PLUTON TURN ON THE FUTURE


# AC AND DC LOW VOLTAGE SWITCHGEARS

## METRO

## ABOUT COMPANY

PrJSC "Pluton" is one of the largest manufacturers of electrotechnical equipment on the territory of Ukraine. The company's products are supplied to many countries around the world. PrJSC "Pluton" holds key position in electrical industry and has been successfully working for over 20 years, realizing the strategy of intensive growth, development and continuous improvement of products quality and services.


The company confirmed compliance of its management principles with quality management system international standard ISO 9001:2008, Environmental Safety ISO 14001:2004, as well as occupational safety and health OHSAS 18001:2007 requirements.

Due to vast experience and modern technologies we make secure, reliable and efficient energy distribution. We are building future, creating products of up- to-date level in compliance with international standards, innovative technologies that ensure safety and comfort of people.

## AC AND DC LOW VOLTAGE SWITCHGEARS

Company "Pluton" offers the best solutions in the field of energy distribution. We have developed switchgear, which provide reliable power supply and trouble-free control.
Low voltage switchgears are designed and produced in accordance with DSTU IEC 60439-1 / EN 60439-1, GOST R 51321.1.

We provide a full range of services starting with recommendations on switchgear components optimum choice and design, and up to installation and commissioning of the supplied equipment on operation site.

We provide the following after switchgear start-up:

- personnel correct and safe operation and maintenance training;
- warranty maintenance;
- post-warranty maintenance;
- spare parts supply;
- repairs.

## APPLICATION AREA

Modern AC switchgears KRU-0.4k, KRU-0.23k and DC switchgears SHPT-220 are provided for metro traction substations and used for reception, distribution of electric power, protection of outgoing lines against overloads and short-circuit currents.
Whereas AC KRU are used for supply of:

- power lighting equipment;
- trains traffic automatic and control equipment (TTAC);
- automatic fare collection system (AFC).

AC switchgears KRU-0.4k and KRU-0.23k are provided for operation in three-phase AC networks with rated voltage 380 V and 220 V, frequency 50 Hz with solid-earthed neutral. DC board SHPT-220 is provided for operation in insulated networks with rated voltage 220 V DC.

# AC AND DC LOW VOLTAGE SWITCHGEARS

## Switchgear key features

- high reliability;
- maintenance convenience;
- reduction of time for maintenance and troubleshooting;
- reduction of fire possibility;
- protection of personnel against electric trauma.

## Environmental Compatibility

Pluton uses materials with minimal impact on environment in its production.

The materials are safe not only during operation, but also at the end of product life.

## Safety

Circuit-breaker controls are located on input and section cabinets front side and protected by transparent door. Controls of outgoing lines distribution cabinets are located behind the door. Conductive parts are located behind protection screens and there is no possibility of operational staff electric shock during routine switchings.


## Main benefits

Switchgears have high reliability level, compact design, easy access to all joint components, simple fixation of protection elements.

Main benefits of switchgears:

- Effective use of available area, high safety and protection level against accidental contacts;
- Increased dynamic stability to short-circuit currents;
- Special busbar assemblies are fixed with holders;
- High static and thermal load capacity due to special bus profile form;
- Large area of copper busbars surface provides good heat sink.


## Serviceability

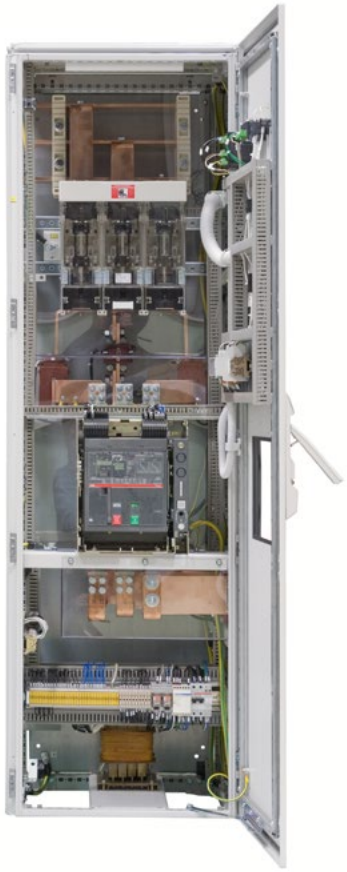
Front panels with color symbolic circuit corresponding to set of switching equipment for each cabinet and visual color LED position indicators (on/off) of switching devices are located on the doors of all switchgears. It allows operational staff to be easily informed about condition of power supply circuits of metro power consumers.

## DESIGN

Switchgear power part is made with application of maintenance-free contact joints technology. Special compensating devices produced in Germany, which fix clamps on contact joints, irrespective of temperature and thermal expansions, are applied. It increases reliability of equipment, fire safety of switchgears and substation as a whole.

Due to modularity of RITTAL structures joining of separate cabinets in switchgear line occurs with high accuracy and required protection level. At the same time there are no skews of metal structures of separate cabinets and whole unit. Due to high accuracy of RITTAL metal structures production there is no mechanical stress on bearing insulation of busbar power circuits. It sufficiently increases operation reliability of equipment. Switchgears protection level is IP 54 acc. to GOST 14254 IEC 60529.

Exclusion of dust ingress into switchgear at IP54 protection level decreases operation costs for maintenance, increases operation reliability, as dust is the reason of overlapping of circuits being charged upon insulation surface. This solution sufficiently reduces fire possibility. Cabinets surface protection is made with triple surface treatment – phosphating, electrophoresis coating and spray textured coloring. It provides switchgear surface resistance to mineral oil, lubricants, machine emulsion, lean acid and alkaline solutions.



## BASIC TECHNICAL SPECIFICATIONS

| Name of parameter | Unit | Value |
|---|---|---|
| Rated voltage of main circuits | V | 127, 133, 220, 380, 400 |
| Rated voltage of auxiliary circuits (if any):<br>- AC<br>- DC | V | <br>110, 127, 220<br>24, 48, 110, 220 |
| Rated frequency | Hz | 50 |
| Rated current of main busbars | A | 250, 400, 630, 1000, 1600, 2000, 2500, 3150 |
| Rated conventional short circuit current of main circuits | kA | 50,0 |
| Dynamic stability of main busbars | kA | 50 |
| Overall dimensions<br>- Width<br>- Height<br>- Depth | mm | <br>600, 800, 1000, 1200<br>2000<br>600, 800 |
| Protection level acc. to GOST 14254, IEC 60529 | - | IP 54 |
| Current range of applied circuit-breakers | A | 0.5 - 4000 |
| Current range of applied disconnectors | A | 100 - 4000 |
| Availability of insulation control devices | - | yes/no |
| Availability of circuit-breakers electric drives | - | yes/no |
| Type of circuit-breakers | - | withdrawable, plug-in, fixed |
| Type of disconnectors | - | cutting, rotating |
| Operation conditions:<br>- Height above sea level<br>- Operation temperatures range<br>- Upper value of relative humidity at 25 °C<br>- Environment | <br>m<br>°C<br>%<br>- | <br>1000<br>+1 ... +40<br>80<br>Explosion-proof, not containing chemical active gas and vapor in concentration that destroy insulation. |

## MAIN COMPONENTS

### Circuit-breakers

Schneider Electric, ABB or similar circuit-breakers are installed in distribution systems as power electric equipment. Switchgears with circuit breakers of other manufacturers are also available.

Moulded case circuit-breakers are highly resistant to shock and vibrations, provide electromagnetic compatibility and can be applied in tropical climate.

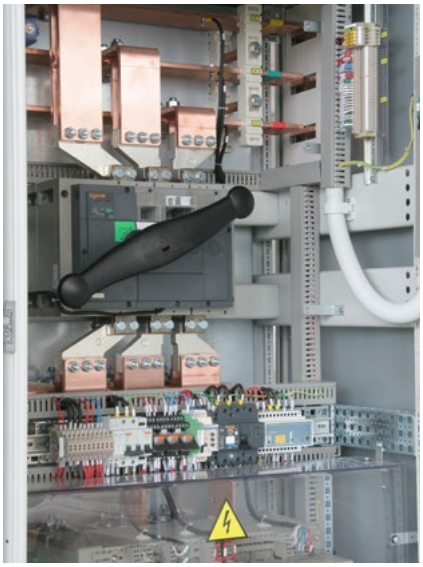
Main features:

- Double insulation – full division of power and auxiliary circuits.
- Selectivity – allows to select only fault area, providing maximum uninterrupted operation.
- Circuit-breaker operation does not depend on pressure and closing speed.
- Access to arc chutes, moving and fixed contacts is provided by simple removal of circuit-breaker cover. It quickens maintenance and increases safety.
- Increased insulated clearances provide leakage current absence and dielectric stability even under overvoltage.

Circuit-breakers can be equipped with electric drives allowing remote control function.

### Disconnectors

Schneider Electric, ABB, OEZ or similar disconnectors are applied for routine maintenance on groups of circuit-breakers in line automation cabinets, in input and sectioning cabinets.



The applied disconnectors have high reliability and control convenience.

### Control system

Cabinets are equipped with microprocessor industrial controller produced by "Bernecker & Rainer". It controls interlockings, controls circuit breakers drives, communicates with higher-level control systems.

Insulation control in switchgears is provided by insulation control devices produced by Bender GmbH and Socomec or similar companies. Insulation resistance value is indicated by LED light on the front panel of device and by indicator, and upon insulation decrease below set limits hardwires in external signaling circuit close. Devices have exit to RS-485 network allowing to transmit insulation resistance values, warning and emergency signals to dispatcher.

Bender GmbH equipment, provided for operation in DC insulated circuits, is applied for insulation control in SHPT-220. Measured insulation resistance is constantly displayed on LCD display. Two separately adjustable alarm relays, being a part of equipment, allow to differentiate "Warning" and "Emergency" signals and send them via hardwire in external signaling circuits. Settings range of channels response is from 1 to 200 kOhm.

Measuring and control of electric parameters in KRU-0.4k, KRU-0.23k is provided by digital multimeters of Lovato Electric S.P.A., SOCOMEC production. Measured values are displayed by means of digital LED indicators on devices front panel.

# IMPLEMENTED PROJECTS

## Metro

**Almaty Metro**
(Republic of Kazakhstan)
Supply of 21 AC switchgear 380/220 V set and 10 DC board 220 V sets

**Baku Metro**
(Republic of Azerbaijan)
Supply of 19 AC switchgear 380/220 V sets and 8 DC board 220 V sets

**Kiev Metro**
(Ukraine)
Supply of 11 AC switchgear 380/220 V sets and 5 DC board 220 V sets

**Kharkov Metro**
(Ukraine)
Supply of 4 AC switchgear 380/220 V sets and 2 DC board 220 V sets

**Yekaterinburg Metro**
(Russian Federation)
Supply of 4 AC switchgear 380/220 V sets and 2 DC board 230 V sets

**Moscow Metro**
(Russian Federation)
Supply of 4 AC switchgear 380/220 V sets and 1 DC board 220 V sets

**Kazan Metro**
(Russian Federation)
Supply of AC switchgear 380/220 V sets

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