



## TRACTION SUBSTATIONS

■ CITY ELECTRIC TRANSPORT ■  
RAILWAYS ■ METRO

## 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 25 years, realizing the strategy of intensive growth, development and continuous improvement of products quality and services.

PLUTON is a modern, dynamically growing company whose main activity is development, production, "turn-key" supply, including installation, commissioning and start-up of low-maintenance DC traction substations for metro, city passenger electric transport and railways.

Due to vast experience and modern technologies we make secure, reliable and efficient energy distribution.

Company actively operates at the market of energy-saving technologies producing AC and DC electric drive systems for voltage up to 600 V and 6000 V.

One of the key activities is development and supply of automatic process control systems, SCADA systems.

Over the past years we have successfully expanded the range of products and geography of our supplies. PLUTON produces more than 70 different types of equipment which correspond modern international requirements and standards, and this is confirmed by testing and certification in the international test center IPH Institut (Germany).

High-level engineering provides a team of highly qualified engineers, who make up the brain power that creates our equipment.

Our main goal is to remain being the leader in production of high-quality equipment, and what helps us is the basic principles of the Company, which we follow and implement in reality: high quality of products, social responsibility, occupational and environmental safety of the company's activities. 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.

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.

Internal inspection of electric equipment quality performed in all production stages allows to provide guaranteed quality of produced goods.

We always aspire to be at the peak of the latest achievements of science and technology in the field of transport, electric drive, automatic control systems, and we apply latest achievements for constant updating of our products.

Over the many years period of successful work we have shown our leadership and professionalism. Currently PLUTON represents technological progress, reliability, quality and international cooperation.

Metros and railways, enterprises of city electric transport, industrial plants and companies of Ukraine, Russian Federation, Belarus, Kazakhstan, Uzbekistan, Baltic countries, Azerbaijan, Germany, Canada, Sweden and other countries of the world are among our customers.

Our partners are the largest companies: ABB, Schneider Electric, Secheron, General Electric, Elpro, Transresch Antriebssysteme, Vacon, Driescher, B&R, etc.

## TURN-KEY TRACTION SUBSTATIONS



PLUTON offers complete solutions for metro, city electric transport and railway traction substations. Main idea of equipment supply concept is **turn-key** supply of traction substation equipment package starting with design and finishing with the facility commissioning.

Turnkey project includes:

- design,
- production and supply of traction substation equipment,
- assembling, installation supervision,
- pre-commissioning,
- integrated tests,
- commissioning,
- personnel training,
- warranty support during warranty period, as well as post-warranty maintenance.

We have many years of experience in development and production of equipment based on the latest achievements of world technologies in the field of electric equipment construction, automation, modern technologies of data transfer.

Decisive role in effective implementation of turnkey objective belongs to advanced schematic, technologic, design solutions of equipment and automation systems construction.

PLUTON manufactures electric equipment in accordance with all requirements and conditions of the Customer, and accepts complete responsibility for failure-free operation of equipment during warranty and post-warranty period, trouble-free startup of equipment.

We are sure that our innovations in the field of power supply will promote increase of power supply reliability upon general decrease of capital costs for construction, as well as operational costs for consumed electric power and equipment maintenance. Here with we accept complete responsibility for the positive and effective result.









**Distinct advantages of PLUTON equipment for traction substations:**

- high degree of reliability and safety;
- technical solutions aimed at advanced world level in order to satisfy consumers modern requirements;
- all equipment for traction substations is a unified automated system requiring minimum attention of maintenance staff, without periodic maintenance and repair;
- complete automation of traction substation control, equipment condition monitoring, self-diagnosis of equipment;
- small overall dimensions, weight and materials consumption of equipment;
- 100% quality control;
- conformity of equipment to international standards.

**Equipment reliability and safety factors:**

- application of equipment components produced by world-leading manufacturers;
- application of components with high switching capacity, dynamic stability to short-circuit currents, sufficient mechanical durability;
- high protection level preventing ingress of dust into equipment, as a result – increase of reliability and fire safety;
- interlocks and protection necessary to guarantee high level of safety and reliability for equipment and for maintenance staff;
- monitoring of traction substation equipment condition with equipment self-diagnosis function.

## EQUIPMENT FOR TRACTION SUBSTATIONS

	 <p>Traction network monitoring and protection system SMTN-3</p>		
<p><b>Medium voltage switchgear</b> (air insulation, SF6 insulation)</p>	<p><b>DC Switchgear</b></p>	<p><b>Rectifiers, inverters with traction transformers</b></p>	<p><b>Modular traction substations</b></p>
<p>Rated voltage 7.2 ... 40.5 kV Rated current – up to 2500 A</p>	<p>Rated voltage 600 ... 3300 V DC Rated current – up to 6000 A</p>	<p>Rectifiers: Rated voltage 600 ... 3300 V DC, Rated current – up to 6000 A Dry rectifier transformers, capacity 630 ... 12 500 kVA</p>	<p>One-, two- and three-unit modular traction substations for city electric transport</p>
			
<p><b>Switchgear up to 1000 V, Auxiliaries and uninterruptible power supply equipment</b></p>	<p><b>SCADA equipment and software</b></p>	<p><b>Metro and Light rail transport overhead line power supply equipment</b></p>	<p><b>Equipment of various application</b></p>
<p>Power transformers, Low voltage switchgear, Power factor compensating units, Uninterruptible power supply units, DC and AC Switchboards, Accumulator batteries, Charging units, etc.</p>	<p>Three-level structure 1) equipment control level 2) substation control level 3) power operator level</p>	<p>Disconnecter Switchgear, Cable connection cabinets, Third rail power supply cabinets, Contactors, grounding switches, etc.</p>	<p>Filter units, Smoothing reactors, Cables combined protection cabinets, Stray currents monitoring units, Substations microclimate control systems, Burglar and fire signaling equipment, Automatic systems for commercial metering of power consumption, etc.</p>

## TRACTION SUBSTATIONS AUTOMATION AND SCADA



One of the key factors for successful implementation of our equipment for traction substations supply concept is **complete automation and control** of traction substations, diagnosis, analysis, monitoring and protection of substation equipment and overhead line. Company PLUTON offers the best integrated SCADA solutions for traction substations.

### Key features of SCADA system equipment, implemented by PLUTON:

- distributed control system (DCS), building-block concept;
- easy maintenance and operation;
- reliable components with a high protection level;
- reliable switching equipment;
- uninterruptible power supply;
- application of ring topology for organization of local computer network for all the substation equipment and backup communication link with upper level system;

- PLC and software compliance with international standards (IEC 61131-2, IEC 61131-3);
- application of industrial equipment from the best world manufacturers;
- modern SCADA system;
- first line professional support during operation.

SCADA system offered by PLUTON has **three-level structure**.

Traction substation equipment (switchgear, rectifiers, auxiliary equipment, etc.) is controlled at **the first level**. The first level of control is implemented on the basis of modern industrial controllers built into the equipment. Controllers monitor and control equipment, as well as perform protection functions.

**The second level** provides complete substation control, and includes redundant controller. This controller is communicatively coupled to a controller installed in the substation

equipment and to substation parameters measurement systems.

Substation control level allows to control substation main circuit current mode and state from operating staff workstation, to control switching devices in normal and emergency modes, to log alarm messages, to keep events records, to display traction substation equipment, as well as hardware and software operation current state on the monitor mimics, etc.

**The third level** of control combines dispersed traction substations into a single system, which provides remote control and monitoring using software and hardware of power operator point. Modern backup servers are applied for collecting and processing of data from substation controllers. Power operators workstations, as well as video wall displaying the state of all substations electrical equipment is provided for substations operational control.

### Basic technical characteristics of SCADA system:

- response time on object status change – up to 2-5 sec;
- system response on command and receipt of its fulfillment confirmation - up to 3 sec;
- mean time to failure for commands conditioning and data gaining functions – 50 thous. hours;
- operation mode – 7/24.

Baku Metro is one of the sites where PLUTON has implemented complete SCADA complex. The project provides control of 30 metro traction substations. Implementation of SCADA complex allowed to improve reliability and efficiency of metro power supply system control, to provide high system fault tolerance and backup of critical components, to decrease service charges on SCADA system and to optimize the number of operational and maintenance personnel.

# MAIN IMPLEMENTED PROJECTS



## Metro

### Republic of Kazakhstan Almaty Metro

Supply of 7 combined traction step-down and 4 step-down substations, tunnels and depot overhead line equipment ("turn-key" projects).

### Republic of Azerbaijan Baku Metro

Supply of 3 combined traction step-down substations, 2 traction and 7 step-down substations, supply tunnels and depot overhead line equipment ("turn-key" projects);

Modernization of SCADA system on 27 substations. Implementation of Power operator center.

### Republic of Belarus Minsk Metro

Supply of 16 traction "turn-key" substations, tunnels and depot overhead line equipment.

### Ukraine Kyiv Metro

Supply of 11 traction "turn-key" substations, tunnels overhead line equipment.

### Kharkiv Metro

Supply of 4 traction "turn-key" substations, tunnels overhead line equipment.

### Republic of Uzbekistan Tashkent Metro

Supply of 18 rectifiers and 1 traction "turn-key" substation.



### Republic of Tatarstan, Russian Federation Kazan Metro

Supply of power transformers and low voltage switchgear for traction substation.

### Russian Federation Yekaterinburg Metro

Supply of 2 traction "turn-key" substations, tunnels overhead line equipment;

### Moscow Metro

Supply of rectifiers, low voltage switchgear for traction substations, tunnels overhead line equipment;

### Nizhny Novgorod Metro

"Turn-key" supply of traction substation;

### St. Petersburg Metro

Supply of rectifiers for traction substations and overhead line equipment.

### Republic of Korea Busan City Metro

Supply of DC switchgear for traction substation.



### Republic of Korea DAWONSYS Company

Supply of equipment for Dawonsys Company own requirements.

### Romania

**Bucharest Metro**  
Implementation of project on outdated rectifier replacement for a new one for traction substation.

### Republic of Turkey Izmir Metro

Supply of equipment for Halkapinar Depo substation.

## City electric transport

### Sweden

Supply of equipment for 8 traction substations in Stockholm.

### Republic of Poland

Supply of traction "turn-key" substation for Lodz city electric transport.

### Romania

"Turn-key" supply of two-unit modular traction substation for Oradea city electric transport.



### Republic of Latvia

Supply of rectifiers for traction substations of Riga city electric transport.

### Republic of Belarus

Supply of equipment for traction substations of Minsk, Grodno, Gomel, Brest, Vitebsk, Mogilev, Bobruisk city electric transport.

### Autonomous Republic of Crimea

Modernization of 7 traction substations for Crimean Trolleybus;

Supply 2 "turn-key" traction substations for Kerch city electric transport.

### Ukraine

Supply of equipment for 31 traction substations of Kyiv city electric transport and 2 Odesa city electric transport traction substations;

Supply of equipment for 7 traction substations of Kryvyi Rih fast tram;

"Turn-key" supply of two-unit modular traction substation for Vinnytsia Tram;



Reconstruction of 1 traction substation for Vinnitsia city electric transport;

Modernization of Control Center and 19 Traction Substations for Power Supply of Lviv City Electric Transport Network ("turn-key" project);

"Turn-key" supply of three-unit modular traction substation for Lviv city electric transport;

"Turn-key" supply of three-unit modular traction substation for Kramatorsk city electric transport.

### Russian Federation

Supply of equipment for traction substations of Moscow, St. Petersburg, Rybinsk, Volgograd, Ufa, Khimki, Tomsk, Lipetsk city electric transport;

Supply of rectifiers and low voltage equipment for traction substations of Moscow monorail transport system, supply of overhead line equipment;

Supply of three-unit modular traction substation for Naberezhnye Chelny City Electric Transport ("turn-key" project).

### Republic of Moldova

Modernization of 4 traction substations for Beltsy city electric transport power supply network.

### Republic of Tajikistan

"Turn-key" modernization of 3 trolleybus substations and supply of equipment for 6 traction substations of Dushanbe city electric transport.

## Railways

### Russian Federation

**Magnitogorsk Iron and Steel Works**  
Supply and commissioning of 1.65 kV DC industrial railway 6 traction substations.

### Orenburg Minerals (Yasniy)

Supply and commissioning of rectifiers for modernization of 1.65 kV DC industrial railway traction substations.

### Georgia

#### Georgian Railway

Supply of PSK-3.3k-3.0k sectioning point.

### Ukraine

#### Ukrainian Railways

Supply of rectifiers and switchgear 3.3 kV for 6 substations of main railway line.

### Southern Mining Company

Supply of equipment, installation supervision and adjustment for reconstruction of 1.65 kV DC departmental railway traction substation.

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