

## ELECTRICAL EQUIPMENT

Low Voltage Electrical Switchboards

Cabinet Cases

Flame Tight Electrical Cabinets with Seismic Design

Direct Current Systems

Fast Time Automatic Transfer Switches

Medium Voltage Switchgears

Alarm Systems & Devices for Directional Protection Against Single-to-Ground Short Circuits

Packaged Transformer & Distribution Substations

Reactive Power Compensation Units

Self-Contained Power Supply

Synchronous Machines Digital Excitation Systems

Automatic Control Systems



## CONTENT

<b>About the Company.....</b>	<b>4</b>
<b>“Freecon” Low Voltage Electrical Switchboards.....</b>	<b>6</b>
General Data.....	6
“Freecon” Low Voltage Electrical Switchboards Based on “F4” In-House Form Factor.....	7
“Freecon” Low Voltage Electrical Switchboards Based on “SIVACON S8” Form Factor.....	8
“Freecon” Low Voltage Electrical Switchboards Based on Logstrup Structural Elements.....	9
Case Studies Based on “Freecon” Low Voltage Electrical Switchboards.....	10
<b>Cabinets’ Cases Based on “Freecon” Form Factor.....</b>	<b>12</b>
<b>Flame Tight Electrical Cabinets with Seismic Design.....</b>	<b>14</b>
<b>Direct Current Systems.....</b>	<b>15</b>
Structure and general Data.....	15
Direct Current Boards (“SchPT”-24, 110, 220 V).....	16
Charging/Boost Charging Rectifiers.....	18
Control Current Cabinets.....	20
<b>Fast time Automatic Transfer Switch (ATS) Systems.....</b>	<b>22</b>
<b>Medium Voltage Switchgears.....</b>	<b>24</b>
8DJH Packaged Gas Insulated Switchgears for Secondary Distribution Networks, 24 kV, max.....	24
Packaged Switchgears with Gas and Air Insulation, 40.5 kV, max.....	26
“Onega” Single-Side Maintenance Chambers for Secondary Distribution Networks, 6 (10) kV, max.....	28
“Onega-M” Single-Side Maintenance Chambers for Secondary Distribution Networks, 6 (10) kV, max.....	32
“Volga” (Packaged) Switchgears for Primary and Secondary Networks, 6(10) kV, max.....	34
<b>Signalling (Alarm) Systems and Directional Protection Against Single Phase-to-Ground Short Circuits in Electrical Networks.....</b>	<b>36</b>
<b>Packaged Transformer and Distribution Substations 6-24/0.4 kV.....</b>	<b>38</b>
Indoor Packaged Transformer Substations.....	38
Modular Packaged Transformer Substations in Concrete Housings.....	40
Modular Packaged Transformer Substations in Concrete Housings.....	42
Modular Packaged Transformer Substations in Metal Block Boxes.....	44
Intelligent Block Modular Substations.....	46
<b>Closed packaged transformer substations 35-110/6-24 kV.....</b>	<b>47</b>
<b>Reactive Power Compensation Units.....</b>	<b>49</b>
<b>Self-Contained Power Supply.....</b>	<b>50</b>
<b>Synchronous Machines Excitation Systems.....</b>	<b>52</b>
<b>Automatic Control Systems (ACS).....</b>	<b>54</b>
General Data.....	54
Energy Supply Operational Dispatch Management.....	55
System Control of Energy.....	56
<b>Core Competencies.....</b>	<b>58</b>
<b>Use in Energy Supply Systems.....</b>	<b>59</b>

## ABOUT THE COMPANY

NIPOM is a multi-business electrical engineering company offering complex solutions for electric power supply and automation.

The Enterprise has all resources required to participate in a complete cycle of a Project implementation — from a facility investigation and design to putting it into operation and support service. In this case, there is no need to engage and coordinate various contractors that results in the Customer’s significant time cutting and cost saving. The Company structure includes reliable assets: Complex project management, Design Institute, R&D Center, Engineering Center, Automatic Process Control System division, Electrical Equipment Production Facility, Modular Equipment Production Facility, Electric Equipment Servicing Department, Construction and Erection Department, Quality Management Department and Logistics Department, etc.

“NIPOM” OJSC is being actively involved in construction and modernization of power facilities owned by the Russian industrial standard-bearers: Gazprom, Rosneft, Transneft, Rosatom, Rossetti, etc. Due to its competence in various branches of industry “NIPOM” OJSC is capable to transfer developed and well proven technical solutions from one industrial sector to another. Many years’ experience allows the Enterprise masterfully meet worldwide challenges and offer balanced cost effective technically perspective solutions.

“NIPOM” OJSC produces electrical equipment for energy distribution and electric installations control, direct current systems and energy-saving equipment.

The Company is ready to offer a variety of equipment options arrangements with the use of electric components manufactured by leading foreign and domestic companies, such as Siemens, Schneider Electric, ABB, Eaton, etc.; in this way meeting individual customer requirements.

“NIPOM” OJSC products range is being dynamically developed thanks to the Company’s effective operation in two ways: in-house production and licensed production of high technology world class products. The Company is Siemens’s licensee to produce low and medium voltage equipment. “NIPOM” OJSC is being annually certified against state-of-the art quality standards applicable in the world electrical engineering and is permanently operating in compliance with reliability, safety and energy saving requirements.





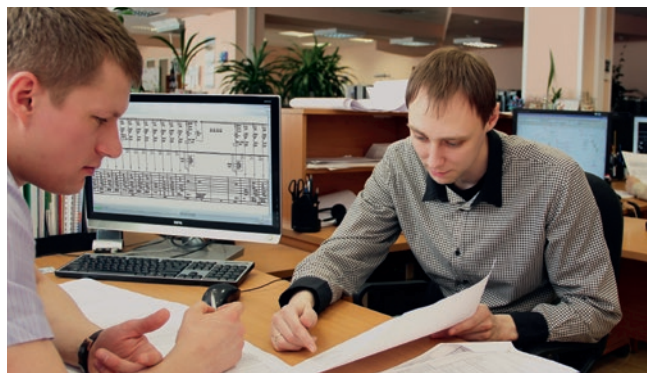
“NIPOM” OJSC offers complex solutions for electric power supply systems:

- ↘ Energy audit
- ↘ Design of power engineering facilities all kinds of voltage
- ↘ Elaboration and manufacturing of electrical engineering products
- ↘ Packaged equipment delivery
- ↘ Implementation of energy control systems ECS
- ↘ Implementation of automated control systems
- ↘ Erection, start-up and commissioning works
- ↘ Construction and erection works
- ↘ Service maintenance
- ↘ Guarantee maintenance
- ↘ Personnel consulting and technical support
- ↘ Personnel development

“NIPOM” OJSC full range of services and products provides a possibility to choose the most effective solutions to decrease electric equipment operating costs, prevent accidents and enhance power supply reliability.

“NIPOM” OJSC is developing on the basis of implementation of innovative production methods combined with state-of-the-art management engineering. The Company production system is based on integrated tools: Quality Management System (QMS), Environmental Management System, innovation-driven growth, continuous improvement systems (KAIZEN-management) and Project Management. This provides quality high level of products manufactured, significantly cuts time and reduces costs of production as well as provides Customers with equipment reliability and timely putting any facility into operation.

Reliable quality equipment and “NIPOM” OJSC specialists operational excellence make its Customers feel confident about the future and their business effective development and prosperity.



# "FREECON" LOW VOLTAGE ELECTRICAL SWITCHBOARDS

## GENERAL DATA

### Designation

Low Voltage Electrical Switchboards "NKU" are designed to receive and distribute electric power (0.69 kV, 50 (60) Hz three-phase alternative current) among consumers.

### Application

It functions as:

- ✧ General switchboards and sub- switchboards, Automatic Transfer Switch (ATS) panels
- ✧ Aggregate panels of electro-technology installations control stations
- ✧ LV Switchgears of Packaged Transformer substations
- ✧ Utilities Switchboards for Electric Generating Stations, etc.

### Functional Capabilities

- ✧ Electric installations power supply protection-ATS arrangement from electric power system (max. 2 lead-ins) and emergency power supply sources, in particular, from electric power system (max. 2 lead-ins) and diesel run power plan (max. 2 lead-ins)
- ✧ Control of power supply system parameters and status
- ✧ Local, remote and automatic control of power consumers
- ✧ Reception of control signals and signals generation of consumers status via wire and digital communication channels (Modbus, Profibus)

### Construction Merits

"Freecon" Low Voltage Electrical Switchboard is a freely configurable system based on "F4" in-house / "NIPON" OJSC / form factor — (for 6,300 A current, max.) and based on "SIVACON S8" licensed unified form factor — (for 7,000 A current, max.) and "Logstrup" — (for 8,500 A currents, max.).

Low Voltage Electrical Switchboards are connected to Distribution Networks:

- ✧ By cables from below and top
- ✧ By buses / bus ducts from top, laterally

Consumers are connected to Low Voltage Electrical Switchboards:

- ✧ By cables from below and top
- ✧ By buses / bus ducts from top

Modifications:

- ✧ CT — single-side / double side maintenance sections with fixed equipment
- ✧ CM — single-side / double side maintenance sections with retractable / removable modules

### Additional Options

- ✧ Link with High-Level Automatic Process Control Systems
- ✧ Digital controller for Relay Protection and Automatic Equipment and Automatic Transfer Switch (ATS)
- ✧ Modbus, Profibus Communications Protocols
- ✧ Electric power metering devices with digital data communication to Utility Metering System
- ✧ ATS based on microprocessor relay protection units and Programmable Logic Controllers (PLC)
- ✧ Microprocessor units for electric motors protection
- ✧ Electric equipment status control, event log keeping, data display on a Central Processing Module

## "FREECON" LOW VOLTAGE ELECTRICAL SWITCHBOARDS BASED ON "F4" IN-HOUSE FORM FACTOR

### Designation

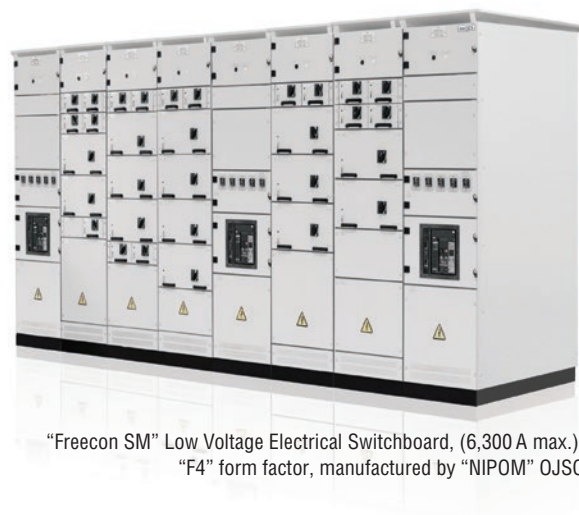
They are designed to control and distribute electric power (6,300 A current) in administrative and industrial buildings and in continuous process flows.

### Main Technical Details

Parameter	Value
Rated voltage, kV	0.69 max.
Grounding system type	TN-C, TN-C-S, TN-S
Rated Switchboard current, A	6,300 max.
Rated permissible short time current of bus bars, $I_{cw}$ , kA	100 max.
Rated shock current of bus bars, $I_{pk}$ , kA	200 max.
Number of control and distribution sections and modules	To be determined as per an electric diagram and the Customer's Technical Assignment
Shell protection rating (as per GOST 14254)	Up to IP54 inclusively
Equipment seismic load resistance as per MSK64 scale	9 grade
Service life, min. years	30

### Advantages

- ✎ High reliability, ease of installation and maintenance, maximum security for personnel due to their form factors
- ✎ Areas/space rational use thanks to small sections sizes
- ✎ Various form factors defining the resistance to the effects of electric arc, earthquakes, impacts and vibrations according to operation and environment conditions
- ✎ Functional members quick change and extension without sections' power dump
- ✎ High sectionalization level, 4 dB max.
- ✎ Possible short-circuit and insulation burning prevention thanks to cable terminal embossing proprietary technology
- ✎ Possible use of domestic and foreign component parts
- ✎ Free configurable functional units and use of non-standard units the Customer's tailored in case of need



"Freecon SM" Low Voltage Electrical Switchboard, (6,300 A max.),  
"F4" form factor, manufactured by "NIPOM" OJSC

## “FREECON” LOW VOLTAGE ELECTRICAL SWITCHBOARDS BASED ON “SIVACON S8” FORM FACTOR

### Designation

They are designed to control and distribute electric power (7,000 A current) in administrative and industrial buildings and in continuous process flows.

“NIPOM” OJSC is the first to hold Siemens’s license to produce LV Switchboards (of the last generation) as “SIVACON S8” modular form factor.

### Advantages

- ✓ High reliability thanks to use of fully tested standard components
- ✓ Maximum security for maintenance personnel due to structures preventing electric arc and short-circuits generation
- ✓ Perfect industrial design of Switchboards in compliance with today’s spacial concepts
- ✓ Space rational use thanks to small sections sizes
- ✓ Bus bars arrangement from top and below
- ✓ Various types of installation in one and the same section
- ✓ Various types of sectionalization
- ✓ Simple change in door upper hinge thanks to its multi-functionality
- ✓ Effective ventilation system
- ✓ Cable and bus bars hookup from top, below and behind
- ✓ Optimal customization to any Customers demands thanks to modularity concept both within a separate section and in (packaged) switchboardse

### Main Technical Details

Parameter	Value
Rated voltage, kV	0.69 max.
Grounding system type	TN-C, TN-C-S, TN-S
Rated Switchboard current, A	7,000 max.
Rated permissible short time current of bus bars, $I_{cw}$ , kA	150 max.
Rated shock current of bus bars, $I_{pk}$ , kA	330 max.
Number of control and distribution sections and modules	To be determined as per an electric diagram and the Customer’s Technical Assignment
Shell protection rating (as per GOST 14254)	Up to IP54 inclusively
Equipment seismic load resistance as per MSK64 scale	9 grade
Service life, min. years	30



“Freecon ST” Low Voltage Electrical Switchboard, (7,000 A max.), “SIVACON S8” form factor, manufactured by “NIPOM” OJSC under Siemens’ license



## “FREECON” LOW VOLTAGE ELECTRICAL SWITCHBOARDS BASED ON LOGSTRUP STRUCTURAL ELEMENTS

### Designation

They are designed to control and distribute electric power (8,500 A current) in administrative and industrial buildings and in continuous process flows.

“NIPOM” OJSC is the first to hold Logstrup’s license (Denmark) to produce Low Voltage Electrical Switchboards in “Logstrup” form factor.

### Main Technical Details

Parameter	Value
Rated voltage, kV	0.69 max.
Grounding system type	TN-C, TN-C-S, TN-S
Rated Switchboard current, A	8,500 max.
Rated permissible short time current of bus bars, $I_{cw}$ , kA	220 max.
Rated shock current of bus bars, $I_{pk}$ , kA	300 max.
Number of control and distribution sections and modules	To be determined as per an electric diagram and the Customer’s Technical Assignment
Shell protection rating (as per GOST 14254)	Up to IP54 inclusively
Equipment seismic load resistance as per MSK64 scale	9 grade
Service life, min. years	30

### Advantages

- ✓ Any configuration of Switchboards-retractable, removable with different types of functional units separation
- ✓ Form factors provide required patterns of inner sectionalization of functional units
- ✓ Reliability and safety thanks to high level of protection against bus-bars system short-circuit and thanks to cabinets mechanical strength
- ✓ Maintenance without power dump and safe work provided thanks to retractable modules and use of draw-out switching devices
- ✓ Prevention of operators’ errors thanks to electrical & mechanical interlocking.
- ✓ Gas excessive pressure release channels



“Freecon SM” Low Voltage Electrical Switchboard, (8,500 A max.) Logstrup form factor, manufactured by “NIPOM” OJSC under Logstrup’s license



## CASE STUDIES BASED ON "FREECON" LOW VOLTAGE ELECTRICAL SWITCHBOARDS

### 0.4 kV CONTROL STATIONS AGGREGATE PANELS (CSAP)

#### Designation

They are designed to receive and distribute electric power (0.4 kV, 50 Hz alternative current) among consumers and to perform control stations' functions of process units critical loads (including gas-an-oil compressor stations).



"Freecon ST" Low Voltage Electrical Switchboard (0.4 kV CSAP)

#### Functions

Manual, remote and automatic control of units' electrical consumers, in particular:

- ✦ Electric motors of fans, valve gates and pumps
- ✦ Heaters
- ✦ Power supply of instrumentation, emergency protection system, lighting

Electric consumers' thermal and current protection.

Parameters control and light indication of power supply system status.

Electric installation's signals generation into a facility control system.

### AUXILIARIES BOARDS (LOCAL DISTRIBUTION PANELS)

#### Designation

They are designed to receive and distribute electric power (0.4 kV, 50 Hz alternative current) among consumers and to perform control stations' functions of critical loads of offsites' units and buildings auxiliary systems and process structures/technological facilities.



"Freecon ST" Low Voltage Electrical Switchboard (0.4 kV Common CSAP)

#### Functions

Manual, remote and automatic control of units' electric consumers, in particular:

- ✦ Electric motors of fans, valve gates and pumps
- ✦ Heaters
- ✦ Power supply of instrumentation, emergency protection system, lighting

Electric consumers on-line switching on-off.

Electric consumers' thermal and current protection.

Parameters control and light indication of power supply system status.

Control signals reception and generation of consumers' status signals into the Automatic Control System.

## LOW VOLTAGE ELECTRICAL SWITCHBOARDS FOR GAS AND LIQUID AIR COOLERS

### Designation

They are designed to receive, distribute power supply and to control electric motors of liquid and gas air coolers' fans.

### Modifications:

#### LOW VOLTAGE ELECTRICAL SWITCHBOARDS FOR "P"-AIR COOLERS

They are designed with soft starters for electric motors' alternative / group smooth start.

#### LOW VOLTAGE ELECTRICAL SWITCHBOARDS FOR "CH"-AIR COOLERS

They are designed with frequency converters to control fans' velocity of rotation.



"Freecon" Low voltage Electrical Switchboard (lead-in section)



"Freecon SM" Low Voltage Electrical Switchboard.  
Control cabinet intended for block valves (0.4 kV control panel)

### Special Function

- ✎ Electric motors currents continuous control and indication
- ✎ Electric motors digital protection against electrical imbalance, abnormal phase rotation, violation of starting current tolerance and starting intervals
- ✎ Technological and commercial energy metering
- ✎ Power Transformer oil temperature and pressure protection

## CABINETS CASES BASED ON “FREECON” FORM FACTOR

### NEWLY-DESIGNED PRODUCT

Cabinet cases based of Freecon own structural element is a ground for manufacturing of low voltage complete devices for distribution and control.

Cabinets’ structure guarantees freedom of electric plant and allows easy upgrading of electric plant with new customer’s options.

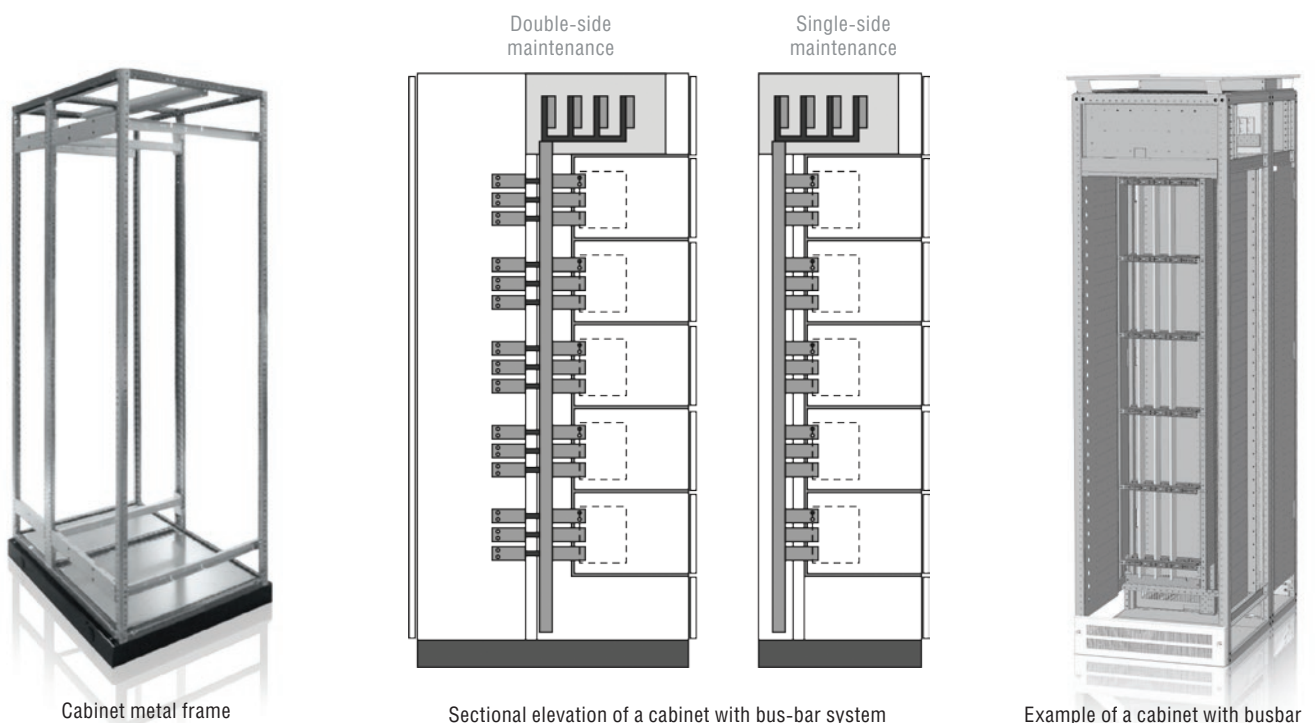
### Cabinets Options

	“Freecon”
Standard lead-in, sectionalization and distribution cabinet	Multi-purpose cabinets (user-defined/ unspecified design)
<ul style="list-style-type: none"> <li>– Specified function of each cabinet type</li> <li>– Selected overall dimensions</li> <li>– Inner sectionalization as per types: 3a, 4b</li> <li>– Switching devices energy supply over rigid bus-bars</li> </ul>	<ul style="list-style-type: none"> <li>– Types of completeness: from frame with a shell to a cabinet fully ready for wiring with bus-bars and universal perforated wiring panels</li> <li>– A variety of overall dimensions with 200 mm pitch as per width and depth</li> <li>– Inner sectionalization as per types: 1, 2a, 2b</li> <li>– Switching devices energy supply over wires or flexible bus-bars</li> </ul>

### Cabinet Service Type

Single-side or double-side maintenance cabinets are included into “Freecon” standard and multi-purpose cabinets. Access to a functional compartment and attachments compartment in single-side maintenance cabinets is provided at the cabinet’s front face. Access to a functional compartment in double-side maintenance cabinets is provided at the cabinet front face and to a attachments compartment-at the cabinet’s back side.

All cabinets of one and the same type of maintenance (i.e. single-side or double-side maintenance ones) are structurally attached and electrically connected with each other if they are installed in one switchboard with a common bus bar system. Multi-purpose and standard cabinets may be combined in one and the same switchboard, in this regard, service degree and type for all cabinets in one switchboard shall be identical.



### Advantages

- ✎ Cabinet structure is rigid, free-of-distortion and impact-proof due to a frame made of galvanized profiles fastened by original right-angle connectors
- ✎ Corrosion-resistant covering of metal parts, zinc covering of internal protection enclosures and assembly components
- ✎ High degree of sectionalizing (up to 4b) and protection (up to IP54)
- ✎ Max. seismic load resistance as per MSK64 scale-9 grade and high strength due to the patented method of elements interfacing and fixing
- ✎ Wide range of cabinets to implement any electric circuits
- ✎ It is possible to order a cabinet with bus bars
- ✎ Quick and simple selection of individual solutions with the help of “Configurator Freecon” custom-made software”

### Cabinets Selection and Configuration

Any cabinet (or cabinets set constituting a switchboard) with detailed characteristics and completeness of each cabinet is selected automatically with the help of the custom-made software developed by “NIPOM” specialists-“Configurator Freecon”. Innovative “Configurator Freecon” software is an effective tool for designing, it allows to speed up and optimize designers’ work.

#### “Configurator Freecon” provides:

- ✎ Compatibility control of various cabinets within a switchboard
- ✎ Specification development relative to cabinet assembly components and parts
- ✎ Insertion of cabinets attachments and interfacing sets into the specification
- ✎ Generation of a switchboard single-line diagram
- ✎ Generation of a switchboard appearance

#### “Configurator Freecon” Advantages:

- ✎ Comfortable and simple interface
- ✎ Integrated equipment database with updating capability
- ✎ Simplicity of the Project implementation and development inherent to designing concept
- ✎ Detailed specification with comprehensive equipment description
- ✎ Detailed documentation in open data format (MS Office, DXF)
- ✎ Insertion of designing deliverables into ordering documentation
- ✎ Exact representation of changes in the Project with indication of the date on which the changes were entered
- ✎ Simplicity to insert changes in the Project during a facility reconstruction
- ✎ Decrease in a designer’s donkey work scope



Distribution Cabinet-Case study



## FLAME TIGHT ELECTRICAL CABINETS WITH SEISMIC DESIGN

### Designation

Flame tight electrical cabinets with seismic design are intended to install low voltage equipment.

### Advantages

- ✓ Seismic resistance up to 9 grade as per MSK64 scale
- ✓ Fire safety level — REI from 30 minutes and more
- ✓ Various standard sizes
- ✓ Fire-proof cable duct



Flame Tight Electric Cabinets with Seismic Design

Form Factor	Single-side maintenance floor cabinet
Design	<ul style="list-style-type: none"> <li>– Frame — a built-up one made of galvanized steel formed sections</li> <li>– Shell — a multilayered crimped material, nonflammable, KMO fire safety class (non-fire-hazardous)</li> <li>– Gasket — a thermo-insulation material</li> </ul>
Fire rating	REI 30 — 30 min., 45 min., 60 min., 90 min., 120 min., 240 min. fire rating as per loss of carrying capacity, integrity and loss of insulating effect
Climatic modification	UKHL3, UKHL4
Operation conditions	Placement/environment—indoors, confined areas with natural ventilation <ul style="list-style-type: none"> <li>– Long-time relative humidity at plus 20°C — 60%</li> <li>– Short-time relative humidity at plus 25°C — 98%</li> <li>– Degree of pollution — “3”</li> </ul>
Protection rating (IP code)	IP41 (IP54 option)
Door	Hinge-on the right or on the left, opening angle, 180° min.
Latch	Metallic with box and pin joint, possible installation of a key lock mechanism
Equipment installation	Permanent installation, on lifting lugs with the help of bolt joints and (or) DIN-rail mounting
Cable entries	Cable inlet/ outlet from above and (or) from below
Ventilation	Non-ventilating
Seismic resistance	Cabinets are in compliance with GOST 17516.1-90, GOST 16962.2-90 as far as seismic load of 9 grade (as per MSK-64 scale) is concerned at vertical elevation of +25 m, max.; and seismic load of 8 grade at vertical elevation of +70 m, max.
Dimensions (W × D × H), mm	600 (800; 1,200) × 600 (800) × 2,400 (2,000)

## DIRECT CURRENT SYSTEMS

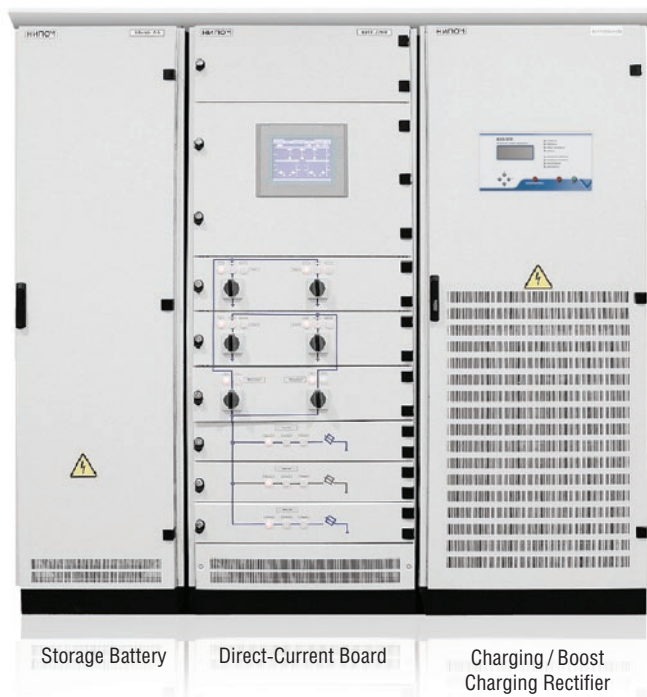
### STRUCTURE AND GENERAL DATA

#### Designation

Direct-Current uninterruptible power supply systems (Direct-Current Systems “SPT”) are used for consumers provision with uninterruptible power supply.

#### Functions

Uninterruptible power supply of operating control circuits, Relay Protection and Automatic Equipment and Alarm Systems, switching devices electromagnets, Power Stations emergency lighting, Electric Substations and other energy facilities; storage batteries charging and constant boost charging and gathering and transmission of data on electric facilities status to the Facility’s Automatic Control System.



#### DIRECT-CURRENT UNINTERRUPTIBLE POWER SUPPLY SYSTEM

**Direct-Current Boards** are used to receive and distribute 220V/110V/24V DC current, protect against overloads and short-circuits in DC electric power consumer networks, to control battery current and bus voltage, as well as control and generate alarm signals if feeders insulation resistance reduces.

**Boost/Charging Devices** are used to charge storage batteries and supply power to DC consumers in floating service.

**Storage Batteries** provide electric equipment off-line operation in case of power interruption in AC electric mains. Depending on operation conditions and the Customer’s special requirements, storage batteries produced by the world leading manufacturers are used.

#### CONTROL CURRENT CABINET

**Distribution Cabinets (“ShOT UM” type) with two Dual Rectifying Modules** are used to supply power to DC circuits and charge Storage Batteries, to provide Storage Battery supply of DC circuits in case of emergency power-off of supply mains at both lead-ins, Automatic Transfer Switching in case of emergency power-off of one of lead-ins in rectifiers’ supply mains, protect against overloads and short-circuits in DC electric power consumer networks, to control voltage on bus bars and generate alarm signals if feeders insulation resistance reduces.

Storage batteries are delivered in a separate cabinet or are built-in into Control Current Cabinets.



## DIRECT CURRENT BOARDS “SchPT”-24, 110, 220 V

### Designation

Direct Current Boards are used to supply uninterruptible power to special consumers of the I-st category, including Relay Protection and Automatic Equipment and Emergency Lighting, Fire-Extinguishing Systems of Industrial facilities, Communication Networks, Substations’ Operating Control Circuits, Emergency Lube Pumps, Automatic Control Systems.

### Main Technical Details

Parameter	Value		
	“SchPT”-24 V	“SchPT”-110 V w/o load-tap / with load-tap	“SchPT”-220 V w/o load-tap / with load-tap
Rated voltage, V	27	110	220
Device rated current, A	2,500 max.		
Rated currents of hookups / connections, A	630 max.		
I <sub>cw</sub> of bus bars, kA	15		
I <sub>pk</sub> of bus bars, kA	25		
Number of hookups	128* max.		
Cabinet dimensions (W × D × H), mm, max.	from 600 × 400...800 × 1,800...2,200		
Sectionalizing degree	4b max.		

\* Provided for one insulation control device, number of hookups in “ShPT” is not limited.



“SchPT” Cabinet  
at Outgoing Lines

### Functional Capabilities

- ✎ Continuous microprocessor monitoring of insulation resistance of deployed feeder system and each outgoing feeder of any length (patented system)
- ✎ Bus bar voltage monitoring
- ✎ Battery charging-discharging current monitoring
- ✎ Connections current monitoring
- ✎ Direct-Current System parameter limit signalling
- ✎ Rectifier connection failure and incoming switch disconnection signaling
- ✎ Events registration and archiving
- ✎ Collection and transmission of electric equipment condition data to the Facility Automatic Control System
- ✎ DC output line regulation at the set level by means of input voltage rise and dip

### Design Options

- ✎ One two-pole or three-pole bus bar system, (for 110 V and 220 V “ShPT”)
- ✎ One two-pole or three-pole bus bar systems with bus couplers
- ✎ Bus bars systems may be divided into sections with cross sections connections to main bus bar systems
- ✎ Bus bar voltage stabilization in a dedicated section, including storage battery charging mode and storage battery charging mode if mains has failed.
- ✎ Consumers power supply ring protection



Direct Current Board "SchPT"  
(with devices installed)



"MIRS-NT" Feeder Insulation Control System



"USN-NT" Voltage Stabilizer



"RMTM-DC" Overcurrent Relay

### Functional Capabilities

- ✦ "MIRS-NT" Insulation Monitoring System (patented one) provides continuous automatic control over bus bars system insulation resistance values, deployed feeder systems and each outgoing feeder of any length. In this regard, measurement accuracy does not depend on network capacity values. The System provides detection of a feeder with lowered value of insulation resistance irrespective of cable length and exercises permanent control over bus bars voltage.
- ✦ "USN-NT" Voltage Stabilizer is used in DC Systems to supply stabilized DC voltage to separate groups of consumers avoiding supply voltage fluctuations exceeding 5%.

Voltage Stabilizer provides:

- DC output line regulation at the set level by means of input voltage rise and dip
- Storage batteries discharge protection (lower than a set value)
- Short-circuit current limitation in case emergency in DC System to provide selective outage of protection devices in DC Systems
- Storage batteries direct-on-line connection to DC System in case device has been damaged

- ✦ "RMTM-DC" Overcurrent Relay is designed to selectively protect current at maximum if they are used as protective devices for automatic circuit-breakers sub-networks, to control current values of protected circuits and to monitor switch positions.

Overcurrent relay has the following advantages:

- Surge current protection
- Control over automatic circuit breaker status (On/Off, Emergency Shutdown)
- Current measuring in the network controlled
- Defects self-diagnostic
- Data transmission to High-level ACS



## CHARGING/BOOST CHARGING RECTIFIERS

### Designation

Charging/Boost Charging Rectifiers “VZP-TPP” are designed for charging and boost charging of lead acid batteries in floating (charge) mode under load. “VZP” technical parameters comply with stringent requirements raised to charging/boost charging modes of storage batteries classified as “Low Maintenance” and “Sealed” ones.

### Use

They are used in DC systems supplying Process/Industrial Facilities, in Control Current systems of Distribution Points, Substations and Power Stations; in Emergency Power Systems complete with Storage Batteries and DC Boards.

Voltage stabilization accuracy of boost charging and fluctuation/surging values meet the requirements of “Low Maintenance” and “Sealed” batteries. They supersede obsolete models of rectifiers not meeting these requirements.

### Design

Charging/Boost Charging Rectifiers “VZP-TPP” are designed as metal cabinets. Power cabling is made from the bottom of cable way. Control and indication elements are located on a front panel.



Charging/Boost Charging Rectifiers “VZP-TPP”



Charging/Boost Charging Rectifiers “VZP-TPP”  
(with devices installed)

### Main Technical Details

Parameter	Value			
Rated outgoing current $I_{\text{outgoing rated}}$ , A	320	250	160	80
Outgoing current control range, A	from 1 to 320	from 1 to 250	from 1 to 160	from 1 to 80
Number of modules	4	3	2	1
Rated DC output voltage $U_{\text{output rated}}$ , V	24; 115; 230			
Output voltage control range	$(0.9 - 1.15) U_{\text{outgoing rated}}$			
Input voltage permitted deviation, %	from -25% to +15%			
Output voltage permitted deviation from the set value within (0.9-1.15) range $U_{\text{output rated}}$ , %, max.	± 0.5			
Output voltage ripple factor with storage battery disconnected at the outlet, $K_n$ , %, max.	1.0			
Rated efficiency output, $\eta$ , %, min.	95			
Overall dimensions (W × D × H), mm, max.	800 × 860 × 2,200	800 × 860 × 2,200	800 × 860 × 1,820	700 × 600 × 1,820

### Additional Functions

Control scheme is based on a microprocessor controller with the following functions:

- ✎ Control of input voltage, surge voltage and reduction in output voltage
- ✎ Battery circuit control
- ✎ Control of boost charging voltage as function of Storage Battery temperature
- ✎ Programmable automatic control during charging mode
- ✎ Overload protection with transfer to voltage stabilization mode
- ✎ Possible parallel operation in hot reserve

### Advantages

- ✎ Extended allowable range of input voltage fluctuations without transfer of DC System to storage batteries supply
- ✎ Survival under AC single-phase conditions
- ✎ DC System protection against interference pulse dips and other defects in network's voltage quality

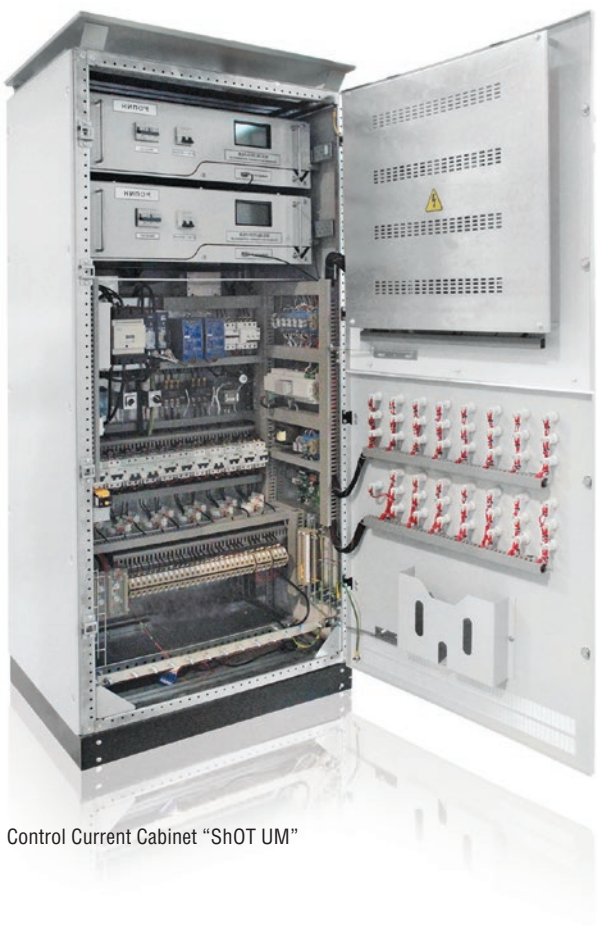
## CONTROL CURRENT CABINETS

### Designation

Control Current Cabinets “ShOT UM” are multi-purpose microprocessor units used as Direct Control Current Supply and Packaged Switchgears for closed Distribution Stations.

### Functional Capabilities

- Automatic charging and boost charging of Storage Batteries with automatic restoration after momentary loss of input voltage
- Temperature compensation of boost charging voltage
- Battery status control
- Storage Batteries line-drop compensation
- Automatic Transfer System at the inlet with possible assignment of main/reserve input or their equivalency
- Digital (discrete) signals generation of “clean” contact type into consumer’s ACS system (Power Supply Automatic Control System) and signals generation into consumer’ ACS Network via Modbus RTU Protocols
- Compensation of load current in inching mode (oil-switch making current, etc.)
- Control and indication of output voltage and fluctuation level



Control Current Cabinet “ShOT UM”

### Advantages

- Rectifiers modular design with possible hot swapping
- Electromagnetic interference (EMI) filter at inlet and outlet
- Uninterruptable customers’ power supply with stabilized voltage
- Control of consumers’ bus bars and feeder insulation

### Main Technical Details

Parameter	Value
Rated output current, $I_{\text{output rated}}$ , A	20, 40
Rated DC output voltage, $U_{\text{output rated}}$ , V	230
Rated efficiency output, % min.	0.85
Input voltage permitted deviation, %	from -25% to +15%
Output voltage permitted deviation from the set value within (0.9–1.15) range, $U_{\text{output rated}}$ , %, max.	± 1.0
Current permitted deviation from the set value in Storage Battery's circuit at charging mode, %	± 1.0
Voltage stabilization accuracy at Storage Battery charging mode, %, max.	± 0.5
Output voltage ripple factor with a Storage Battery disconnected at the outlet, $K_n$ , %, max.	1.0
Rated efficiency output, $\eta$ , %, min.	90
Number of outgoing connections, max.	24
Cooling	natural air cooling*
Overall dimensions (W × D × H), mm	600 × 800 × 1,800...2,200

\* Forced air cooling activates only in case of rectifier module overheating at maximum load.



## FAST TIME AUTOMATIC TRANSFER SWITCH (ATS) SYSTEMS BASED ON “F4” “FREECON” FORM FACTOR

### Designation

It is designed to provide uninterrupted power supply to electric equipment of process units during main power supply upsets with possible forecast of such upsets/faults and incipient failure detection. Reliability increases due to high switching speed over to a standby lead-in with the help of a thyristor switch. If there a significant percent share of kinetic load among consumers, fast time ATS “BAVR” synchronically switches a faulty bus-bars section over to a standby lead-in without excess currents occurrence.

### Advantages

- ✧ Time to detect a faulty bus-bar section (depending on an emergency type and load characteristics) — 6 ms, min.
- ✧ No need for kinetic load
- ✧ Determination of asymmetric short circuits in consumers’ power supply network
- ✧ High speed switching performance due to thyristor switch
- ✧ Outgoing line operation shutdown during short circuits
- ✧ Simple setup of color display with touch-sensitive control
- ✧ Exhaustive continuity monitoring of control circuits
- ✧ Developed self-diagnostic system



“BAVR”

### Design

ATS structure includes a power unit and a control unit.

ATS power switch-measuring unit is designed for:

- ✧ Measurement of bus section’s electric parameters
- ✧ Power switching of a faulty bus-bars section over to a standby section in two-section power supply mains with two 0.4 kV lead-ins
- ✧ Bus bar protection against overloads and short circuits

Switching over takes place when a thyristor switch activates and a main switch of a faulty bus section deactivates further on. Control system of “BAVR—SUBA-NT” initializes a signal for power supply switching over.

Control system of “BAVR—SUBA-NT” is a mono-bloc unit with controls and indication terminals located on its front panel. “SUBA-NT” is powered either by two 24 V dc independent lead-ins or by 24 V DC uninterruptible power supply.

“SUBA-NT” provides as well:

- ✧ Parameters signaling and control
- ✧ Events log keeping
- ✧ Transient phenomena oscillographic testing
- ✧ Data communication to High Level (Automatic Process Control Systems) as per Modbus RTU Protocol
- ✧ Device self-diagnostics

### Main Technical Details

Parameter	Value
Number of lead-ins	2
Kind of current, number of phases	Alternative, 3-ph., 50 Hz
Rated voltage, V	380
Rated lead-in / input current, A	630, max.
Short-circuit shock current, kA	19
Insulation resistance of Switchboard conducting parts under normal conditions MOhm, min.	1.0
Climatic factors group	IP54 max.
Equipment seismic load resistance as per MSK64 scale	UKHL 3
Mean Time Between Failures (MTBF), hours	250,000
Time to detect a faulty bus section, ms, max.	80
Incoming lines maximum section	95 mm <sup>2</sup>
Switchboard overall dimensions (W × D × H)	1,800 × 600 × 2,200

### Options

Depending on rated current and customer's demands, various types of power units are supplied:

- ✎ Arrangement of switching devices and control units:
  - In one and the same floor cabinet
  - In one and the same outside mounted cabinet
  - Lead-ins, bus section breaker, thyristor switch and control unit-in separate cabinets
- ✎ Single-side / double-side maintenance
- ✎ It is integrated into LV Switchboard of a Packaged Transformer Substation or is an independent item

## "FREECON" SWITCHBOARDS FOR PRIMARY AND SECONDARY DISTRIBUTION SYSTEMS UP TO 6 (10) KV

### NEWLY-DESIGNED PRODUCT

#### Designation

"Freecon" switchboards with composite insulation are designed for 3 phase AC, 50 Hz electric energy distribution with rated voltage of 6 (10) kV in systems with insulated neutral or in resonant/resistance grounded systems.

While developing "Freecon" switchboards, contemporary trends in global switchboards design have been taken into consideration.

#### Application

"Freecon" switchboards are used in energy primary and secondary distribution systems. Generating and grid companies, industrial enterprises and facilities use "Freecon" switchboards.



"Freecon" Switchboard Developed and Produced by "NIPOM" JSC

#### Completeness

- ✦ "Freecon" switchboards are equipped with vacuum power circuit breakers manufactured by leading foreign producers, e.g. ABB, Siemens, etc.
- ✦ "Freecon" switchboard secondary diagrams are designed on the basis of microprocessor type protective relays breakers manufactured by leading domestic and foreign producers

#### Design Merits

"Freecon" switchboard case is made of corrosion resistant galvanized steel; it has a higher mechanical strength; metal grounded partitions separate it into several compartments. Modular type design is used; each module has its own case; modules are firstly connected with each other with the help of bolt detachable joints and only then main and secondary circuits are connected as required.

#### Advantages

- ✦ User-friendly operation supported by maintenance and routine switching on cell's facade side and access to instrument current transformers
- ✦ Strengthened case capable to withstand mechanical loads of M6, M40
- ✦ Improved quality due to high degree of standardization
- ✦ Small overall dimensions enable to place more units on the surface
- ✦ High reliability and operational safety lead to exclusion of wrong actions of operators due to mechanical locks and active mnemonic diagram

## Main Technical Details

Parameter	Value
Rated voltage, kV	6; 10
Maximum working voltage, kV	7.2; 12
Current frequency of main and secondary circuits, Hz	50 ± 1.25
Rated current, A of:	
– Switchboard main circuits	630; 1,000; 1,250; 1,600; 2,000; 2,500; 3,150
– Bus bars	1,000; 1,600; 2,000; 2,500; 3,150; 4,000
Current transformer rated current, A	100; 200; 300; 400; 600; 800; 1,000; 1,200; 1,500; 2,000; 3,000; 4,000
Rated interrupted current of power circuit breakers, kA	20; 25; 31.5; 40
Time duration of conventional thermal current flow with, sec.:	
– Main conducting circuits	3
– Grounding circuits	1
Conventional thermal current, kA	20; 25; 31.5; 40
Electro-dynamic current	51; 64; 81; 102
Type of circuit breakers used:	
– Vacuum	VD4, Sion, VF12, BB/TEL, VM1-T, VCB, ZN63A-12
– Electronegative gas	HD4
Rated voltages of control and warning circuits, V:	
– At direct current	110 ± 5 %; 220 ± 5 %
– At alternative current	220 ± 5 %
– Light circuits	24
Rated output of internal auxiliary transformers, kVA	40
Protection rating as per GOST 14254	IP31
Insulation level as per GOST 1516.3-96	Normal insulation
Insulation type	Air; combined
Insulation of conducting parts	With bare buses; with partially insulated buses
Maintenance type	Single-side, double-side
Cabinet overall dimensions, mm:	
– Width	650; 800; 1,000
– Depth	1,450
– Height	2,300
Doors available in cabinet draw-out element compartment	With doors
Service life, years, min	30



## MEDIUM VOLTAGE SWITCHGEARS

### 8DJH PACKAGED GAS INSULATED SWITCHGEARS FOR SECONDARY DISTRIBUTION NETWORKS, 24 kV MAX.

#### Designation

8DJH Packaged Gas-Insulated Switchgears are designed to complete 24 kV 3-phase AC current, 50 Hz switchgears in networks with insulated or grounded neutral through a Peterson coil/resonant grounded resistor.

“NIPOM” OJSC is the first to hold Siemens’s license to produce 8DJH Gas-Insulated Switchgears.

#### Use

8DJH Packaged Gas-Insulated Switchgears are used in Secondary Distribution Networks (including severe environment) for indoor installation in Distribution and Transformer Substations premises of:

- ✎ Power supply enterprises and urban Power Stations
- ✎ Enterprises of different branches of industry

#### Modular Design

- ✎ Unit cells and cell blocks are connected in series against each other and are expanded in any order—free of electronegative gas operation in-situ
- ✎ Three options of LV section height, LV hookups/connections to cells—by means of plug-in contacts

#### Advantages

- ✎ Operational reliability
- ✎ Personnel safety: primary circuits in a sealed shell are safe for contact; BB fuses and cable sealing boxes are accessible only with grounded connections; control is possible only with enclosed casings; logic mechanical interlocking; capacitor system for voltage absence indication; connections grounding via a ground-wire with possible fault close-in
- ✎ Operational safety: sealing throughout service life (a welded tank and welded-in bushing insulators); maintenance-free drive components; access to switching devices drives outside electronegative gas tanks; protection against faulty (improper) switching due to logic mechanical interlocking
- ✎ Minimal operational costs throughout service life thanks to maintenance-free, climate loads independence and max. availability for service
- ✎ Possibility to use communications-electronics of leading domestic and foreign manufacturers (on the Customer’s demand)
- ✎ Environmental friendliness



8DJH Switchgear, manufactured by “NIPOM” OJSC under Siemens AG license

## Main Technical Details

Parameter	Value
Rated voltage, kV	20, max.
Maximum working voltage, kV	24, max.
Rated working current <sup>1)</sup> , A for:	
– Cells with a load interrupter switch	400 or 630
– Bus-bars	630
– Bus-bars with power vacuum circuit-breakers	250 or 630
– Transformer cells/bays	200 <sup>2)</sup>
Rated frequency, Hz	50 / 60
Rated short time electro-dynamic current, kA	63, max.
Rated short time thermal current, kA, for:	
– Gas-Insulated Switchgears within 1 sec., kA	25, max.
– Gas-insulated Switchgears within 3 sec., kA (upon request)	20
Rated current with fault close-in for:	
– Cells with a load interrupter switch, kA	63 <sup>3)</sup>
– Bus-bars with power vacuum circuit-breakers, kA	63 <sup>4)</sup>
– Transformer cells/bays, kA	25
Electronegative gas pressure in a tank (at 20 °C)	
– Design pressure for insulation (a), kPa	150
– Min. working pressure for insulation (a), kPa	130
Ambient temperature, °C	
– Without secondary devices	– 25 / – 40 <sup>5)</sup> to + 70
– With secondary devices	– 5 / – 15 <sup>5)</sup> / – 25 <sup>5)</sup> to + 55
– Storage / transportation including secondary devices	– 40 to + 70
Protection rating for:	
– Primary circuit elements under high voltage	IP65
– Gas-Insulated Switchgears	IP2X / IP3X <sup>6)</sup>
– LV section	IP3X / IP4X <sup>6)</sup>

<sup>1)</sup> Rated working currents are defined for ambient temperatures of 40 °C, max. Average meaning for 24 hours is 35 °C, max. (as per IEC / EN 62271-1 / VDE 0671-1).

<sup>2)</sup> Depending on BB fuses ratings.

<sup>3)</sup> 52.5 kA at 60 Hz.

<sup>4)</sup> 63 kA during preparation stage.

<sup>5)</sup> Depending on secondary devices used.

<sup>6)</sup> Designs as per GOST requirements.

## PACKAGED SWITCHGEARS WITH GAS AND AIR INSULATION, 40.5 kV MAX.

### Designation

Distribution equipment with electronegative gas and air insulation are designed to complete 40.5 kV 3 phase ac current, 50 Hz Switchgears in networks with insulated or grounded neutral through a Peterson coil/resonant grounded resistor. It is used for energy distribution at the primary and secondary levels.

### Use

Packaged Switchgears are used for indoor installation in Distribution and Transformer Substations premises of industrial enterprises, power supply entities and urban Power Stations.

### Merits of Gas-Insulated Packaged Switchgears

- ✓ Packaged Gas-Insulated Switchgears with full or partial sectionalization (by means of metal partitions), with sealed all-welded tanks made of stainless steel. These Switchgears incorporate the following switching devices: load interrupter switch-circuit breaker-ground-wire and vacuum power-circuit-breaker arc interruption chambers.
- ✓ Bushing insulators welded into a tank
- ✓ Insulated-phase current-conducting elements outside tanks (bus-bars)
- ✓ Climate independence and environmental resistance
- ✓ Small sized design provides minimal demand in space
- ✓ Simplicity of installation-no need to work with special electronegative gas
- ✓ Continuous non-contact monitoring of electronegative gas content
- ✓ Maintenance free throughout service life
- ✓ Insulation gas used retains its insulation properties throughout service life, cleaning and refilling free
- ✓ Operational cost saving throughout service life

### Merits of Air-Insulated Packaged Switchgears

- ✓ Packaged Air-insulated Switchgears with full or partial sectionalization (by means of metal partitions) incorporate either draw-out or stationary switching devices
- ✓ Bus-bars are located in air; this arrangement provides convenient installation and setup
- ✓ Possible switching devices replacement/change
- ✓ All operations are possible to perform with HV section door closed
- ✓ Clear and reliable indication of switching devices position; control elements are arranged on HV section door

### Merits of Air-Gas Insulated Packaged Switchgears

- ✓ Operational reliability
- ✓ Personnel safety: full protection against contact with conducting parts, enclosed grounded metal casing; bus-bars insulation made of polymer coating; use of special interlocks that makes faulty commutation impossible
- ✓ High commutation life
- ✓ Insulation testing without disconnection from a cell
- ✓ Environmental friendliness

## Delivery

“NIPOM” OJSC is entitled to exclusively deliver 40.5 kV, max., Packaged Switchgears (produced by Siemens Co.).

Distribution level	Insulation	Bus bar system	Type of a device	Electric parameters (maximum values)			
				Rated voltage (kV)	Short time thermal current (3 sec. kA)	Bus-bar current (A)	Feeder current (A)
Primary distribution level	electronegative gas insulation	Single	NXPLUS C	15 24	31.5 25	2,500 2,500	2,500 2,000
			8DA10	40.5	40	4,000	25,00
		Double	NXPLUS C	24	25	2,000	1,250
			NXPLUS	36	31.5	2,500	2,500
	Air insulation	Single	SIMOSEC	17.5 24	25* 20	1,250 1,250	1,250 1,250
			NXAIR	24 max.	50 max.	4,000 max.	4,000 max.
Secondary distribution level	electronegative gas insulation	Single	NXPLUS C	15 24	31.5 25	2,500 2,500	2,500 2,000
	Air insulation		SIMOSEC	17.5 24	25* 20	1,250 1,250	1,250 1,250

\* 1 sec.



Switchgears series intended for Primary and Secondary Distribution Networks (40.5 kV, max.)

## “ONEGA” SINGLE-SIDE MAINTENANCE CHAMBERS FOR SECONDARY DISTRIBUTION NETWORKS, 6 (10) kV MAX.

### Designation

“Onega” single-side maintenance chambers (SSMC) with air insulation are designed to complete 6 (10) kV 3-phase AC current, 50-Hz switchgears in networks with insulated or grounded neutral through a Peterson coil / resonant grounded resistor.

“NIPOM” OJSC holds a license of “PO Eltekhnika” Company to produce “Onega” SSMC.

### Use

“Onega” 6 (10)-E2 SSMC cells are used at the secondary level of energy distribution. These cells are used by electric distribution companies and at industrial enterprises’ electrical facilities and at infrastructure facilities as well.

### Completeness

At the Customer request BB/TEL power vacuum circuit-breakers (manufactured by “GK Tavrida Electric” Company Group) or VL12 (manufactured by “PO Eltekhnika” Company) may be mounted in “Onega” SSMC cells.



“Onega” SSMC Switchgear produced by “NIPOM” OJSC under “PO Eltekhnika” Company license

### Design Merits

- ✧ Metal casing made of galvanized steel with powder paint coating; facade elements make a structure reliable and durable, and switching devices’ transverse arrangement relative to bus bars makes a structure compact.
- ✧ Cell’s body is divided into functional sections in order to provide high switching capacity.
- ✧ Functional section doors are equipped with mechanical and electromagnetic interlocking

### Advantages

- ✧ Operational safety thanks to multilevel system of built-in interlocks, three-position structure of switching devices with electronegative gas insulation and thanks to design solutions
- ✧ A large variety of grid schemes provides operational flexibility.
- ✧ Maintenance costs are minimized due to high reliability of equipment comprised.
- ✧ Costs for construction of new Switchgears and updating of existing ones are minimized due to their small size.
- ✧ Switchgears are integrated into Automatic Control and Automatic Electric Power Accounting Systems by means of microprocessor relay protection units



## Main Technical Details

Parameter	Value
Rated voltage, kV	6; 10
Maximum working voltage, kV	7.2; 12
Rated current, A for:	
– Bus bars	630; 1,000
– Line ends / outputs	630; 1,000
– Fuses	200, max.
– Power vacuum circuit breakers	1,000
– Load interrupter switches	630
– Disconnecting devices	630; 1,000
– Current Transformers	50–1,000
Rated breaking current, kA, for:	
– Fuses with rated current 160 A, max.	63
– Fuses with rated current 200 A, max.	50
– Power vacuum circuit-breakers	20
Short-time thermal current with flow duration of 3 sec., kA	20
Short time electro-dynamic current, kA	51
Specified parameters of making current of load interrupter switches, kA:	
– The greatest current peak	31.5; 40; 51
– Initial symmetrical value	12.5; 16; 20
Rated voltages of control circuits and sub circuits, V with:	
– Direct current	24; 48; 100; 220
– Alternative current	220
– For lighting circuits	24
Test norms of main conducting circuits' insulation tested with one-minute voltage at 50Hz, kV::	
– With respect to ground	42
– Between contacts of power circuit-breakers and load interrupter switches	42
– Between contacts of disconnecting devices and fuses	48
Overall dimensions, mm:	
– Width	375; 500; 750
– Depth	840
– Height, Nos.1, 2, 3, 4 dimensions	2,010/2,210/2,235/2,035
Protection rating as per GOST 14254	IP31
Service life, min., years	30

## “ONEGA-M” SINGLE-SIDE MAINTENANCE CHAMBERS FOR SECONDARY DISTRIBUTION NETWORKS, 6 (10) kV MAX.

### NEW PRODUCT

#### Designation

“Onega” single-side compact maintenance chambers (SSMC) are designed to complete 6 (10) kV 3-phase AC current, 50 Hz switchgears in networks with insulated or grounded neutral through a Peterson coil/resonant grounded resistor.

Onega-M SSMC cells are equipped with power vacuum circuit-breakers, circuit breakers with electronegative gas insulation and load interrupter switches, and a system of air-insulated bus bars.

“NIPOM” OJSC holds a license of “PO Eltekhnika” Company to produce “Onega-M” SSMC.

#### Use

Onega-M SSMC small size cells are used at the secondary level of energy distribution; they are used by electric distribution companies, as well as at industrial enterprises’ electrical facilities and at infrastructure facilities.

The use of Onega-M SSMC allows forming any switchgear designed to be installed in transformer sub-stations and at assembly points of radial, transmission or loop distribution networks.



“Onega-M” SSMC Switchgear produced by “NIPOM” OJSC under “PO Eltekhnika” Company license

#### Advantages

- ✧ Small size allows designing compact switchgears
- ✧ High flexibility in constructing switchgear diagrams and providing various layout solutions enables to use the optimum number of switching devices
- ✧ Switching devices embedded separately in a modular fashion provide an increased maintainability which distinguishes Onega-M SSMC cells from traditional single blocks with electronegative gas insulation
- ✧ Application of Russian-made components provides a competitive product cost and independence from the market conditions

## Main Technical Details

Parameter	Value
Rated voltage, kV	6; 10
Maximum working voltage, kV	7,2; 12
Rated current, A for:	
– bus bars	630
– main circuits	630
– fuses	200 max
Rated breaking current, kA	20
Short-time thermal current, kA	20
Flow duration of short-time thermal current, sec:	
– of the main conducting circuits	3
– of the ground circuits	1
Rated voltages of control circuits and sub-circuits, V with	
– direct current	24; 220
– alternative current	220
– for lighting circuits	24
Electrical insulation resistance, MOhm, min.:	
– of main conducting circuits	1000
– of control circuits and sub-circuits	1
Short time electro-dynamic current, kA	51
Service life, min., years	25
Protection rating as per GOST 14254	IP31

## “VOLGA” PACKAGED SWITCHGEARS FOR PRIMARY AND SECONDARY NETWORKS, 6 (10) kV, MAX.

### Designation

“Volga” Packaged Switchgears with combined insulation are designed to supply power [rated voltage of 6 (10) kV 3-phase ac current, 50 Hz] in networks with insulated or grounded neutral through a Peterson coil / resonant grounded resistor.

“NIPOM” OJSC holds a license of “PO Eltekhnika” Company to produce “Volga” Packaged Switchgears.

### Use

“Volga” 6 (10)-U3.1 Packaged Switchgears are used both at the primary and secondary levels of energy distribution. “Volga” Switchgears are used by energy generating and electric distribution companies, industrial enterprises and at infrastructure facilities as well.

### Completeness

“Volga” Packaged Switchgears are equipped with VF12 power vacuum circuit-breakers manufactured by “PO Eltekhnika” Company.



“Volga” Switchgears produced by “NIPOM” OJSC under “PO Eltekhnika” Company license

### Design Merits

- ✧ Casing made of galvanized steel with grounded metal partitions and higher mechanical strength
- ✧ Modular concept is used in its structure; each module has a separate casing; modules are connected with bolted split joints and primary and secondary circuits are connected thereafter

### Advantages

- ✧ Strengthened body sustaining heavy mechanical loads
- ✧ Higher quality due to high level of standardization
- ✧ Small overall front-end dimensions provide the possibility to place more cells on one and the same area
- ✧ High reliability and operational safety due to mechanical interlocks to prevent personnel's malfunctioning

## Main Technical Details

Parameter	Value
Rated voltage, kV	6; 10
Maximum working voltage, kV	7.2; 12
Rated current, A:	
– Packaged Switchgear main circuits	630; 800; 1,000; 1,250; 1,600; 2,000; 2,500; 3,150
– Bus bars	1,600; 2,500; 3,150
– Current Transformers	200; 300; 400; 600; 800; 1,000; 1,200; 1,500; 2,000; 3,000; 4,000
Rated breaking current of power circuit-breaker, kA	20; 25; 31.5
Short-time thermal current, kA	20; 25; 31.5
Current flow time duration of short-time thermal current, sec.:	
– Main conducting circuits	3
– Ground circuits	1
Short time electro-dynamic current, kA	51; 64; 81
Rated voltages of control circuits and alarm / signalling circuits, V with:	
– Direct current	110; 220
– Alternative current	100; 220
– For lighting circuits	24
Electric insulation resistance, MOhm, min.:	
– Main conducting circuits	1,000
– Control circuits and sub-circuits	1
Protection rating as per GOST 14254-96	IP31
Service life, min., years	25



# SIGNALLING (ALARM) SYSTEMS AND DIRECTIONAL PROTECTION AGAINST SINGLE PHASE-TO-GROUND SHORT CIRCUITS IN ELECTRICAL NETWORKS

## Designation

Signalling (alarm) systems and devices for directional protection against single phase-to-ground short-circuits in electrical networks "SNZ OZZ" are designed to detect different types of single phase-to-ground short-circuits: one-time, temporary/transient, intermittent and sustained ones available in Substation's bus-bar sections, Stations and Distribution Points of 6-35 kV and to detect single phase-to-ground short-circuits available at specific connections.



"SNZ OZZ" manufactured by "NIPOM" OJSC under NPP (Research & Production Enterprise) "ALIMP" (Automatic fault locator finders") LLC license

## Operational Capabilities

- ✦ Internal configuration as per Ethernet interface, IEC 60870-5-103 protocol
- ✦ Settings input and storage
- ✦ Detection of faulty connections
- ✦ Detection and indication of single phase-to-ground short-circuits (one-time, temporary/transient, intermittent and sustained ones)
- ✦ Digital signals reception, warning signals and control commands generation
- ✦ On-line continuous operability monitoring (self-diagnostic) throughout service life
- ✦ Locking of all outputs if a device is faulty to prevent false responses
- ✦ Galvanized electric isolation of lead-ins/terminals, including power supply, to provide high interference protection
- ✦ High resistance and reliability of lead-ins/terminals insulation relative to a casing and against each other to improve resistance to excess voltages occurring in secondary circuits of connections

## Protection Functions and Automatics

- ✦ Detection of single-phase-to-ground short-circuits on one of two bus bar sections under control
- ✦ Detection of connection with single-phase-to-ground short-circuits
- ✦ Determination of single-phase-to-ground short-circuits type
- ✦ Signals detecting single-phase-to-ground short-circuit availability
- ✦ Commands generation and transmission to operational units at designed conditions
- ✦ Oscillographic testing of aero-sequence current and voltage in an emergency situation with max. 2 seconds duration
- ✦ 30 last responses archive with data stored in case of operational power supply fault

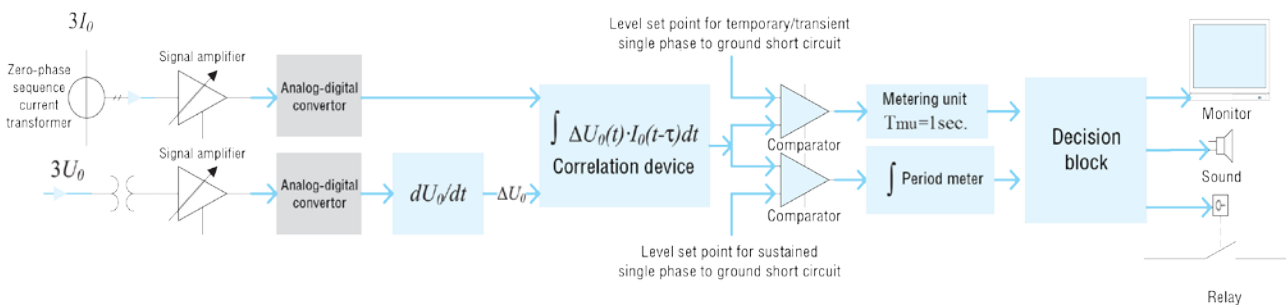
## Main Technical Details

Parameter	Value
Number of current measurement channels ( $3I_0$ )	$\leq 24$
Maximum current range under control $3I_0$ , A	$\pm 0.005 - 1.000$
Main relative error of current measurement $3I_0$ within a working range, %	0.2
Thermal withstand capability of current path $3I_0$ cat input terminals, A, min. for:	
– A long time	2
– A short time (2 sec.)	5
Thermal withstand capability of voltage path, V, min., for:	
– A long time	150
– A short time (2 sec.)	200
Number of voltage measurement channels $3U_0$	$\leq 2$
Number of voltage measurement channels $U_{\text{phase}}$	$\leq 6$
Maximum voltage range under control $3U_0$ or $U_{\text{phase}}$ , V	$\pm 0.01 - 150$
Relative error of voltage measurement, %	0.2
Working frequency range of input signals, kHz	0.05 – 10

## Advantages

- Device operation is based on use of electrical units of transient phenomenon occurred at the moment of insulation fault to ground potential, it provides operation transient stability with arresting of all types of ground short-circuits
- The method used to detect single phase-to-ground short-circuit allows to determine selectively damages of 6-35 kV electric mains connections (hookups) under any operation conditions of neutral (insulated, compensated) with high interference protection
- Any input analogue data processing architecture makes possible implementation of some data processing algorithms cumulatively. The use of such algorithms provide alarm systems and devices for directional protection against single phase-to-ground short-circuits with monitoring and protection functions not only in electric networks but in generators and electric motors as well

## Chain Diagram of Processing Paths for Alarm System and Directional Protection Against Single Phase-to-Ground Short-Circuits



# PACKAGED TRANSFORMER AND DISTRIBUTION SUBSTATIONS

## INDOOR PACKAGED TRANSFORMER SUBSTATIONS 6-24/0.4 kV

### Designation

Indoor Packaged Transformer Substations “KTP” with the capacity of 25 to 3,150 kVA, are designed to receive and convert HV 6 (10, 15, 20) kV electric energy, into LV 0.4 (0.23; 0.69) kV electric energy and distribute electric power [three phase alternative current, 50 (60) Hz] among consumers.

### Architecture

Freely configurable Packaged Transformer Substations are designed in accordance with particular customized Technical Assignments.

### Completeness

#### High Voltage Switchgears:

- ↘ 8DJH gas-insulated cubicles
- ↘ “Onega” 6 (10)-E2 SSMC cubicles
- ↘ “Volga” 6 (10)-U3.1 Packaged Switchgears
- ↘ Packaged Switchgears produced by domestic and foreign companies

#### Low Voltage Switchboards:

- ↘ Freely configurable “Freecon” Switchboard based on “F4” in-house / “NIPON” OJSC/ form factor — (for 6,300 A current, max.) and based on “SIVACON S8” licensed unified form factor — (for 7,000 A current, max.) and “Logstrup” — (for 8,500 A current, max.)

#### Power Transformers:

- ↘ Oil-Immersed Sealed Transformers
- ↘ Dry Transformers

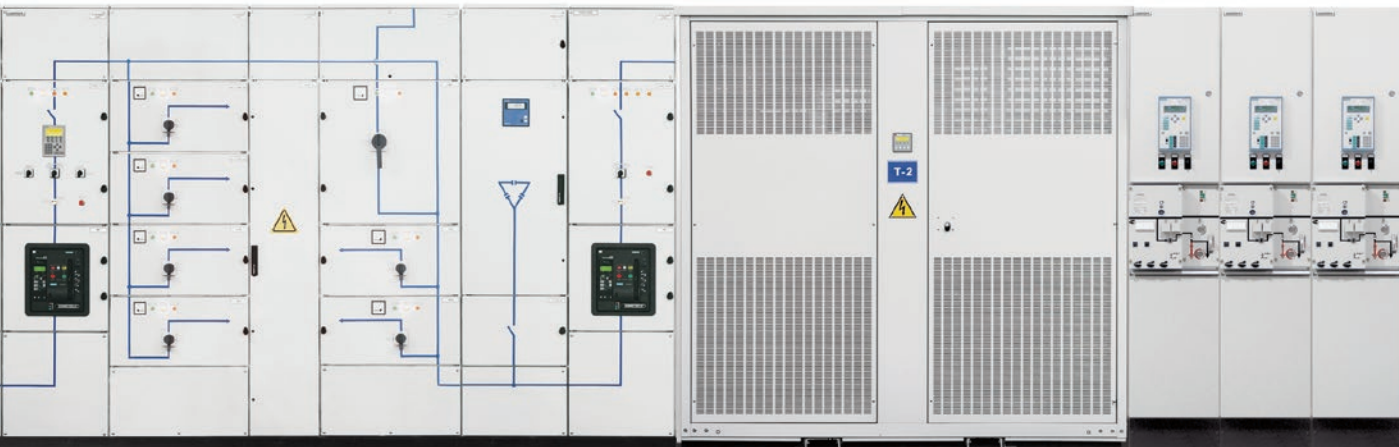
#### Reactive Power Compensation Units:

- ↘ Automatic reactive-power control up to 1,000 kVAr (reactive kilovolt-ampere)



## Main Technical Details

Parameter	Value
Power Transformer capacity, kVA	3,150 max.
Type of Power Transformer	Oil, dry
Rated voltage on HV side, kV	20 max.
Rated voltage on LV side, kV	0.69 max.
Rated current of bus bars on HV side, A	3,150 max.
Rated current of bus bars on LV side, A	8,500 max.
Rated current of automatic input breaker on LV side, A	6,300 max.
Short time thermal current on HV side, for Switchgears with:	
– Air insulation, kA/2 sec.	20
– Gas insulation, kA/1 sec.	20; 25
Short time electro-dynamic current on HV side for Switchgears with:	
– Air insulation, kA/2 sec.	31.5; 40; 51
– Gas-insulation, kA/1 sec.	50; 63
Short time thermal current on LV side, kA/1 sec.	220 max.
Short time electro-dynamic current on LV side, kA	330 max.
Insulation strength of HV6 (10) main circuit, kV/min., sec.	32 (42) / 3.0
Insulation level as per GOST 1516.1 with Oil/Dry Transformer	Standard / Thinned
Climatic modification and category of location (as per GOST 15150, GOST 15543.1)	U1, UKHL1, UKHL3, UKHL4 and in categories combination (combined placement)
Shell protection rating (as per GOST 14254) / HV Switchboard / LV Switchboard / Packaged Transformer Substations	IP31 / IP20 до IP54 / IP23
Service life, years, min.	30



Indoor Packaged Transformer Substation

## MODULAR PACKAGED TRANSFORMER SUBSTATIONS IN CONCRETE HOUSINGS

### Designation

Modular Packaged Transformer Substations in Concrete Housings “BKTPB” with voltage of 6 (10, 15, 20)/0.4 kV with one or two 1,600 kVA Power Transformers are designed for electric power supply of housing and utilities infrastructure, industrial facilities, villa community, individual dwellings zone, etc.

### Completeness

#### High Voltage Switchboards:

- ✧ 8DJH gas-insulated cubicles
- ✧ “Onega” 6 (10)-E2 SSMC cubicles
- ✧ Packaged Switchgears produced by domestic and foreign companies

#### Low Voltage Switchboards:

- ✧ Freely configurable “Freecon” switchboards
- ✧ Auxiliaries boards and metering boards

#### Power Transformers:

- ✧ Oil-immersed Sealed Transformers
- ✧ Dry Transformers

Modular Packaged Transformer Substations in Concrete Housings may be equipped with:

- ✧ Automatic heating
- ✧ Emergency lighting
- ✧ Bugler and fire alarm systems
- ✧ Integration into Automatic Power Consumption Measurement System

By order, the following items may be installed in “BKTPB” for the purpose to take measurements and meter electricity:

- ✧ Current and voltage Transformers in HV Switchboards
- ✧ Transformers (at input and outgoing lines) in LV Switchboards
- ✧ Active-and-reactive energy meters
- ✧ Voltmeter with a variable connector at LV Switchboard lead-in
- ✧ Ammeters in each phase at LV Switchboard lead-in/input
- ✧ Automatic Power Consumption Accounting System units

### Advantages

- ✧ Fully ready-to-use, standard tests conducted in full scope
- ✧ Advanced electrical equipment
- ✧ Compactness and urban architecture compatibility
- ✧ Quick installation and commissioning
- ✧ Simplification of land allotment procedure
- ✧ Power extensibility using additional modules
- ✧ Transportation without State Road Traffic Safety Inspection approval (dimensions are permitted for transportation)
- ✧ Seismic design basis and durability due to double reinforcement and high quality concrete
- ✧ Vandal-proof design



## Main Technical Details

Parameter	Value
Power Transformer capacity, kVA	100; 160; 250; 400; 630; 1,000; 1,250; 1,600*
Rated voltage on HV side, kV	20 max.
Rated voltage on LV side, kV	0.69 max.
Rated current of bus bars on HV side, A	630; 1,000
Rated current of bus bars on LV side, A	200; 320; 500; 800; 1,250; 2,000; 2,500; 3,200
Short time thermal current of bus bars on HV side, for Switchgears with:	
– Air insulation, kA/2 sec.	20
– Gas insulation, kA/1 sec.	20; 25
Short time electro-dynamic current on HV side for Switchgears:	
– Air insulation, kA/2 sec.	31.5; 40; 51
– Gas insulation, kA/1 sec.	50; 63
Short time thermal current of bus bars on LV side, kA/1 sec.	20; 30; 50
Short time electro-dynamic current on LV side, kA	50; 70; 110
Climatic modification and category of location (as per GOST 15150, GOST 15543.1)	U1, UKHL1
Shell protection rating (as per GOST 14254)	IP23
One block dimensions, mm	
– Height/Width/Depth of a shell	2,865/2,560/5,240
– Height of double floor/cable spreading room	1,020/1,690
Weight, kg	
– Shell with HV/LV switchgear equipment without a Transformer, max.	18,100
– Cable spreading room, max.	
Height, mm: 1,020	7,500
Height, mm: 1,690	10,000
– Double cable spreading room, max.	9,000
– Oil catcher, max.	215
Service life, years, min.	30

\* Installation of Transformers with capacity of 1,600 kVA (TSL, TONp, etc. types) is possible by order.



Modular Complete Two Transformers Substations  
in Concrete Housing "2 BKTPB"



Modular Complete One Transformer Substation  
in Concrete Housing "1 BKTPB"

## MODULAR PACKAGED DISTRIBUTION SUBSTATIONS IN CONCRETE HOUSINGS

### Designation

Modular Packaged Distribution Substations in Concrete Housings “BKRPB” with voltage of 6 (10, 15, 20) are designed for electric power distribution in urban and industrial networks.

Modular Packaged Distribution Transformer Substations in Concrete Housings “BK RTPB” voltage of 6 (10, 15, 20)/0.4 (0.23; 0.69) kV with 1,600 kVA Transformers are designed to distribute and convert electric energy in networks with insulated neutral on high voltage side and dead grounded neutral on 0.4 kV side.

BKRPB and BK RTPB Substations are of modular construction based on “BK TPB” module. Quantity of BKRPB and BK RTPB Substations to be defined by the Project. “BKRPB” standard design solution includes 4 or 6 modules and BK RTPB standard design solution includes 4,6 or 8 modules fully ready to use.



Modular Packaged Distribution Substations in Concrete Housings “BKRPB”

### Completeness

#### High Voltage Switchboards:

- ✎ 8DJH gas-insulated cubicles
- ✎ “Onega” 6 (10)-E2 SSMC cubicles
- ✎ Packaged Switchboards produced by domestic and foreign companies

#### Switchboard scheme options:

- ✎ For two bus bars sections
- ✎ Loopback scheme consists of four bus bars sections with appropriate sectional devices

#### Low voltage switchgears only for BK RTPB:

- ✎ Freely configurable “Freecon” Switchboards

### Electric Power Measurements And Accounting:

- ✎ Voltmeters with a variable connector in Voltage Transformers bays and ammeter in cells of incoming and outgoing lines
- ✎ Current Transformers with 0.2S (0.5S) accuracy rating are installed for electricity accounting
- ✎ Energy meters are installed in a separate metering panel, their type to be defined by the Project

### Relay Protection, Automatic Equipment and Alarm :

- ✎ Microprocessor units of various series produced by any manufacturers may be used as Relay Protection and Automatic Equipment for incoming, outgoing and sectional cells
- ✎ BKRPB is equipped with Panels with Uninterruptible Power Supply (UPS) to provide uninterruptable power supply to Relay Protection and Automatic Equipment
- ✎ Logic selectivity function is provided for perfect coordination of HV Switchboard protection operation
- ✎ Burglar Alarm System is installed additionally with the possibility to transmit signals via radio-channels to a Central Guard Console
- ✎ Fiber line arc flash protection may be installed by order

## Main Technical Details

Parameter	Value
Rated voltage, kV	20 max.
Rated current of bus bars on HV side, A	2,500 max.
Rated current of main circuits, A	2,500 max.
Short time thermal current of bus bars on HV side, for Switchgears with:	
– Air insulation, kA/2 sec.	20
– Gas-insulation, kA/1 sec.	20; 25
Short time electro-dynamic current on HV side for Switchgears with:	
– Air insulation, kA/2 sec.	32; 51
– Gas-insulation, kA/1 sec.	51; 63
Rated voltage of secondary circuits, V for:	
– Alternative current	220
– Lighting at alternative current	24
Power Transformer capacity, kVA*	630; 1,000; 1,250; 1,600**
Rated voltage on LV side, kV*	0.69 max.
Rated current of bus bars on LV side, A*	1,600; 2,000; 2,500
Short time thermal current of bus bars on LV side, kA/1 sec.*	20; 30; 50
Short time electro-dynamic current of bus bars on LV side, kA*	50; 70; 110
Climatic modification and category of location (as per GOST 15150)	U1; UKHL1
Shell protection rating (as per GOST 14254)	IP23
Dimensions, mm:	
– Height	3,520
– Height of a cable spreading room (in clear)	1,620 / 1,800
– Width	5,120
– BKRPB length	10,480 (15,720 max. for 6 modules)
– BK RTPB length	15,720 (20,960 max. for 8 modules)
Weight, kg:	
– One module with equipment and without a Transformer	20,000
– One cable spreading room, max.	9,000
– One oil catcher*	215
Service life, years, min.	30

\* Only for BKRPB.

\*\* With longitudinal arrangement of Transformers.



Modular Packaged Distribution Transformer Substations in Concrete Housing "BK RTPB"

## MODULAR PACKAGED TRANSFORMER SUBSTATIONS IN METAL BLOCK BOXES

### Designation

Modular Packaged Transformer Substations in Metal Block Boxes “BKTPM” with voltage of 6 (10, 15, 20)/0.4 kV with one or two Power Transformers of 100 kVA to 2,500 kVA capacity are designed for electric power supply of industrial entities, mining industry enterprises and infrastructure facilities.

### Design

Packaged Transformer Substations are made as welded block boxes and may be shipped by any mode of transport.

Block boxes may be made of metal powder painted with required layer of a warmth-keeping jacket or sandwich panels.

### Completeness

#### High Voltage Switchboards:

- ✎ 8DJH gas-insulated cubicles
- ✎ “Onega” 6 (10)-E2 SSMC cubicles
- ✎ “Volga” 6 (10)-U3.1 Packaged Switchgears
- ✎ Packaged switchboards produced by domestic and foreign companies

#### Low Voltage Switchboards:

- ✎ Low Voltage Switchboards
- ✎ Auxiliaries boards and metering boards

#### Power Transformers:

- ✎ Oil-immersed Sealed Transformers
- ✎ Dry Transformers



Modular Packaged Transformer Substations  
in Metal Block Boxes “BKTPM”

## Main Technical Details

Parameter	Value		
Power Transformer capacity, kVA	100; 160; 250; 400; 630; 1,000; 1,250; 1,600; 2,500		
Rated voltage on HV side, kV	20 max.		
Rated voltage on LV side, kV	0.69 max.		
Rated current of bus bars on HV side, A	630 (1,000)		
Rated current of bus bars on LV side, A	6,300 max.		
Short time thermal current of bus bars on HV side, kA / 3 sec.	20		
Short time electro-dynamic current of bus bars on HV side, kA	51		
Short time thermal current of bus bars on LV side, kA / 1 sec.	100 max.		
Short time electro-dynamic current of bus bars on LV side, kA	200 max.		
Climatic modification and category of location (as per GOST 15150)	U1, UKHL1		
Shell protection rating (as per GOST 14254)	IP23		
BKTPM dimensions, mm*			
– One module depth	6,000	9,000	12,000
– One module width		3,000 max.	
– One module height		3,000 max.	
Weight of module with equipment, w/o a transformer, max., kg	5,000	6,850	11,000
Service life, years, min.	30		

\* Dimensions may be adjusted as per BKTPM and technical building completeness with equipment.

### Block Boxes Options:

- ✎ Environmental control
- ✎ Emergency lighting
- ✎ Burglar and fire alarm
- ✎ Fire-extinguishing system
- ✎ Domestic module

By order, the following items may be installed in BKTPBM for the purpose to take measurements and meter electricity:

- ✎ Voltmeter with a variable connector at LV Switchboard input
- ✎ Ammeters in each phase at LV Switchboard input
- ✎ Ammeters and Current Transformers at LV Switchboard outgoing lines
- ✎ Active-and-reactive energy meters
- ✎ Automatic Power Consumption Accounting System units



## INTELLIGENT BLOCK-MODULAR SUBSTATIONS

### Designation

Alongside with standard solutions, “NIPOM” OJSC offers Intelligent Block-Modular Substations which are designed to receive, supply, convert and distribute electric energy [three-phase alternative current of 6 (10, 15, 20)/0.4 (0.23; 0.69), 50 (60) Hz]. These Substations are capable to monitor status, account energy and control Substation’s switching devices. This control is exercised through a remote access from a control console or a mobile device. The Substation operates off-line and with no permanent personnel attendance at the Facility.

“NIPOM” industrial complex offers ready-made solutions relative to Intelligent Block-Modular Substations based on in-house Substations in concrete shells (BKTPB) and in metal shells (BKTPM).



Intelligent Block-Modular Substation

### Specific Features

Technical solutions and remote management tools are used to provide control of networks parameters, Packaged Transformer Substations operation modes and, in case of need, remote control on medium/low voltage sides.

Control data and commands are transmitted via one or several communication channels, in particular via RS-485 industrial interface, fiber optic and GSM-network.

Intelligent Block-Modular Substations are easily integrated into commercial and technical Power Accounting Systems that comprise active and reactive energy meters with data transmission digital interface.

### Functional Capabilities

Intelligent Block-Modular Substations are equipped with Automatic Control Systems that provide:

- ✎ Generation of data on status of start-control devices (disconnecting switches, circuit-breakers, wire fuses)
- ✎ Remote control of three-position disconnecting switches and automatic circuit-breakers
- ✎ Measurement of main parameters of energy consumed
- ✎ Commercial and technical energy accounting
- ✎ Control of switchgears' parameters and read-out of an event log via Web-server or an operator terminal directly at a Substation
- ✎ Digital data exchange with High-Level APCS (Automatic Process Control Systems) with the use of industrial data communication protocols including those intended for the use in Substations

### Advantages

- ✎ Reduction in current expenditures due to decrease in troubleshooting time arising from ad hoc detection, insulation, diagnostic and eliminations of defects
- ✎ Efficient use of labor resources thanks to Substations automatic performance
- ✎ Data transmission to High-Level APCS

## CLOSED PACKAGED TRANSFORMER SUBSTATIONS 35-110/6-24 kV

### NEWLY-DESIGNED PRODUCT

#### Designation

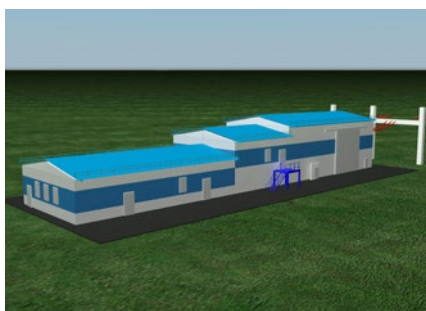
Closed packaged substations are designed to receive and transform 110 (35) kV energy to 6 (10, 15, 20) kV energy and to distribute 3-phase AC current, 50 (60) Hz energy to the consumers.

#### Advantages

- ✦ delivery is performed in separate block modules with the technological equipment in place; interconnection into a single unit is directly at the site
- ✦ possibility to implement the substation based on the most commonly used schemes (4H, 5H, 5AH)
- ✦ maximum operational compatibility enabling to reduce costs and time for performing construction, assembly and commissioning work on site
- ✦ a base of unified blocks enabling to configure a substation of any geometry within a wide power range
- ✦ possibility to use different equipment produced by the leading Russian and foreign manufacturers
- ✦ maximum adaptation to the Smart Grid level transition

#### Comparison of KZPS variants

Indicators	KZPS 35-110/6-24 kV types		
	one-level	two-level	three-level
Minimum usable construction space, m <sup>2</sup>	more than 800	more than 450	more than 300
Construction term (after execution of a contract), months	12	12	12
– including the work completion time at the construction site, months	6	6	6



One-level CIS



Two-level CIS



Three-level CIS

### Main Technical Details

Parameter	Value
Rated feeder line voltage, kV	110 (35)
Number of line leads to the HVSG section, pcs.	2
Availability and position of the automatic transfer switch on the HV side	yes/no
Design of the automatic transfer switch on the LV side	yes/no
HVSG type	8DN8 produced by Siemens AG (or similar)
20/10 (6) kV in-house switchgear type	Freecon switchboard produced by "NIPOM" JSC (or similar)
0.4 kV low-voltage switchgear type	Low-voltage package module produced by "NIPOM" JSC: – based on SIVACON S8 construct – based on F4 construct (or similar)
Availability of electric power metering equipment on the LV side	yes/no
Design of the line leads on the HV side	cable (CL)/aerial (AL)

## REACTIVE POWER COMPENSATION UNITS

### GENERAL DATA AND CHARACTERISTICS

#### Designation

Automatic Power Compensation Units “KRMA” 0.4 / 100...1,000 kVAr are used for power factor increasing on electrical installations of production enterprises and three-phase electrical Distribution Networks for voltage up to 380 V, frequency 50 Hz by means of reactive power automatic regulation.

#### Function

Electronic regulator controlled by microprocessor provides step-by-step regulation of required power factor in selected range of compensated reactive power.



“KRMA” 0.4 / 250 kVAr

#### Design

- ✦ One or two cabinets
- ✦ Double-sided maintenance cabinet
- ✦ Fixed and cellular/modular form factor with plug-in removable modules

#### Indication

- ✦ Power factor
- ✦ Network parameters
- ✦ Fuse condition

#### Options

- ✦ General failure signal generation
- ✦ Connection with High-Level ACS via RS-485 (communication protocol) channels
- ✦ Resistivity bridge harmonic filters

#### Main Technical Details

Parameter	Value
Power	3-phase, N, PE, 380 V
Reactive power, kVAr	100 ... 500 (1,000)
Control step, kVAr	10 ... 100
Maximum number of control steps	12
Climatic parameters	UKHL 4.2
Protection rating (as per GOST 14254)	IP20
Overall dimensions (W × D × H), mm, max.	800 (1,600) × 800 × 1,800 (2,200)
Weight, kg	350–400

## SELF-CONTAINED POWER SUPPLY

### NEWLY-DEVELOPED DESIGN

#### Designation

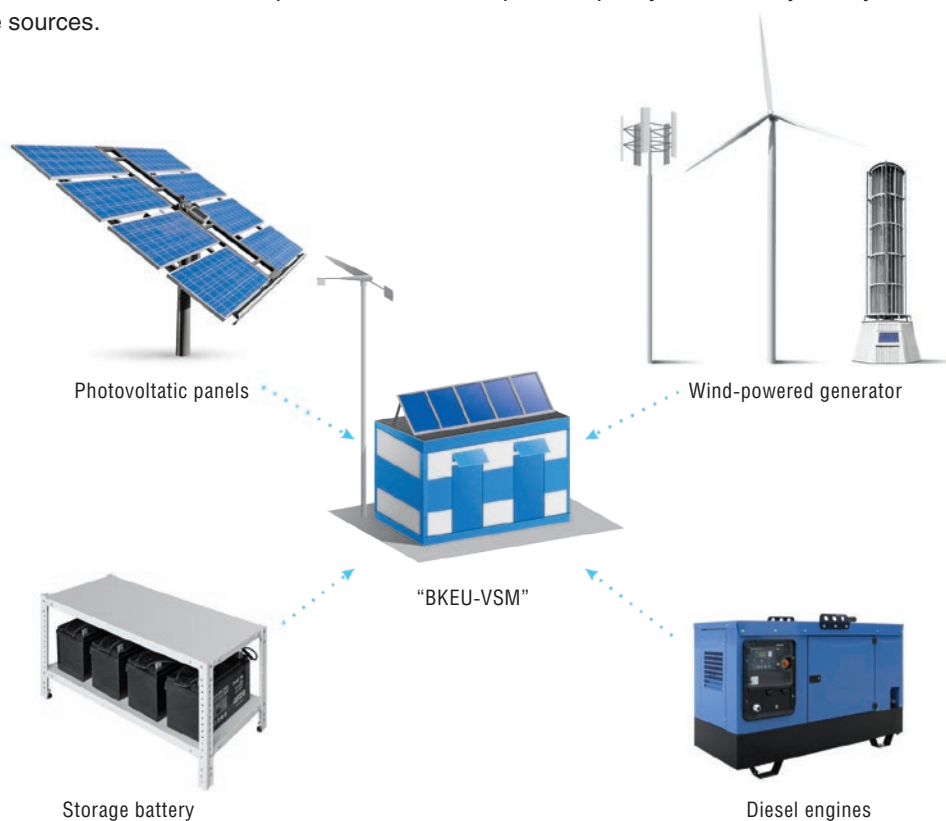
Self-contained power supplies (SPS) are designated for uninterruptable power supply of remote objects that require minimum maintenance including ones on territories with undeveloped mains infrastructure.

#### SPS based on wind-powered generators and solar battery "BKEU-VSM"

Completely built-in and plant tested power unit is a metal block box made of heat-insulated sandwich-panels that includes:

- ✓ Up to 10 kW wind-powered generator
- ✓ Up to 3 kW solar battery
- ✓ Emergency power supply system based on up to 15 kW diesel generator with 10 days fuel capacity
- ✓ Power accumulation, transformation and distribution system
- ✓ Heating system (electric system is the main one and diesel fuel system is stand-by one)
- ✓ Vent system
- ✓ Safety fire alarm and gaseous fire suppression system
- ✓ Lightening system
- ✓ Automated power plant control system allowing remote control and operation with data transmission on higher level

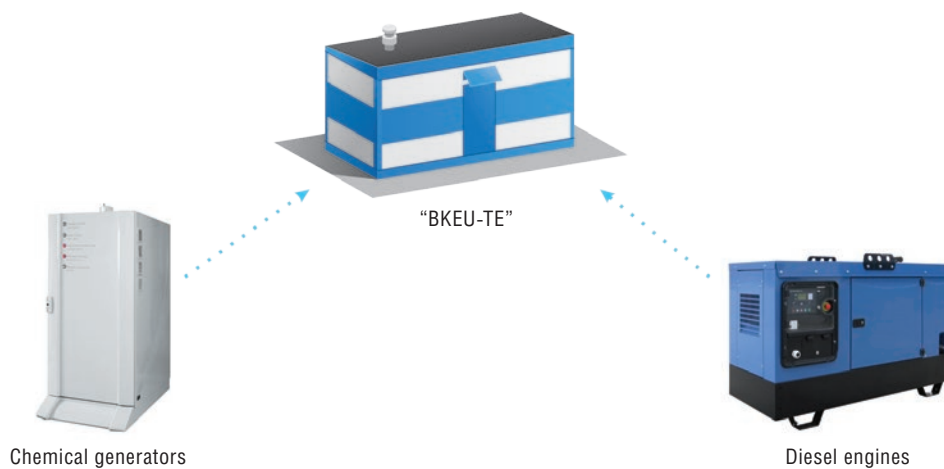
Such design has a modular concept of equipment suite depending on the Customer's needs and purposes and may be equipped with one of more above power sources of required capacity. Additionally it may be added with traditional or alternative sources.



### SPS based on chemical generator “BKEU-TE”

Completely built-in and plant tested power unit is a metal block box made of heat-insulated sandwich-panels that includes:

- ✧ Chemical generator up to 10 kW
- ✧ Power transformation and distribution system
- ✧ Heating/cooling system (heat-recovering is the main one, gas system is stand-by and diesel fuels system is emergency)
- ✧ Gas line hook-up block
- ✧ Vent system interlocked with gas contaminations control system and hydrogen detector
- ✧ Safety fire alarm and gaseous fire suppression system
- ✧ Lightning system
- ✧ Automated power plant control system allowing remote control and operation with data transmission on higher level
- ✧ Stand-by source block (option)



### Advantages of self-contained power supply

- ✧ Decrease of expenses related to organization of power supply on territories with undeveloped mains infrastructure
- ✧ Decrease of energy sources consumption, decrease of maintenance expenses and thus decrease of power supply self-cost on remote objects due to use of renewable sources of power
- ✧ Harmonization due to possible use of different types of power sources in different combinations taking into account specific conditions of the place
- ✧ Automated control system allowing remote monitoring and control of power package operation modes using wire and wireless communication channels



# SYNCHRONOUS MACHINES EXCITATION SYSTEMS

## GENERAL DATA AND CHARACTERISTICS

### Designation

Digital Excitation Devices “VTC-SD” and “VTC-SG” are used for excitation current control of up to 12,500 kW high voltage Synchronous Motors and up to 60,000 kW Turbo-Generators providing functions of energy saving and synchronous operation stability improvement.

### Advantages

- ✎ Use of high performance state-of-the-art hardware components with temperature extended range
- ✎ Full identity, independence and compatibility of main and back-up controllers
- ✎ Increased viewing intervals to monitor Synchronous Machines / Turbo-Generator and Excitation System parameters. These intervals provide control and registration of electromotive force induced in a rotor during starting and other transient modes
- ✎ Microelectronics high-scale integration, minimum number of electronic components
- ✎ Use of modular thyristors; they are placed on a common plate radiator; such arrangement provides heat efflux beyond a device structure, dust protection and simplifies its maintenance
- ✎ Stable operation of an Excitation Device with Machines / Turbo-Generators of different types and with various loads due to an access to extended settings list
- ✎ Operation adaptation with HV smooth-start systems and partial redundancy of Synchronous Motors and Precision Synchronization Devices
- ✎ Sensor / screen graphic color interface provides convenient configuration of settings control and protection in-situ
- ✎ On-line viewing of oscillograph charts and trends of main parameters
- ✎ Unloading of event logs and oscillograph charts onto USB-flash drive
- ✎ Digital link with upper-level ACS



“VTC” Excitation Devices for Synchronous Machines. “Freecon” “F4” form factor

### Excitation Device Series

#### "VTC-SD-Sch", "VTC-SG-Sch"

For excitation current control of Brush Synchronous Motors and Generators

#### "VTC-SD-B", "VTC-SG-B"

For excitation current control of Brushless Synchronous Motors and Generators

### Main Technical Details Relative to Excitation Devices For Brush Excitation System

Parameter	Value						
Driven / Excited Synchronous Motor (Turbo-Generator) output, kW	200–1,250	1,600–2,000	2,500–4,000	5,000–6,300	8,000–12,500	12,500	60,000 max. (turbo-generator)
Rated rectified voltage, V	48	75	115	150	230	230	300, 345, 460, 600
Rectification circuit	3-phase with zero lead			3-phase, bridge circuit			
Rated rectified current, A	320; 630						630 max.
Current boosting ratio	up to 2.0 I <sub>nom</sub>						
Supply voltage of control and protection circuits, V	~220, =220						
Shell protection rating (as per GOST 14254)	IP 21; IP 54						
Overall dimensions (W × D × H), mm, max.	700 × 800 × 1,800		700 × 800 × 2,200			2 cabinets: 700 × 600 × 2,200 1,000 × 600 × 2,200	
Weight, kg, max.	250		300			550	
Service life, min.	20						

### Main Technical Details Relative to Excitation Device For Brushless Excitation System

Parameter	Value	
Driven / Excited Synchronous Motor (Turbo-Generator) output, kW	200–12,500	60,000 max. (turbo-generator)
Rated exciting current, A	10 max.	50 max.
Current boosting ratio	up to 2.0 I <sub>nom</sub>	
Supply voltage of control and protection circuits, V	~220, =220	
Shell protection rating (as per GOST 14254)	IP 21; IP 54	
Overall dimensions (W × D × H), mm, max.	700 × 600 × 1,800	2 cabinets: 700 × 600 × 2,200 1,000 × 600 × 2,200
Weight, kg, max.	170	450
Service life, min.	20	

# AUTOMATIC CONTROL SYSTEMS (ACS)

## GENERAL DATA

### ACS Special Features

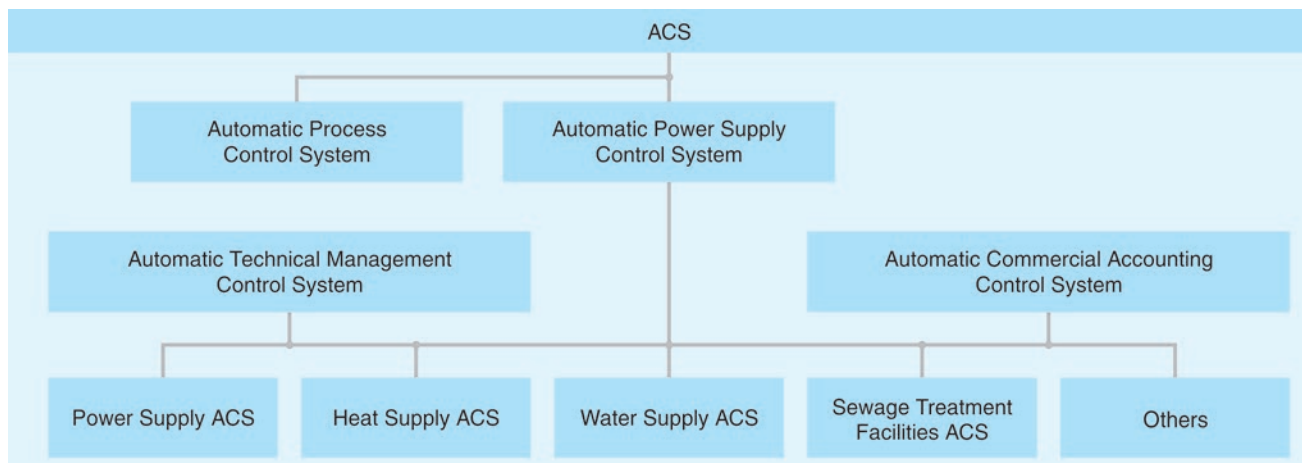
Automatic Control Systems implemented by “NIPOM” OJSC meet all standard requirements raised to today’s control systems. These ACS provide full integration with existing MES and ERP-Systems thanks to standard industrial interfaces and protocols.

Despite rapid emerge of new developments and short life cycle of products manufactured, Automatic Control Systems offered by “NIPOM” OJSC provide long-term protection of Customers’ CAPEX thanks to their flexibility and easy expansion capacity and readiness for upgrading and improvement in future.

Customers’ investments security is the main priority while drawing up plans for modernization, reconstruction and extension of existing and operating Automatic Systems since hardware already available together with software used and knowledge and real-life experience gained by service specialists are very valuable and constitute a substantial stake of the Enterprise’s value. Main concept for modernization is coherent and gradual transition with the Enterprise’ nonstop operation.

“NIPOM” OJSC competence allows to implement solutions focused on various industrial and production sections that meet the Customer’s specific demands.

### ACS Structure



Under severe competition conditions manufacturing companies are forced to reduce working expenses, constantly increase efficiency and improve products quality, cut time required to plan and launch finished products at the market; use processes and technologies based on optimal employment of raw materials and energy resources. ACS is a critical key to solve abovementioned tasks.

Due to timely submission of trustworthy information about processes /equipment and control tools status to operational staff and due to automatic regulation functions, ACS provide:

- ✎ Process safety management
- ✎ Energy saving of products manufactured
- ✎ Reduction of production costs
- ✎ Products quality improvement
- ✎ Increase in the Enterprise’s load
- ✎ Decrease in human factor effect
- ✎ Improvement of control operability and power supply quality
- ✎ Environmental safety

## ENERGY SUPPLY OPERATIONAL DISPATCH MANAGEMENT

### Designation

Power Supply Operational Dispatch Management Systems aim at prevention of untimely response to pre-alarm due to alarm containment time cutting and prompt response to pre-alarms that occur at process facilities with geographically distributed electric installations of various purpose.

Dispatch Management Systems allow to improve efficiency of critical equipment use and reliability of power supply systems operation, enhance service quality and reduce quantity of errors introduced by personnel (who control power supply) due to:

- ✧ Consumers' real-time power supply control
- ✧ Timely provision of personnel with sufficient, trustworthy information about operation modes, transient processes, electrical consumers protection status and electric equipment status as well
- ✧ Provision of personnel with information in order to analyze, optimize, plan equipment operation and its maintenance
- ✧ Timely warning of duty personnel about emergency and pre-emergency situations

### Completeness

Dispatch Management Systems implemented by "NIPOM" OSC comprise the following elements:

- ✧ Hardware and software complex for local electric installation control, for monitoring of electric installations parameters and switching devices status, for protection management; Automatic Transfer System to provide manual control of electric equipment exercised in remote mode from a Facility duty personnel Post
- ✧ Industrial Ethernet Network hardware and software complex with fiber-optic communication channels
- ✧ Hardware and software unit located at a Facility duty personnel Post to provide visualization of dynamic mimics of all electric installations and remote control of their commutation devices switchovers; signaling of deviations, alarm and pre-emergency situations; events logging and archiving
- ✧ GSM-network for automatic transmission of SMS-messages about important abnormal situations via mobile phones

### Advantages

- ✧ Obtaining of all necessary information in one and the same place
- ✧ Remote control
- ✧ Search and troubleshooting time optimization
- ✧ Primary analysis of digital protection response and on-line adjustment of digital protection settings excluding the necessity to patrol a remote Electric Facility
- ✧ Recording of personnel actions
- ✧ Transmission of data into the Enterprise's MES and ERP-Systems, Remote Control Posts and Company's offices
- ✧ User's interface adaptation to the Enterprise's organization; structure for control and visualization



## SYSTEM CONTROL OF ENERGY

Implementation of System control of energy at the Enterprise includes some organizational and technical measures taken in order to reduce energy costs and increase labor productivity. These Systems accomplish tasks to plan and control the key economic parameters-specific power consumption rates per a unit of goods manufactured, optimization of a production cycle, monitoring and control of Energy Supply Systems operation modes.

System control of energy are implemented on the basis of existing accounting and IT systems that provide collection of energy consumption data and preparation of reports relative to all main utilities.

On the basis of data collected energy use studies are conducted in order to assess existing power resources, energy consumption for previous period and as of to date, to estimate energy use potential.

Energy use studies allow to determine energy-intensive facilities and structures together with production capabilities, equipment, systems, processes and staff that substantively contribute to energy consumption. In addition, other factors that strongly influence in total energy input are revealed.

Data collected and its studies provide energy demand models versus goods manufactured lots, seasonality of production, capacity load, energy costs per a unit of goods manufactured.

### Main Phases of Implementation of Energy Management System

1	Energy audit	<ul style="list-style-type: none"> <li>– Definition of sources of inefficient energy costs and unreasonable energy losses</li> <li>– Identification of main energy consumers</li> <li>– Reception of objective data on utilities amount of use</li> <li>– Definition of energy efficiency factors</li> <li>– Determination of energy saving potential and increase in energy effectiveness</li> <li>– Development of standard, general measures to be taken for the purpose of energy-saving and increase in energy effectiveness with cost estimation of these measures</li> </ul>
2	Commercial accounting and technical metering arrangement	<ul style="list-style-type: none"> <li>– Localization of additional utilities accounting devices</li> <li>– Installation of additional utilities accounting devices</li> <li>– Reconstruction (modernization) of existing utilities accounting devices</li> </ul>
3	Automatic collection and monitoring of data on utilities consumed	<ul style="list-style-type: none"> <li>– On-line data submission</li> <li>– Long-term and reliable data storage within several years (3 years or more)</li> </ul>
4	Analysis of utilities consumed, supervision of deviations of actually consumed power from planned figures	<ul style="list-style-type: none"> <li>– Within shops, sections, departments, process units</li> <li>– According to cost structure</li> </ul>
5	Preparation of reports relative to all utilities/energy resources	
6	Energy consumption forecast in compliance with the Output Program	

## Features

- ✓ Reception of data on utilities consumed at process units, departments, sections/areas, shops via links with Process Control Systems (1C Enterprise, SAP, Sytelene, etc.)
- ✓ Calculation of actual specific utilities consumption per a unit of goods manufactured, recording of exceedance of consumption norms and analysis of deviations from targeted values for a definite period (a shift, a day, a month, a year)
- ✓ Supervision and analysis of deviations of actually consumed utilities from planned figures by value
- ✓ Utilities distribution as per cost centers for utilities cost optimization
- ✓ Electric installation management in accordance with Utilities Consumption Program
- ✓ Utilities Consumption forecast for any time periods (future planning)
- ✓ Utilities Consumption analysis as per types of products

## Benefits of Implementation

Implementation of System control of energy has specific findings:

- ✓ Reduction of expenses incurred for utilities procurement
- ✓ Optimization of contracts and tariffs
- ✓ Decrease in utilities consumption per a unit of goods manufactured provide possible the Enterprise's competitive recovery at domestic and foreign markets
- ✓ Company's manageability improvement
- ✓ Production cycle improvement

System control of energy (based on Output Programs and change in utilities tariffs) forecasts energy consumption changes and products costs for 2-3 years ahead.

First results upon implementation of the System have been obtained in 2 months.





## CORE COMPETENCIES

### Licenses, Certificates:

Designing of nuclear stations equipment  
 Manufacturing of nuclear stations equipment  
 Russian Maritime Registry of Shipping  
 Membership in Design and Construction Self-Regulatory Organizations  
 Energy Survey Permit



### EC Declaration of Conformity

#### Certificated of Conformance to Quality Management Systems:

ISO 9001:2008, ISO 9001:2008 "IQNet"  
 ISO 14001:2004, ISO 14001:2004 "IQNet"  
 STO Gazprom 9001-2012



#### Documents Conforming Products Compliance with GOST Requirements And Specific Requirements of Industries Where These Products Are Used:

GOST-R-conformity  
 "Gazprom" OJSC facultative certification system  
 "AK" Transneft" OJSC Register of Specifications and Testing Programs and Procedures  
 Appraisal by Federal Grid Company of the Unified Energy System of Russia and "Rossetti" OJSC



### Social Esteem:

Complete switchgears with composite insulation "Freecon" are winner of All-Russian Contest held under "100 Best Products of Russia" Program in 2014  
 Packaged Switchgears, Direct-Current Systems (DCS), Energy Management Systems, Digital Excitation Devices (VTC) are winners of All-Russian Contest held under "100 Best Products of Russia" Program in 2013

The 3-d place in All-Russian "Production Systems—2013" Rating in "The Best System of Work Site Arrangements 58" nomination

Among 30-tops of "Techuspekh" Rating of Russian hi-tech rapidly developing enterprises in 2012

The 3-d place granted for operating efficiency results obtained among Nizhny Novgorod region enterprises in 2012

The 3-d place in "League of the Best-National Level" Rating in 2012

Winner in "Annual Pilot Project" nomination among companies—"Siemens" partners in 2012

Winner in "Russian Quality" contest in 2011

Winner in "Vigorous Growth" nomination among companies—"Siemens" partners in 2011

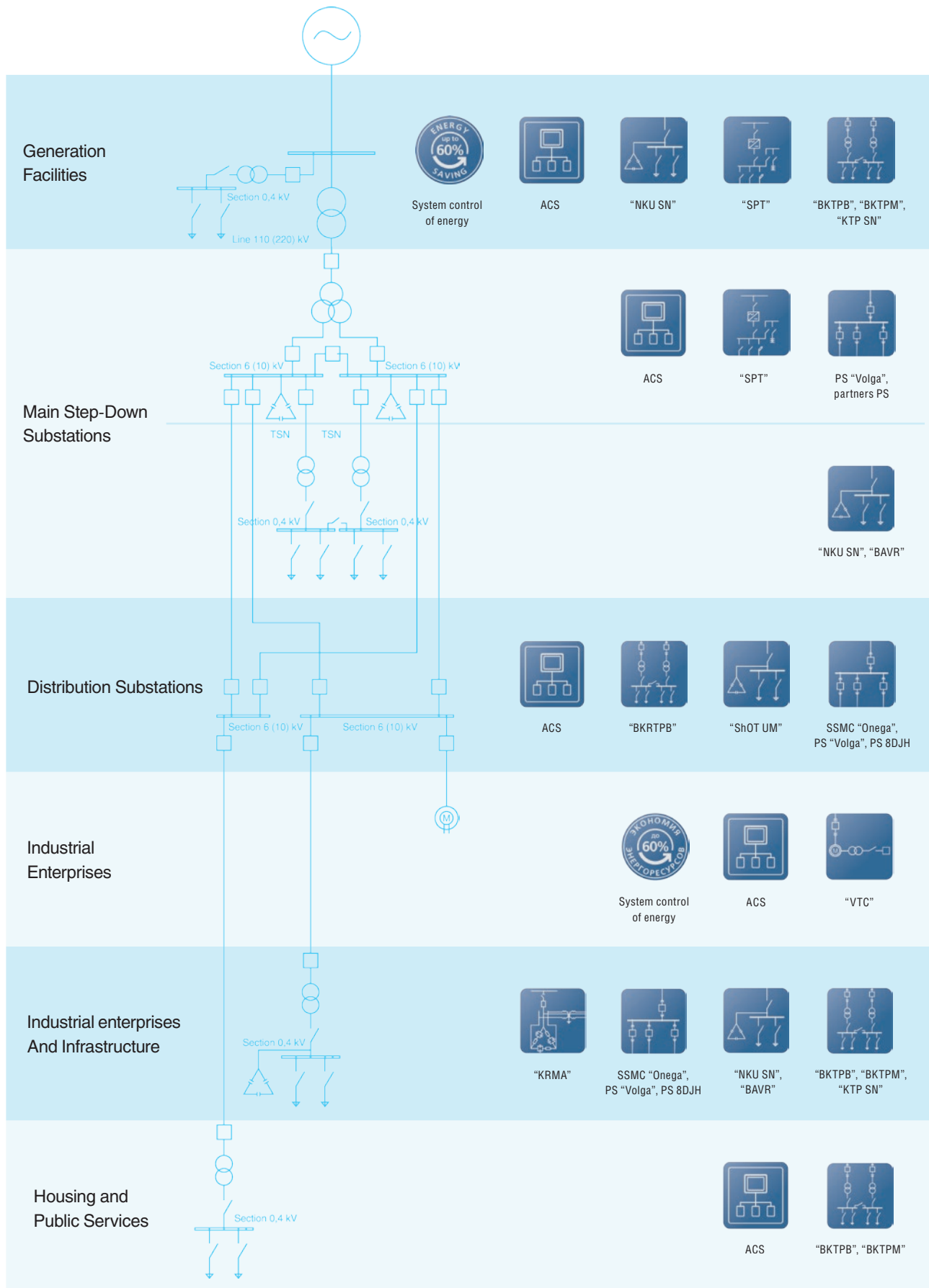
Winner in "Annual Project-2011" nomination among companies—"Siemens" partners in 2011

Winner in All-Russian "The best Russian Enterprises, Dynamics, Efficiency, Responsibility—2010" contest

"Engineering Valor" Mark awarded by Supreme Engineering Council and Russian Engineering Academy in 2010



USE IN ENERGY SUPPLY SYSTEM



# NIPOM<sup>®</sup>

JOINT STOCK COMPANY

Address: Zelyenay St. 10, Dzerzhinsk  
Nizhny Novgorod Reg., Russia, 606007

Tel.: +7 (8313) 243-888  
Mobile: +7 905 010-33-55  
Fax: +7 (8313) 243-871

e-mail: [office@nipom.ru](mailto:office@nipom.ru)  
http: [www.nipom.net](http://www.nipom.net)



Information stated in this booklet contains general descriptions, characteristics that may be changed as the result of products improvement. More detailed data may be obtained from “NIPOM” OJSC specialists as per contact information given below.

QMS complies with ISO 9001:2008, ISO 14001:2004 International Standard and “Gazprom” STO 9001-2012



Certified  
by the Russian Register