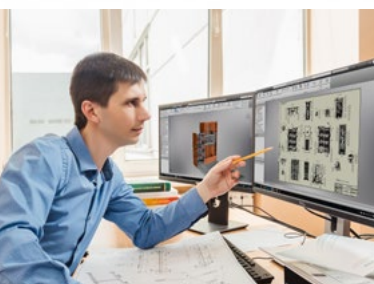




## TRACTION SUBSTATIONS

■ CITY ELECTRIC TRANSPORT ■  
RAILWAYS ■ METRO

## ABOUT COMPANY



PLUTON is the modern innovative manufacturer of electrotechnical equipment produced for needs of city electric transport, metro and railways. PLUTON holds key positions in electrical industry and has been successfully working over 30 years, implementing the strategy of intensive growth, development and continuous improvement of products and services quality.

More than 70 different types of PLUTON equipment are supplied to various countries of the world and successfully applied in the field of transport, power industry and production sector. PLUTON Group has representative offices in 7 countries of the world and continues to develop dynamically and extend its global presence.

The Company's main activity includes development, manufacturing and "turn-key" supply of low-maintenance DC traction substations.

The 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.

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 Customers.



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. PLUTON equipment meets modern international requirements and standards, and this is confirmed by testing and certification in the international test center IPH Institut (Germany).

We always follow global trends in the market, analyse and take Consumers requirements in the field of transport, electric drive, automatic control systems into account, and apply the latest achievements for constant improvement of our products.

A great team of highly qualified engineers and experts provide a high-level engineering, and make up the brain power that creates our equipment.

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

Metros and railways, enterprises of city electric transport, industrial plants and companies of Ukraine, Sweden, Romania, Republic of Poland, Republic of Turkey, Republic of Kazakhstan, Republic of Uzbekistan, Republic of Estonia, Republic of Azerbaijan, Republic of Korea and other countries of the world are among our Customers.

Our partners are the largest companies: ABB, Schneider Electric, Sécheron, General Electric, ELPRO, transresch Antriebssysteme, Vacon, DRIESCHER, B&R, etc.

## “TURN-KEY” TRACTION SUBSTATIONS



PLUTON offers integrated “turn-key” solutions for metro, city electric transport and railway traction substations – from design to commissioning.

“Turn-key” 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 “turn-key” objective belongs to advanced schematic, technological, 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. Herewith, 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



## Medium voltage switchgear (air insulation, SF6 insulation)

- / Rated voltage 7.2 ... 40.5 kV
- / Rated current – up to 2500 A



## DC Switchgear

- / Rated voltage 600 ... 3300 V DC
- / Rated current – up to 6000 A



## Switchgear up to 1000 V, Auxiliaries and uninterruptible power supply equipment

- Power transformers,
- Low voltage switchgear,
- Power factor compensating units,
- Uninterruptible power supply units,
- DC and AC Switchboards,
- Accumulator batteries, charging units, etc.



## Metro and Light rail transport overhead line power supply equipment

- Disconnecter Switchgear,
- Cable connection cabinets,
- Third rail power supply cabinets,
- Contactors, grounding switches, etc.



IEC 61850  
IEC 61131



### Rectifiers, inverters with traction transformers

Rectifiers:  
Rated voltage 600 ... 3300 V DC  
Rated current – up to 8000 A  
Dry rectifier transformers,  
capacity 630 ... 12 500 kVA



### Power systems protection

SOTA® monitoring and protection system  
Cable control system  
Current relay series CR-100



### SCADA equipment and software

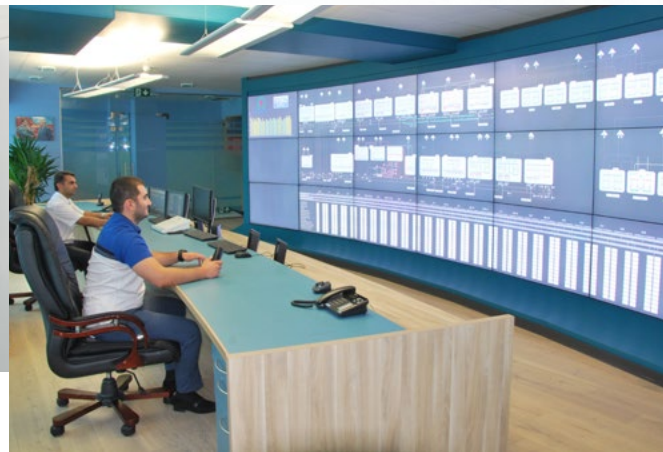
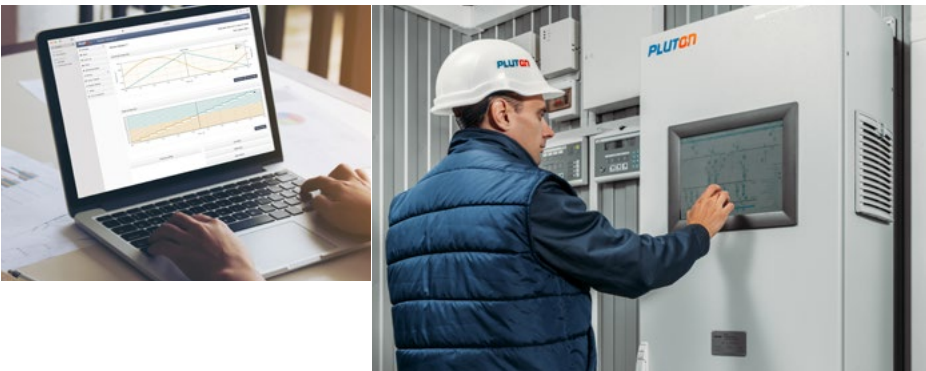
Three-level structure  
1) equipment control level  
2) substation control level  
3) power operator level



### Equipment of various application

Filter units,  
Smoothing reactors,  
Cables combined protection cabinets,  
Stray currents monitoring units,  
Substations microclimate control systems,  
Burglar and fire signalling equipment,  
Automatic systems for commercial metering of  
power consumption, etc.

## 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. 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;

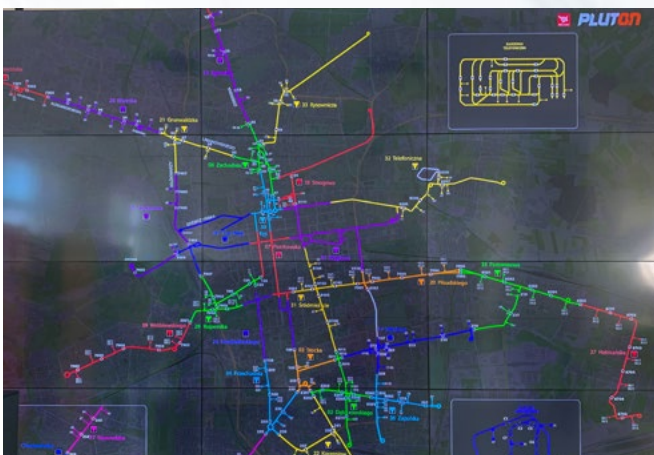
- PLC and software compliance with international standards (IEC 61131-2, IEC 61131-3);
- application of industrial equipment from the best world manufacturers;
- modern SCADA system;
- first line professional support during operation.

SCADA system offered by PLUTON has a **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 a 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 controlling 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 the power operator point. Modern backup servers are applied for collecting and processing of data from substation controllers. Power operators workstations, as well as a 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 s;
- system response on command and receipt of its fulfilment confirmation - up to 3 s;
- expected time to failure for commands conditioning and data gaining functions – 50 thousand hours;
- operation mode – 24/7.

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 improving 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	13 "turn-key" substations, equipment for tunnels and depot contact network
Republic of Azerbaijan	Baku Metro	12 "turn-key" substations, equipment for tunnels and depot contact network; modernization of telecontrol system for 27 substations; development of Operations Control Center;
Ukraine	Kyiv Metro	11 "turn-key" substations, equipment for tunnels contact network; technical modernization of 12 combined traction step-down substations
	Kharkiv Metro	4 "turn-key" substations, equipment for tunnels contact network
Republic of Uzbekistan	Tashkent Metro	18 rectifiers and 1 "turn-key" substation
Republic of Korea	Busan Metro	DC switchgears for traction substation
	Dawonsys Company	equipment for Dawonsys Company own requirements
Republic of Turkey	Izmir Metro	equipment for Halkapınar Depo substation
Romania	Bucharest metro	replacement of outdated rectifier for a new one for Piata Unirii 1 traction substation
Sweden	Stockholm	equipment for 5 traction substations

## CITY ELECTRIC TRANSPORT

Sweden	Stockholm	equipment for 10 traction substations
Republic of Poland	Lodz	1 traction “turn-key” substation; modernization of automated dispatching control system of Power distribution center and connection of 30 tram substations
	Zgierz	two-unit modular traction “turn-key” substation
Romania	Oradea	two-unit modular traction “turn-key” substation
Republic of Latvia	Riga	rectifiers for traction substations
Ukraine	Kyiv	equipment for 31 traction substations; 2 two-unit modular traction “turn-key” substation
	Odesa	equipment for 2 traction substations
	Lviv	modernization of control center and 19 traction substations; supply of three-unit modular traction “turn-key” substation
	Vinnytsia	two-unit modular traction “turn-key” substation, reconstruction of 1 traction substation
	Kramatorsk	three-unit modular traction “turn-key” substation
	Dnipro	equipment for 4 traction substations
	Mykolaiv	two-unit modular traction “turn-key” substation
	Kremenchuk	modernization of traction substation
AR of Crimea	Kryvyi Rih	equipment for 7 traction substations
	Simferopol	modernization of 7 traction substations
Republic of Tajikistan	Kerch	2 traction “turn-key” substations
	Dushanbe	modernization of 3 trolleybus “turn-key” substations, equipment for 6 traction substations
Republic of Moldova	Beltsy	modernization of 4 traction substations

## RAILWAYS

Ukraine	Ukrainian Railways (Ukrzaliznytsia)	rectifiers and DC switchgears 3.3 kV for 6 substations, sectioning points 3.3 kV
	Southern Mining Company (Kryvyi Rih), departmental railway	equipment for 1.65 kV DC traction substation
	Kryukovsky Railway Car Building Works (Kremenchuk)	equipment package for special traction substation of testing area
Georgia	Georgian railway	sectioning point 3.3 kV
Republic of Poland	Polish Railway	rectifier set at Warsaw-Prague traction substation
Republic of Estonia	Estonian Railways	DC switchgear for Raasiku traction substation

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