

Velikiye Luki | Moscow

CJSC Plant of Electrotechnical Equipment | CJSC ZETO

Outdoor Switchgears ORU 110kV



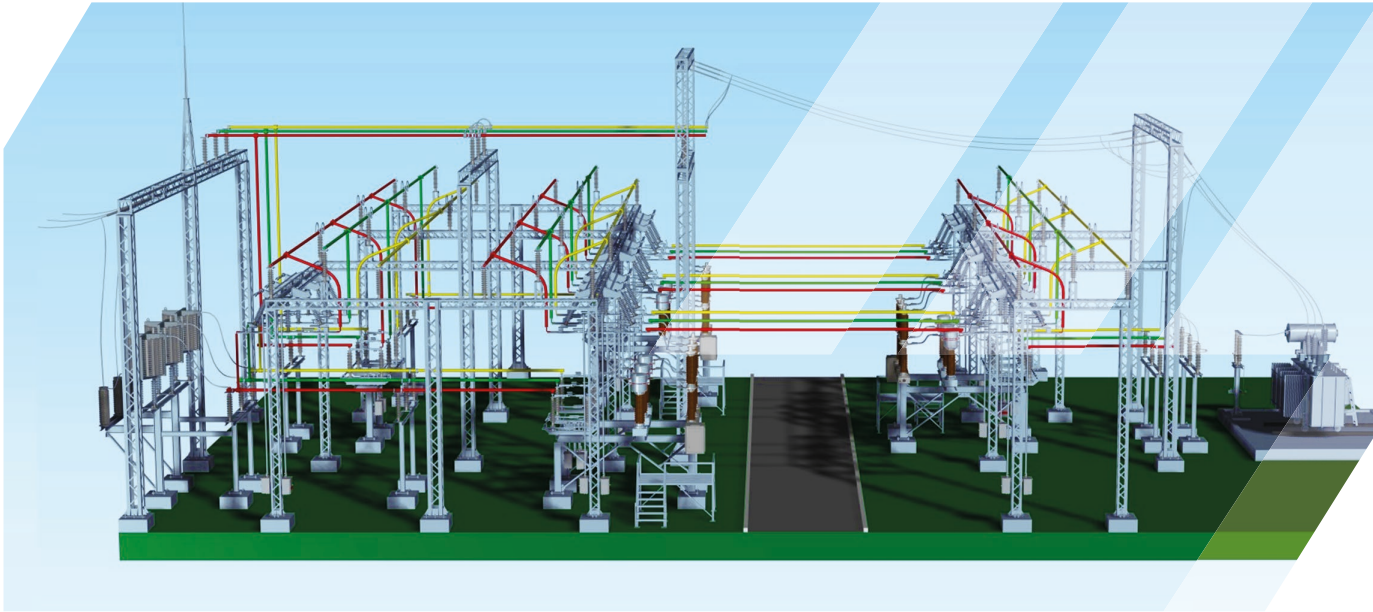
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New Layout Solutions for ORU-110 schematic diagram



A compact module (KM) for 110kV switchgears is one of modern solutions to implement the requirements of packaged product deliveries for turnkey construction of electricity generation facilities, both at new construction and upgrading of substations. The compact modules are sets of fully-assembled, prefabricated functional units for implementing all the required substation types as well as shorten the design time and minimize the time for construction, mounting and operation of power facilities. Updating and construction of stations and substations almost in all market segments are based on principles of a comprehensive approach – from design to commissioning. Sets of fully-assembled, prefabricated functional units are used.

At this stage, CJSC ZETO offers its innovative solutions in the high-voltage product market, particularly, packaged deliveries marked as the following:

- KM-ORU (KM-OPY) – a compact module for ORU-110 (outdoor switchgear).
- KMB-ORU (KMБ-OPY) – a unit-type compact module for ORU-110 (outdoor switchgear).
- KM-ZRU (KM-3PY) – a compact module for ZRU-110 (indoor switchgear).

Advantages

The packaged deliveries ensure the advantages as follows:

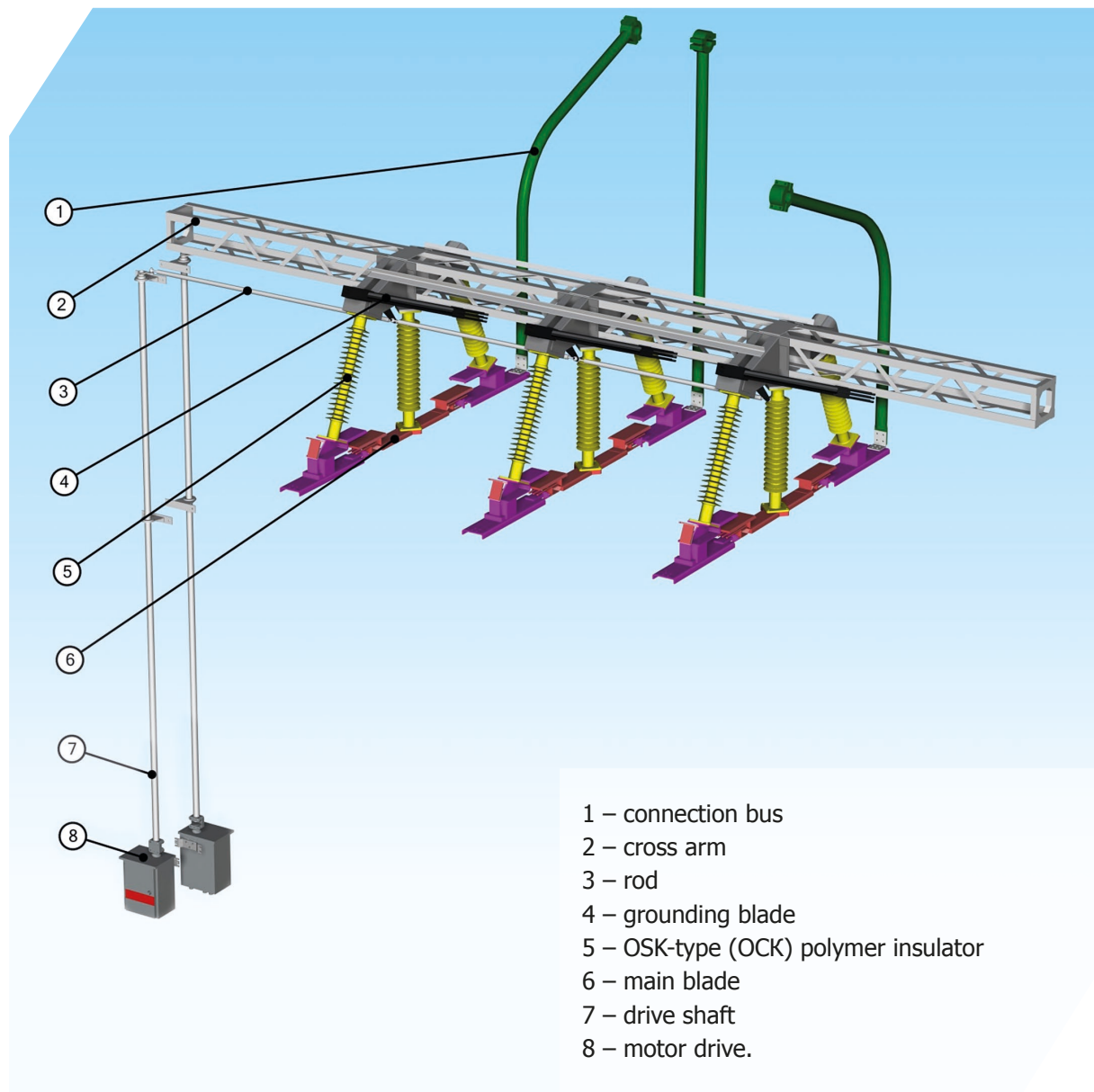
- Using the components from a single manufacturer, except the foundation.
- The reduced area of a switchgear cell – up to 45%.
- The decreased quantity of foundation piers.
- Less time consumed on erection works.
- No welding operations during erection.
- Possible installation both on cast foundation piers and on sleepers.
- Using the accessory equipment by any manufacturer.
- Possible implementation of various circuit designs for combinations of units and steel structures.
- Using the standard units and steel structures reduces time spent on designing.

The compact modules allow the high-voltage side of a 110kV substation of any configuration to be made both based on standard and customized schemes and are intended to receive and distribute three-phase 50Hz AC power of a rated voltage 110kV.

Compact module KM-ORU features a maintenance-free overhead disconnector RGNPSh (РГНПШ) with two current-carrying circuit interruptions and using contact groups of RG-series (РГ) disconnectors. This engineering solution made abandoning a draw-out element on a circuit breaker possible, as in foreign counterparts, which increased significantly the module's functional reliability in severe Russian conditions; this solution also enabled scheduled and repair tasks on a circuit breaker and current transformers to be carried out without bus system suppression, in full compliance with electrical safety requirements.



Overhead Disconnector RGNPSh-110 (РГНПШ-110)



Intended use

The disconnectors are intended for closing/opening of dead sections of live electric circuits as well as grounding of opened sections using earthing switch.

Operating conditions

The disconnector can be used under the following conditions:

- Outdoors at an ambient temperature of -60°C to $+40^{\circ}\text{C}$.
- Ice crust thickness at ice-covered ground no more than 20mm.

- Installation altitude 1000m above sea level.
- Seismic resistance 9 on the MSK-64 scale.

Symbolic designations

RGNPSh.(X1X2) – 110 / 2000 - 50 UKhL1 (PP-110) [РГНПШ.(Х1Х2) – 110 / 2000 - 50 УХЛ1 (ПП-110)]

R (P) – disconnecter

G (Г) – horizontal rotary type

N (H) – normal insulation level under GOST 1516.3-96

P (П) – polymer-insulated

Sh (Ш) – bus-type

X1 – quantity of earthing switches per pole; the index is missed for a design with no ground wires

X2 – location of earthing switches relative to the cross arm. The index is used for PP-110 (a – on the incoming line side, b – on the transformer side)

110 – rated voltage, kV

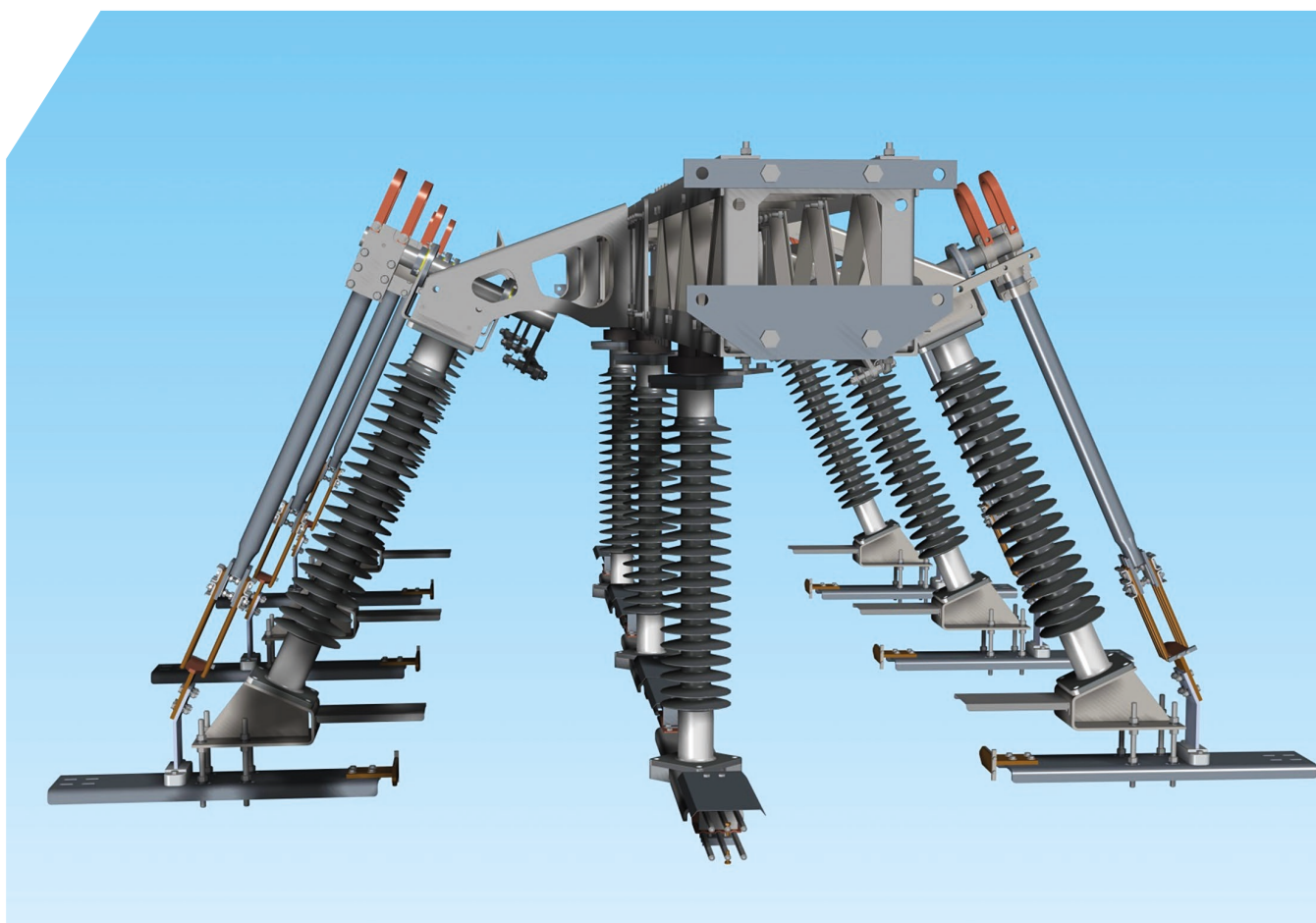
2000 – rated current, A

50 – rated short-time withstand current, kA

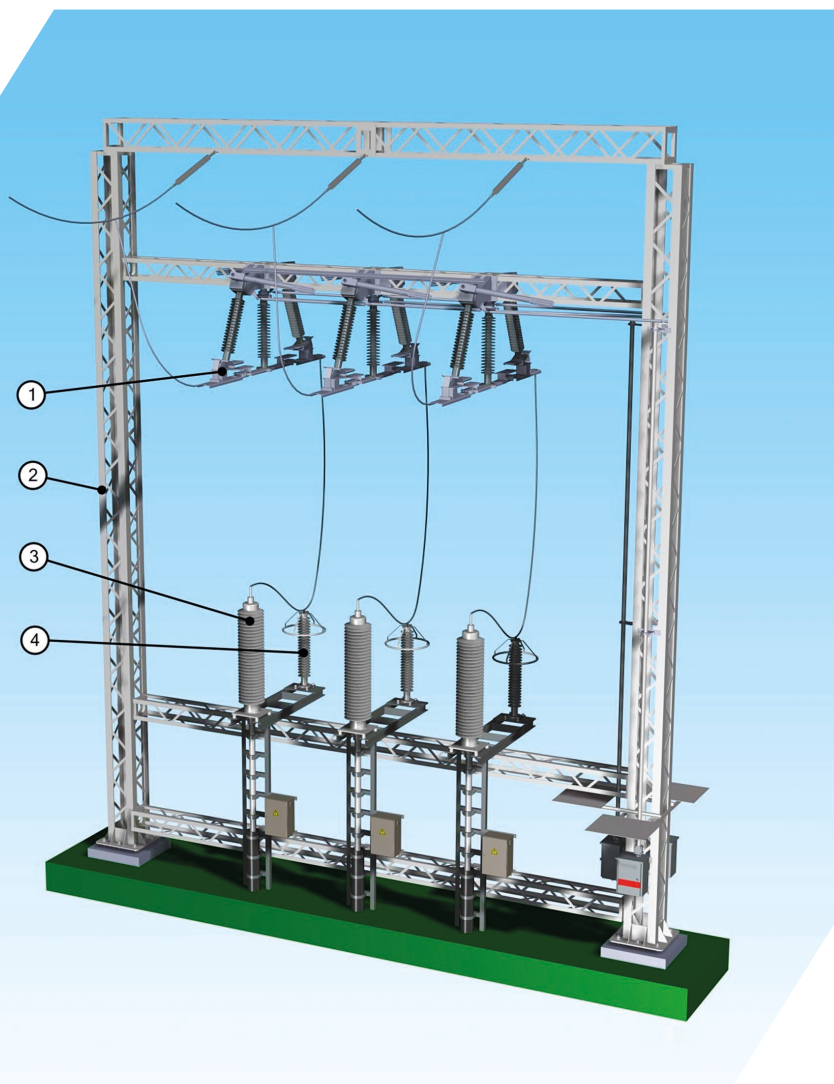
UKhL (УХЛ) – climatic design under GOST 15150-69

1 – placement category under GOST 15150-69

PP-110 (ПП-110) – a modification to be used at a crossing point; the designation is missed in other designs



Outdoor Crossing Point OPP-110 (ОПП-110)



Basic components:

- 1 – bus disconnector (RGNPSH)
- 2 – steel structure
- 3 – cable sleeve
- 4 – surge protection device (SPD).

Intended use

Crossing points OPP-110 are designed to connect overhead and cable transmission lines or to go to a lower line level.

Symbolic designations

OPP-110/2000-50 UKhL1 [ОПП-110/2000-50 УХЛ1]

O – outdoor

PP (ПП) – crossing point

110 – rated voltage, kV

2000 – rated current, A

50 – rated short-time withstand current, kA
UKhL (УХЛ) – climatic design under GOST 15150-69

1 – placement category under GOST 15150-69

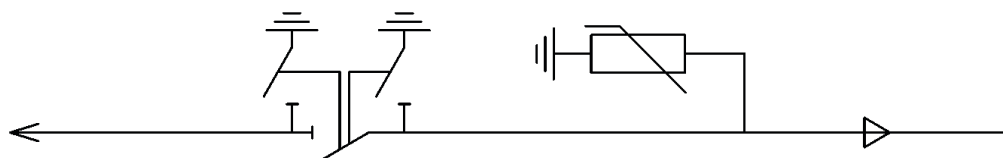
Operating conditions

The outdoor crossing point can be used under the following conditions:

- Outdoors at an ambient temperature of -60°C to $+40^{\circ}\text{C}$.
- Ice crust thickness at ice-covered ground no more than 20mm.
- Installation altitude 1000m above sea level.
- Seismic resistance 9 on the MSK-64 scale.

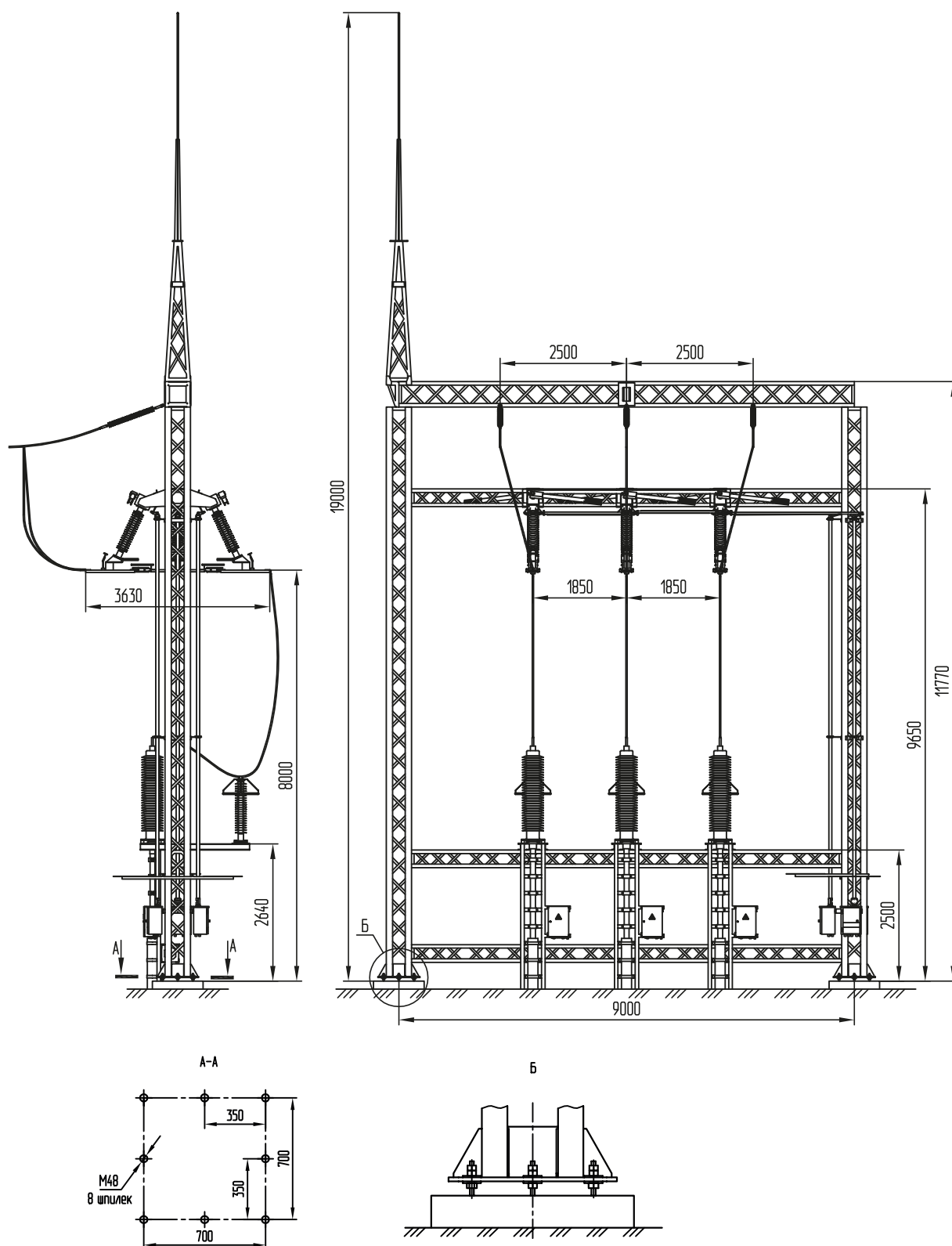
Advantages

The OPP-110 allows you to save arrangement and foundation areas.



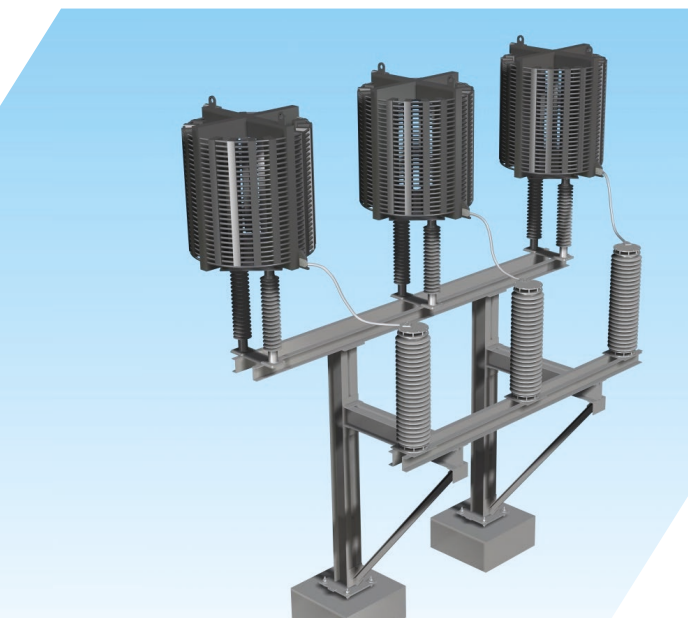
Wiring schematic diagram of the crossing point's main current-carrying circuit

OPP-110 Overall, Installation and Coupling Dimensions



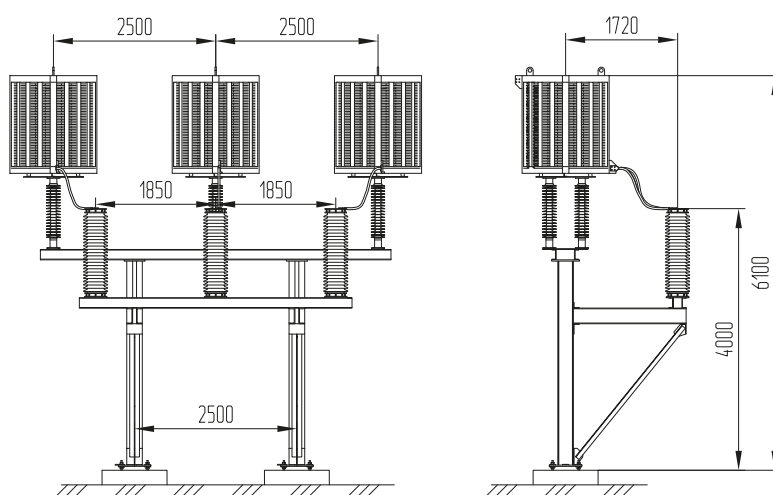
Examples of 100kV Unit Configurations

HF line trap and coupling capacitor unit (VChKs (ВЧКс))

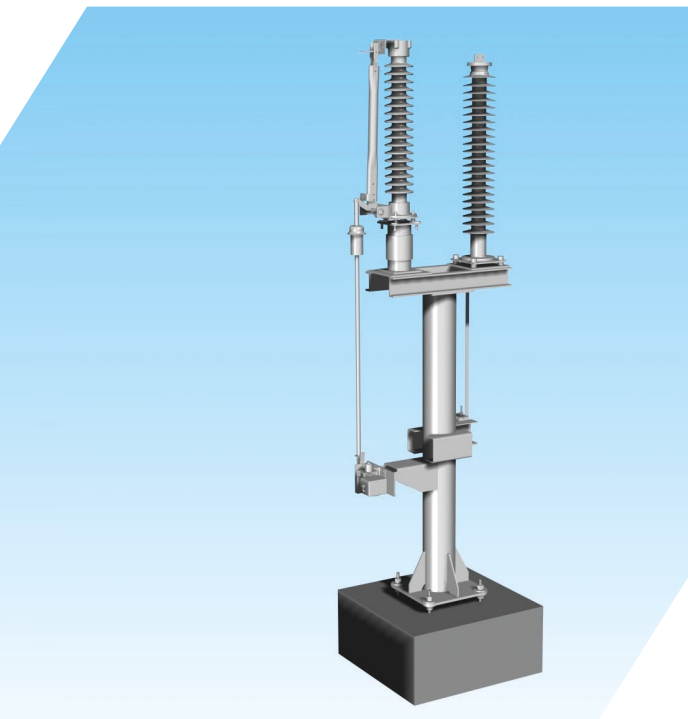


Intended use

A receive unit VL-2 (ВЛ-2) is intended to connect the VL-110kV both as a gantry type and a no-gantry variant.

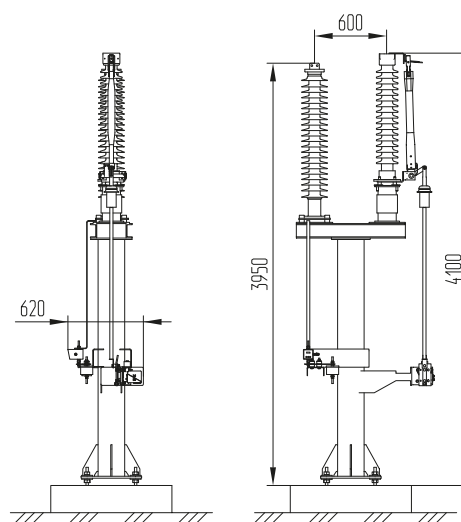


Neutral earthing switch and surge arrester unit (ZON & OPNN (ЗОН-ОПНН))

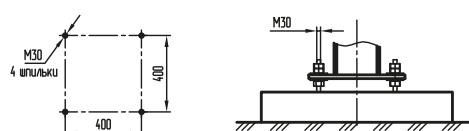


Intended use

A neutral earthing switch and surge arrester unit is designed to protect the ungrounded transformer neutral against any lightning and switching overvoltages.



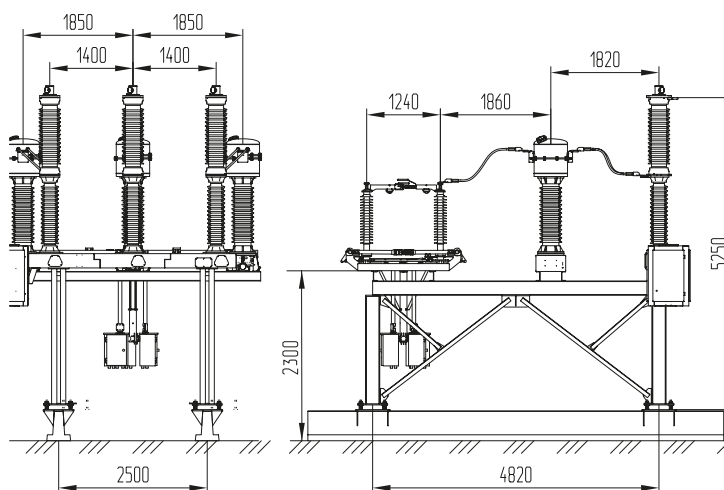
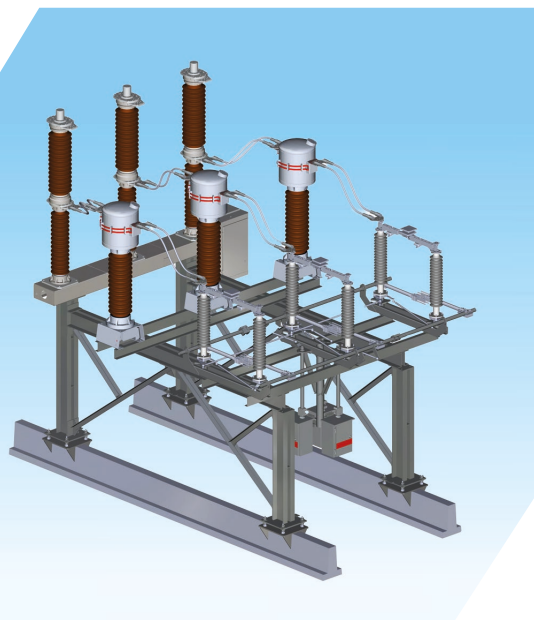
A method of the unit's fastening to the foundation



Disconnecter/current transformer/circuit breaker unit (RTV (PTB))

Intended use

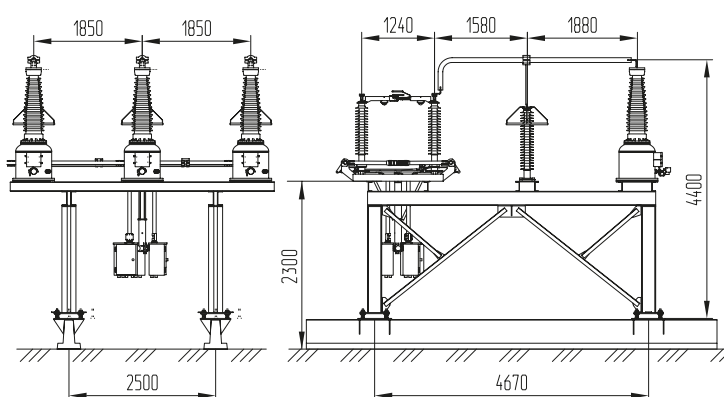
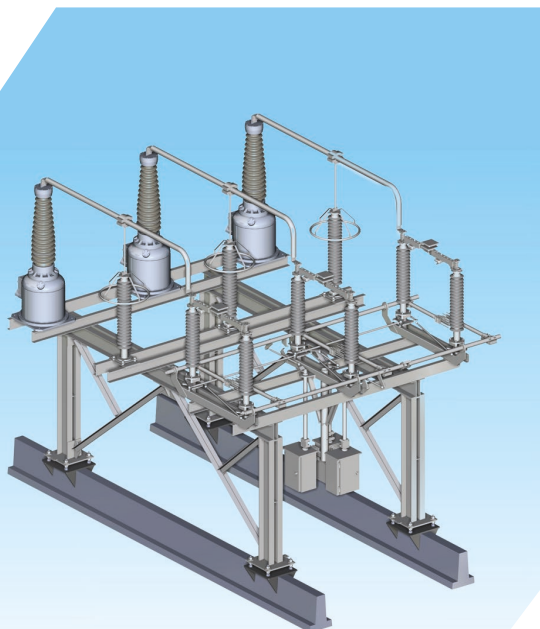
The disconnector/current transformer/circuit breaker unit is used both as a part of other units and independently as a part of KM-ORU-110.



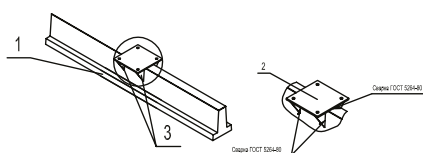
Disconnecter/surge arrester/voltage transformer unit (ROTn (POTH))

Intended use

The disconnector/surge arrester/voltage transformer unit is used as a part of KM-ORU as a measuring cell.

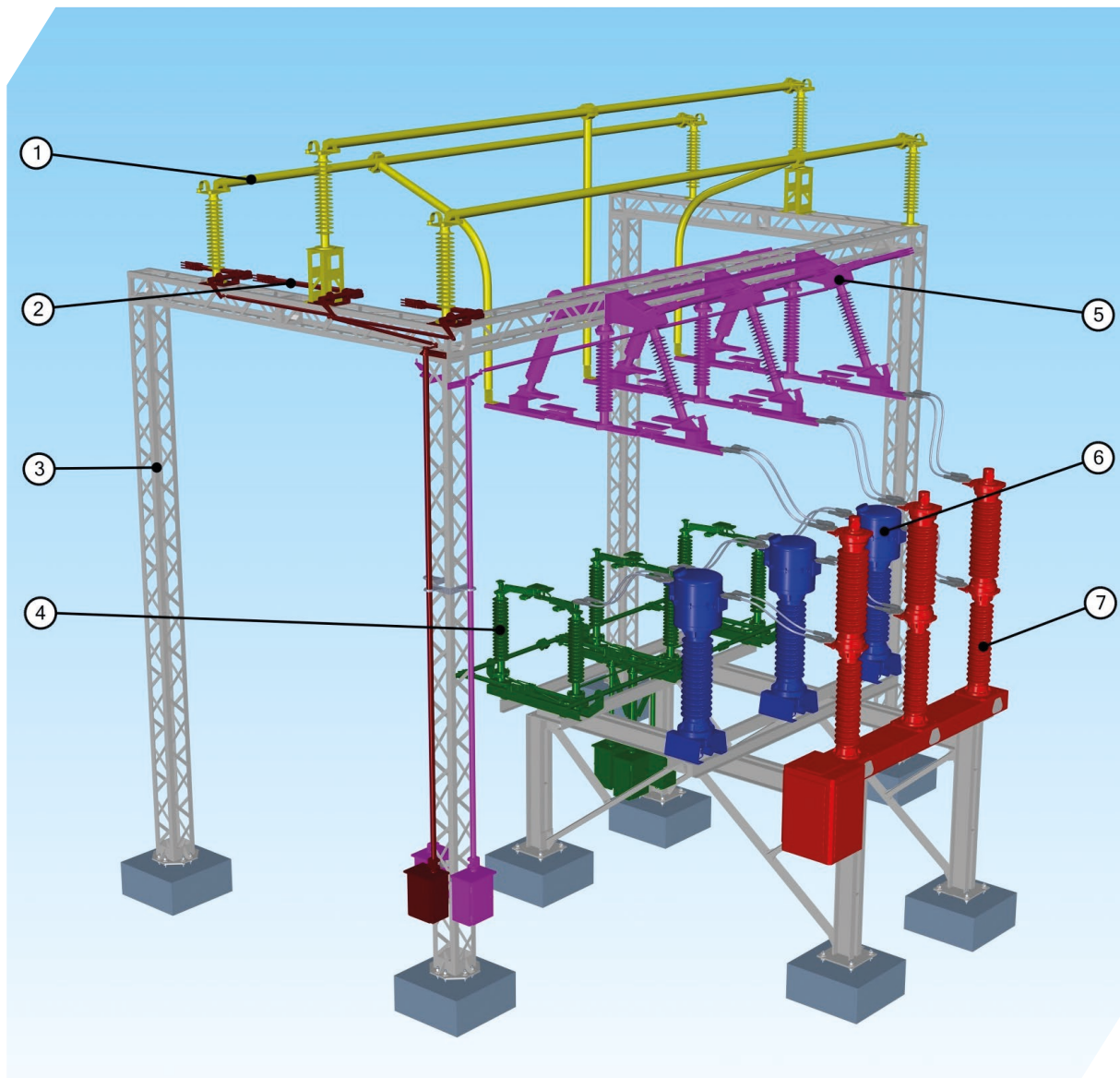


A method of the unit's fastening to sleepers



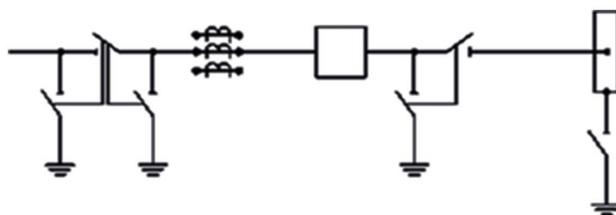
1 - лежень; 2 - пластина; 3 - раскос

Basic Components of the KM-ORU-110



- 1 – rigid busbars
- 2 – busbar earthing switch
- 3 – steel structure
- 4 – line disconnector
- 5 – bus disconnector
- 6 – current transformer
- 7 – circuit breaker

Wiring schematic diagram of the compact module's main current-carrying circuit



Technical Parameters of the KM-ORU-110

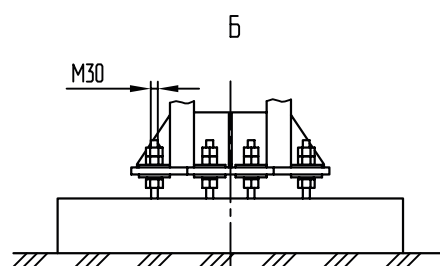
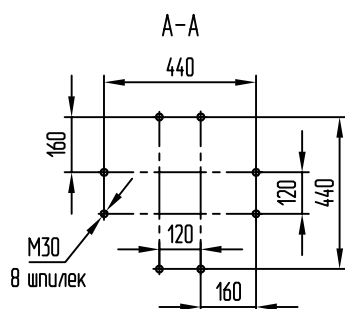
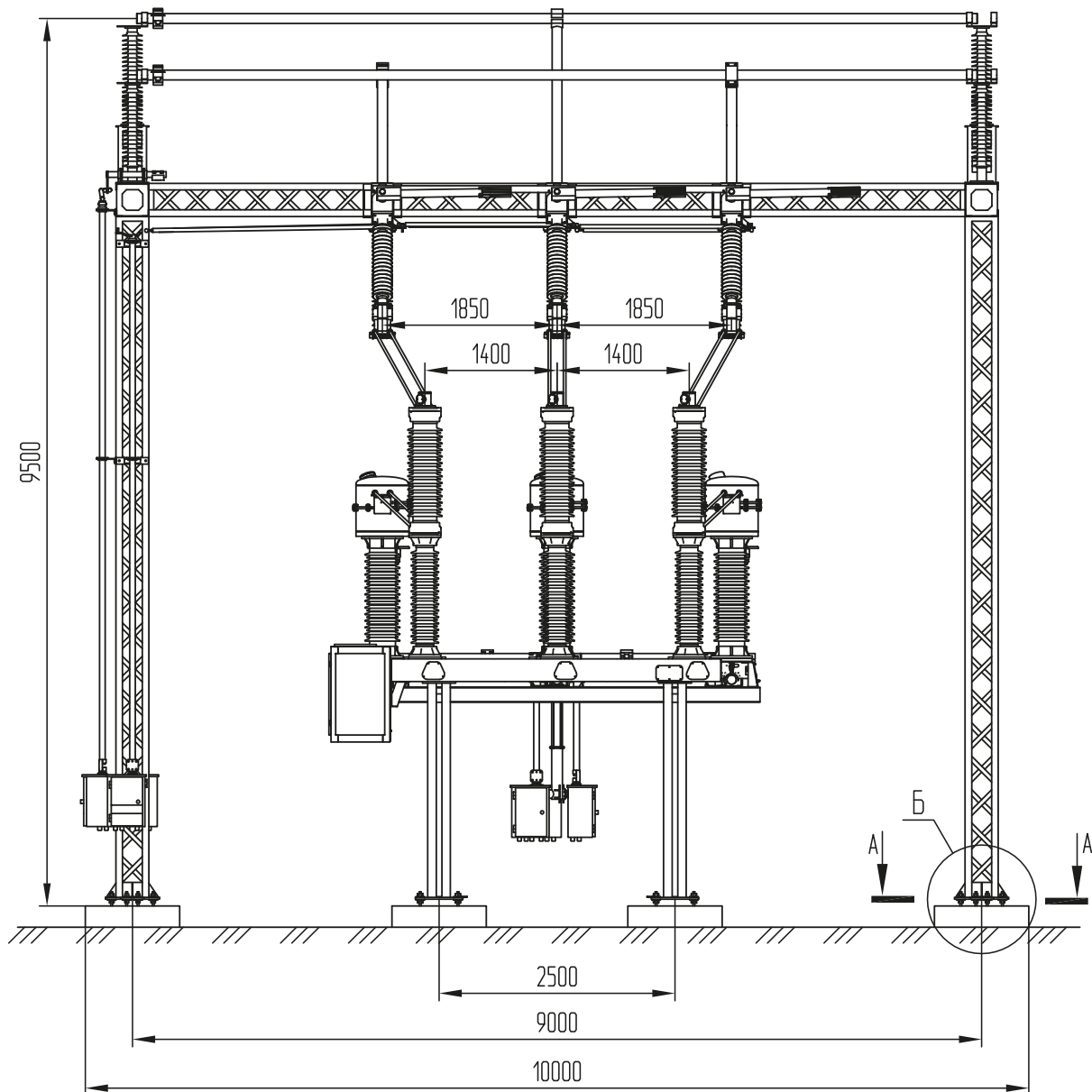
Technical characteristics	Norm
Rated voltage, kV	110
Maximum operating voltage, kV	126
Rated current, A	2000
Rated frequency, Hz	50
Short-time withstand current, kA	40
Duration of short-time withstand current, s: - for main blades - for earthing switches	3 1
Lightning impulse test voltage 1,2/50 μ s, kV: - relative to ground - between open contacts	450 570
Test one-minute power frequency voltage, kV: - relative to ground - between open contacts	230 230
Seismic stability, as per MSK-64 scale, points	9
Ice thickness, mm	20
Wind speed at maximum ice thickness, m/s	15
Wind speed without icing, m/s	40
Degree of insulation pollution as per GOST 9920	II*
Climatic version as per GOST 15150	UKHL1

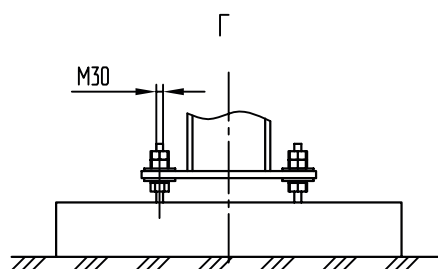
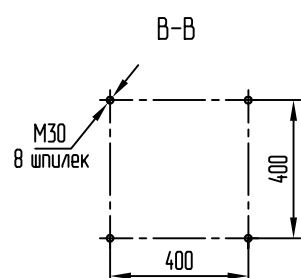
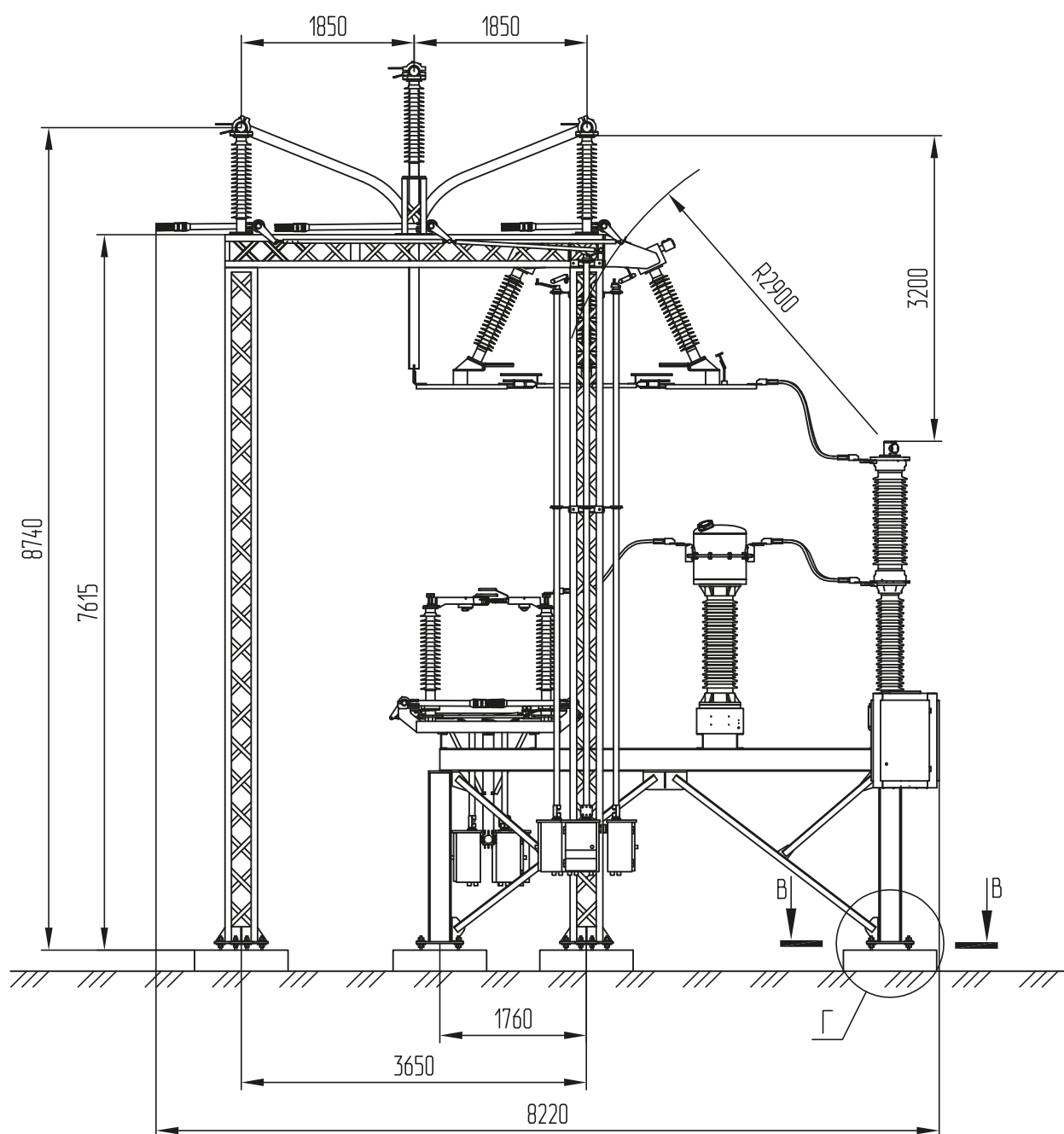
Design features

- A basic module can be complemented with grounding, measuring, surge arrester, and HF signal processing units, etc., depending on the diagram to be implemented.
- Upon a customer's request, the module can be complemented with a cellular gantry, a line gantry, cable structure within a cell, accessorized line insulation, intermediate connection cabinets, and remote control units.
- Bearing steel structures can be installed on cast, pile or sleeper foundations.
- A steel structure shall be assembled on-site with bolting.
- Structure of supporting poles makes it possible to extend the pre-assembled units on site with no reworking.



Overall, Installation and Coupling Dimensions of the KM-ORU-110



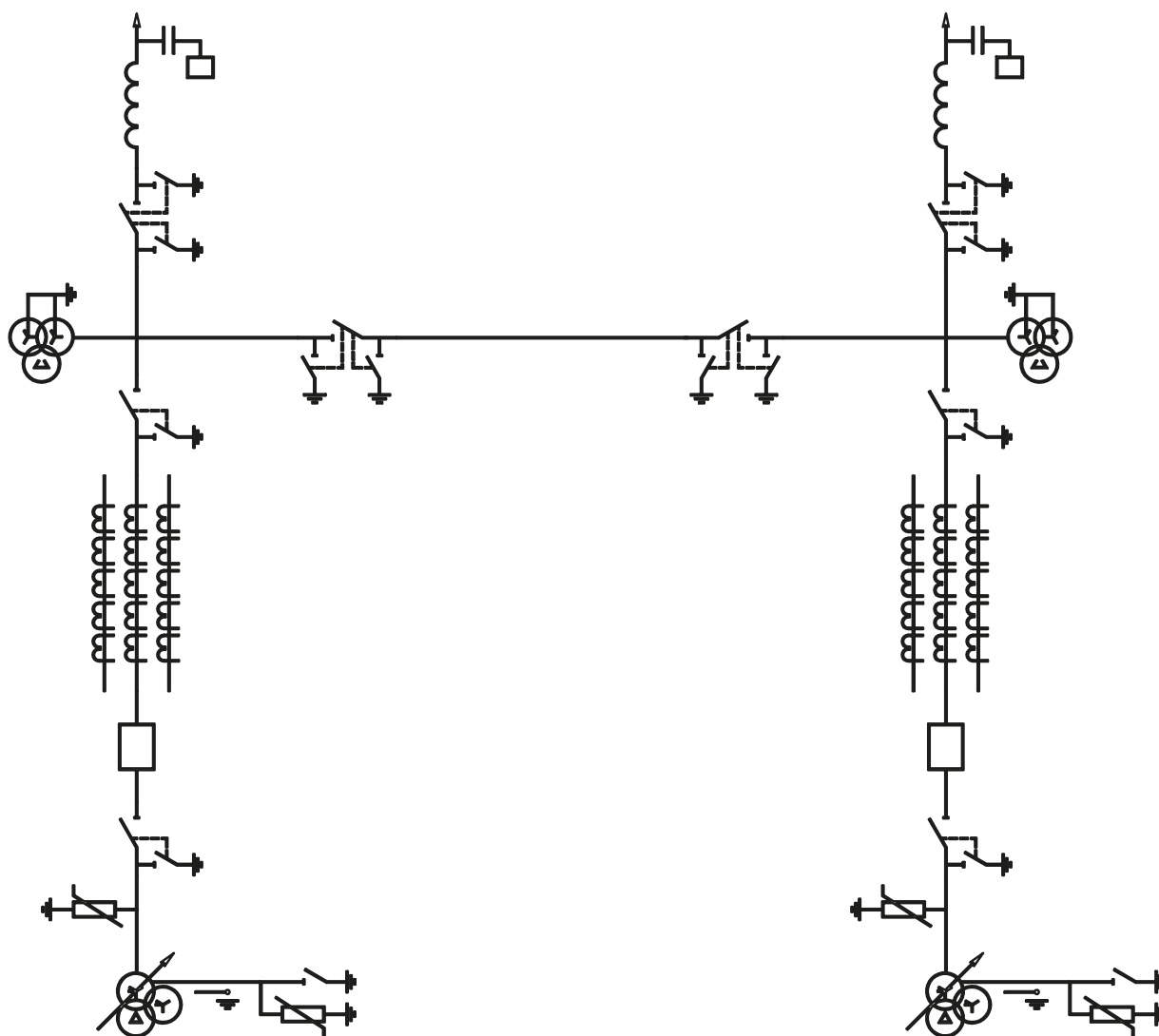


KM-ORU vs. KMB-ORU

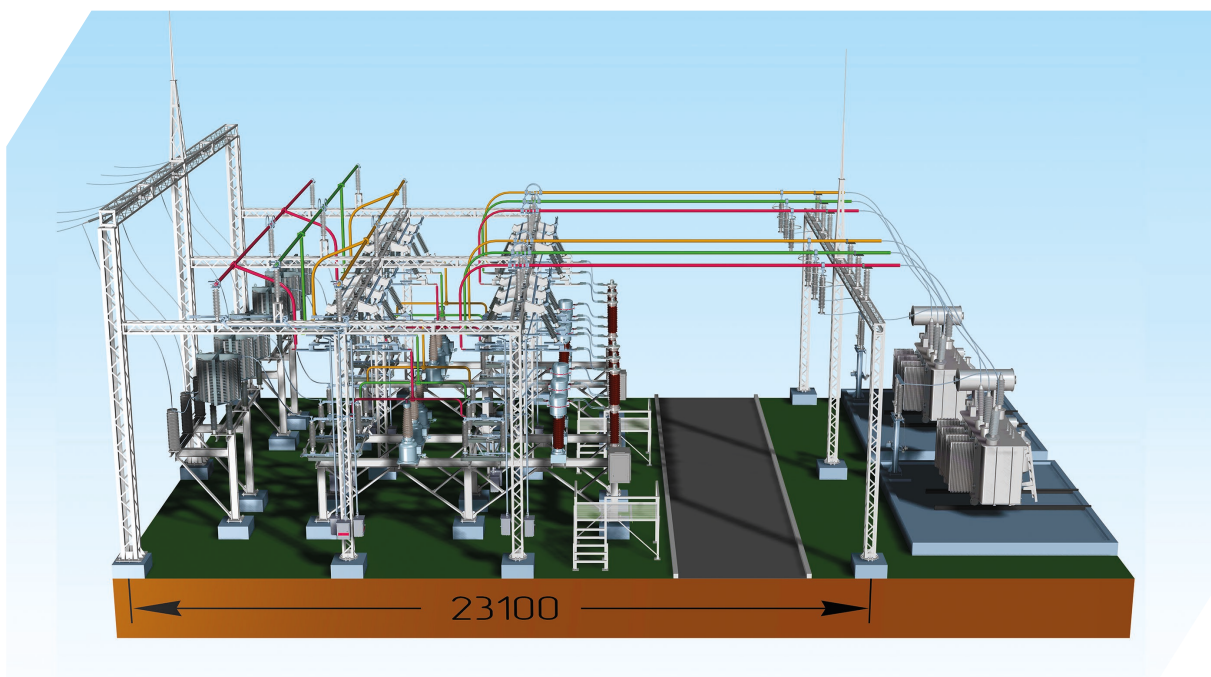
KM-ORU (KM-OPУ) is an ORU-110 configuration based on a compact module using the overhead disconnector RGNPSh (РГНПШ), units and two/three-level rigid busbars.

KMB-ORU (КМБ-OPУ) is an ORU-110 configuration based on free-standing units and rigid busbars.

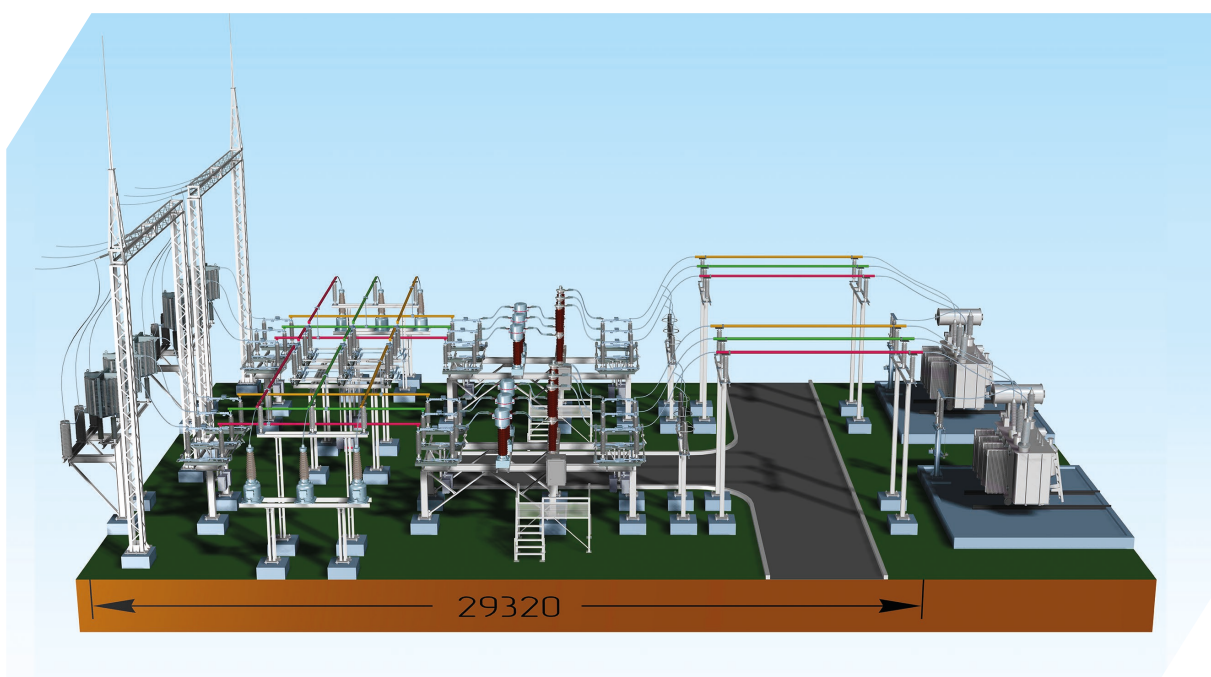
Principle Schematic Diagram 110-4N (110-4H)



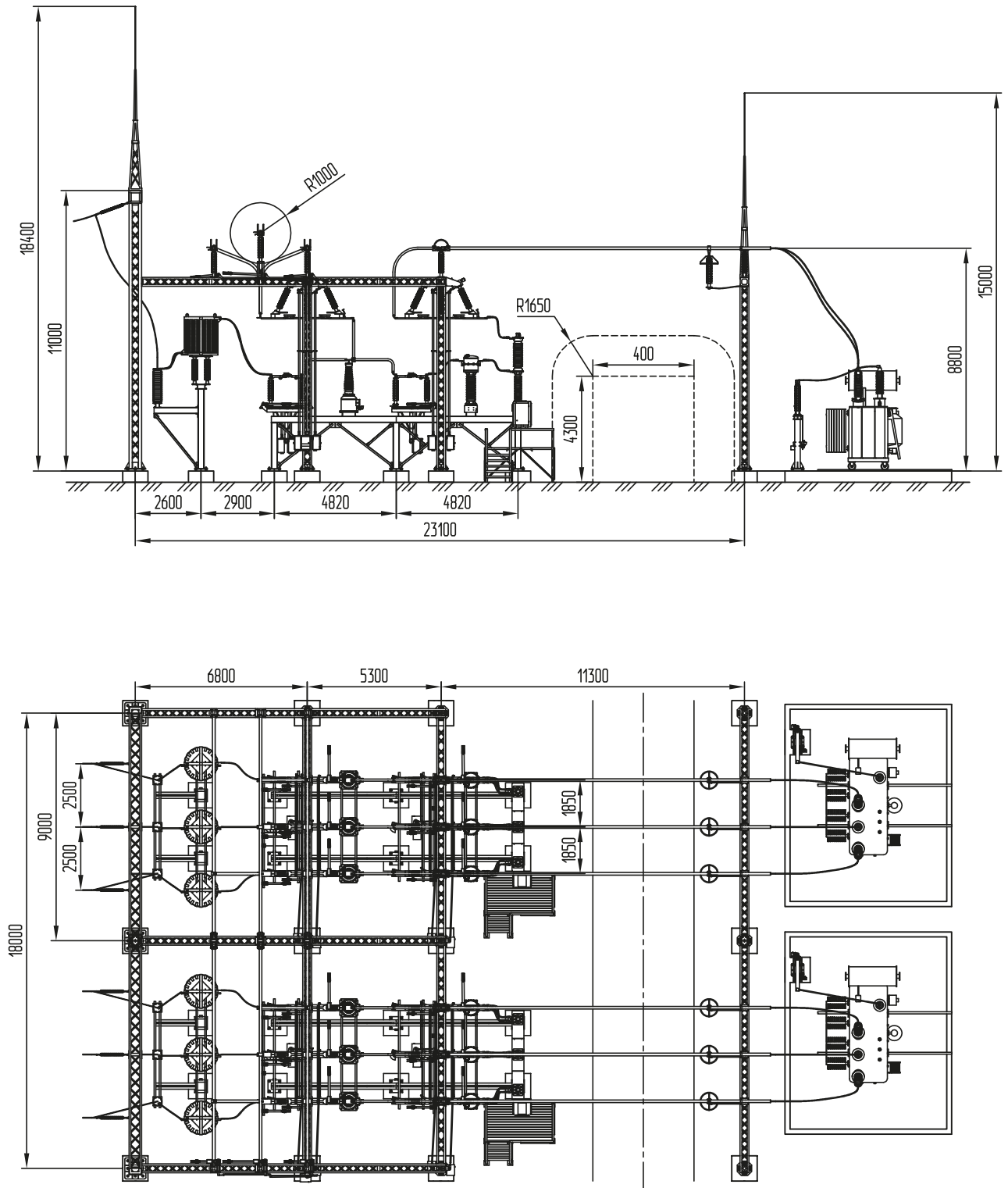
KM-ORU Based on the Modular 4N schematic diagram



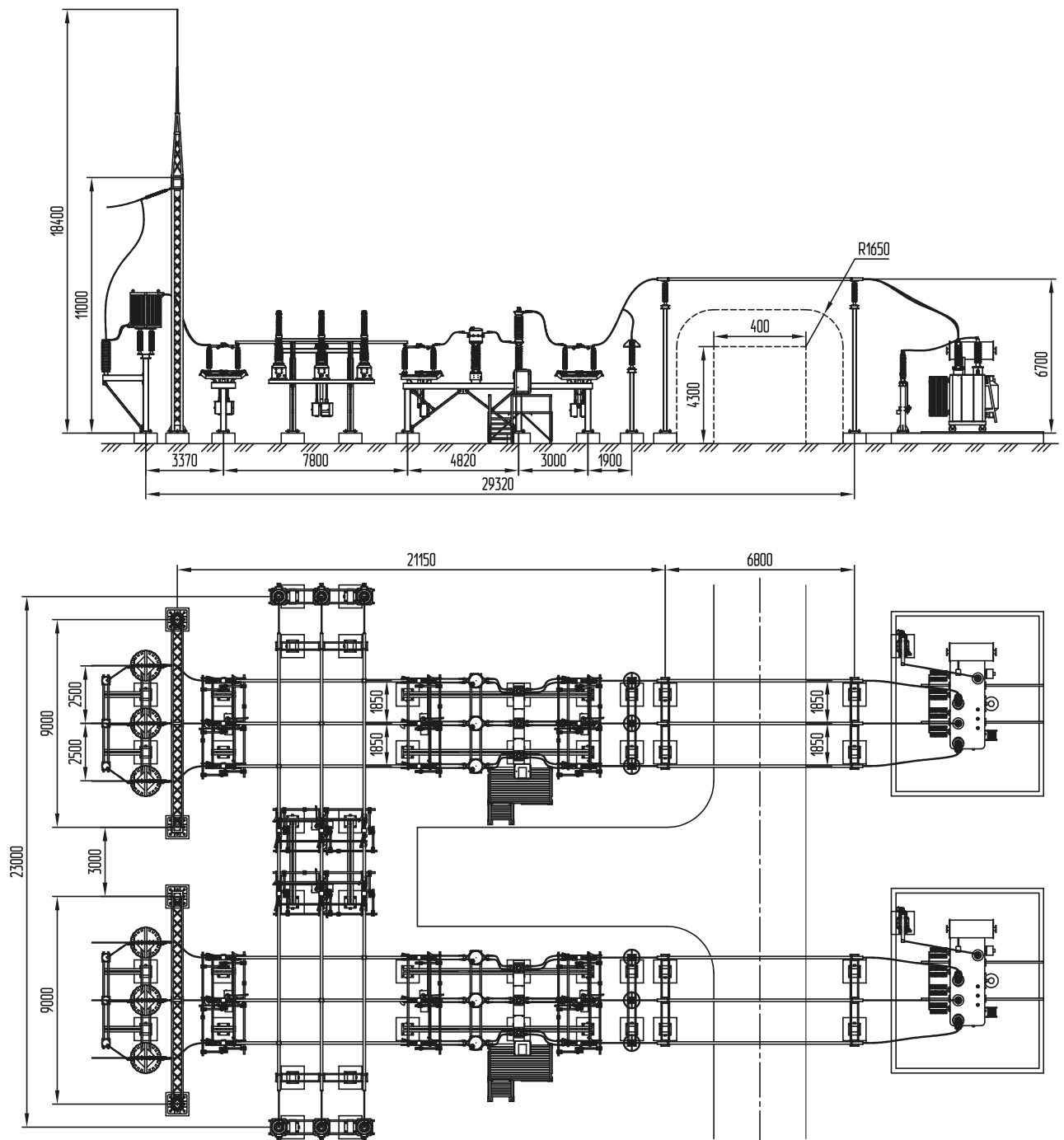
KMB-ORU Based on the 4N schematic diagram (Unit Type)



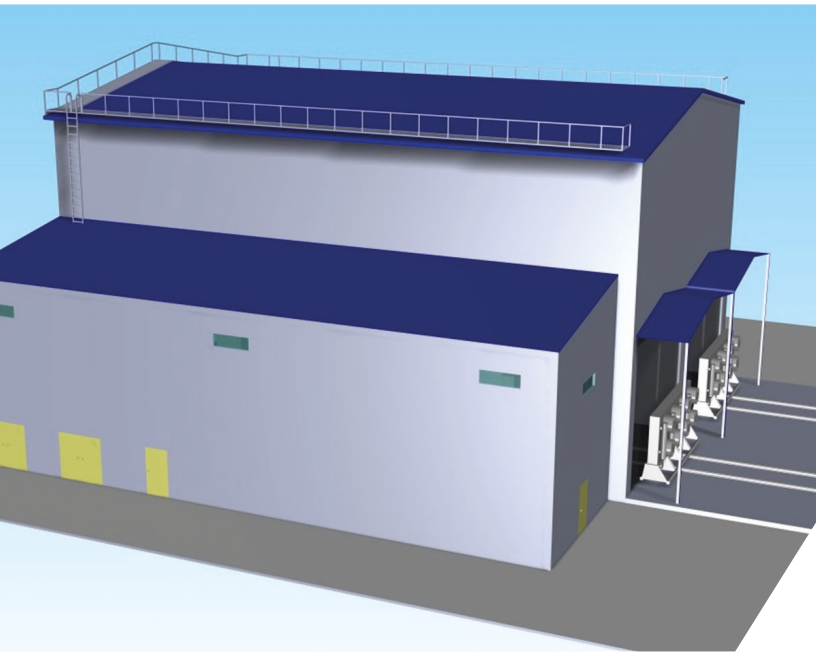
KM-ORU Based on the Modular 4N schematic diagram



KMB-ORU Based on the 4N schematic diagram (Unit Type)



KM-ZRU-110 with a Substation Control House Based on the 4N schematic diagram



Technical Characteristics

Rated voltage:

- On the HV side – 110kV.
- On the LV side – 10(6)kV.

Rated current – 2000 A.

Power of power transformers:

- Indoor installation – up to 2 x 63 MVA.
- Outdoor installation – 2 x 80 MVA and higher.

ZPS-110/10(6)kV (ЗПС-110/10(6)кВ) building characteristics:

- Snow load – 126kg/m², III snow area (standard load).
- Wind pressure – II Area – 30 kgf/m².
- Minimum air temperature $t = -26^{\circ}\text{C}$.
- Fire resistance rating – III.
- Seismic resistance 7 on the MSK-64 scale.

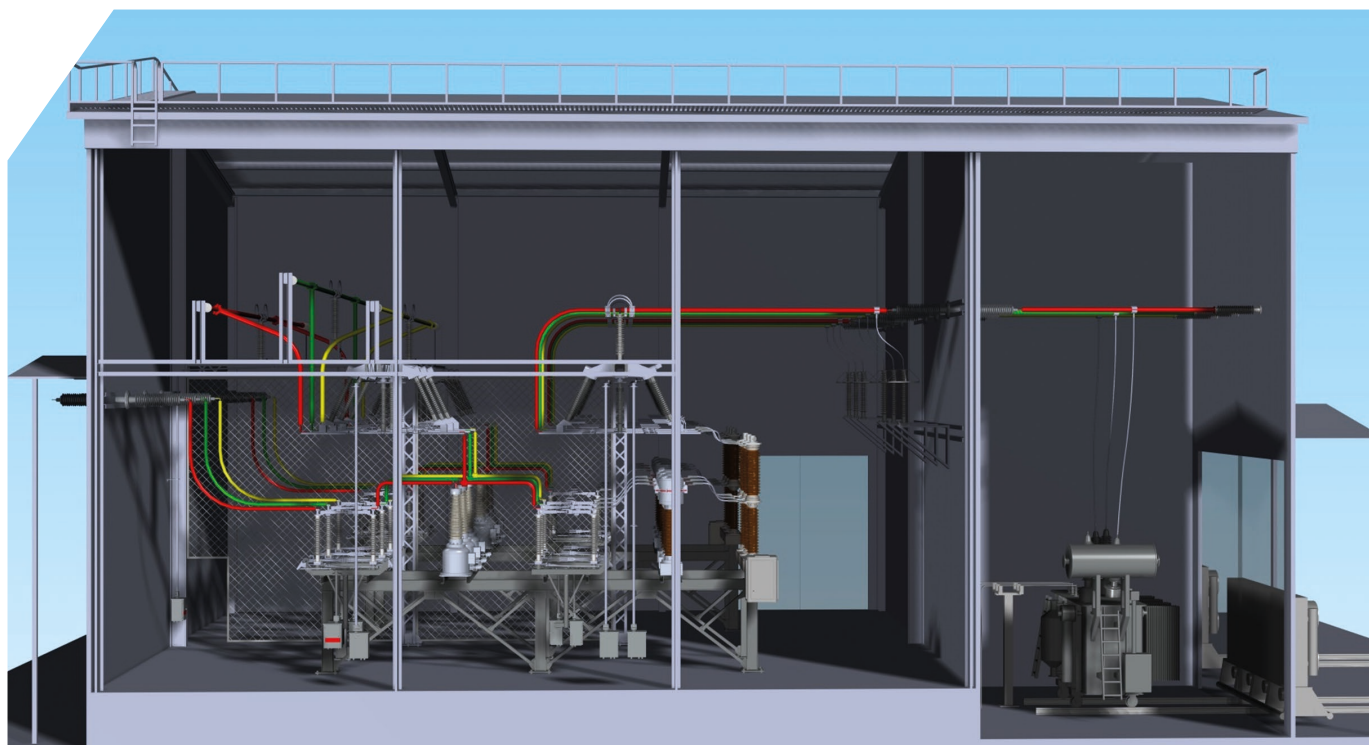
Design features

110kV voltage input:

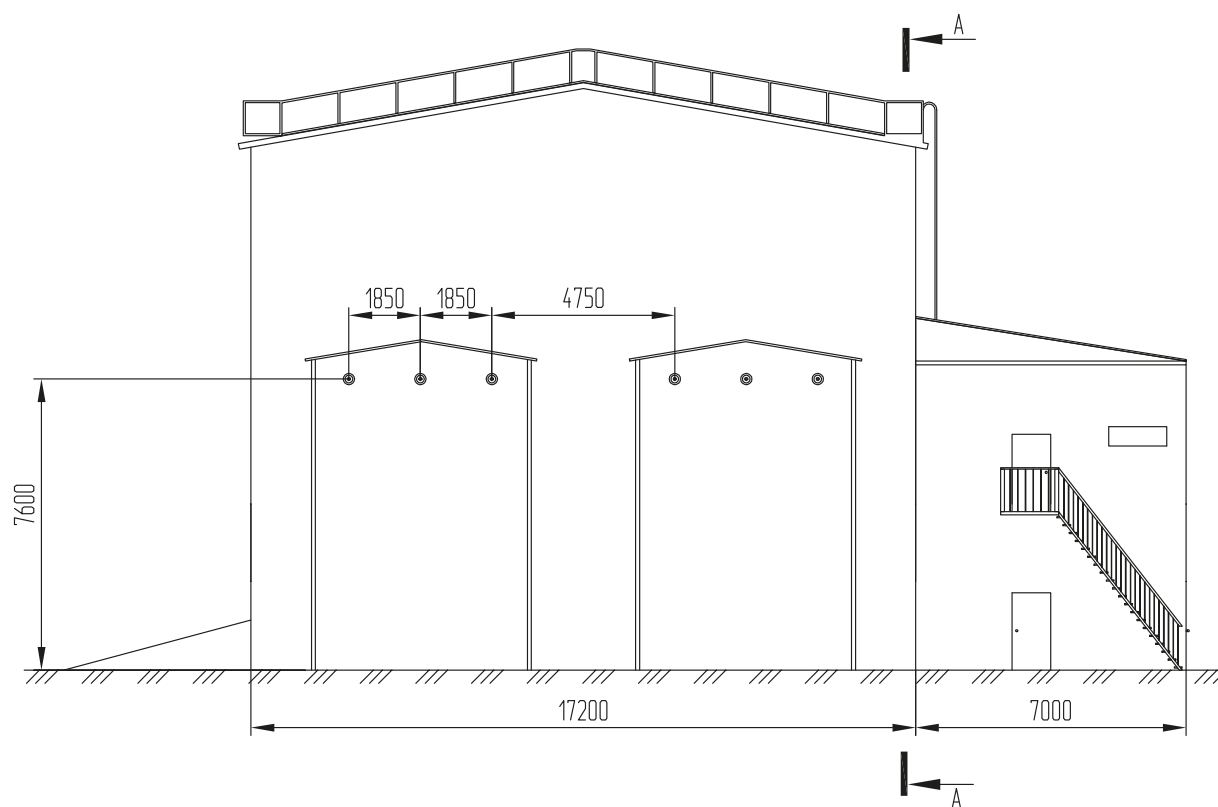
- Air type via a wall entrance insulator.
- Cable type via a cable sleeve.

10(6)kV LV outlet – cable type.

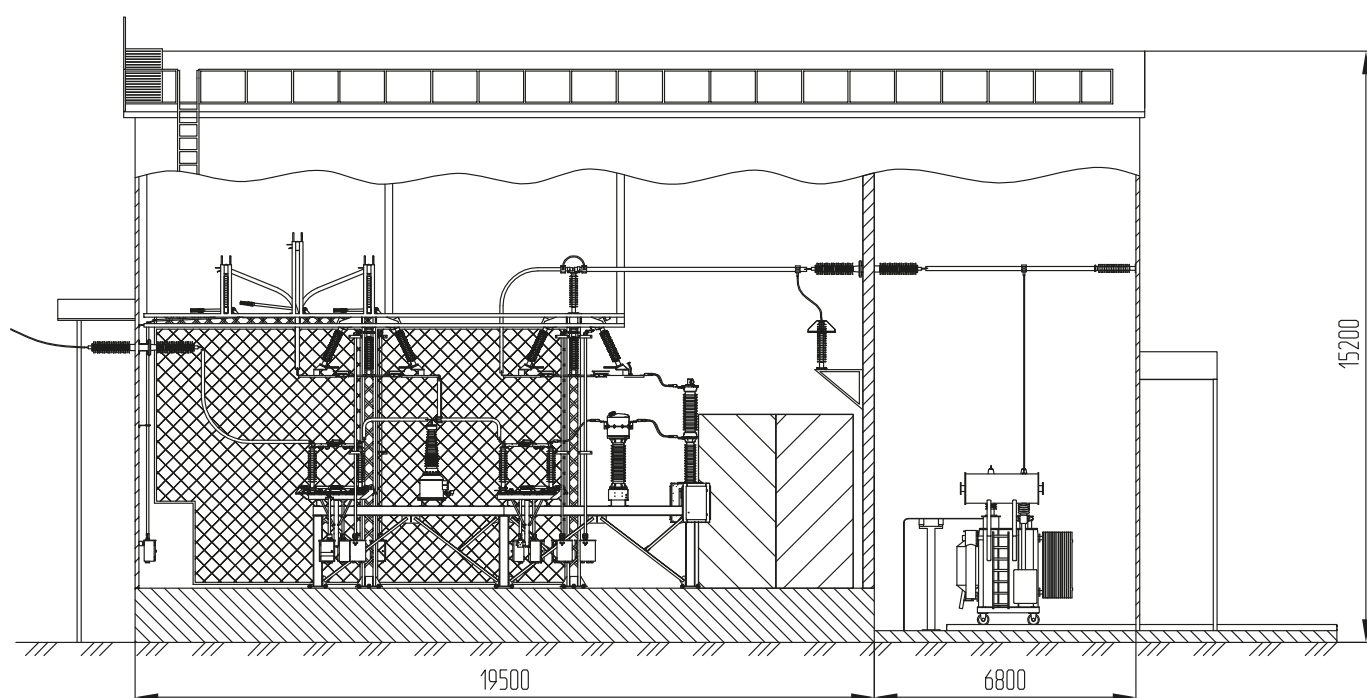
Installation of a power transformer cooling system is possible.



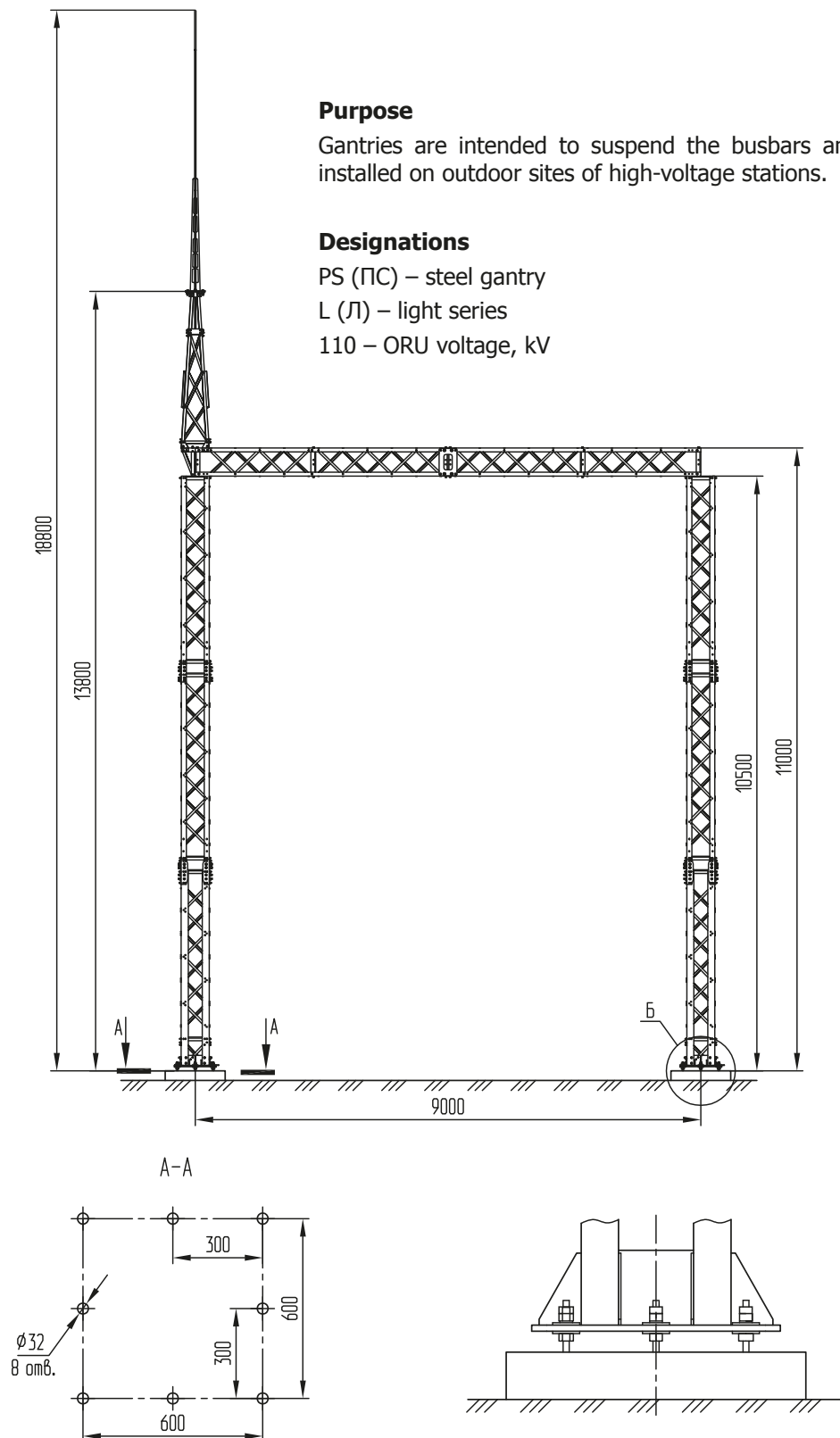
Basic Overall Dimensions



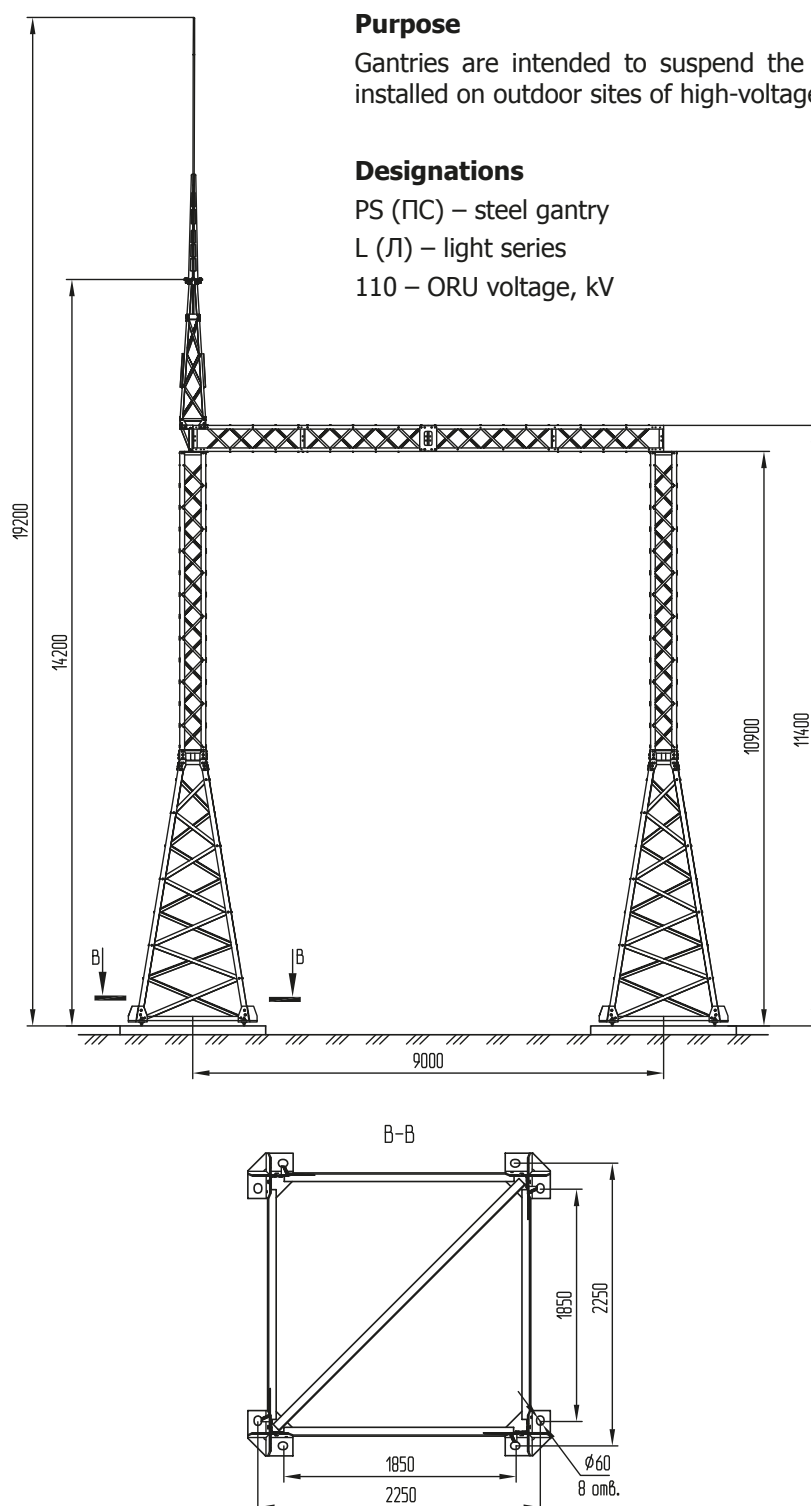
A-A



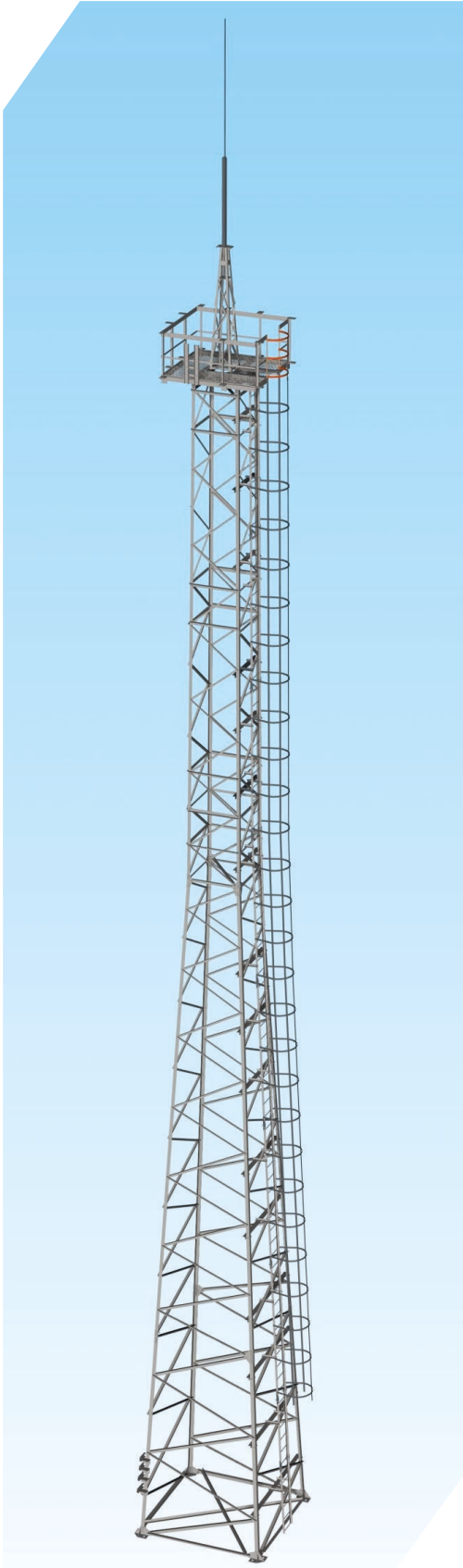
Overall and Installation Dimensions of a PSL-110 (ПСЛ-110) Gantry Counterpart



Overall and Installation Dimensions of a PST-110-Ya1 (ПСТ-110-Я1) Gantry Counterpart

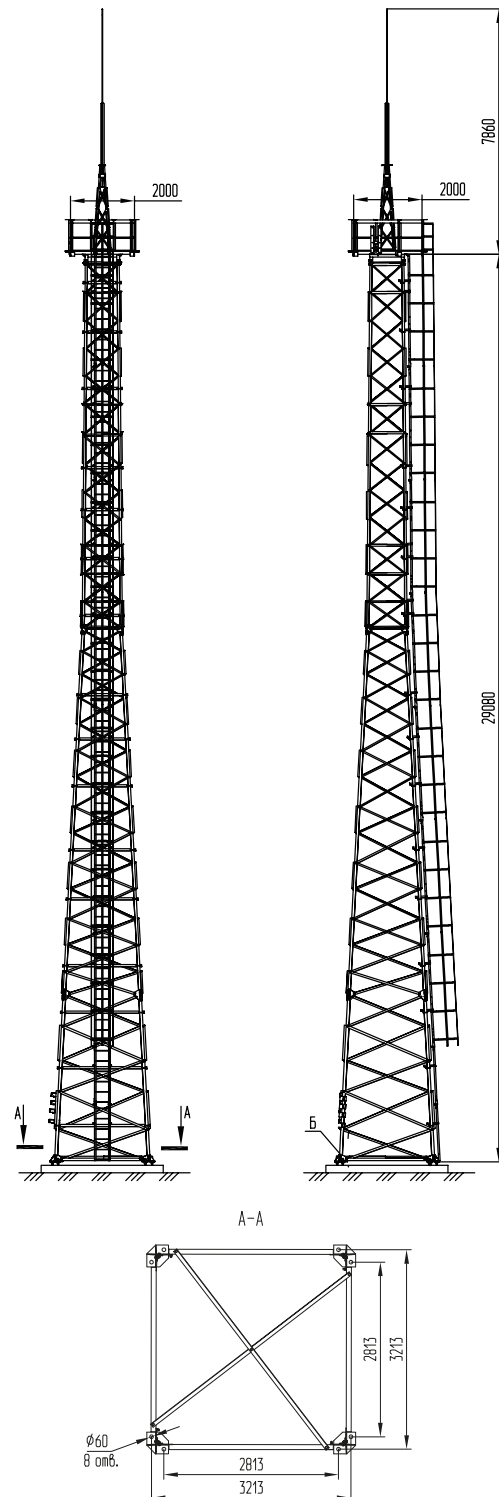


Floodlight Tower



Purpose

Floodlight towers are used to light and to ensure lightning protection of outdoor switchgears of electrical substations up to 500kV, storages and petroleum pipelines.



Implemented Projects

- Novoye Rakhino Substation, Branch of IDGC of the North-West – Novgorodenergo
- Novolisino Transformer Substation, Oktyabrskaya Railway, JSC RZD
- Gatchina Transformer Substation, Oktyabrskaya Railway, JSC RZD
- Luzhayka Transformer Substation, Oktyabrskaya Railway, JSC RZD
- Leypyasuo Transformer Substation, Oktyabrskaya Railway, JSC RZD
- Main Feeding Substation, OJSC Mil Moscow Helicopter Plant, Moscow Oblast
- Tambov Substation No.5, Tambov Oblast
- Gorodskaya Substation, Grid Company OJSC, Tatarstan
- Rosva Substation, Kaluga Oblast
- Sviyaga Substation, Ulyanovsk Oblast
- Substation No.102A, Mirny
- Kropotkinskaya Substation, Buryatia
- Raspredelitel'naya Substation, Saratov Distribution Grids
- Losevo-Kamennogorsk (12km, 29km, 46km) Transformer Substation, Oktyabrskaya Railway, JSC RZD
- Kinderi Substation, Grid Company OJSC, Tatarstan
- Tsentral'naya Substation, Kazan
- Bogatoye Substation, IDGC of Volga
- Lipetsk Special Economic Zone
- Kiliya Substation, EK Odessaoblenergo, Ukraine
- Elizavetino Transformer Substation
- Luzhskaya-Sortirovochnaya Transformer Substation
- Main Feeding Substation GPP-2, Mikhailovsky GOK, Metalloinvest Management Company
- KabbalkGips Substation
- Gorodskaya Substation, Almetyevsk
- Nikolskoye LSR Substation, Leningrad Oblast
- Kazan Transformer Substation – Airport, Gorky Railway
- Main Feeding Substation GPP-6, Stoilensky GOK, OJSC NLMK
- Malgobek-3 Substation, Branch of OJSC IDGC of the North Caucasus – Ingushenergo
- Galashki Substation, Ingushetia
- GTU TETs (Combined Heat and Power Plant), MO ZATO, Znamensk
- Vostochnaya Substation, Samara Distribution Grids
- VChNG Substation, JSC NK Rosneft
- Losevo-Kamennogorsk 12 km Transformer Substation
- Tyulyachi Substation
- Avtozavodskaya Combined Heat and Power Plant
- Vanino Substation
- Kirov Thermal Power Station-3, OJSC Volzhskaya TGK
- Promkomzona Substation
- Plastik Substation
- Leningrad Nuclear Power Plant, Rosenergoatom Concern OJSC
- Main Feeding Substation – 1 Matrosov Mine, Magadan Oblast
- Chkalovskaya Substation
- Moskovskaya-Tovarnaya Transformer Substation
- Visla Substation
- Kingesepsskaya Substation
- Pechnaya Substation
- Rostachinskaya Substation, OJSC Orenburgneft
- Naryshkinskaya Substation
- Orositel'naya Substation, OJSC Kuzbassenergo
- V. Pokrovka Substation
- Vostochnaya Substation
- Vyselki Substation
- Vysokaya Gora Substation
- Lapsary Substation
- Sukhoy Port Substation
- Nezhegol Substation
- Igora Substation, OJSC Lenenergo
- Substation-318 Vozrozhdenie





ЗАВОД ЭЛЕКТРОТЕХНИЧЕСКОГО ОБОРУДОВАНИЯ
Качественный мир
для вашего распределительного устройства 110 кВ
ЗАО ЭТО
КМ ОРУ 110 кВ



Implemented Projects





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