



AUXILIARIES. CABLES PROTECTION

■ CITY ELECTRIC TRANSPORT ■

ABOUT COMPANY

PLUTON is one of the largest manufacturers of electrotechnical equipment on the territory of Europe. The company's products are supplied to many countries around the world. PLUTON holds key position in electrical industry and has been successfully working for over 30 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 9001:2015, Environmental Safety ISO 14001:2015, as well as occupational safety and health ISO 45001:2018 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.



I. AUXILIARIES EQUIPMENT

Auxiliaries cabinets for public electric transport traction substations have the following characteristics:

- reliability,
- high level of personnel protection against possible electric trauma during routine maintenance;
- minimum time consumption for maintenance and faults elimination in case of their arising, etc.

Auxiliaries set includes:

1. Auxiliaries cabinet ShSN.
2. Input unit IU.
3. Control current cabinet ShOT1M.



Set of auxiliaries cabinets links up ideally with other equipment that Pluton Company supplies for public electric transport traction substations in the part of design, link-up with traction substation automated control system (TS ACS), etc.

Auxiliaries equipment is designed and produced in accordance with DSTU IEC 60439-1, GOST R 51321.1, EN 60439-1.

I. I. AUXILIARIES CABINET



Auxiliaries cabinet ShSN is provided for public electric transport (tram, trolleybus) traction substations auxiliaries circuits power supply.

ShSN is a one-side maintenance cabinet providing IP54 protection level according to GOST 14254, IEC 529, EN 60 529.

Owing to original design and rational use of inner space, new auxiliaries cabinet replaced three cabinets SHSN-1M, SHSN-2M, SHSN-3M of previous generation, operated until now at the majority of traction substations.

Controls are divided into two groups:

- 1st group – controls that are most often used in routine switching are located on the cabinet door;
- 2nd group – controls that are less often used in routine switching are located inside the cabinet on two rotating frames.

Relay and contactor equipment as well as protection and automatics equipment is installed on mounting panel located behind rotating frames.

Simplicity, high production and equipment adjustment technology, as well as good reparability are provided owing to such a design solution.

ShSN Technical Parameters

Name of Parameter	Unit	Value
Rated voltage of inputs, 50 Hz	V	220 (380)
Rated voltage of auxiliaries AC	V	24, 36, 220, 380
DC		24, 220
Rated current	A	100
Number of inputs	-	3
Automatic transfer	-	yes
Input units resistance to short-circuit currents	kA	25 (16)
Maintenance	-	one-side
Protection level	-	IP 54
Overall dimensions (WxHxD)	mm	1200x2000x500
Weight, maximum	kg	290

Auxiliaries cabinet can be connected to three inputs: two high-voltage inputs from auxiliaries transformers and one city input 0.4 kV with automatic transfer in case of supply loss in any input.

Accounting of active power consumed for substation heating is done with modern digital four-zone meters.

Relay-commuting units of world-leading manufacturers, such as Schneider Electric, ABB or similar are used in our equipment.

I. 2. INPUT UNIT

Input unit (IU) is provided for input of auxiliaries power supply circuits of public electric transport traction substations and a substation auxiliaries active energy accounting.

IU is assembled in one-side maintenance metal cabinet providing IP54 protection level in accordance with GOST 14254, IEC 529, EN 60 529.

IU is equipped with modern four-zone energy-accounting meters.



IU Technical Parameters

Name of Parameter	Unit	Value
Rated voltage of inputs, 50 Hz	V	220 (380)
Rated current	A	100
Number of inputs (maximum)	-	3
Input units resistance to short-circuit currents	kA	25 (16)
Maintenance	-	one-side
Protection level	-	IP 54
Overall dimensions (WxHxD)	mm	800x2000x 500
Weight, maximum	kg	170

Consumed energy counters can be as with transformer activation and direct-flow.

Upon transformer activation of meters, current transformers are placed in separate section inside IU for sealing.

Protection and automatics equipment is installed on the mounting panel.

I. 3. CONTROL CURRENT CABINET

Operating current cabinet (ShOT1M) is meant for DC power supply of traction substation consumers and serves as uninterrupted power source for traction substation equipment control circuits, and also protection circuits.

ShOT1M is a one-side maintenance cabinet providing IP54 protection level according to GOST 14254, IEC 529, EN 60 529.

ShOT1M is based on high-frequency voltage converter according to PUSH-PULL circuit.



ShOTIM Technical Parameters

Name of Parameter	Unit	Value
Rated voltage of inputs, 50 Hz	V	230, 380
Rated rectified voltage at output (DC	V	220
Accuracy of output voltage maintaining	%	±1
Output current	A	до 25
Accumulator batteries capacity	A/h	12 -40
Charger	-	fixed
Maintenance	-	one-side
Protection level	-	IP 23
Overall dimensions (WxHxD)	mm	800x2000x500
Weight, maximum	kg	305

2. CABLES PROTECTION

2.1. CABLES COMBINED PROTECTION CABINET

Modern cables combined protection cabinet (ShKZ) is provided for diagnosis and protection of public electric transport traction substation DC cables with application of pilot wires (or cable armor and screen).

Cables combined protection cabinet is designed and produced in accordance with DSTU IEC 60439-1, GOST R 51321.1, EN 60439-1.

Cables combined protection cabinet (ShKZ) is designed as one-side maintenance cabinet providing

IP54 protection level in accordance with GOST 14254, IEC 529, EN 60 529.

Controls and visualization units are located inside the cabinet on rotating frame, other components of the circuit are arranged on mounting panel behind the rotating frame.

Mechanical and electrical interlocks, power cables pilot cores disconnectors are provided to increase safety level during routine maintenance in ShKZ.

ShOT1M is based on high-frequency voltage converter according to PUSH-PULL circuit.

Charging-rectifying unit is based on double conversion with DC link: rectification of AC voltage, conversion of DC voltage.

ShOT1M control system is a microprocessor one with visualization panel on LCD graphic display.

The cabinet includes modern, maintenance-free acid storage batteries with operation life minimum 15 years, protection units, automatics.



Cables combined protection cabinet (ShKZ) controls cables and interlocks condition in accordance with following parameters:

- insulation degradation between pilot and main wires;
- cable failure;
- cable pilot and main wire core-to-core fault;
- cable pilot wire fault on cable shield;
- DC poles insulation condition control;
- potential cables protection in the system with earthed negative pole.

ShOTIM Technical Parameters

Name of Parameter	Unit	Value
Rated voltage of controlled DC power network	V	600, 750
Rated voltage of power supply (50 Hz)	V	220
Rated voltage of automatics circuits	V	24, 220
Number of diagnosable cables	-	10 (5+5)
Maintenance	-	one-side
Protection level	-	IP54
Overall dimensions (WxHxD)	mm	600x2000x500
Weight, maximum	kg	180

IMPLEMENTED PROJECTS



Vinnitsia Tram (Ukraine)

Supply of 1 set of auxiliaries equipment as a part of modular substation

Kiev City Electric Transport (Ukraine)

Supply of 53 pcs. of auxiliaries equipment (ShSN, IU, ShOT)

Odessa City Electric Transport (Ukraine)

Supply of 3 pcs. of auxiliaries equipment (ShSN, IU, ShOT)

Republic of Belarus City Electric Transport

Supply of 16 pcs. of auxiliaries equipment (ShSN, IU, ShOT) and 3 cables protection cabinets

Kerch City Electric Transport (Autonomous Republic of Crimea)

Supply of 6 pcs. of auxiliaries equipment (ShSN, IU, ShOT) and 1 cables protection cabinet

Crimean Trolleybus

(Autonomous Republic of Crimea)
Supply of 14 pcs. of auxiliaries equipment (ShSN, IU, ShOT)

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