK-30
Quantity of set up anodes, items	10	20	30
Total current for one channel, A		10	
Total potential current of the anode circuit, not more than, A	50	100	
Quantity of set up corrosion sensors, not more than		6	
Quantity of set up bimetal reference electrodes, not more than		4	
Quantity of set up reference electrodes, not more than	8	10	10
CPS resistance indication		+	
Current-drainage indication for each AB		+	
Total potential indication		+	
Connectors cross-station, not more than, mm ² - from the reservoir, minus terminal and plus terminal CPS - from the anodes - from the reference electrodes and regulation cable		1x35 или 2x25 10 6	
Terminal-block cabinet type		Double-service cabinet	
Mass, not more than, kg *	60	70	
Size (WxHxD), mm*	800x600x300	1000x600x300	1200x600x300
Protection degree, not less than		IP34	
Operating temperatures rate, °C		-60 ÷ +45	
Relative humidity upper range value +25 °C, %		98%	

* - sizes and weight are indicated without a package header

TERMINAL-BLOCK CABINETS

GENERAL TECHNICAL CHARACTERISTICS TBC.SK with CPS

GENERAL CHARACTERISTICS	TBC*. SK-0,25	TBC*. SK-0,5	TBC*. SK-1,0
Quantity of set up anodes to the terminal-block cabinet, items	10, 20	10, 20	10, 20, 30
Quantity of set up corrosion sensors, not more than		6	
Quantity of set up bimetal reference electrodes, not more than		4	
Quantity of set up reference electrodes, not more than	8, 10	8, 10	8, 10, 10
Total potential current of the anode circuit, not more than, A	10	15	25
Nominal output power CPS, kW	0,25	0,5	1
Power supply voltage of the alternate one-phase current frequency 50 Hz (± 3 Hz) for CPS, V		230 $\pm$ 10%	
Safe stress of the grid, V		150 $\div$ 264	
Out voltage sliding control limits, %		5 $\div$ 100	
Total potential monitoring rate, V		-4,5 $\div$ -0,5	
Polarization potential monitoring rate, V		-2,5 $\div$ -0,5	
Polarization potential and total potential maintenance standards not less than, %		1	
Output voltage rate, B		1 $\div$ 96	
Total power dispersion on CPS output, not more than, %		2	
Terminal-block cabinet type		Double-service cabinet	
Cooling type		Air, natural	
Mass, not more than, kg **	150		160
Size (WxHxD), mm **	630x745x1040		630x745x1340
Protection degree, not less than		IP34	
Operating temperatures rate, °C		-60 $\div$ +45	
Relative humidity upper range value +25°C, %		98%	

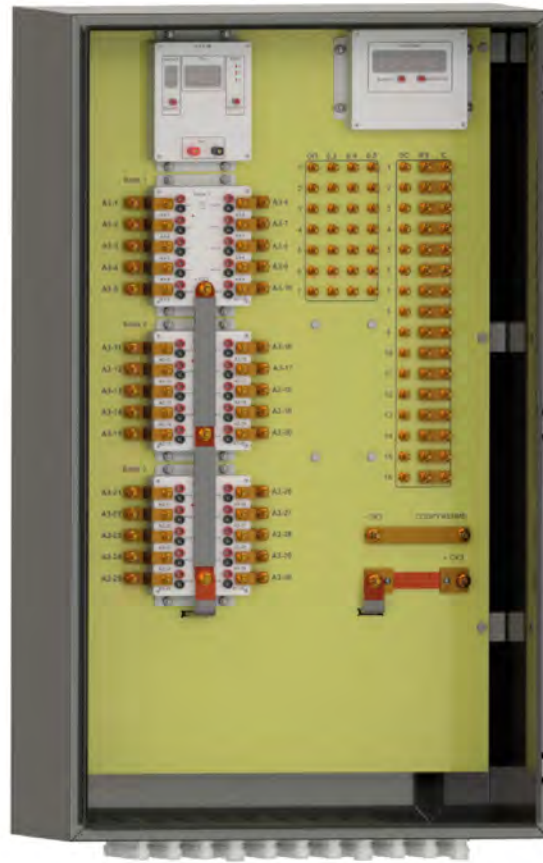
*- TBC type. ** - sizes and weight are indicated without a package header

REQUEST FORM:

TBCX.SK - X - X - XRE - XCFS. CPS - H

					Cathode protection station, kW (possible values - 0,25, 0,5, 1)
					Cathode protection station incorporated communication (in case of lack it is not indicated)
					Quantity of the set up corrosion flow sensors (possible values - no more than 6)
					Quantity of the set up reference electrodes (possible values - no more than 14)
					Critical current of the tunnel, A (possible values - 5, 7,5, 10)
					Quantity of the set up anode beds (possible values - 10, 20, 30)
					Terminal-block cabinet type (possible values - TBC1.SK и TBC2.SK), Producer «SoyuzKomplekt LTD»

GENERAL IMAGE TBC2.SK-30-5A-14RE-4CFS



GENERAL IMAGE TBC2.SK-30-5A-14RE-4CFS.CPS-1



POWER PROTECTION UNITS

PPU.SK TU 3435-019-09890805-2014

FUNCTION • Power Protection Units (PPU.SK) are used into Cathode Protection Systems of underground steel communications from corrosion. They are designed for the process of joint protection of several objects from the same CPS as well as from deleterious effect suppression of neighbouring pipelines and other communications through the process of a protection current device setting and current distribution of the currents sinking into each steel communication in order to achieve demanded protective potential.

GENERAL CHARACTERISTICS:

- Transmittance start of the unit - $0,2 \div 0,3$ V.
- Ongoing current control.
- Protective potential regulation (for PPU.SK.GR-P).
- Distance monitoring and management mode (for PPU.SK.GR-P).
- Lack of setting up of current resolution – its gradual regulation.
- Lack of setting up of protective potential – its gradual regulation (for PPU.SK.GR-P).
- Out voltage leveling for CPS
- Operational characteristics of the unit indication:
 - output current indication (current resolution – 100 mA);
 - power terminal clips voltage indication (current resolution – 100 mA);
 - protective potential indication (current resolution – 10 mV, for PPU.SK.GR-P).
- It is not necessary to set up inner power supply for current control operation (the part of energy of the traditional reagent metering unit, which evolves from resisting elements like warmth, can be used)
- Easy to operate (current and protective potential for PPU.SK.GR-P are produced by a micrometric potentiometer)
- Fast electronic protection from emergency operations mode.
- Units fitting with easy replaced protection units giving protection from momentum overload.
- An ability to integrate into the Smart Integrated Corrosion Monitoring System (SICMS) "Atlantic" (for PPU.SK.GR-P only).

TWO GENERAL VERSIONS OF POWER PROTECTION UNITS (PPU.SK):

- PPU.SK.GR is an electronic device made up on the bases of cutting-edge schematic design solutions with the process of gradual regulation and current control as well as with an ability of distance control.
- PPU.SK.GR-P is an extended version of PPU.SK.GR. An additional function of protective potential regulation of the protected communication as well as distance regulation and management one are included into it.

This equipment allows to guarantee the process of joint protection of several objects from corrosion according to the scheme given in BR 29.240.00-TRR-163-16 "Service Electric Power Transmission Lines and Cathode Protection Units. Maintenance Rules and Regulations", BR 91.020.00-TRR-170-17 "The Main Pipelines Transportation of Oil and Oil Products. Cathode Protection System of the Objects of the Main Pipeline. Design Rules and Regulations".

After having delivered PPU.SK are installed into the MOC Column or into the electric wiring cabinets.

GENERAL CHARACTERISTICS

PPU.SK.
GR-1

PPU.SK.
GR-10

PPU.SK.
GR-30

Nominal current of the channel, A	1	10	30
Current control rate:			
- minimal regulated current, not more than, A	0,01	0,1	0,1
- total regulated current not more than, A	1	10	30
Total potential measuring rate, V	0,2 ÷ 0,3		
Minimal potential drop on power terminal clips pf the PPU (in case of current regulation, not more than, V	3,5		
Total potential drop on power terminal clips pf the PPU (in case of current regulation, not more than, V	5	50	150
Total power dispersion, not more than, W	An indication unit is not indicated	0,6	
Minimal voltage of an indication unit of PPU (in case of current-drainage through the PPU not less than 1,5 A), not more than, V	150 ± 30		
Accessible reverse voltage value not more than, V	100		
Total resistance of the power source (CPS), not more than, V	100		
Total humidity under +25 °C, %	98		
Operating temperatures rate, °C	-60 ÷ +60		
Possible quantity of the set up channels into the column of the MOC.SK-P01, not more than	2		
Possible quantity of the set up channels into the column of the MOC.SK-P02, not more than	4		
Possible quantity of the set up channels into the wiring duct, not more than*	4		
PPU size**:			
- length, mm	172 ± 5	246 ± 5	296 ± 5
- width, mm	122 ± 5	128 ± 5	128 ± 5
- height, mm	65 ± 5	135 ± 10	135 ± 10
PPU mass, g **	460 ± 100	2400 ± 300	2700 ± 300

* - quantity of the channels may be increased according to the customer's request

** - this characteristic is given for one unit only

GENERAL CHARACTERISTICS

PPU.SK.
GR-P-10

PPU.SK.
GR-P-30

Nominal current of the channel, A	10	30
Current control rate:		
- minimal regulated current, not more than, A	0,1	0,1
- total regulated current not more than, A	10	30
Total potential measuring rate, V	$-4 \div 0$	
Minimal potential drop on power terminal clips pf the PPU (in case of current regulation), not more than, V	$0,2 \div 0,3$	
Total potential drop on power terminal clips pf the PPU (in case of current regulation), not more than, V	3,5	
Total power dispersion, not more than, W	50	150
Minimal voltage of an indication unit of PPU устройства индикации (in case of current-drainage through the PPU not less than 1,5 A), not more than, V	0,6	
Resistance emergency breaker trip, V	150 ± 30	
Accessible reverse voltage value not more than, V	100	
Total resistance of the power source (CPS), not more than, V	100	
Total humidity under +25 °C, %	98	
Operating temperatures rate, °C	$-60 \div +60$	
Possible quantity of the set up channels into the column of the MOC.SK -P01, not more than	1	
Possible quantity of the set up channels into the column of the MOC.SK-P02, not more than	2	
Possible quantity of the set up channels into the wiring duct, not more than*	4	
PPU size**:		
- length, mm	296 ± 5	
- width, mm	128 ± 5	
- height, mm	135 ± 10	
PPU mass, g **	2800 ± 300	

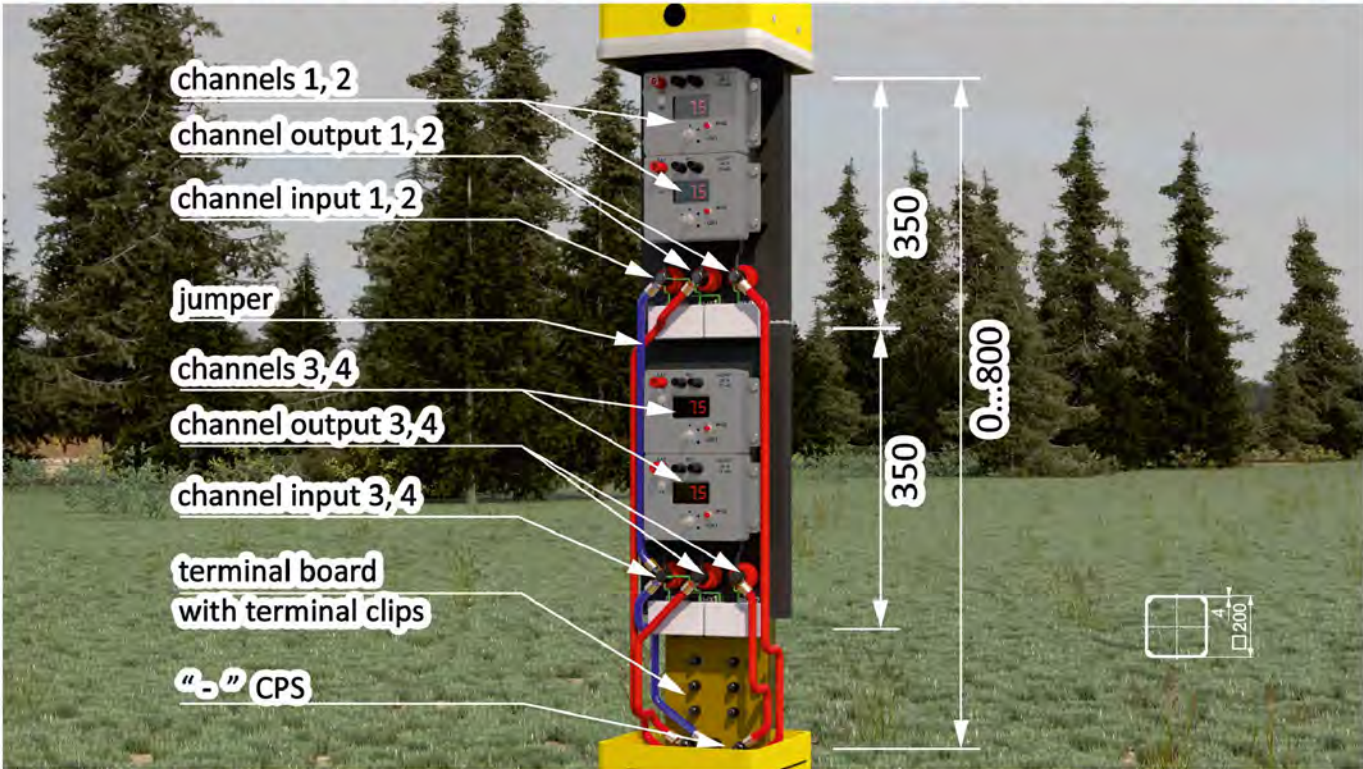
* - quantity of the channels may be increased according to the customer's request

** - this characteristic is given for one unit only

GENERAL IMAGE PPU.SK.GR-P-30-4. CPS.F



GENERAL IMAGE MOC.SK-P02-12-4(0)- PPU.SK.GR -10-4.R-0-C.MCL1



REQUEST FORM:

PPU. SK. X - X - X. X. X

	Conducting power of the Power Protection Unit (possible values - F – forward conductance, R - reverse conductance, for model PR only)
	CPS- delivery into the wiring duct (in case of delivery into the MOC (Metering Operation Center) cabinet, it is not indicated)
	Quantity of canals (possible values – from 1 to 4)
	Rated current value of the canal, A (possible values - 1, 10, 30 for PPU.PR 10, 30 for PPU.PR-P)
	PPU - (possible values - GR – gradually-regulated, GR-P - gradually-regulated potetiometric)
	Producer «SoyuzKomplekt LTD»
	Power Protection Unit

ALTERNATE CURRENT-DRAINAGE SYSTEMS OF THE MAIN PIPELINES

ACDS.SK TU 3435-004-09890805-2013

FUNCTION • During the process of crossover and parallel alternate current transmission lines with the underground pipeline, induced voltage and currents may emerge because of the influence of induction which can influence an operating process of the mentioned pipeline. These factors may, in their turn, result in intensive electrolyte corrosion. Alternate Current-Drainage Systems (ACDS.SK) of the main pipelines are designed for the process of protection of the main pipelines through the process of alternate current-drainage induced by transmission lines into the ground conductor securing protective potential of the construction at the same time.

GENERAL CHARACTERISTICS:

- Alternate Current-Drainage of the current induced high voltage transmission line into the ground conductor.
- Protective potential in the ground conductor leakage prevention
- Operating characteristics of the unit:
 - Current-drainage indication (current resolution – 100 mA);
 - Power terminal clips voltage indication (current resolution – 100 mV).
- Lighting protector unit.
- Set up amperometric transformer.
- Fast electronic protection from emergency operations mode.
- An ability to integrate into the Smart Integrated Corrosion Monitoring System (SICMS)“Atlantic”.

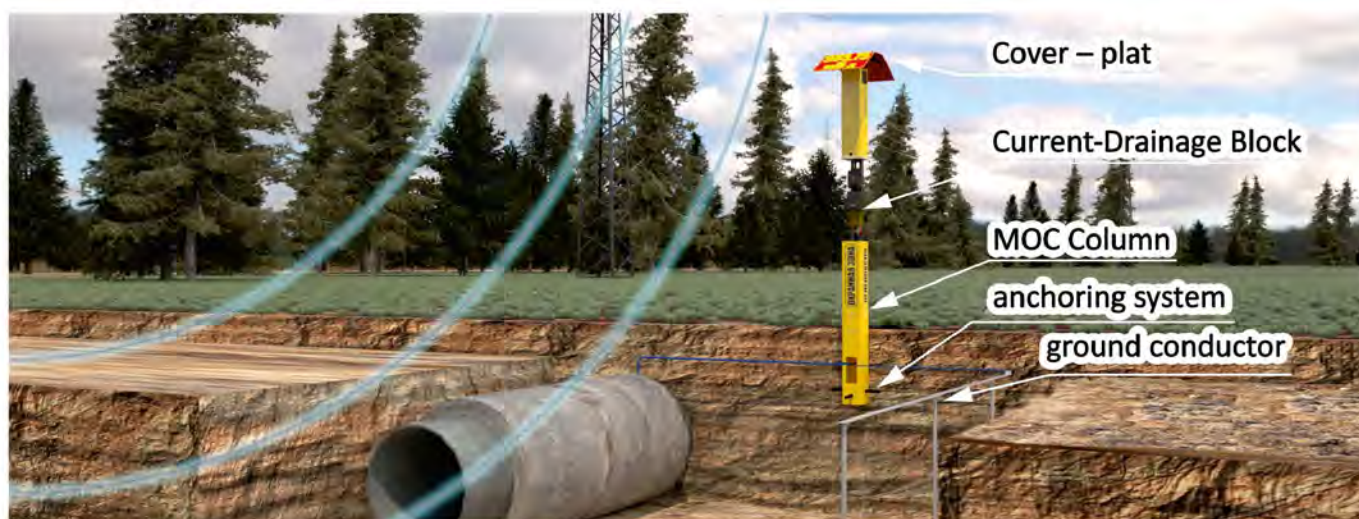
AN ALTERNATE CURRENT-DRAINAGE SYSTEM ACDS.SK CONSISTS OF THE FOLLOWING GENERAL ELEMENTS:

- MOC Column (P02 type);
- Current-Drainage Block – CDB.SK;
- lighting protector unit;
- • composite ground conductor with a cable for setting up.

ACDS.SK are included “The Core Products Register” of PJSC “Transneft”. They meet the requirements of OTR -75.180.00-TRR-035-15 with changes 1 to “Appendix I” of the BR 29.240.00-TRR-163-16 “Service Electric Power Transmission Lines and Cathode Protection Units. Maintenance Rules and Regulations” as well as the BR 91.020.00-TRR-170-17 “The Main Pipelines Transportation of Oil an Oil Products. Cathode Protection System of the Objects of the Main Pipeline. Design Rules and Regulations”.

GENERAL IMAGE

MOC.SK -P02-6-2(0)- ACDS.SK.40.(D2x3-H1,5x2x3).O.35x15-0-CP.MCL1



GENERAL CHARACTERISTICS

ACDS.
SK.20

ACDS.
SK.40

ACDS.
SK.80

Nominal current-drainage 50 Hz, A	20	40	80
Minimum value of current-drainage to put an indication system into operation, A	2	2,5	3
Accessible voltage of direct current, U _{max} , V	12		
Current flow under U _{max} = 12 V, not more than, mA	1		
Total short-limited current-drainage 1 sek/50Hz, I _{A[~]} , A	400		
Operational conditions	continuous		
Operating temperatures rate, °C	-60 ÷ +60		
Climatic discharge	MCL1		
Cables cross-station, not less than, mm ²	35		
An item set up inside the MOC (P02 type without a composite ground conductor) mass, kg	22 ± 1,5		

GENERAL CHARACTERISTICS OF COMBINED GROUND CONDUCTOR OF THE STANDARD KIT

Ground conductor type	Name	Frames	Ground conductor material	Ground conductor with support connections mass, kg
Horizontal	h	Line 4x40x2000 mm*	Stainless steel (S) или hot dip galvanizing steel (HD) or copper steel(C)	2,65 ± 0,1
Vertical	v	Bit insert Ø16x1500 m*		2,5 ± 0,1

* - possible replacement of standard frames according to the Customer's Request.

REQUEST FORM:

MOC.SK-P02-X - X (X)-ACDS. SK. X. (G2xX-B1, 5xXxX). X. XxX-X-X. MCL1

Climatic discharge
MCL1

CP – cover plate communication.
Acceptable values:
C – cover plate (hat),
DM – distance mark.

Indication post communication (possible values - IP – there is an item into the kit 0 – no items)

Cable size of the set up cable, mm² x length of the set up cable, m

Eliminator material according to the table

Vertical ground conductor - (V), Length of the section (1,5m) x quantity of the plugs (sections) x quantity of the vertical conductors

Horizontal ground conductor - (H), Length of the section (2m) x quantity of the plugs

Rated current drain, A (possible values - 20, 40, 80)

Branch conductor system, producer «SoyuzKomplekt LTD»

Terminal board colour. May take following values: B - blue, R - red, 0 – without colour marking.

Quantity of the power units (possible values - 2-4)

Quantity of the measuring terminals (possible values - 1-8)

MOC (Metering Operation Center), cabinet type - P02, Producer «SoyuzKomplekt LTD»

CURRENT CONTROL DEVICES

CCD.SK TU 3435-014-09890805-2014

FUNCTION • Current Control Devices of the anode beds (CCD) are used in CPS (Cathode Protection Systems) of the continuous underground metal objects (pipelines) from corrosion. They are designed for regulation of the protective currents control of the anode beds and for currents distribution into the anode beds.

GENERAL CHARACTERISTICS:

- Current-drainage measuring and indication for each channel (for CCD-M.SK only).
- Setting up of the process of integration of current drainage for each channel for CCD-M.SK only).
- Current measuring shunt in each measuring channel.

CURRENT CONTROL DEVICES CCD-SK ARE PRODUCED IN FOLLOWING CONFIGURATIONS:

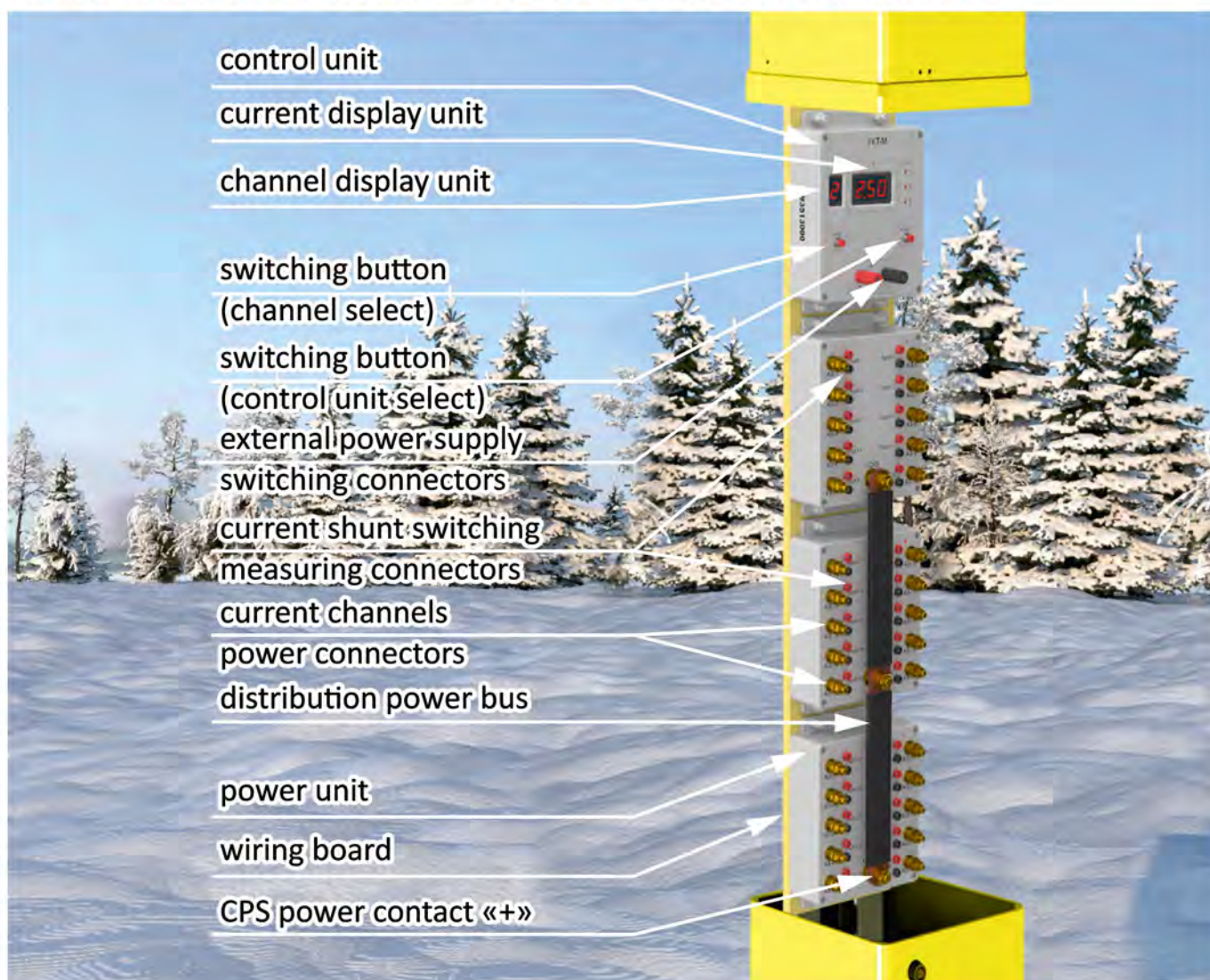
- CCD.SK is a device made on the bases of terminal-block connector and current measuring shunt for setting up cables from the anode beds connected with a utility bus on the one side with setting up with a positive terminal of CPS.
- CCD-M.SK made on the bases of the multilink devices. Constructively this unit consists of two assemblies: a power block and a regulation block. The power block is designed for setting up the anode beds connected with a utility bus on the one side with setting up with a positive terminal of CPS. The regulation block is designed for current-drainage measuring in each current channel and gives an information about a fault-free channel.

CCD.SK affords to connect of conducting tracks of the anode beds with the positive terminal of CPS and gives an opportunity to meet the requirements of the setting up process ESD and GSD according to BR 29.240.00-TRR-163-16 "Service Electric Power Transmission Lines and Cathode Protection Units. Maintenance Rules and Regulations", BR 91.020.00-TRR-170-17 "The Main Pipelines Transportation of Oil and Oil Products. Cathode Protection System of the Objects of the Main Pipeline. Design Rules and Regulations".

CCD.SK.SK and CCD-M.SK after being delivered are installed in MOC.SK Column (P02 type).

GENERAL CHARACTERISTICS	CCD.SK	CCD-M.SK
Total operational current of one channel, A	5, 7,5, 10	5, 7,5, 10
Quantity of the channels	10, 20, 30	10, 20, 30
Total cable cross-section of the anode «+ CPS», mm ²	1x35 или 2x25	1x35 или 2x25
Total cable cross-section of the anode bed, mm ²	10	10
Current integration rate for each channel	24 ÷ 240	-
Independent current channel indication	+	-
Automatic combining and total current indicator	+	-
Operating temperatures range, °C	-60 ÷ +45	-60 ÷ +45
Permissible humidity, %	98	98

GENERAL IMAGE MOC.SK-P02-CCD-M.SK-30-5-0-C.MCL1



REQUEST FORM:

MOC.SK-P02-X-X-X-GSH-0-C. MCL1

					Climatic discharge MCL1
					CP – cover plate communication. Acceptable values: C – cover plate (hat), DM – distance mark
					Indication post communication (possible values - IP – there is an item into the kit, 0 – no items)
					General shunt communication (total current shunt). In case of lack it is not indicated
					Rated current drain canal, A - 5, 7,5, 10)
					Quantity of the independent canals for current measuring (possible values - 10, 20, 30)
					Current Control Devices (CCD) type (possible values - CCD.SK и CCD-M.SK)
					MOC (Metering Operation Center), column type - P02, producer «SoyuzKomplekt LTD»

COPPER SULFATE REFERENCE ELECTRODES

CSRE.SK TU 3435-005-09890805-2013

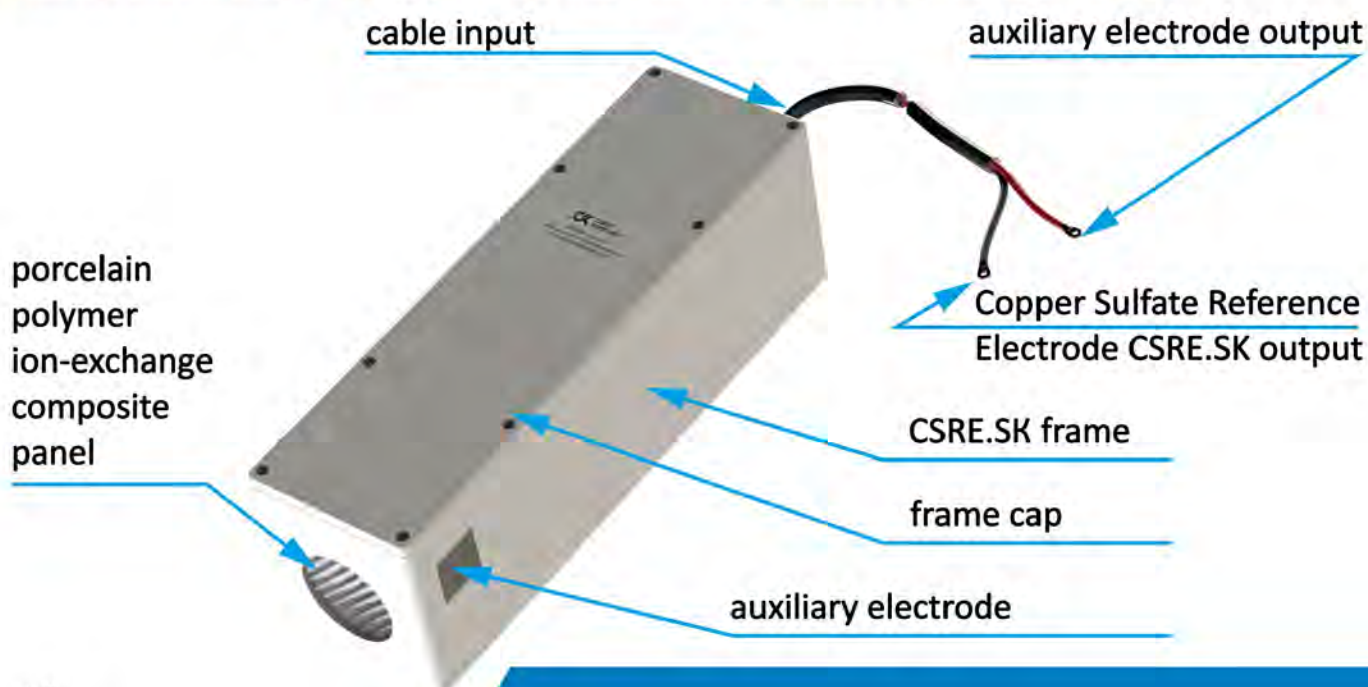
FUNCTION • Permanent-type of Copper Sulfate Reference Electrodes (CSRE.SK) are designed for utilization on the objects of pipeline transportation in order to keep measuring of the protective potentials of the communications and the potential drop in the field environment while defining anticorrosion protection of the metal communications.

GENERAL CHARACTERISTICS:

- The construction of the device consists of an open composite membrane: outer part is an ion-exchange one and an inner contact part which is made of ceramics. It provides security of the connection with a ground electrolyte and a necessary operating period for the device.
- An electrolyte is located in a gel state. CSRE.SK "Etalon-1" and CSRE.SK "Etalon-2" is made up with an electrolyte in tough state. CSRE.SK "Etalon-2" is designed for the process of setting up under plug of the reservoir or under the housing of trunk pipeline station.
- High impact case for "Etalon-1.0" and "Etalon-2.0".
- An open cylindrical case which is an ion-exchange membrane (for "Etalon-3.0"). It is delivered with a steady backfill.
- Devices are delivered filled with electrolyte and ready for an operating process.
- Devices can be completed with a special container for the process of installation and operational replacement.
- An auxiliary electrode in a kit (a potential sensor).
- A cable operating period corresponds with a Cooper Sulfate Reference Electrode.

CSRE meet the requirements of GOSTR 51164, GOST 9.602, in BR 91.020.00-TTR-170-17 "Service Electric Power Transmission Lines and Cathode Protection Units. Maintenance Rules and Regulations", BR GRR-29.100.99-TTR-032-19 "The Main Pipelines of Oil and Oil Products. Electric Cathode Unit. Reference Electrode long-term action".

GENERAL IMAGE CSRE.SK «ETALON»-1.0 AND «ETALON»-2.0



GENERAL CHARACTERISTICS

CSRE.SK
«ETALON»-1.0

CSRE.SK
«ETALON»-2.0

CSRE.SK
«ETALON»-3.0

SP of the RE comparing with sample silver-chloride reference electrode under the temperatures $+25 \pm 3$ °C, мВ	100 ± 20	100 ± 20	100 ± 20
Electrolyte state (copper sulfate, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$)	jellous	hard	hard
Ion-exchange membrane type	Composite porcelain polymer		
SP variation of the RE between the items of the same series, not more than, мВ	15	15	15
SP instability of the RE between the items of the same series, not more than, мВ:			
- in 30 days	15	15	15
- in 90 days	30	30	30
Inner resistance more than, кОм	6	6	6
Mass (without a cable), not more than, kg	3	3	9
Electrode size (without regular backfill), not more than:			
- length, mm	95 ± 5	95 ± 5	-
- width (diameter), mm	90 ± 5	90 ± 5	68 ± 5
- height, mm	300 ± 10	300 ± 10	240 ± 10
Cable termination cross-station, not less than, mm^2	0,75	0,75	0,75
Length of the measuring cable, m*	5	5	5
Auxiliary electrode size (potential sensor), mm	25×25	25×25	25×25
Service treatment temperatures rate, not less than, °C	-45...+45	-45...+45	-45...+45
Storage and transportation temperatures rate, not less than, °C	-45...+60	-45...+60	-45...+60
CSRE.SK and shielded measuring conductive tracks operational period, not less than, years	15	15	30

*- The length of the cable outputs may be changed according to the Customer's request.

GENERAL IMAGE CSRE.SK «ETALON»-3.0

CSRE.SK frame

(porcelain polymer ion-exchange composite panel)

filling material

auxiliary electrode

auxiliary electrode output

filling material bag

Copper Sulfate Reference Electrode CSRE.SK output

REQUEST FORM:

CSRE.SK «Etalon» -X - X

Length of the measuring cable, m (possible values – not less than 5)

Copper sulfate reference electrodes, Producer «SoyuzKomplekt LTD».
Model (possible values - «Etalon»-1.0, ««Etalon»»-2.0 or «Etalon»-3.0)

ANODE BEDS

AB.SK TU 3435-011-09890805-2015

FUNCTION • Anode beds (AB.SK) are designed for using them as the low-soluble elements of the anode beds connecting the positive terminal of an alternator of CPS with the ground and for providing protective currents exhaust into the ground.

GENERAL CHARACTERISTICS:

- High operational period.
- An anode bed is provided with a corrosion resistant cable which is used in CPS.
- Several modifications of the device used for different environment conditions.
- Safe anchoring and airtight packing of the connecting point of the lead cable and of the operational electrode.

FOUR GENERAL MODIFICATIONS OF THE ANODE BEDS AB.SK ARE PRODUCED:

SAB.SK.FS - surface anode beds;

SSAB.SK.FS - standard surface anode beds;

DSAB.SK.FS - deep-seated anode bed;

SBDAB.SK.FS – standard block deep-seated anode beds.

Anode beds AB.SK.FS meet General Technical Requirements GTR OTT-29.100.99-KTH-163-12 change 2 "The Main Pipeline Transportation of Oil and Oil Products. Cathode Protection Systems. Anode beds". They are included into "The General Product Type Register" bought by PJSC "Transneft".

The anode bed AB.SK. is produced by using a method of special corrosion resistant foundry FS 15 (iron silicon) according to GOST 7769. In case of high chloride content or sea water content the foundry becomes alloyed by chrome which increases its resistance.

SSAB.SK.FS are delivered in the kit. They are delivered in a metal tube filled with a mineral activator. An anode layer activator significantly increases a connecting current-drainage space and this process makes transient resistance "operational electrode – ground" low as well as protective current spreading.

GENERAL CHARACTERISTICS of SAB.SK.FS and SSAB.SK.FC

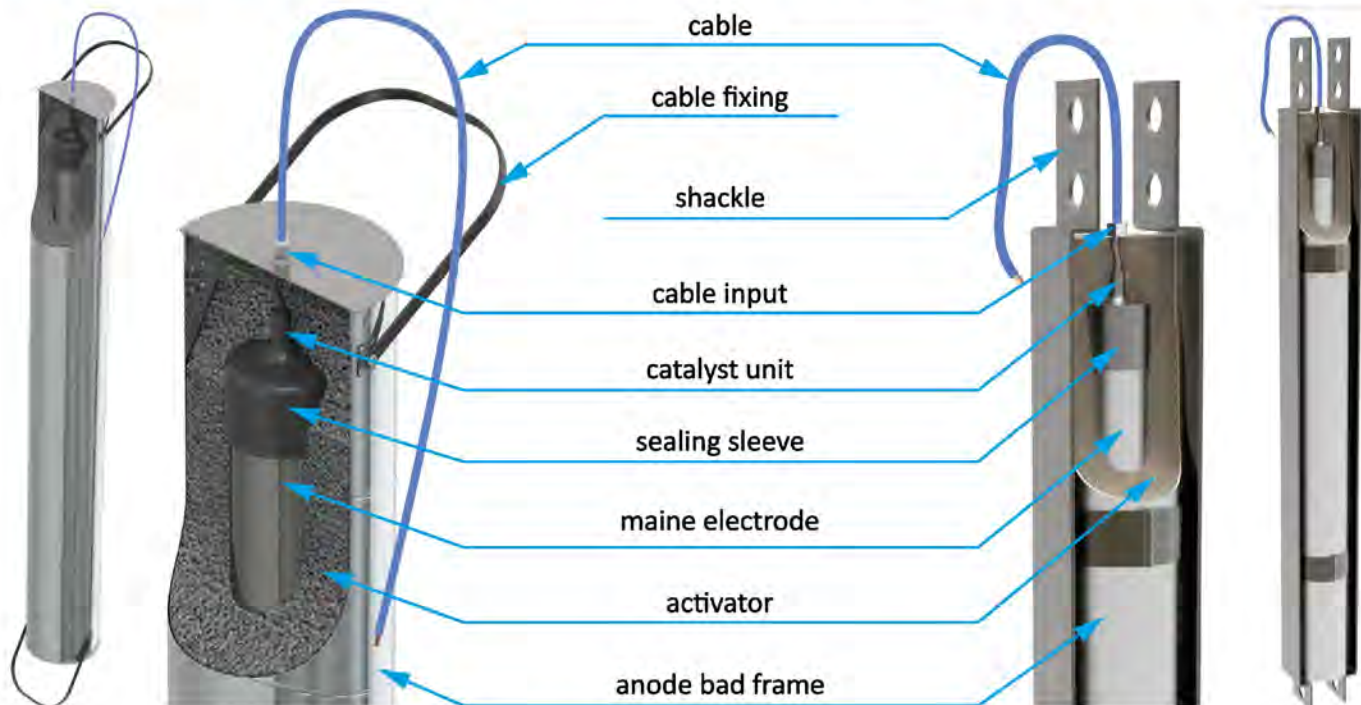
GENERAL CHARACTERISTICS	SAB.SK. FS-23	SAB.SK. FS-32	SAB.SK. FS-44	SSAB.SK. FS-23	SSAB.SK. FS-32	SSAB.SK. FS-44
Electrode nominal mass (grab mass), kg	23 ± 3	32 ± 3	44 ± 3	23 ± 3	32 ± 3	44 ± 3
Length of the electrode (of the grab), mm	1510 ± 10	1500 ± 10	1455 ± 10	1510 ± 10	1500 ± 10	1455 ± 10
Anode bed mass, kg	23 ± 3	32 ± 3	44 ± 3	55 ± 3	61 ± 3	74 ± 3
Length of the anode bed (without a cable), mm	1510 ± 10	1500 ± 10	1455 ± 10	1600 ± 10	1600 ± 10	1600 ± 10
Active space of an anode bed, not less than, m	not indicated			160 ± 5	160 ± 5	160 ± 5
Length of the tube of the anode bed, mm	not indicated			1600 ± 10	1600 ± 10	1600 ± 10
Active surface area of the anode bed, not less than, m ²	0,2668	0,3028	0,3555	0,804	0,804	0,804
Nominal current load, not less than A	1,6	2,3	3,1	1,9	2,7	3,7
Total current load for the anode bed, not less than, A	4	5,7	7,7	4,6	6,4	8,8
Total quantity of the anode beds in a kit, items	not limited					
Anode bed operational period (including a current-carrying cable and a catalyst unit) – nominal current load, not less than, years	30	30	30	30	30	30
Dissolution rate, not less than, A-year/kg	0,3	0,3	0,3	0,3	0,3	0,3
Use environment	soil					

GENERAL CHARACTERISTICS DSAB.SK.FS AND SBDAB.SK.FS

GENERAL CHARACTERISTICS	DSAB.SK. FS-23	DSAB.SK. FS-32	DSAB.SK. FS-44	SBDAB.SK. FS-23	SBDAB.SK. FS-32	SBDAB.SK. FS-44
Electrode nominal mass (grab mass), kg	23 ± 3	32 ± 3	44 ± 3	23 ± 3	32 ± 3	44 ± 3
Length of the electrode (of the grab), mm	1510 ± 10	1500 ± 10	1455 ± 10	1510 ± 10	1500 ± 10	1455 ± 10
Anode bed mass, kg	33 ± 3	42 ± 3	54 ± 3	55 ± 3	61 ± 3	74 ± 3
Length of the anode bed (without a cable), mm	1890 ± 10	1890 ± 10	1890 ± 10	1890 ± 10	1890 ± 10	1890 ± 10
Active space of an anode bed, not less than, m	not indicated			160 ± 5	160 ± 5	160 ± 5
Length of the tube of the anode bed, mm	not indicated			600 ± 10	1600 ± 10	1600 ± 10
Active surface area of the anode bed, not less than, m ²	0,2668	0,3028	0,3555	0,804	0,804	0,804
Nominal current load, not less than A	1,6	2,3	3,1	1,9	2,7	3,7
Total current load for the anode bed, not less than, A	4	5,7	7,7	4,6	6,4	8,8
Total quantity of the anode beds in a kit, items	32	32	25 not limited	32	25	20
Anode bed operational period (including a current-carrying cable and a catalyst unit) – nominal current load, not less than, years	30	30	30	30	30	30
Dissolution rate, not less than, A-year/kg	0,3	0,3	0,3	0,3	0,3	0,3
Use environment	soil					

GENERAL IMAGE AB.SK.FS-SSAB

GENERAL IMAGE AB.SK.FS-SBDAB



REQUEST FORM:

AB.SK.FC - XX - XXXX - XX - X/X - X - XX

Block construction - BC
and total quantity of the blocks into the column, items.
Non-block construction - NBC

Tank breather tube communication:
- Tank breather tube installed - TBT;
- without a tank breather tube - O

Total length of the cable termination glands/decrement step
(or length of the cable termination), m

Total quantity of the anode beds in the kit for setting up
in one wellsite (cut) items.

Anode bed length:
- 1510 mm (anode bed mass - 23 kg);
- 1500 mm (anode bed mass - 32 kg);
- 1455 mm (anode bed mass - 44 kg).

Anode bed type:
- SAB - surface anode bed;
- SSAB - standard surface anode bed;
- DSAB - deep-seated anode bed;
- BDSAB - block deep-seated anode bed

Anode beds, Producer «SoyuzKomplekt LTD», anode material - iron silicon

MAGNESIUM ANODE PROTECTORS

PM.SK TU 3435-012-09890805-2015

FUNCTION • Magnesium anode protectors (MAP.SK) are designed for using them into ground protection units into the local CPS of steel communications as individual means of CP and (or) a redundant system.

GENERAL CHARACTERISTICS:

- Good electrochemical characteristics.
- High electrochemical capacity.
- An activator provides the equipment with better connecting with the ground, better current distribution conditions and the passivation of the anode bed surface.

MAGNESIUM PROTECTORS MP.SK ARE PRODUCED IN THE FOLLOWING MODIFICATIONS:

- RMAP.SK-20 are designed for the ground protection of steel reservoirs from drainage water corrosion;
- MAP.SK-5, MAP.SK-10, MAP.SK-20 are designed for the ground protection of oil and gas products pipelines from the underground corrosion;
- MAP.SK-5P, MAP M.SK-10P, MAP.SK-20P with an activator are designed for the ground protection of oil and gas products pipelines from the underground corrosion;
- MAP.SK-12-80 and MAP.SK-15-80 are designed for the ground protection of steel and petroleum field communications from from the underground corrosion.

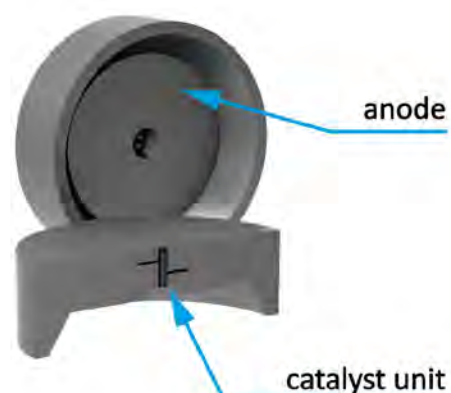
General characteristics and the process of utilization of Magnesium Protectors for underground communications meet the requirements of GOST R 51164 and GOST 9.602, BR 29.240.00-TRR-163-16 "Service Electric Power Transmission Lines and Cathode Protection Units. Maintenance Rules and Regulations" as well as BR 91.020.00-TRR-170-17 "The Main Pipelines Transportation of Oil an Oil Products. Cathode Protection System of the Objects of the Main Pipeline. Design Rules and Regulations".

GENERAL CHARACTERISTICS	MAP.SK-5 (MAP.SK K-5P)	MAP.SK-10 (MAP.SK-10P)	MAP.SK-20 (MAP.SK-20P)	RMAP.SK-20	MAP.SK-12-80	MAP.SK-15-80
MA Mass, not less than, kg	5 (5)	10 (10)	20 (20)	20	12	15
Mass (netto), not less than, kg	-, (16)	-, (30)	-, (60)	-	-	-
Steady state potential (electrode potential) of the protector comparing with the Magnesium Anode Protector (MAP) for:						
- for alloy MAP-1, not less than B	- 1,6	1,6	1,6	1,6	1,6	1,6
- for alloy MAP-2, not less than B	- 1,55	- 1,55	- 1,55	- 1,55	- 1,55	- 1,55
Capacity utilization of the Magnesium Anode Protector (MAP), not less than, A·h/kg	2330	2330	2330	2330	2330	2330
Capacity utilization						
- for alloy MAP-1, not less than	0,65	0,65	0,65	0,65	0,65	0,65
- for alloy MAP-2, not less than	0,60	0,60	0,60	0,60	0,60	0,60
Practical equivalent weight, not less than, A·year/kg	0,145	0,145	0,145	0,145	0,145	0,145

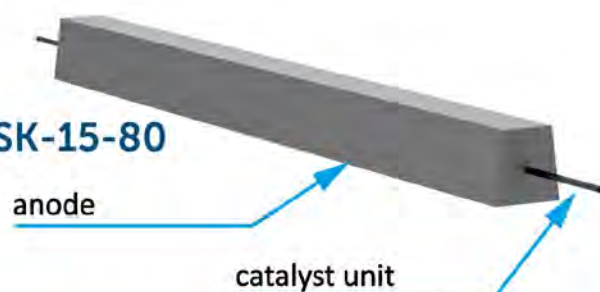
GENERAL IMAGE MAP.SK-20



RMAP.SK-20



MAP.SK-15-80



MAP.SK-12-80



MAP.SK -20P



REQUEST FORM:

MAP.SK - X - X X (X)

Magnesium Anode Protectors alloy (possible values - MP1 or MP2)

P - packed (in case of lack it is not indicated)

Anode cross-section size (applied for MAP.SK-12-80/MAP.SK-15-80, in other cases it is not indicated)

Magnesium anode protectors mass, kg

Producer «SoyuzKomplekt LTD»

Magnesium Anode Protectors (possible values - MAP - Magnesium anode protector, RMAP - Reservoirs Magnesium Anode Protector)

METERING OPERATION CENTERS

MOC.SK TU 3435-018-09890805-2014

FUNCTION • Metering Operation Centers (MOC.SK) are designed for connecting with power and measuring circuits of CPS, operation characteristics regulation of CPS and their control while using additional devices and equipment.

GENERAL CHARACTERISTICS:

- MOC.SK Column is a seamless (weldless) column made by polymetric compound extrusion molding on the bases of polyvinylchloride. The colour of the MOC.SK Column is yellow RAL 1023.
- Information marking is stamped by means of screen printing using ultraviolet radiation resistant pigment. An additional protection from ultraviolet radiation is provided by stamping special protective lacquer on the information marking. Operational period of the information marking is not less than 15 years.
- Power assistance is used in circularization points of the column in its inside diameter in order to make construction resistance characteristics (to make resistance concentration less) better.
- MOC.SK is made of flameproof materials.
- MOC.SK allows to set up additional devices and equipment of CPS inside the column.

MOC.SK meet the requirements of GOST R 51164 and GOST 9.602, BR 01.120.00-GTR-186-16 "The Typical Colour Solutions for the Objects and Equipment for the Pipelines and Oil Products Pipelines," LD-29.240.00-GTR-163-16 "Service Electric Power Transmission Lines and Cathode Protection Units. Maintenance Rules and Regulations", BR 91.020.00-GTR-170-17 "The Main Pipelines Transportation of Oil an Oil Products. Cathode Protection System of the Objects of the Main Pipeline. Design Rules and Regulations" as well as GTR-75.180.00 -GTR-042-18 "The Main Pipeline Transportation of Oil and Oil Products. Cathode Protection Units. Metering Operation Centers. Maintenance Rules and Regulations". They are included into "The General Product Types Register", bought by PJSC "Transneft".

GENERAL CHARACTERISTICS	Type P01	Type P02
MOC height, mm	2500	
Column cross-station	Square	
Face width (side), mm	200 ± 5	
Column resistance, not less than, kN	2,5	
Protection degree, not less than	IP34	
Mass, kg	14 ± 1,5	17 ± 1
Operating temperatures range, °C	-60 ÷ +60	

ADDITIONAL EQUIPMENT CP

PPU.CK.GR	1 - 2 canals	1 - 4 canals
PPU.SK.GR-P	1 canals	1 - 2 canals
ACDS.SK	-	1 canals
CCD.SK, CCD -M.SK	-	10, 20, 30 canals
CMU.SK (CMMU.SK)	1 canals	2 - 3 canals

Making up MOC.SK cutting-edge polymer materials are used. The materials have their special characteristics. The characteristics are as follows:

- high mechanical reliability and light weight;
- flameproof;
- an ability to use in any climatic conditions;
- no season service needed;
- operational period is not less than 15 years.

Metering Operation Centers (MOC.SK) range of solutions consists of the following units:

- MOC (P01 type) is designed for the process of commutation of power and measuring circuits, additional equipment CPS placement.
- MOC (P02 type) is designed for the process of commutation of power and measuring circuits, additional equipment CPS placement as well as the equipment for corrosion monitoring (telemechanics systems).

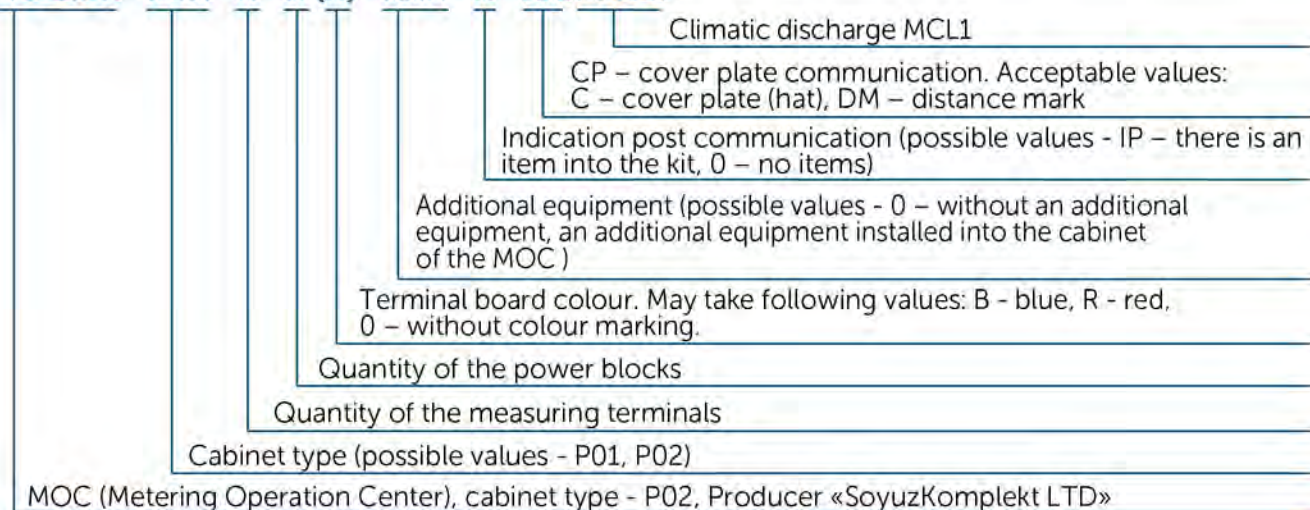
Information marking on the MOC.SK Column is stamped with the process of linking to the length of the pipeline (either the main pipelines or technological pipelines and technological reservoirs as well as reference symbols according to CPS sheet). The MOC.SK, set up on the linear pipeline portion, provided with distance marks (or cover plates) with distance indication which can be read from the board of a helicopter during the inspection flights if the linear pipeline portions tracks. Besides, the MOC.SK is provided with an indication post. The MOC.SK set up in the technological pipelines and tank batteries, are provided with signal hats.

THE INFORMATION WHICH IS STAMPED ON THE MOC.SK COLUMN AND COVER PLATES

MOC installed on the technological pipelines and process reservoirs		MOC installed on major pipeline	
MOC	MOC with CSRE	MOC	MOC with CSRE
MOC-K	MOC end-cutting (for extensive AB)	Test-stations	MOC with CSRE and (or) current taps
MOC-C	MOC connecting (for extensive AB)	MOC-CC	MOC crossing over the communications
Test-stations	MOC with CSRE and (or) current taps	MOC-R	MOC with an idle branch
MOC-CC	MOC crossing over the communications	MOC-D	MOC drainage point
MOC-D	MOC drainage point	MOC-AB	MOC with setting up AB
MOC-AB	MOC with setting up anode bads	MOC-MAP	MOC with setting up the magnesium anodes
MOC-MAP	MOC with setting up the magnesium anodes	MOC-ACDS	MOC with Alternate Current-Drainage Systems

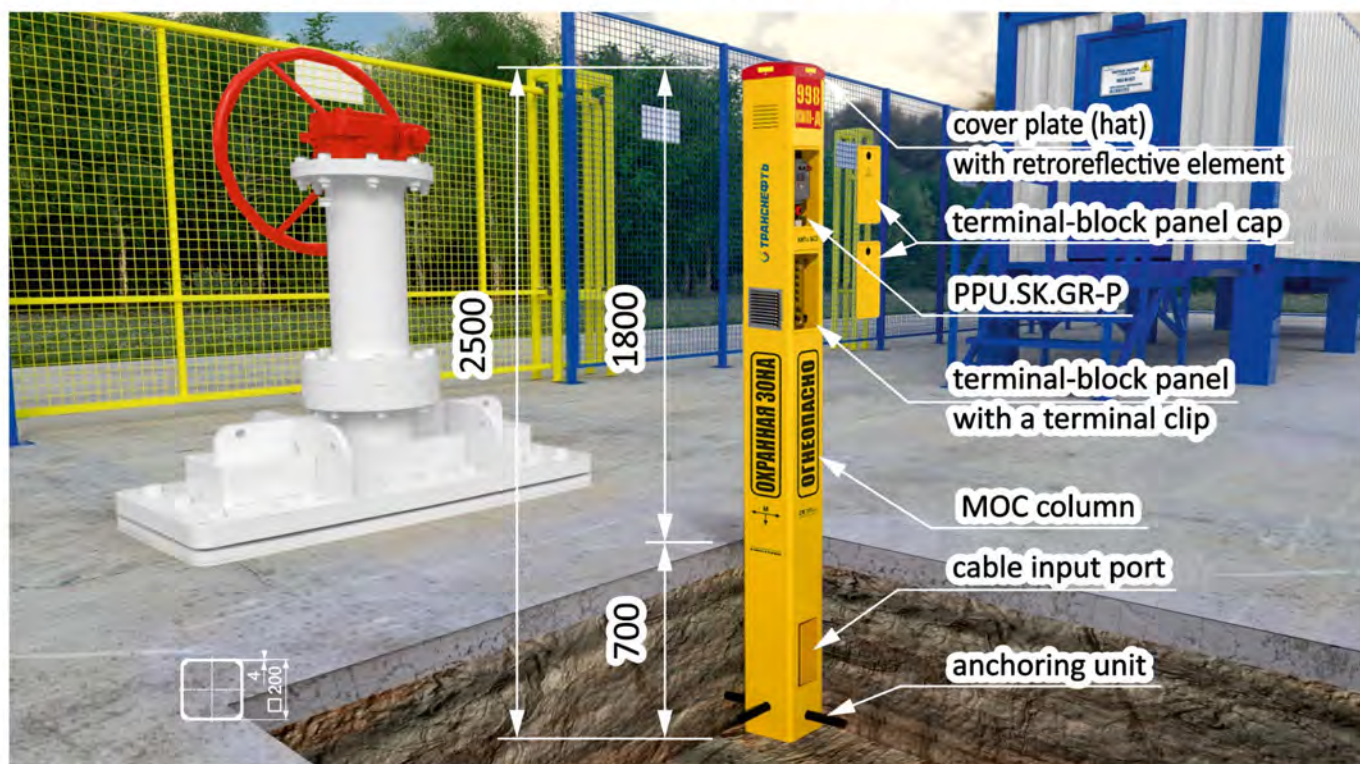
REQUEST FORM:

MOC.SK - P0X - X - X (X) - XXX - X - XX.MCL1

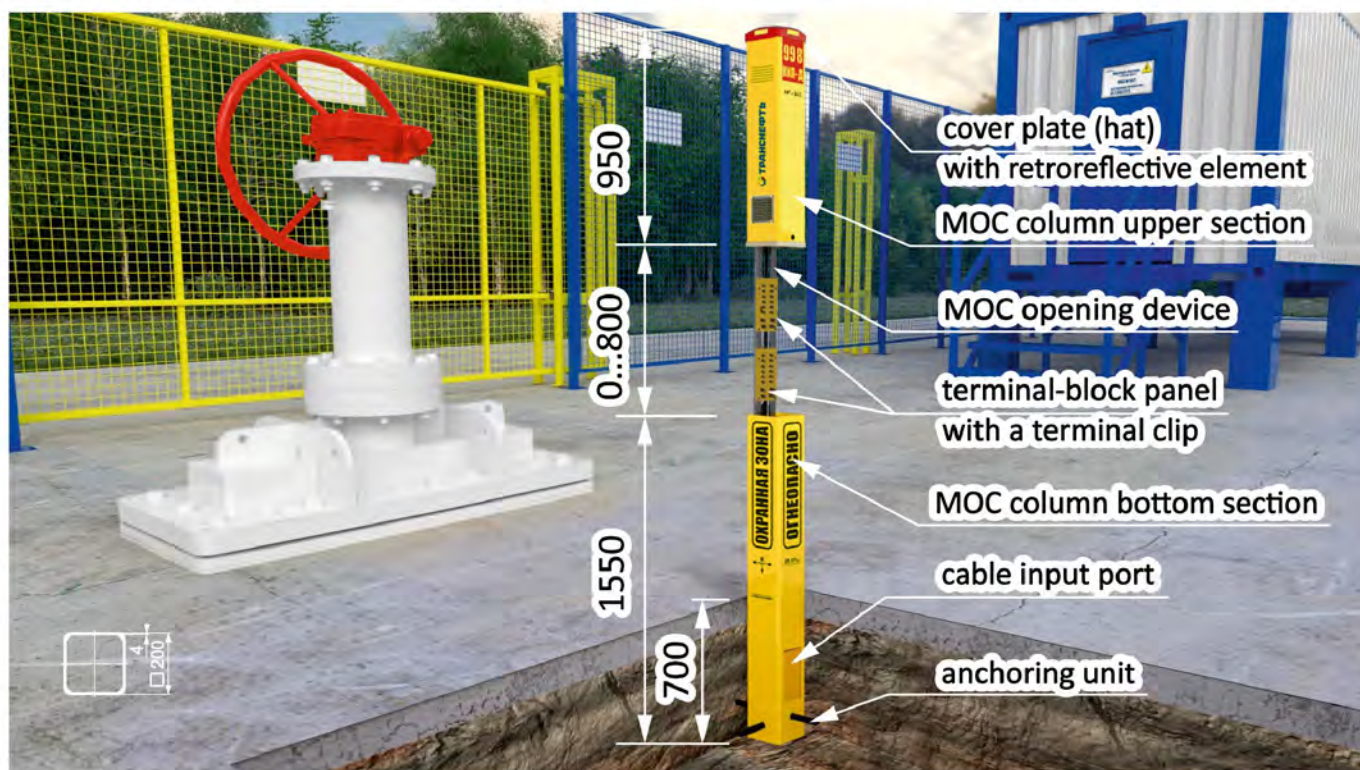


METERING OPERATION CENTERS

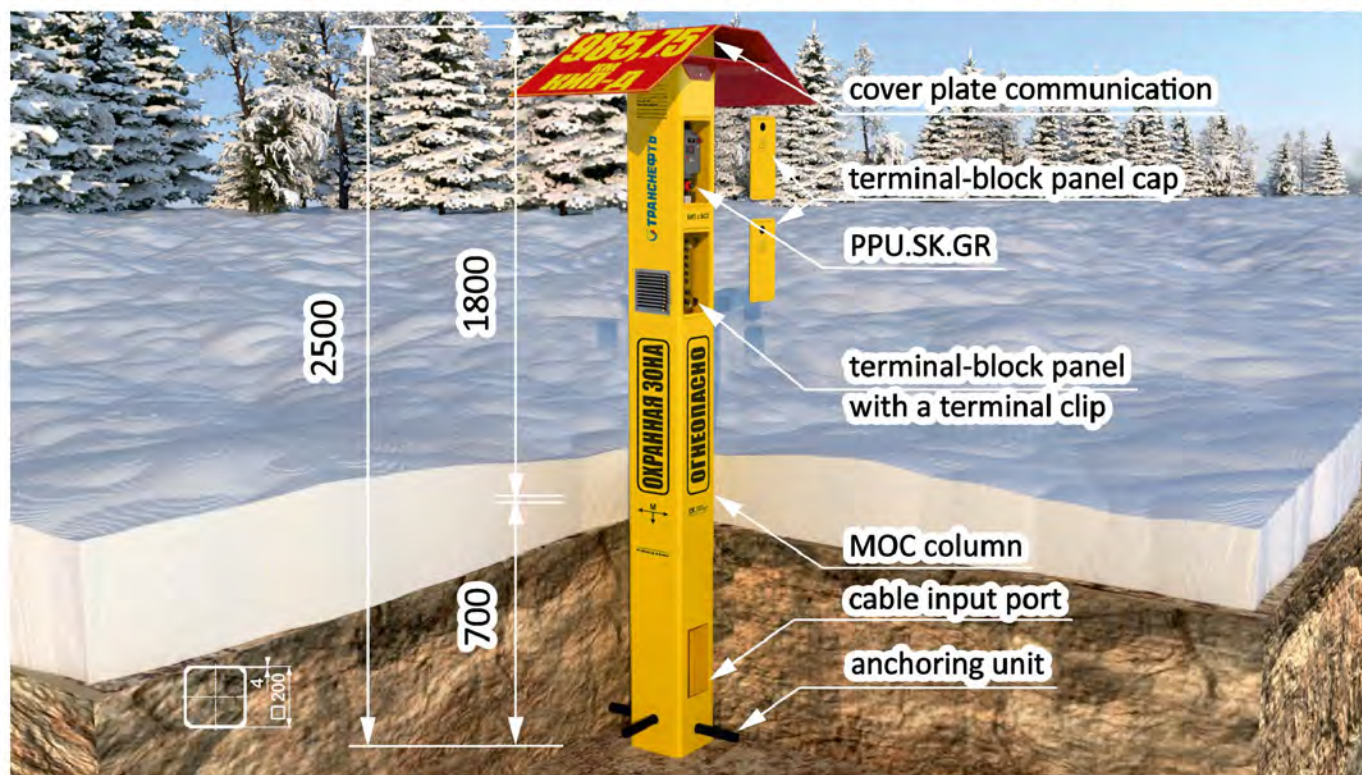
GENERAL IMAGE MOC.SK-P01-12-4(0)-PPU.SK.GR-P-10-1.F-0-C.MCL1



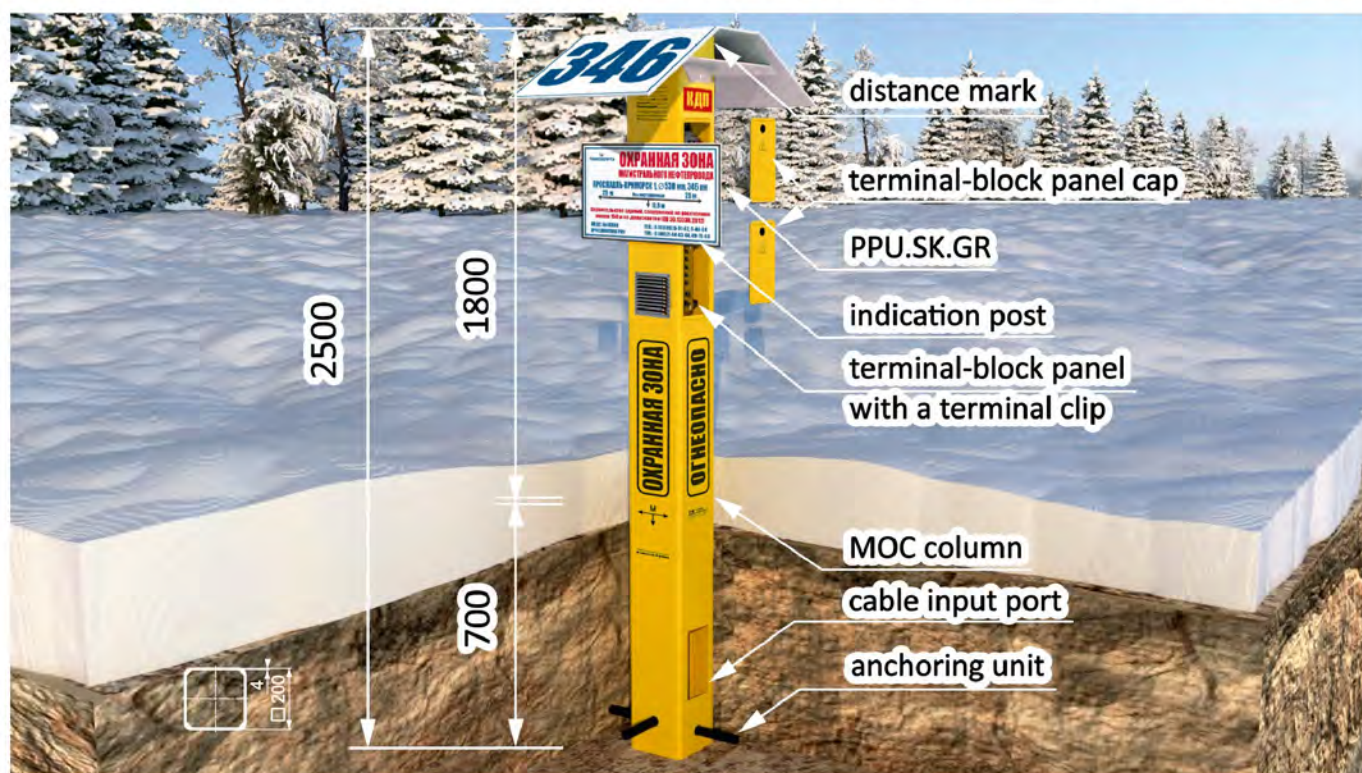
GENERAL IMAGE MOC.SK-P02-12-4(0)-12-4(0)-0-C.MCL1



GENERAL IMAGE MOC.SK-P01-12-4(0)-PPU.SK.GR-10-1.F-0-CP.MCL1



GENERAL IMAGE MOC.SK-P01-12-4(0)-PPU.SK.GR-10-1.R-IP-DM.MCL1



INFORMATION WARNING SIGNS

IWS.SK TU 5220-003-09890805-2014
IWS.SK TU 5220-020-09890805-2014

FUNCTION • Information Warning Signs (IWS.SK) are designed for the process of marking the borders of the protected areas, objects (equipment), different types of communications crossover, turning points indication as well as distance marking and the process of reading of the indication marks during the process of the helicopter inspection, borders zones and other indication points.

GENERAL CHARACTERISTICS:

- IWS.SK Column is a seamless (weldless) column made by polymetric compound extrusion molding on the bases of polyvinylchloride.
- Information marking is stamped by means of screen printing using ultraviolet radiation resistant pigment. An additional protection from ultraviolet radiation is provided by stamping special protective lacquer on the information marking. Operational period of the information marking is not less than 10 years.
- Light weight and easy installation.
- IWS.SK Column is made of flameproof and corrosion resistant materials.
- No seasonal services needed.
- The Customer's identity style must be followed.

Information Posts (information tables) IP.SK are made of a high-impact, flameproof, freezeproof, polymer materials 5 mm thick. The information given on the Information Posts (information tables) is stamped by means of full-colour ultra-violet printing in order to provide protection and correspondence to the demanded colours (according to colour registers and standard colour samples of RAL) (согласно цветовым регистрам стандартных образцов RAL) during all the operational period.

The information warning signs were made according to GTR-75.200.00-TRR-044-19 "Main Pipelines Transportation of Oil and Oil Products. Signs. Information Posts. Maintenance Rules and Regulations", GTR-03.100.00-TRR-028-15 "The order of Preparation and Organization of a Pre-Project Inspection of the Objects of the Development Programme, Maintenance, Repair and Retrofit of the Main Pipelines of PJSC "Transneft" as well as the Process of General Maintenance Programmes of the Main Pipelines of PJSC "Transneft", LD-01.120.00-GTR-186-16 "The Typical Colour Solutions for the Objects and Equipment for the Pipelines and Oil Products Pipelines", and LD- ПД-91.020.00-KTH-170-17 "The Main Pipelines Transportation of Oil an Oil Products. Cathode Protection System of the Objects of the Main Pipeline. Design Rules and Regulations"

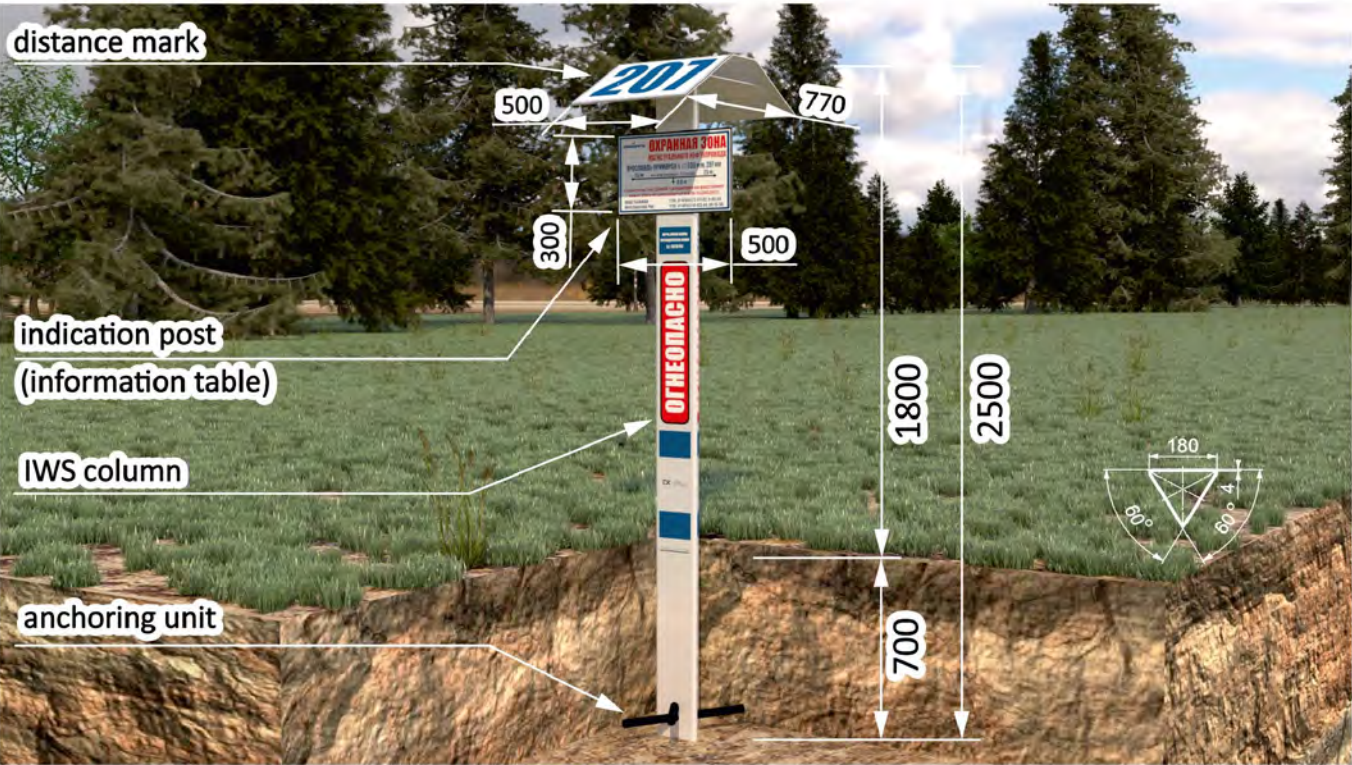
GENERAL CHARACTERISTICS	Column type - 1	Column type - 2	Information sign installed on the pipeline
Column height, mm	1250 ÷ 2500	2500	500
Column cross-station	triangle	square	triangle
Face width (side), mm	180 + 5	200 ± 5	180 + 5
TW,mm		4	
mass, not more than, kg	9,5 ± 1,5	14 ± 1,5	5 ± 1 (with mounting table)
Column resistance, not less than, kN	1,5	2,5	-
Operating temperatures range, °C		-60 ÷ +60	

REQUEST FORM (sample):

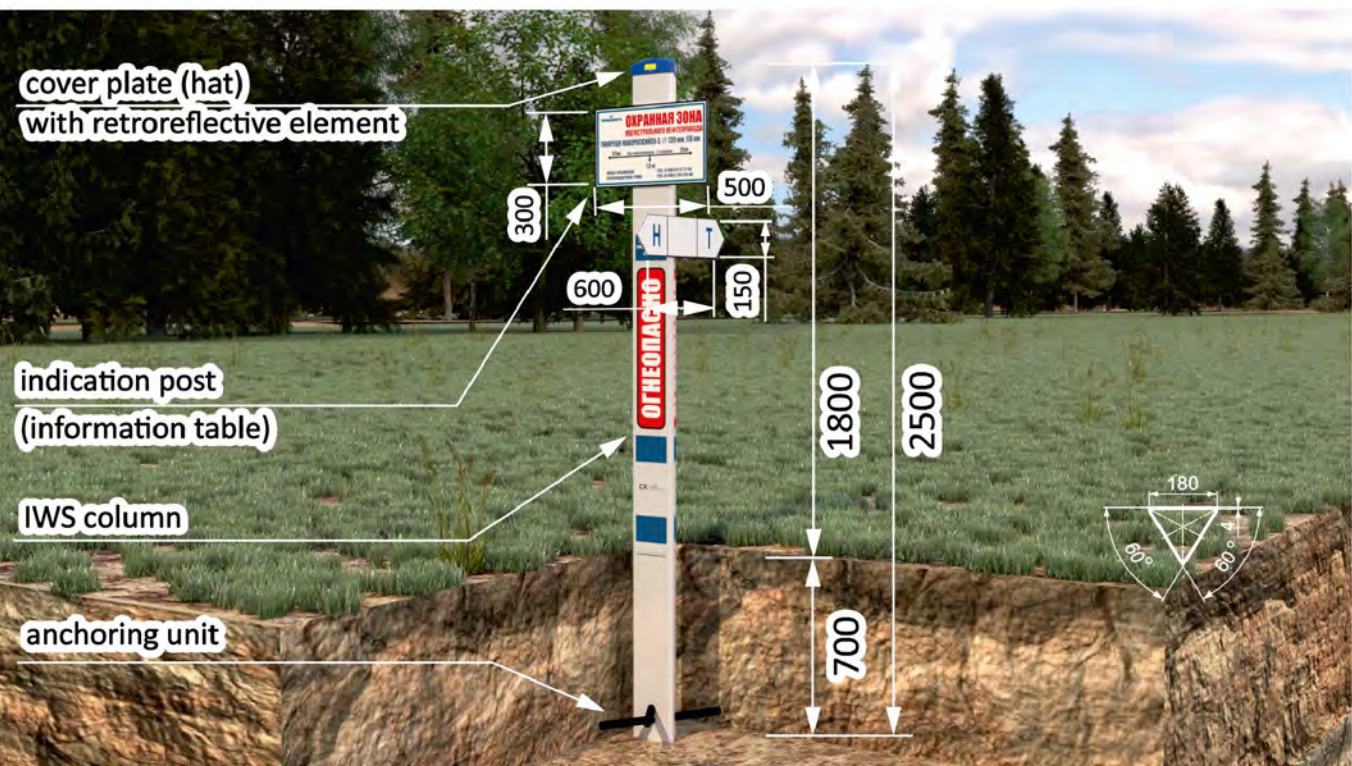
IWS. SK. IP. DM – INDICATION POST WITH A CANOPY FOR AIR CONTROL

Distance mark (canopy)
Indication post (information table)
Producer «SoyuzKomplekt LTD»
Information Warning Signs

GENERAL IMAGE IWS.SK.IP.DM



GENERAL IMAGE IWS.SK.IP+IP.SK

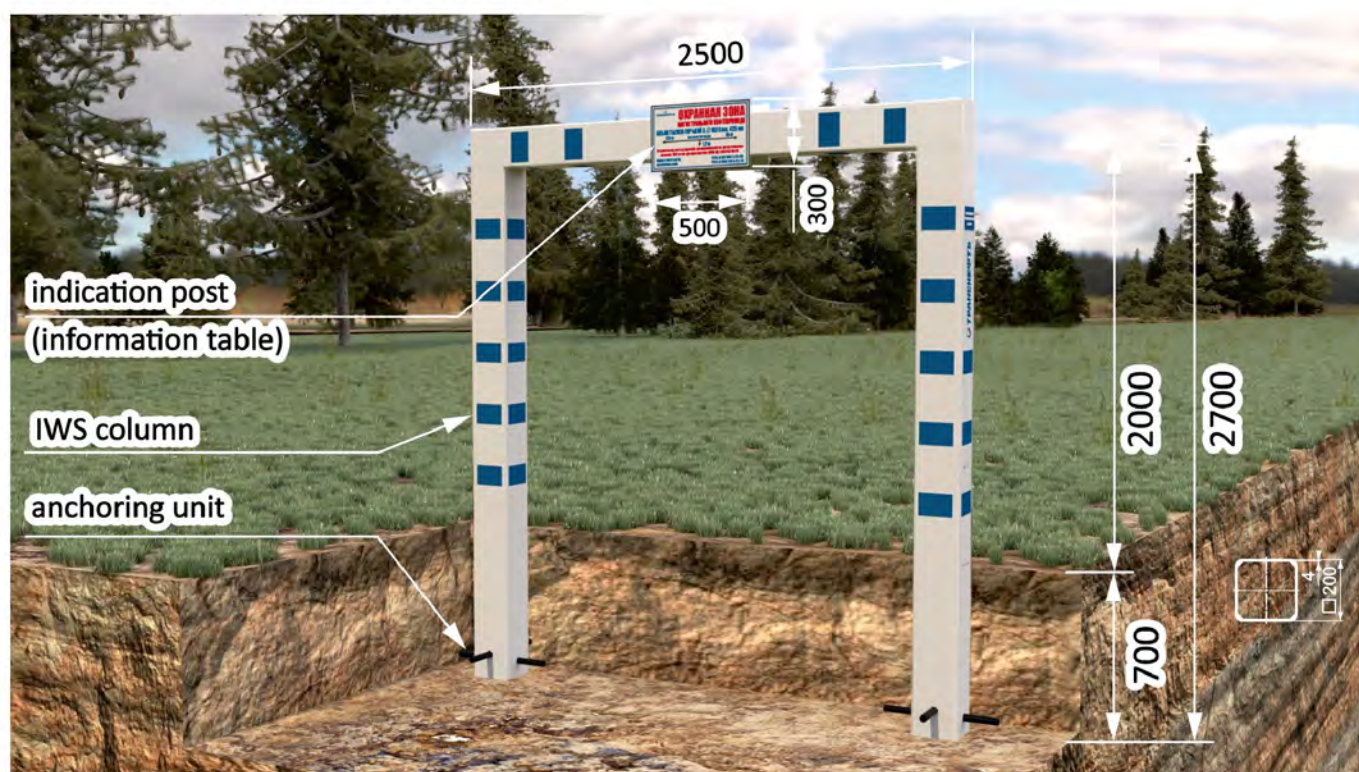


INFORMATION WARNING SIGNS

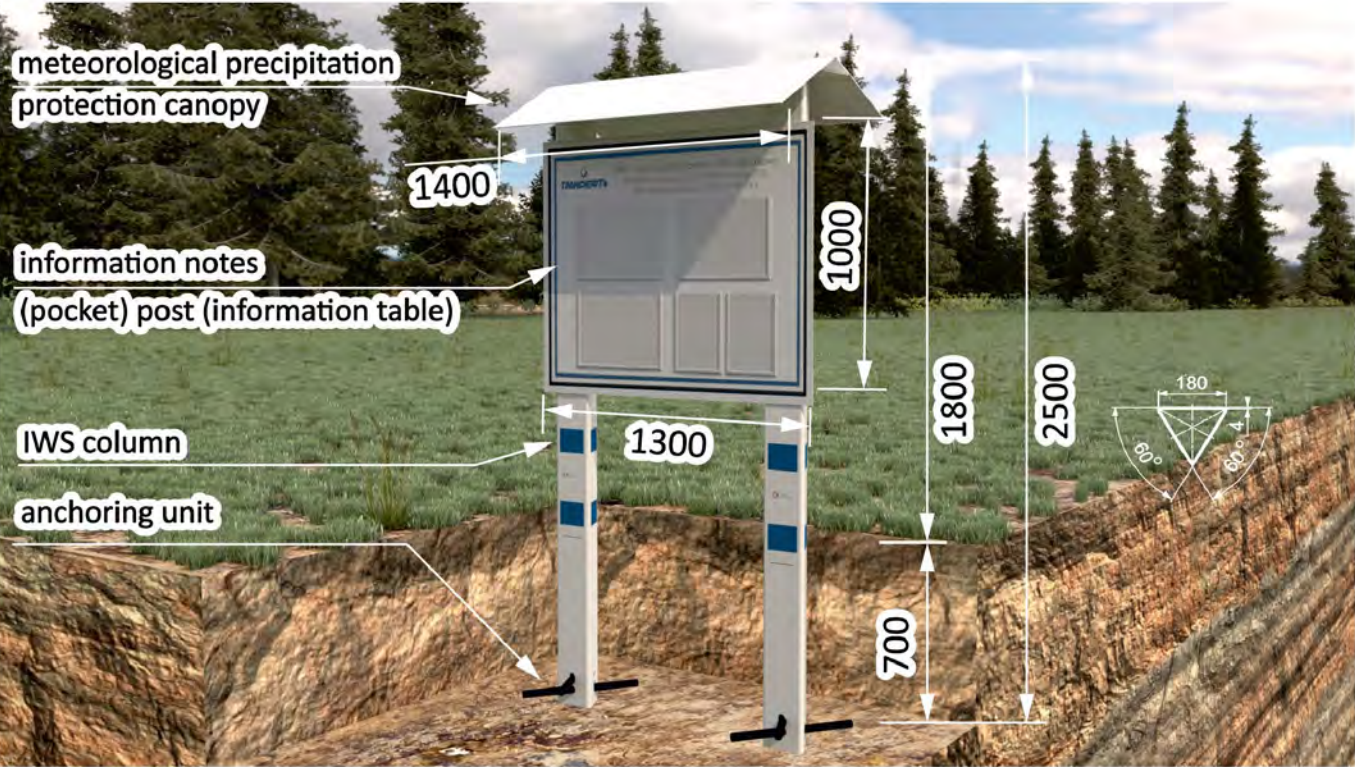
GENERAL IMAGE IWS.SK.IP.U



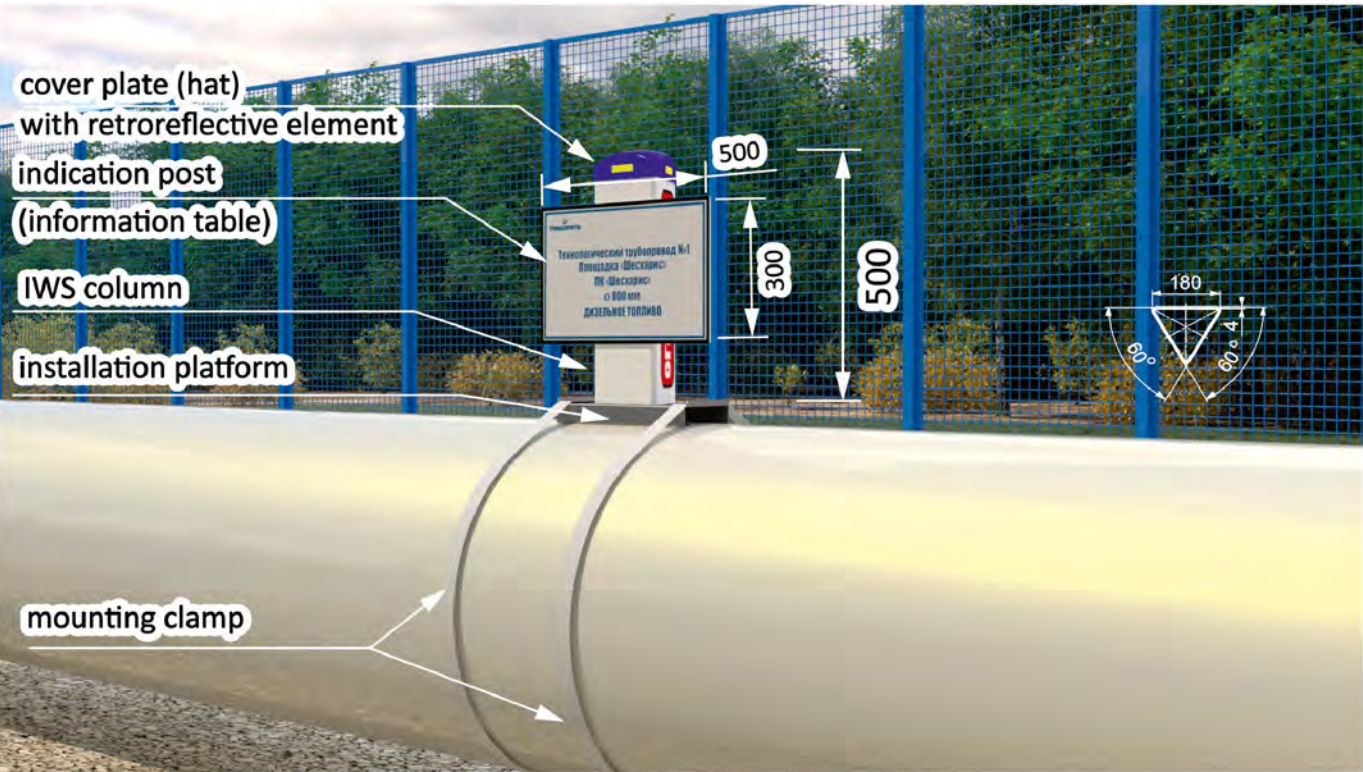
GENERAL IMAGE IWS.SK.IP.U



GENERAL IMAGE IWS.SK.ZAZ

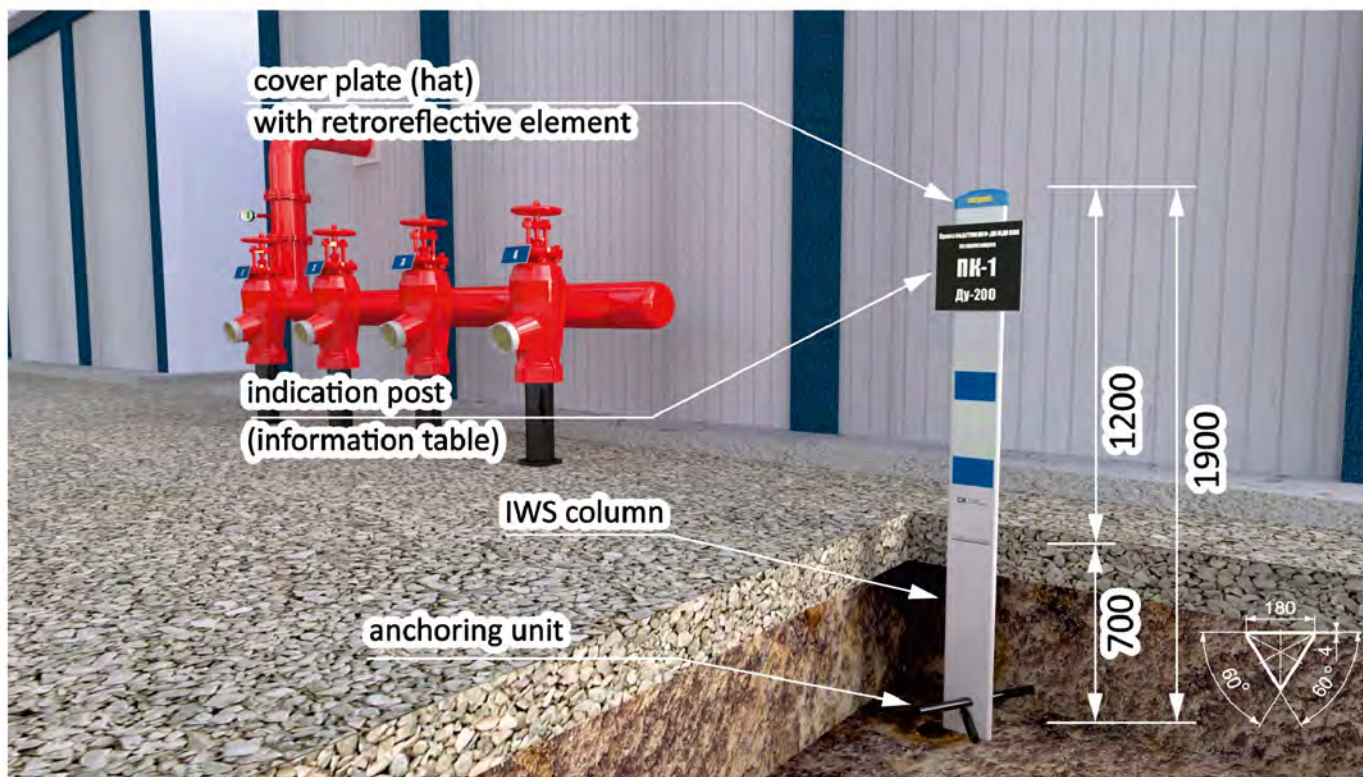


GENERAL IMAGE IS.SK.D.IP, where D – outer diameter of the pipeline, mm

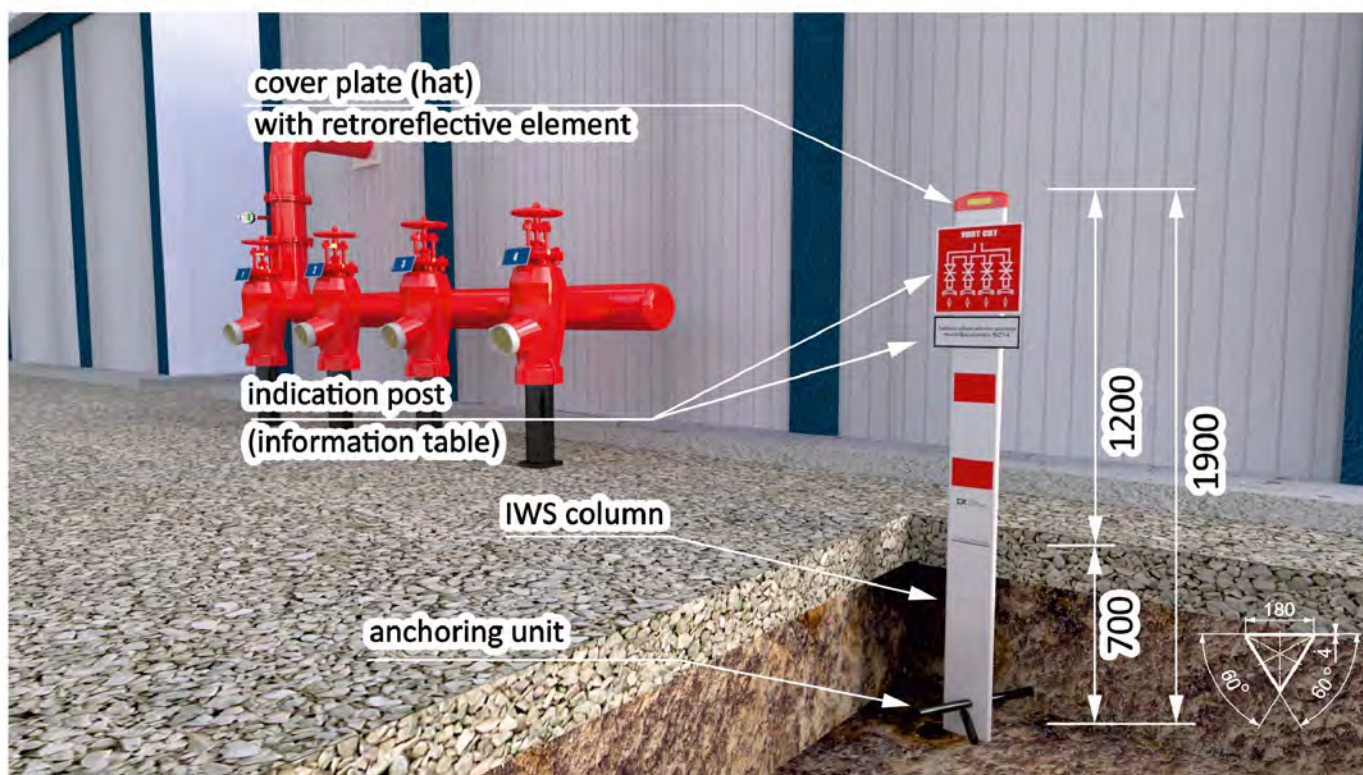


INFORMATION WARNING SIGNS

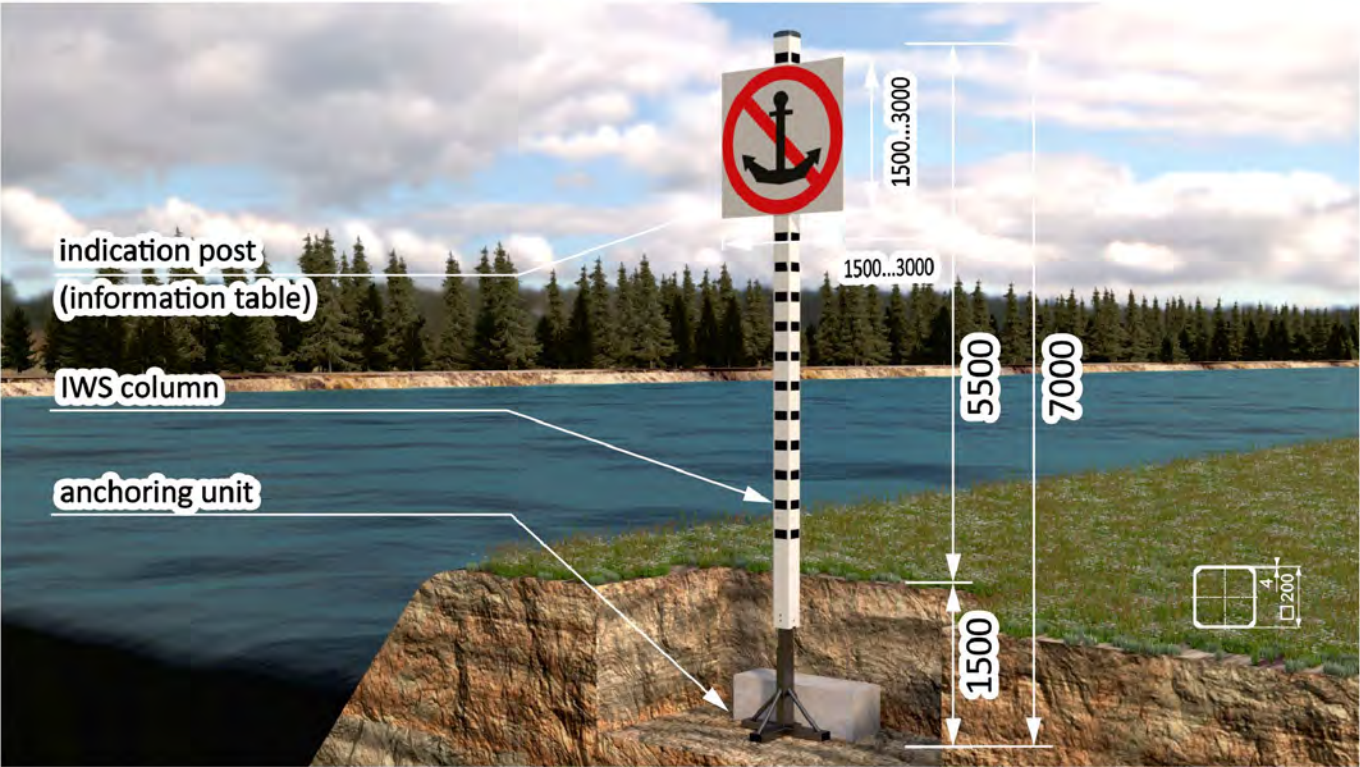
GENERAL IMAGE IWS.SK.IP



GENERAL IMAGE IWS.SK.IP

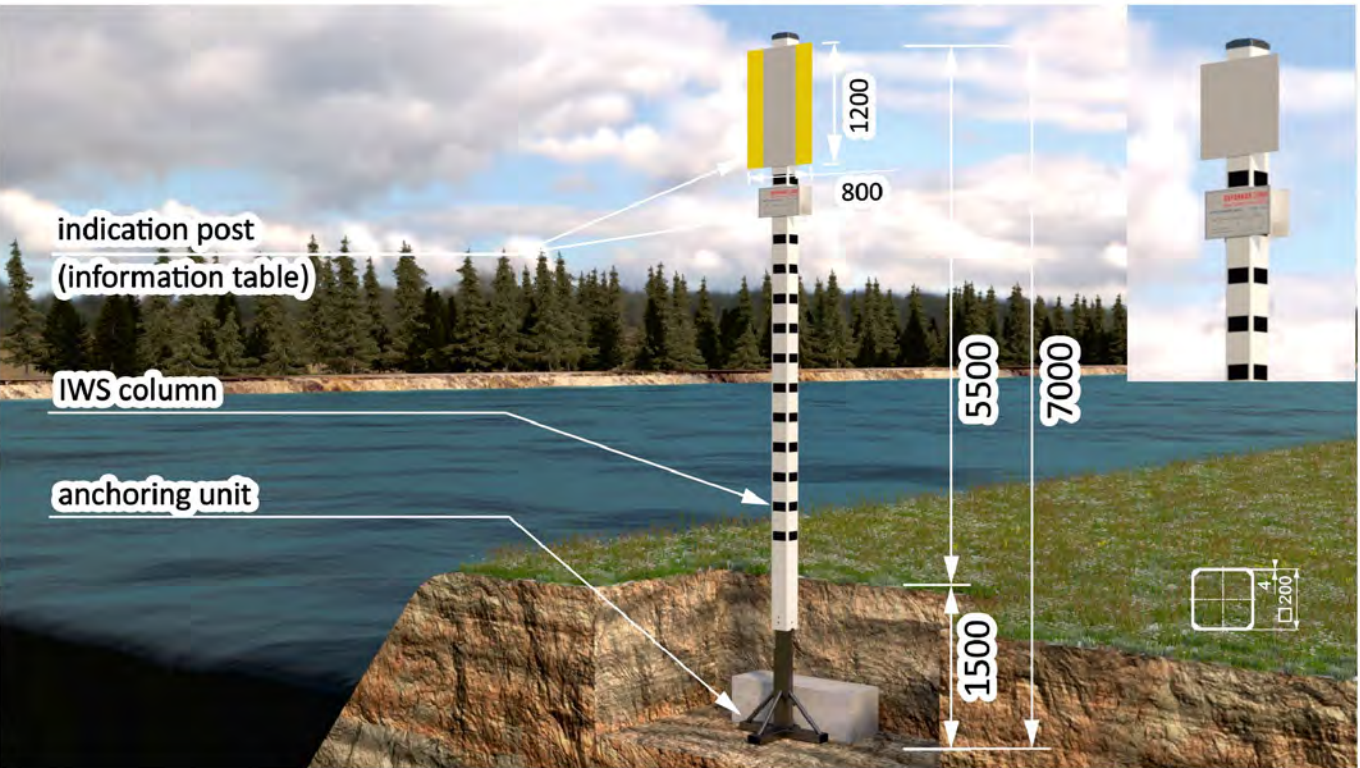


GENERAL IMAGE IWS.SK.SSZ.PS



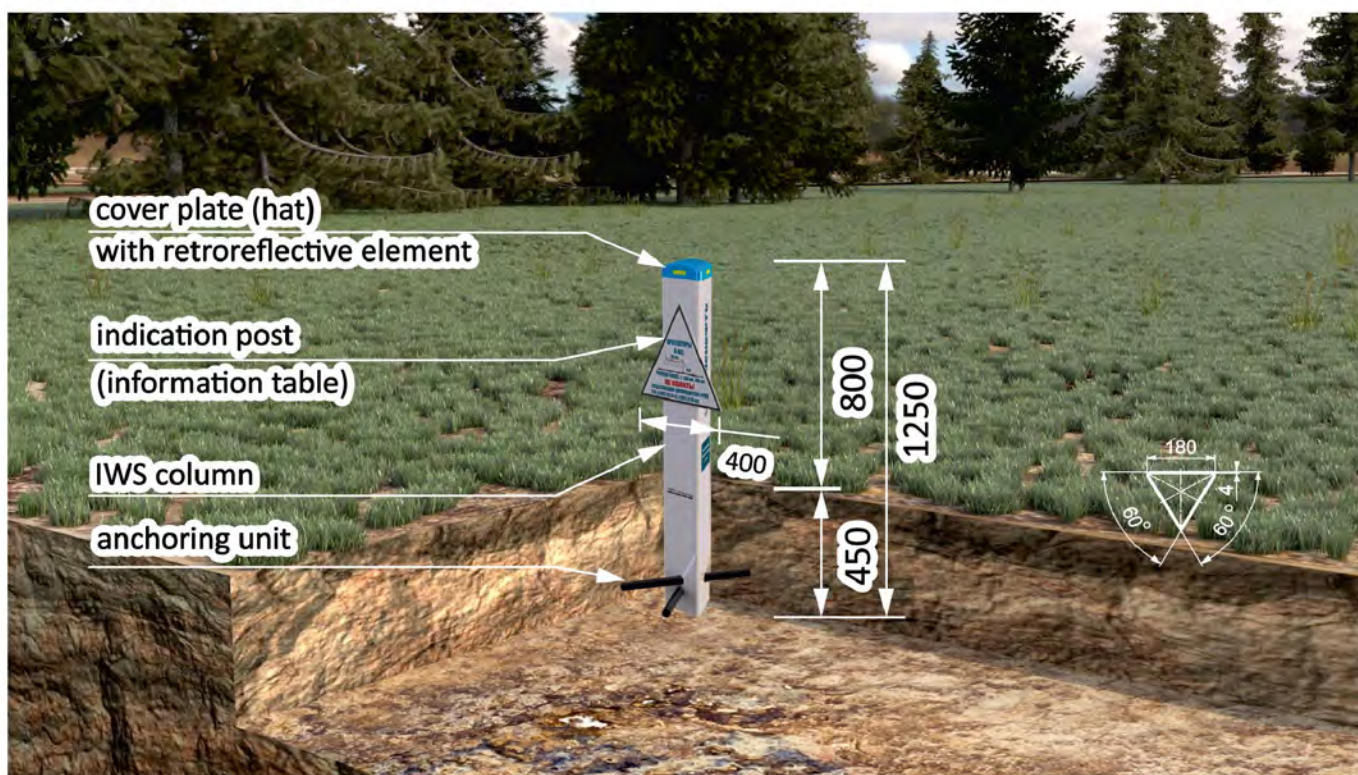
GENERAL IMAGE IWS.SK.SSZ.NR

GENERAL IMAGE IWS.SK.SSZ.NNR

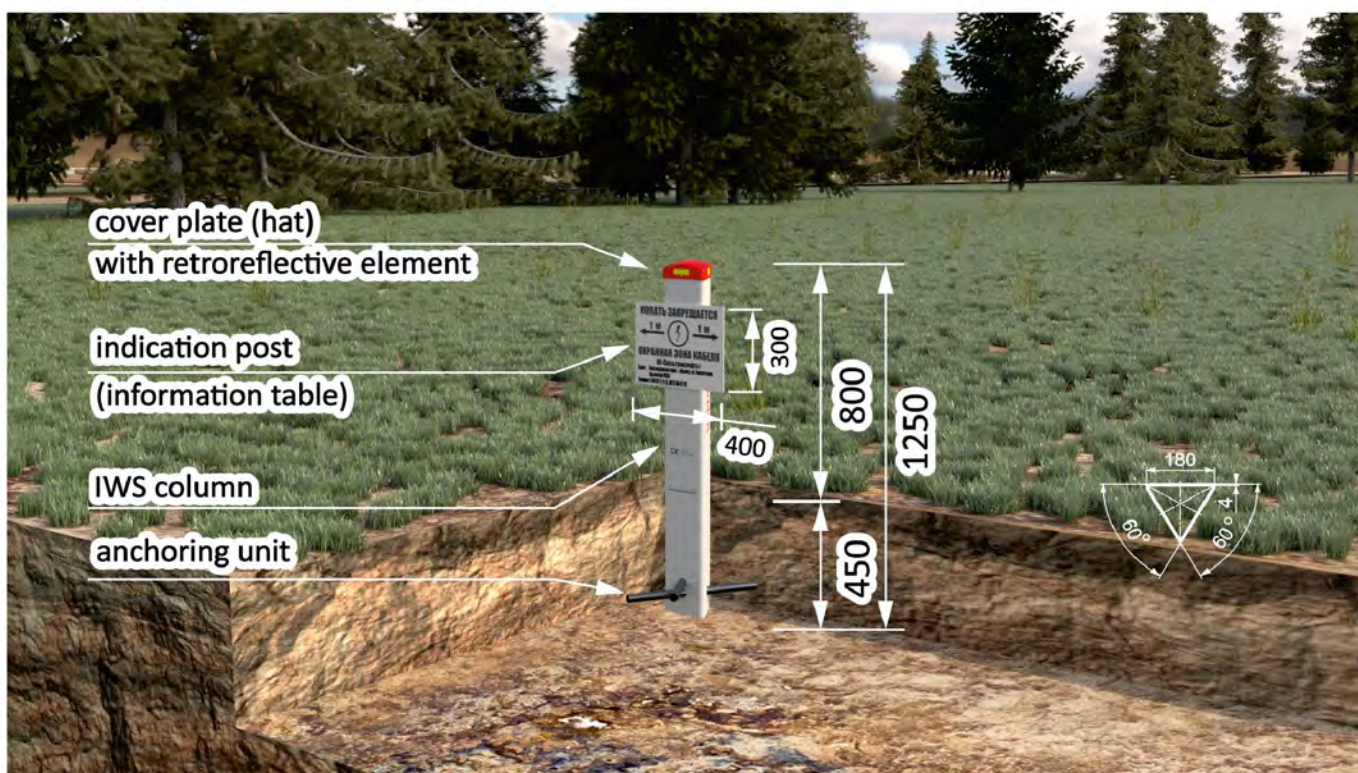


INFORMATION WARNING SIGNS

GENERAL IMAGE IWS.SK.IP



GENERAL IMAGE IWS.SK.IP



INFORMATION POSTS (information tables)

IP.SK TU 5220-020-09890805-2014



Size IP.SK:



maximum
linear size A
≤ 600 мм



maximum
linear size B
> 600 мм



maximum
linear size C
≤ 150 мм

REQUEST FORM:

IP. SK. X - item IP (information tables)

Frame (possible values - A, B, C)

Producer «SoyuzKomplekt LTD»

Indication posts (information tables)

THE PROCEES OF MARKING OF CABLE POWER CIRCUITS AND COMMUNICATION LINES

IWS.SK TY 5220-020-09890805-2014

FUNCTION • Information Warning Signs (IWS.SK.IP) «BEWARE CABLE» are designed for the process of marking of the cable circuits (power supply, communication lines). The Information Warning Signs (IWS.SK.IP) meet the requirements of IWSI (Information Warning Signs (IWS.SK.IP) and Their Installation Requirements) as well as A5-95 Scatchbook «The process of cable placing. Accessible line voltage up to 35 kV into the cut».

GENERAL CHARACTERISTICS:

- IWS.SK Column - IWS.SK Column is a seamless (weldless) column made by polymetric compound extrusion molding on the bases of polyvinylchloride.
- Information marking is stamped by means of screen printing using ultraviolet radiation resistant pigment. An additional protection from ultraviolet radiation is provided by stamping special protective lacquer on the information marking. Operational period of the information marking is not less than 10 years.
- Light weight and easy installation.
- IWS.SK Column is made of flameproof and corrosion resistant materials.
- No seasonal services needed.
- The Customer's identity style must be followed.

CABLE NETS SIGNS ARE PLACED:

- in cable tracks;
- in cable socket;
- in cable track turning point;
- in cable tracks crossover with other communications.

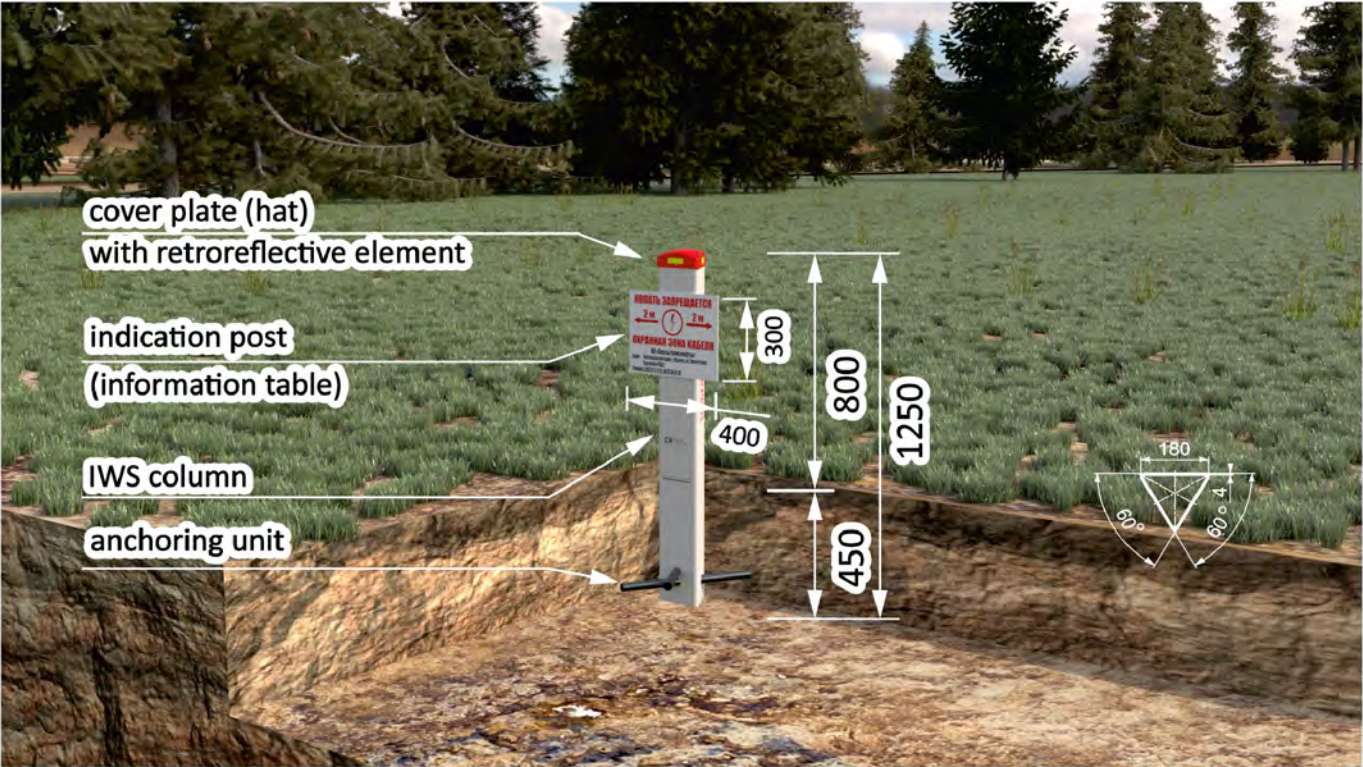
GENERAL CHARACTERISTICS	IWS.SK.IP	IWS.SK
Column height, mm	1250 ÷ 2500	1250 ÷ 2500
Column cross-station	triangle	triangle
Face width (side), mm	180 + 5	180 + 5
WT, mm	4	4
Column resistance, not less than, kH	1,5	1,5
Information table	+	-
Mass, not more than, kg	11 ± 1,5	9,5 ± 1,5
Operating temperature tange, °C	-60 ÷ +60	-60 ÷ +60

REQUEST FORM (sample):

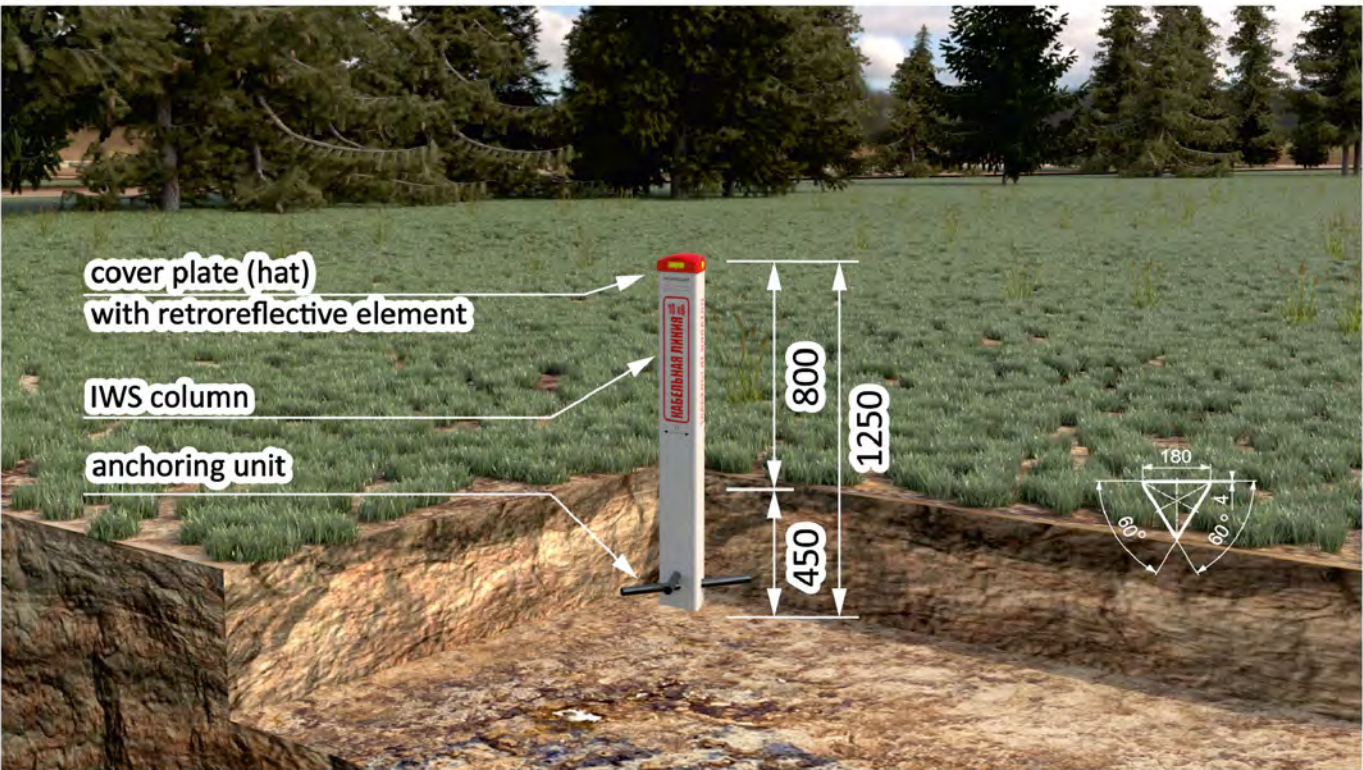
IWS. SK. T – INDICATION POST «BEWARE: CABLES» WITH AN INFORMATION TABLE

Indication post (information plate) Producer «SoyuzKomplekt LTD» Warning sign	

GENERAL IMAGE IWS.SK.IP



GENERAL IMAGE IWS.SK



SMART INTEGRATED CORROSION SYSTEM "ATLANTIC"

SICMS.SK TU 4217-007-09890805-2013

FUNCTION • Smart Integrated Corrosion Monitoring System (SICMS) "Atlantic" is designed for distance characteristics of CPS control, optimization and adequate management of technological characteristics of cathode protection stations. The System provides with a technological process of CPS support at a good level between destructive zones of "underprotection" and "overprotection" considering monitoring data, geological conditions in the location point of a pipeline mainlaying as well as climatic or seasonal changes.

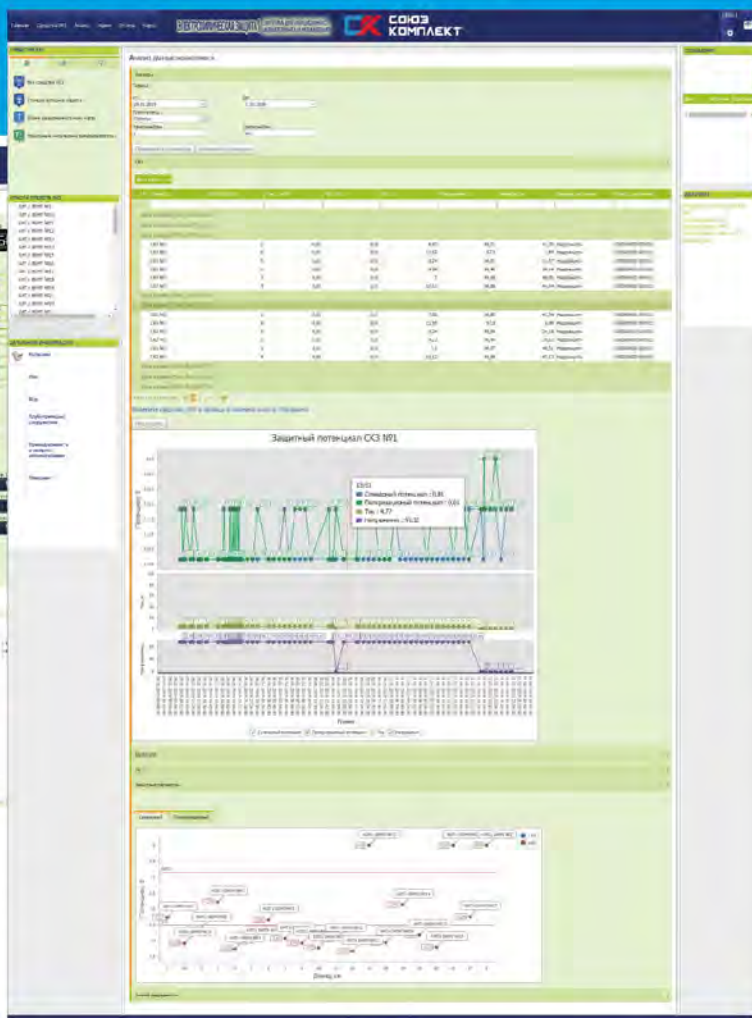
GENERAL CHARACTERISTICS:

- An increasing module structure.
- A power-efficient network for the process of data transmission.
- An analytic data processing.
- Optimization (minimization and adaptation) of protective configuration from the point of view of the environment, communications state etc.
- Information and smart support of the process of taking decisions on the matter of management of CPS.

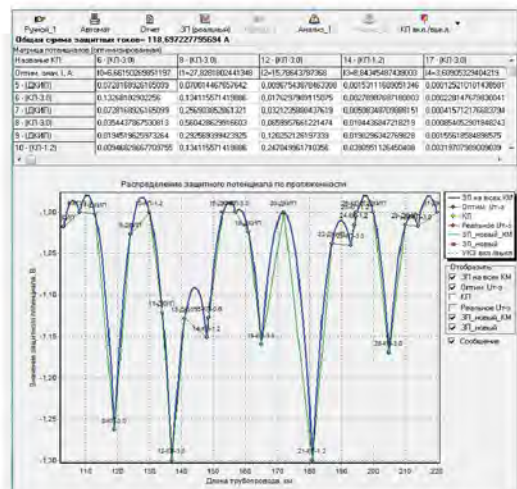
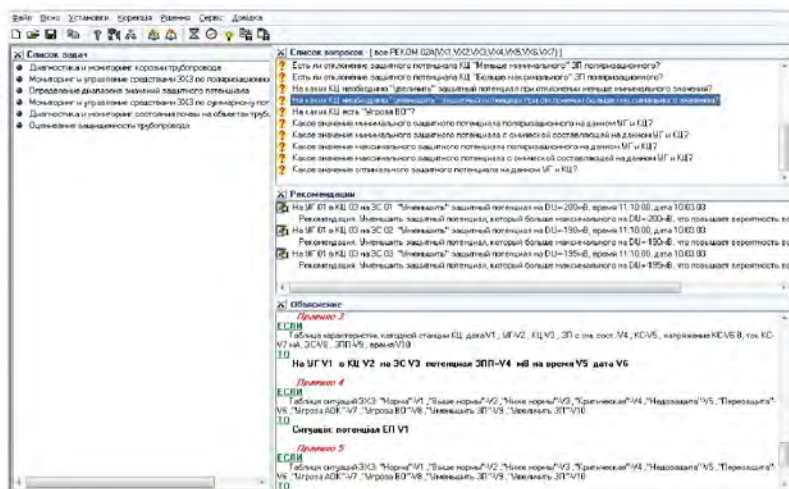


SOLVED PROBLEMS

- The problem of CPS protection of the objects of the pipeline systems from corrosion processes at all levels automatization.
- The process of information exchange between the users of different levels via the Internet channels network through the common interface using access data and access rights.
- Protection configuration of CPS monitoring, Corrosion Monitoring Units (CPU) set up into the MOC.SK and other means of CPS according to giving a request form.
- The process of collecting, processing, storage and displaying of CPS means monitoring results, and an inspection data, the tube state data, isolation data, corrosion ground aggressivity etc.
- Protection configurations optimization process considering monitoring data, geological conditions in the location point of a pipeline mainlaying, climatic and seasonal changes.
- The process of giving recommendations and automatic instructions CPS modes management in an on-line mode.



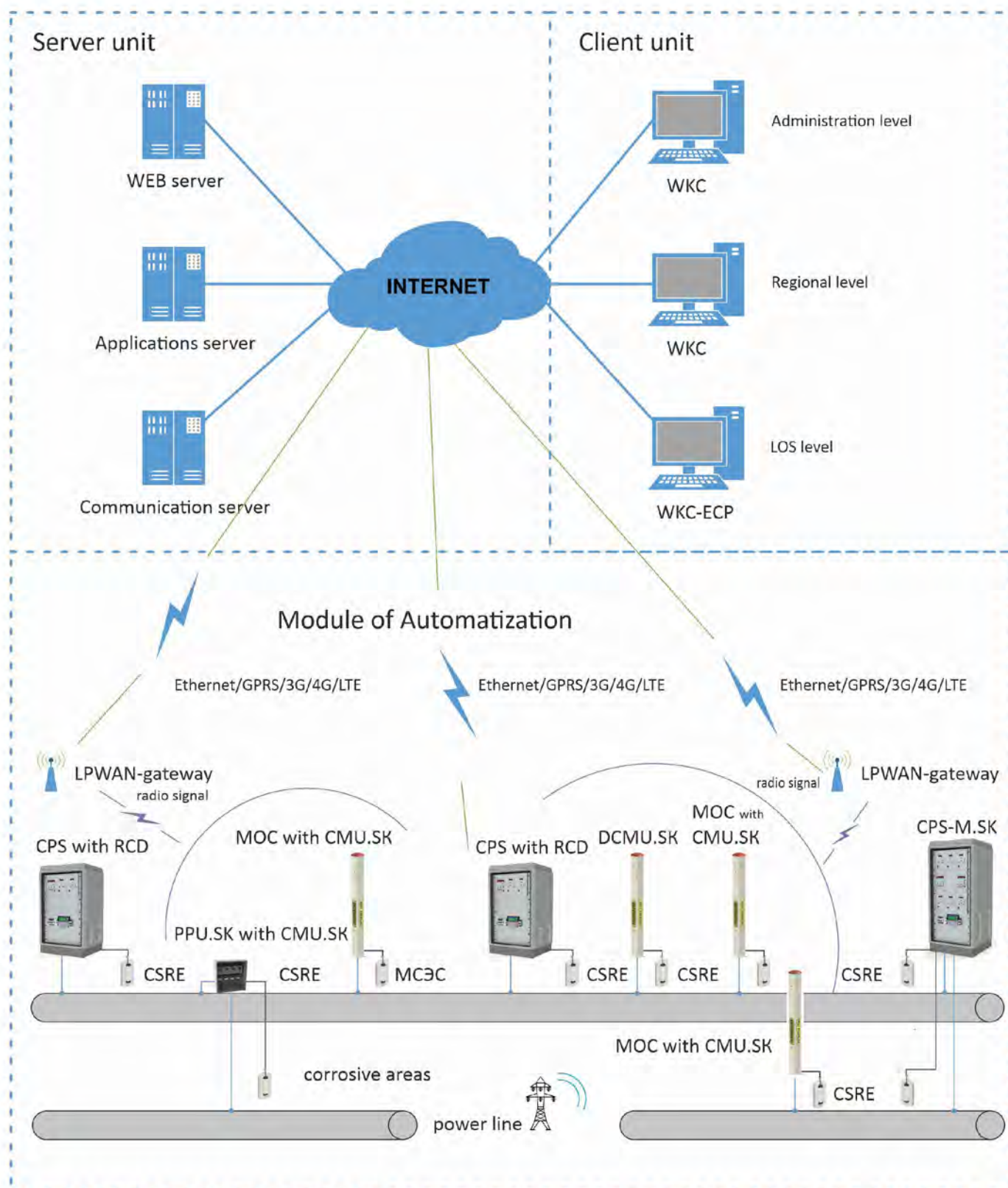
- In case of emergency conditions changes of CPS or an unauthorized access a warning message is given through different channels.
- The process of analytical interactive data processing, carrying out of the process of comparative and retrospective analysis to solve the problem of evaluation of the protection system of the objects of the pipeline system from corrosion.
- An ability to use a map service for displaying the objects, Cathode Protection System and the information connected with them on the map.
- The process of arranging of analytical, final and collation reports based on the system data.
- An access rights mode management to the data and system settings, keeping operational registers into the system.
- Information and smart support of the process of taking resolutions on the process of management of the means of Cathode Protection System and the system itself.



A SYSTEM'S STRUCTURE

Smart Integrated Corrosion Monitoring System (SICMS.SK) "Atlantic" is a hardware-software system.

(SICMS.SK) "Atlantic" arrangement schematic structure



THE FOLLOWING GENERAL RANGE OF EQUIPMENT AND MODULES CAN BE INCLUDED INTO THE SYSTEM:

- **CPS-M.SK** – Module Cathode Protection Station;
- **DCMU.SK** are Distance Control and Management Units of CPS produced by other companies;
- **MOC.SK** are Metering Operation Centers;
- **CMU.SK** are Corrosion Monitoring Units, set up into Metering Operation Centers which are designed for the process of measuring of polarization and total potentials and transmitting data through the power-efficient line LPWAN. CMU.SK installation process is provided for all the Pipeline track within MOC.SK;
- **CMMU.SK** are Corrosion Monitoring and Management Units set up into Metering Operation Centers together with PPU.SK-GrP are designed for carrying out the process of monitoring and management as well as measuring of total potential and transmitting data through the power-efficient line LPWAN;
- **CMU.SK-1** are Corrosion Monitoring and Management Units set up into Metering Operation Centers together with PPU.SK-Gr are designed for carrying out the process of measuring current regulation of PPU and transmitting given configurations through the power-efficient line LPWAN;
- **CMU.SK-2** are Corrosion Monitoring and Management Units set up into Metering Operation Centers together with ACDS.SK are designed for measuring current-drainage and transmitting given configurations through the power-efficient line LPWAN;
- **CMU.SK-3** are Corrosion Monitoring and Management Units set up into MOC installation location point and are designed for the process of resistance measuring and transmitting given configurations through the power-efficient line LPWAN. CMU.SK-3 set up into MOC installation location point can be included into CPS-M.SK;
- **PPU.SK** are Power Protection Units which are designed for the process of joint protection of several objects of the Cathode Power Station. They provide the station with current-drainage regulation as well as protect from deleterious effect suppression of neighbouring pipelines and other communications through the process of a protection current device setting and current distribution of the currents sinking into each steel communication in order to achieve demanded protective potential;
- **ACDS.SK** is an Alternate Current-Drainage System of the Main Pipelines which is designed for the process of protection from current drainage induced by transmission lines from the protected construction on the ground electrode. It provides the construction with a joint protection of protective potential of the construction as well as decreases dangerous voltage of the system "the pipe-the ground" for a safe process of working for the staff;
- **CCD-M.SK** is a Current Control Device of the anode ground connection which is designed for protective current control and current distribution from the anode ground connections.
- **CSRE.SK** is a permanent Copper Sulfate Reference Electrodes which is designed for using it for carrying out a process of measuring of protective potentials of the communication and $\mu\alpha$ potentials drop both in the ground and in the electrolyte in the field conditions while defining corrosion resistant protection of the underground metal constructions efficiency;
- **LPWAN** is an airlock which is designed for making up LPWAN line and which uses a licensed broadband LoRa-modulation allowing to increase transfer capability of the communication line and protection from the interfering signals. The airlock transmits decoded data via the Internet/GPRS/3G/4G/LTE channels from the final device to the central network server. Then they go to the applications server from which the data go to the final user.

A structural scheme of CPS of the System "Atlantic" makes up an Automatization Module (MA) of SICMS.

SMART INTEGRATED CORROSION SYSTEM "ATLANTIC"

The Automatization Module (MA) CONSISTS OF THE FOLLOWING EQUIPMENT:

- Cathode Protection Stations CPS-M.SK;
- CMU.SK-3 set up into MOC installation location point can be a constructive part of CPS-M.SK;
- Metering Operation Centers MOC.SK with Corrosion Monitoring Units CMU.SK и CSRE.SK;
- Metering Operation Centers MOC.SK with Corrosion Monitoring and Management Units CMU.SK, CSRE.SK, PPU.SK.GR-P;
- Metering Operation Centers MOC.SK with Corrosion Monitoring and Management Units CMU.SK-1, CSRE.SK, PPU.SK.GR;
- Alternate Current-Drainage System ACDS.SK provided with Corrosion Monitoring and Management Units CMU.SK-2;
- Metering Operation Centers MOC.SK with Corrosion Monitoring and Management Units CMU.SK-3, MOC;
- other means of CPS (anode beds, power protection units etc.).

SICMS.SK SOFTWARE CONSISTS OF THE FOLLOWING ELEMENTS:

- a server part of the system is a server software complex which is responsible for the process of collecting of the information and information storage and the Client's Software System. The server part operates in a permanent mode providing a permanent process of collecting of the information and the information storage. The server part includes a communication server, a data bases server, an application server and a web-server;
- the client's server includes the clients' working positions for the processing and data analysing.

SICMS.SK SERVER PART consists of:

- CPS Communication server is designed for receiving data from the means of CPS and transmitting configuration instructions and management instructions back. Mobile communication lines GSM/GPRS supported as well as TCP and UDP protocols during the process of data transmitting via power-efficient transmission line LPWAN.
- Data Base Server of CPS is designed for the process of collecting and storage monitoring data taken from technical means of testing and distance control SICMS.SK, measuring and test reports for the process of evaluation of protection process of the pipeline from corrosion.
- CPS Web-Server is designed for using the system both in analysis mode and evaluation of protection process of the objects of the pipelines from corrosion one through the internet browser providing a simultaneous access to the information displaying on the web-interface and system functions according to the users' positions.
- An application server of CPS is designed for carrying out the system of domain logics processing users' requests and inner module system moments as well as choosing and giving data to the distant users.

These servers can be located in one single-unit server according to the system complication and quantity of the equipment.

THE CLIENT'S PART consists of::

- SAW-CPS is a Software Analysis Workstation. It is a combination of the Client's programmes for an industrial local control which is designed for making the process of collecting, processing, storage and analysis of the information of the protection process of the pipeline from corrosion and set up elements of CPS. It is also designed for providing distance monitoring and the process of protection of the CPS configurations regulation.
- SAW-C –It is a combination of the Client's programmes provided for supervisor control of the protection of the pipeline process.

THE FOLLOWING PARTS OF THE SYSTEM ARE USED AS CONNECTION SYSTEM. THEY ARE AS FOLLOWS:

- The process of connection between SICMS Server and CPS can be carried out through the Ethernet (transmission connection cable) channels and GPRS/3G/4G/LTE connection channels;
- The process of connection between SICMS and a radio communication airlock can be carried out through the Ethernet (transmission connection cable) channels and GPRS/3G/4G/LTE connection channels. The airlocks LoRaWAN setting up location is the same as CPS.SK setting up location;
- The process of connection between MOC.SK and CMU.SK (CMMU.SK-1, CMU.SK-1, CMU.SK-2, CMU.SK-3) and an airlock LPWAN can be carried out through radio communication lines using LoRaWAN Technology;
- The process of the information exchange online-mode both with SICMS Server as well as the users of SAW-CPS and SAW-C can be carried out through the Internet Channels using authorized access means according to the user position and a given login\password pair.

AS A RESULT OF SMART INTEGRATED CORROSION SYSTEM "ATLANTIC" WE ACHIEVED THE FOLLOWING:

- The technological process of CPS support is carried out at a suitable level between "an underprotection process" and "an overprotection process as well as decrease of harmful consequences caused by CPS without telemechanics. So it may be the reason to make operation period of the pipeline at least for 5÷10 years longer as well as decrease emergency situations caused by corrosion.
- The process of permanent technological process regulation of CPS and its permanent provisions both during the technological process stages and its intensification due to MOC monitoring in the pipeline track between neighbouring CPU and in all the corrosion threat areas. This process gives a full image of the process of the pipeline protection and thus increases a real corrosion protection level approximately for 20-30%.
- A complex approach to the process automatization of solving the problems of CPS (the process of monitoring, the process of protective configurations regulation, the process of the information analysis, the process of evaluation of the protection process, the process of reports arrangement, recommendations etc.) realization which provides its potential growth for 30-40% and thus makes the pipeline system operational period longer. Besides, it decreases the pipeline current repairs charges because of its permanent and efficient protection process as well as increases the quality and taken decisions on CPS management accuracy. Finally, it allows to decrease quantity of man-hours spent on CPS service in track conditions.

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