



Minsk electrotechnical plant named after V.I.Kozlov

Unitized transformer substations



ESTEEMED CUSTOMERS!

We are grateful for your interest to our products. "Minsk Electrotechnical Plant named after V.I. Kozlov" is one of the biggest producers of electrotechnical equipment. History of the Plant started in 1956. Since then we accumulated great experience and tradition. Our basic products are:

- ☒ power transformers;
- ☒ unitized transformers substations;
- ☒ devises and converters for anticorrosive protection of metallic structures;
- ☒ assembled switchgear;
- ☒ multi-purpose transformers;
- ☒ welding equipment;
- ☒ devices for household applications.

Our products can fully meet high requirements of the users. The Plant can develop and manufacture items with parameters and characteristics differing from those indicated in this Catalogue.

In production processes we use modern technological equipment of the world leading companies. The Plant has implemented one of the best steel-cutting lines made by "Georg" company of Germany. Laminations for transformer cores processed by this cutting line allow the so-called scarf-joint stacking, using step-lap technique, which considerably improves quality of the cores. French company "Alsthom Atlantique" has installed and started equipment for making corrugated transformer tanks and vacuum chamber for oil-filling.

At our Plant great attention is given to development of new updated products. For many years we have accumulated engineering and manufacturing experience. Designs and characteristics are constantly improving. Our research and testing labs are equipped with all facilities providing necessary testing of goods.

Our products meet interstate standards, and carry quality certificates of conformance awarded by national certification bodies of Belarus and Russia.

Quality System of the plant has got certification in accordance with ISO-9001 Standard from international certification body "KEMA" (Holland) along with the state certification body of the Republic of Belarus.

**4,Uralskaya str.
220037 Minsk
Republic of Belarus
Phone/Fax: (+37517) 230-32-93, 245-80-92
E-mail: oved@metz.by**

Table of contents

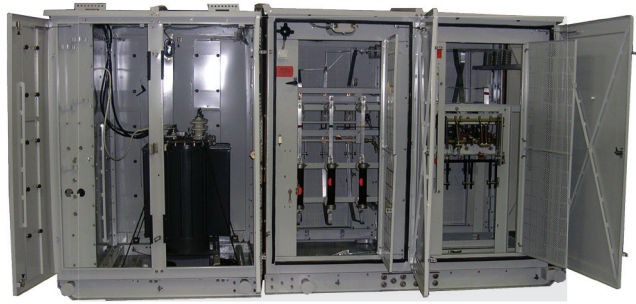
UNITIZED TRANSFORMER SUBSTATIONS

of kiosk type for industrial power supply	8
Unitized Transformer Substations of КТП ТАС, КТП ПАС type	
rating 63-400 кV·A, with a voltage 6(10)кV	10
Unitized Transformer Substations of КТП ТАС-М, КТП ПАС-М type (modernised)	
rating 630 кV·A, with a voltage 6(10) кV	17
Unitized Transformer Substations of КТП ТАС-М type (modernized)	
rating 63-250 кV·A, with a voltage 6(10) кV	21
Unitized Transformer Substations of КТП ТАС type	
rating 1000 кV·A, with a voltage 6(10) кV	23
Unitized Transformer Substations of КТП ТАС type	
rating 630 кV·A, with a voltage 6(10) кV	25
КТП with KY (with compensation of reactive power)	27
КТП with KY (with compensation of reactive power)	
rating 63-400 кV·A, with a voltage 6(10) кV	28
2КТП with ABP (with automatic load transfer)	30
2КТП ТАС with ABP (with automatic load transfer)	
rating 630 кV·A, with a voltage 6(10) кV	31
2КТП ТАС with ABP; 2 КТП ПАС with ABP	
rating 630 кV·A, with a voltage 6(10) кV	34

TRANSFORMER SUBSTATIONS for power supply of users in agricultural branch, small industrial and other units	37
Unitized Transformer Substations of КТП типа КТП-02, КТП-04 и КТПР types	
rating 25-250 кV·A with a voltage 6(10) кV	38
МТП-type pole-mounted transformer substations	
rating 25-100 кV·A with a voltage 6(10) кV	40
МТП-type pole-mounted transformer substations	
rating 160, 250 кV·A with a voltage 6(10) кV	42
МТПО-type pole-mounted single phase transformer substations	
rating 4 and 10 кV·A with a voltage 6(10) кV	44
TRANSFORMER SUBSTATIONS for railway needs	46
Unitized Transformer Substations of КТПЖ type	
rating 25; 100; 250; 400 кV·A with a voltage 27.5 кV	48
МТПЖ type pole-mounted transformer substation	
rating 10 кV·A with a voltage 27.5 кV	50
МТПЖ type pole-mounted transformer substation	
rating 1,25-10 кV·A with a voltage up to 27,5 k	52
КТПОС type unitized transformer substations	
rating 25; 40; 63 кV·A with a voltage 6(10) кV	53
UNITIZED TRANSFORMER SUBSTATIONS of special purpose	55
КТПТО-80 type unitized transformer substation	
rating 80 кV·A with a voltage 380/55-95 V	57



Unitized Transformer Substations of КТП ТАС



Unitized Transformer Substations of КТП ПАС



Unitized Transformer Substations of КТП ТАС-М type (modernized)



Unitized Transformer Substations of КТП ТАС type (1000)



Unitized Transformer Substations of КТП ТАС type (630)



КТП with КУ (with compensation of reactive power)



2KTPTAC with ABP; 2KTPAC with ABP



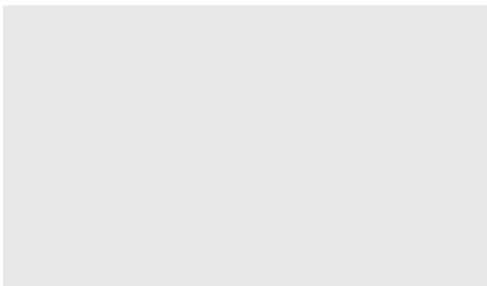
Unitized Transformer Substations of KTP type KTP-02, KTP-04 и KTPP types



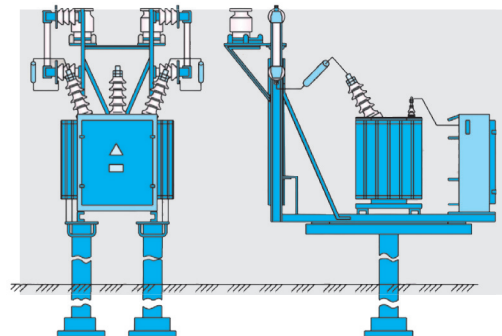
MTP-type pole-mounted transformer sub-stations (25-100)



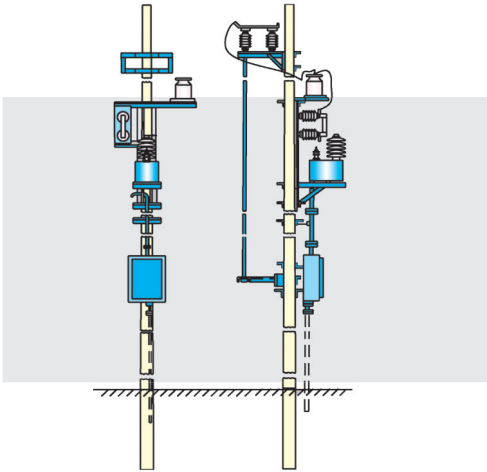
MTP-type pole-mounted transformer sub-stations 160. 250



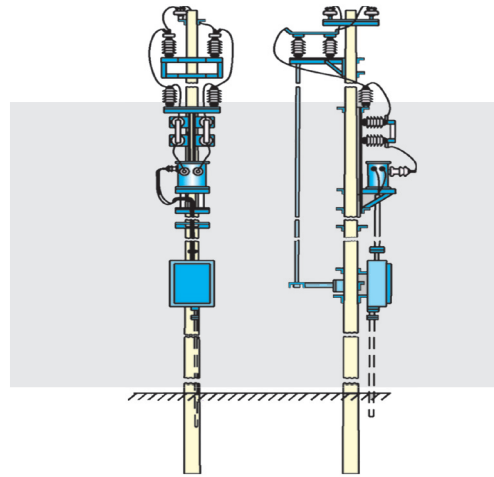
MTPO-type pole-mounted single phase transformer sub-stations



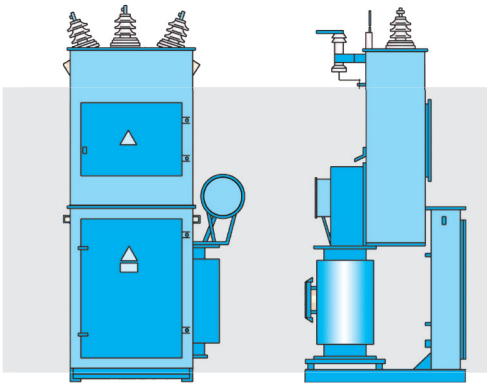
Unitized Transformer Substations of KTPZH type



**MTPZh type pole-mounted transformer
Substation 10**



**MTPZh type pole-mounted transformer
Substation 1.25-10**



**KTIPOC type unitized transformer sub-
stations**



**KTIPO-80 type unitized transformer sub-
station**

UNITIZED TRANSFORMER SUBSTATIONS of kiosk type for industrial power supply

Unitized transformer substations (КТП) of kiosk type are one or two-transformer substations for outdoor installation and are intended to receive electric energy – three-phase, 50 Hz a.c. of 6 or 10 kV, to transit it through (КТП of double-ended type) and to convert it into 0,4 kV as well as for power supply and protection of consumers in urban areas, of industrial and other facilities in regions with moderate climatic conditions (from – 45°C to + 40°C).

High voltage input lead into substation 6 (10) kV is cable or air; output leads 0.4 kV are cable or cable-air.

- Outgoing feeders are fitted with automatic circuit breakers of stationary or pull-out (as per request of customer) version.
- Constructively, КТП are made in cabinet version. Main elements are fastened by bolts.
- КТП design provides its mounting on footing, tamped ground, or cement blocks of 600 mm high (in delivery set are not included).
- КТП with air inlet is connected to power transmission line through disconnecting switch which is supplied complete with substation and is mounted on the transmission line nearest pole.
- КТП has function of active power consumption metering. It is possible the installation of reactive energy counter (as per customer's request) as well as the counter of any modification (combined, electronic, etc.).
- To maintain normal КТП operation conditions, circuit design provides indoor lighting and equipment heating function. Switching-on the electric heating unit may be carried out by hand as well as automatically.
- КТП has exterior lighting feeder with automatic ON / OFF function. КТП version may be without exterior lighting feeder (as per customer's request).
- КТП circuit design provides current and voltage control on the 0.4 kV side.
- КТП design provides the next protection types:
 - against lighting overvoltage (if any air power lines);
 - against interphase short circuit;

- against overload of power transformer;
- against overload and short circuits of 0.4 kV power lines;
- against short circuits of КТП heating and lighting circuits;
- transformer protection gas device (in КТП-100 kV·A; КТП-630 kV·A – as per request of customer).
- КТП are equipped with electrical and mechanical interlocking (complete outfit) ensuring safety of attending personnel.
- HV-circuits in КТП rating 63 – 630 kV·A are resistant to (during 1 second) short circuit currents: dynamically – 16 kA, thermally – 6.3 kA; HV-circuits in КТП rating 1000 kV·A: dynamically – 32 kA, thermally – 12.5 kA.
- КТП enclosure protection degree – IP 34 (IP 23 – for transformer compartment).
- Design of transformer compartment and transformer bushing compartment provides the localization of open electric circuit exposure within compartment. Localization capacity is provided by short circuit current 6.3 A during 1 second.
- КТП:
 - non-hazardous for environment;
 - design allows prompt assembling and starting at the operation place and prompt disassembling by changing of mounting location.
 - have rubber seals on doors and on abutting assembled joints;
 - have attractive aesthetic appearance;
 - are completed with ТМГ series modern hermetically sealed transformers of own production.

The Plant can produce КТП of any configuration including with vacuum circuit breakers as per demand of customer.

Unitized Transformer Substations of КТП ТАС, КТП ПАС type

rating 63-400 kV·A, with a voltage 6(10)kV

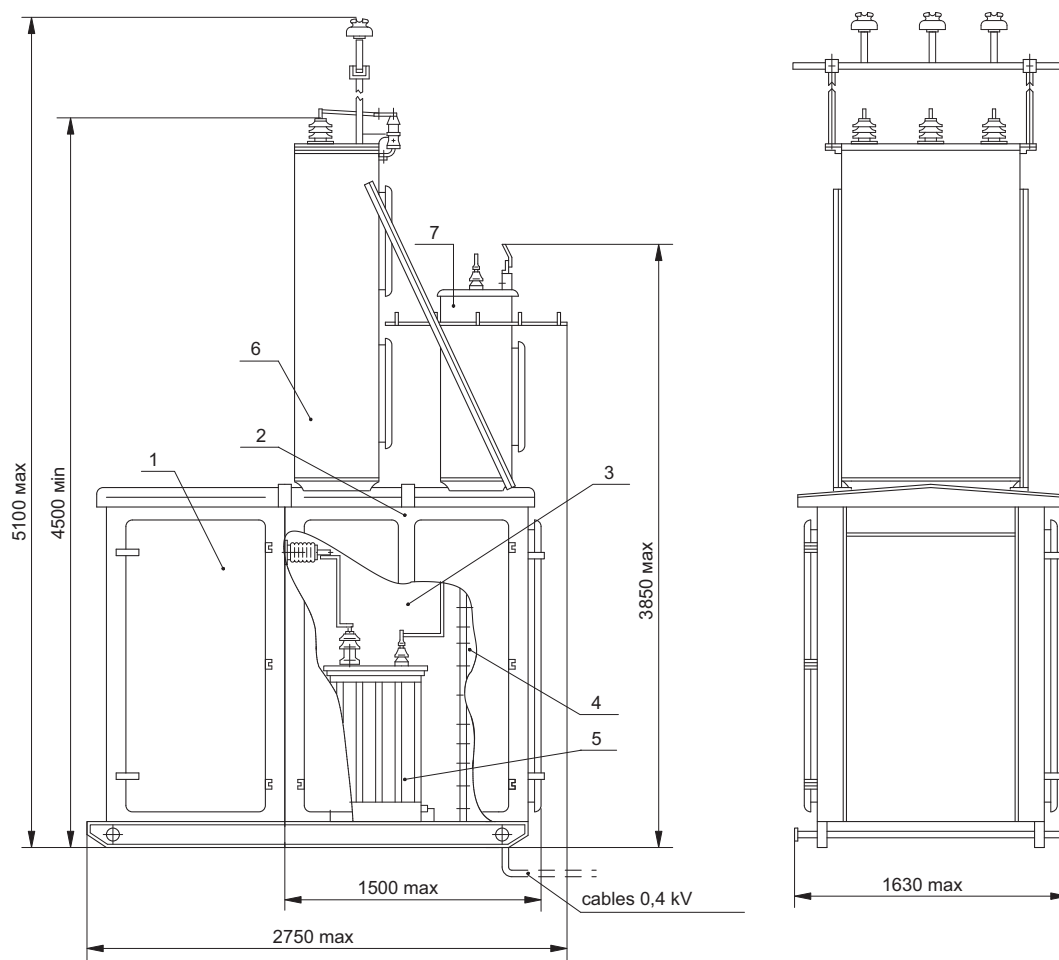
Main technical parameters

Transformer type	ТМГ									
Transformer rated power, kV·A	63		100		160		250		400	
Transformer connection/vector group	Yyn-0								Yyn-0, Dyn-11	
HV rating, kV	6	10	6	10	6	10	6	10	6	10
HV fuse rated current, A	16.0	10.0	20.0	16.0	31.5	20.0	50.0	31.5	80.0	50.0
LV rating, kV	0,4		0,4		0,4		0,4		0,4	
Rated current of outgoing lines, A:										
N 1	25		40		80		100		100	
N 2	25		40		80		100		160	
N 3	63		100		160		200		200	
N 4	40		80		100		160		200	
N 5	40									
N 6	63									
street lightning	16,25									

Notes:

- * - in accordance with the customer's option.
- Transformer connection/vector group, as well as currents and number of outgoing feeders may be selected as per customer's will.

Overall dimensions and mass of KТПТAC rating 63-250 kV·A



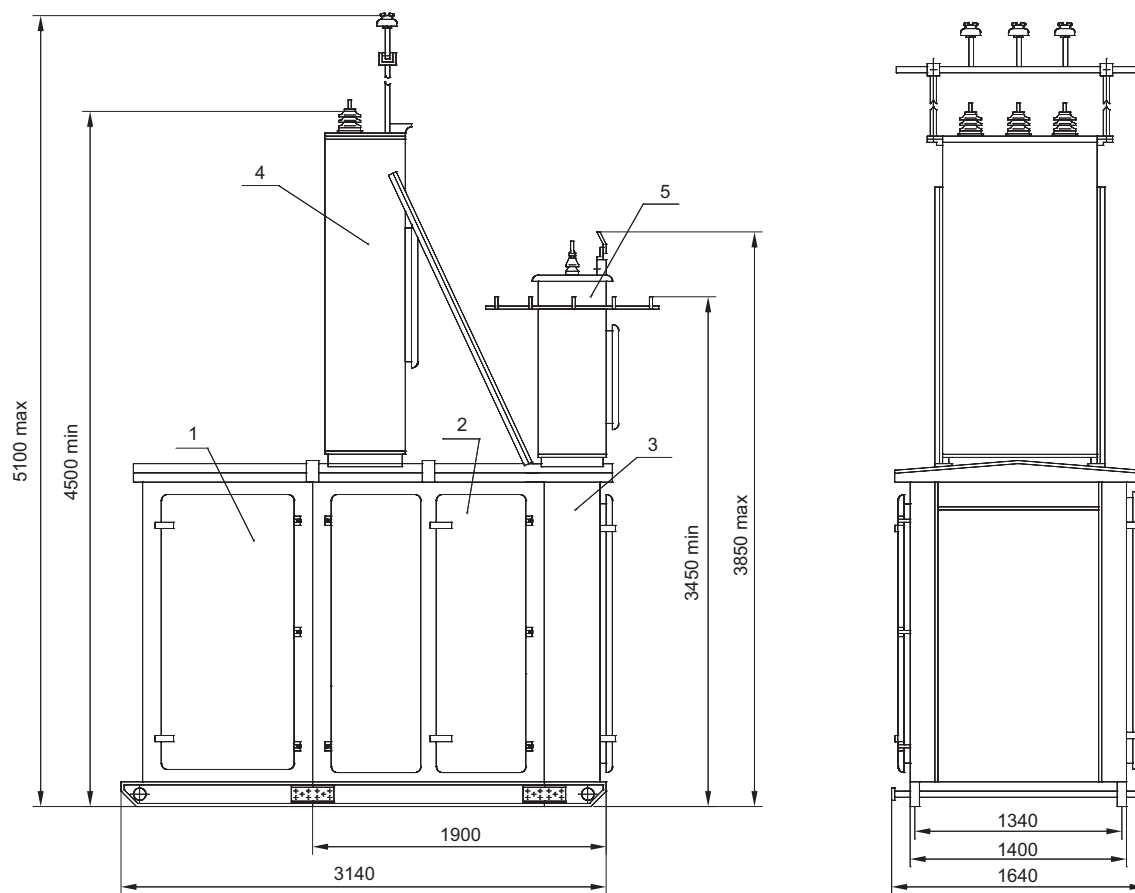
Notes:

Mass (transformer excluded) at most, kg:

- with cable-type lead-in – 1880;
- with air-type lead-in – 1630.

- 1 - transformer input cabinet (for KТП with cable-type lead-in only);
- 2 - cabinet for transformer and LV distributing gear;
- 3 - transformer compartment;
- 4 - compartment for LV distributing gear;
- 5 - transformer (if ordered);
- 6 - HV air-type input cabinet (only for KТП with air-type lead-in);
- 7 - LV outputs cabinet (for KТП with air-cable-type lead-outs only).

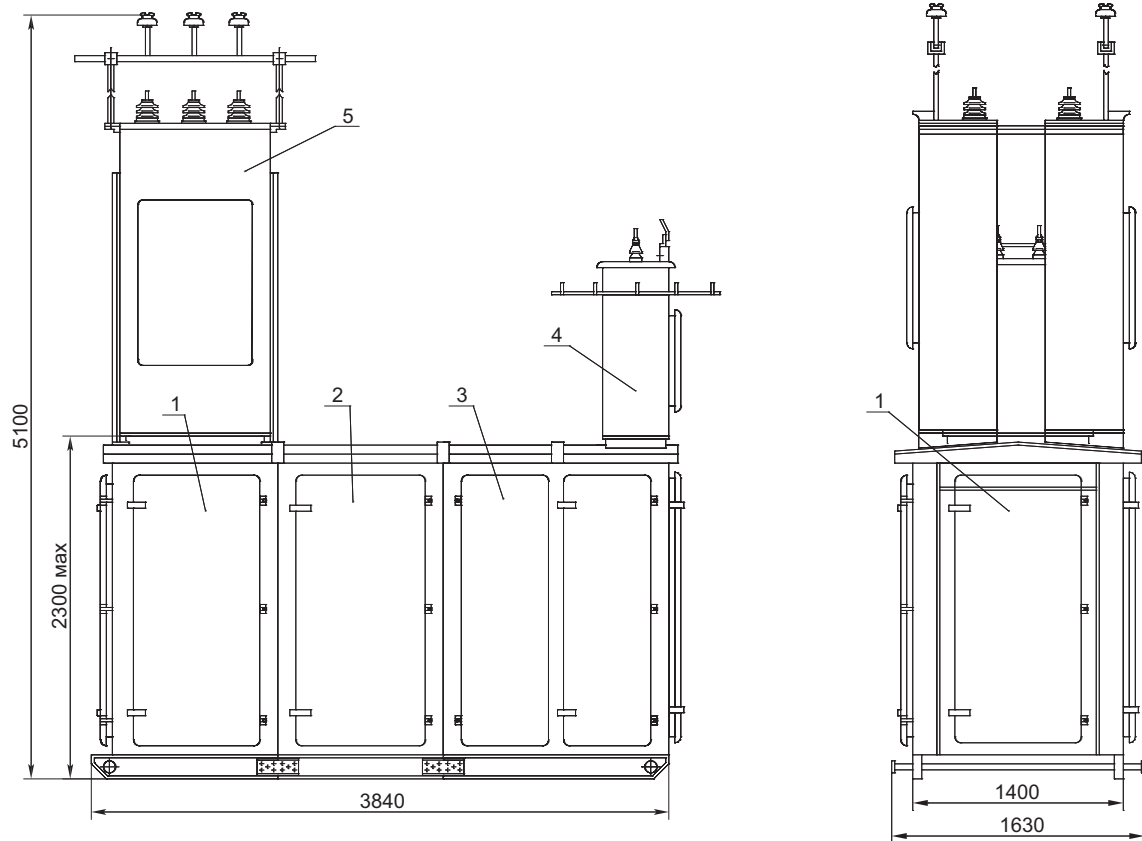
Overall dimensions and mass of KТПТAC rating 400 kV-A



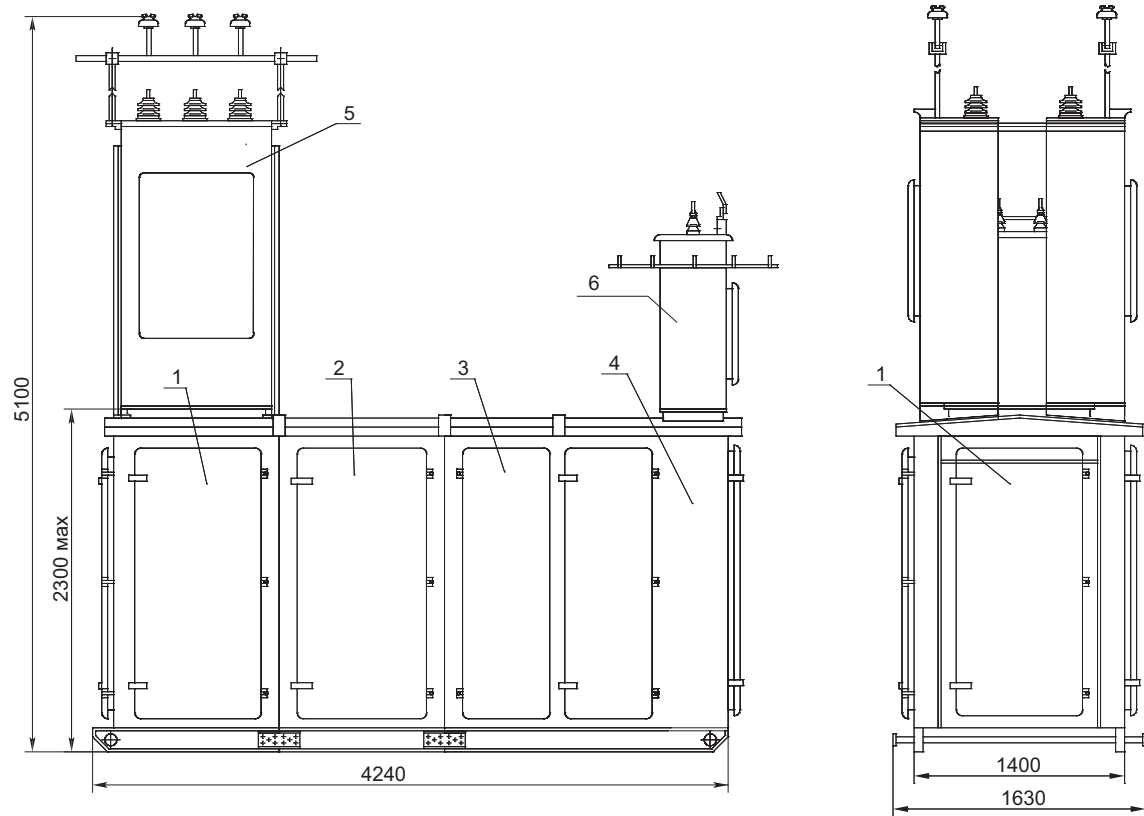
Notes:

Mass of KТП (transformer excluded):
 - with air-type input, at most 2850 kg
 - with cable-type input, at most 3350 kg

- 1 - transformer input cabinet (for KТП with cable-type lead-in);
- 2 - cabinet for transformer;
- 3 - cabinet for LV distributing gear;
- 4 - HV air-type input cabinet (for KТП with air-type lead-in);
- 5 - LV air-type outputs cabinet (for KТП with air-type lead-outs).

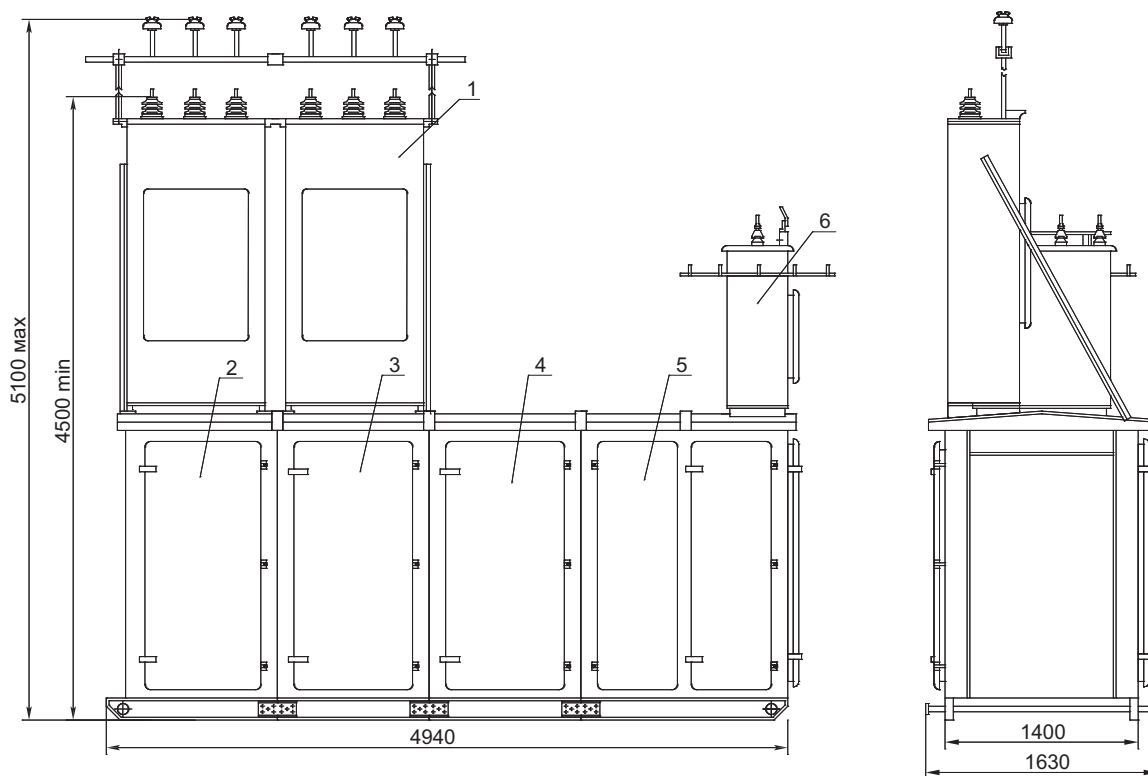
Overall dimensions and mass of КТППАС rating 63-250 kV·A**Notes:**

- 1 - HV input cabinet;
- 2 - transformer input cabinet;
- 3 - cabinet for transformer and LV distributing gear;
- 4 - LV air-type lead-outs cabinet (for КТП with air-type lead-outs only);
- 5 - HV air-type lead-in cabinets (for КТП with air-type lead-in only).

Overall dimensions and mass of КТППАС rating 400 kV·A**Notes:**

- 1 - HV input cabinet;
- 2 - transformer input cabinet;
- 3 - cabinet for transformer;
- 4 - LV distributing gear compartment;
- 5 - HV air-type lead-in cabinets (for КТП with air-type lead-in only);
- 6 - LV air-type lead-outs cabinet (for КТП with air-type lead-outs only).

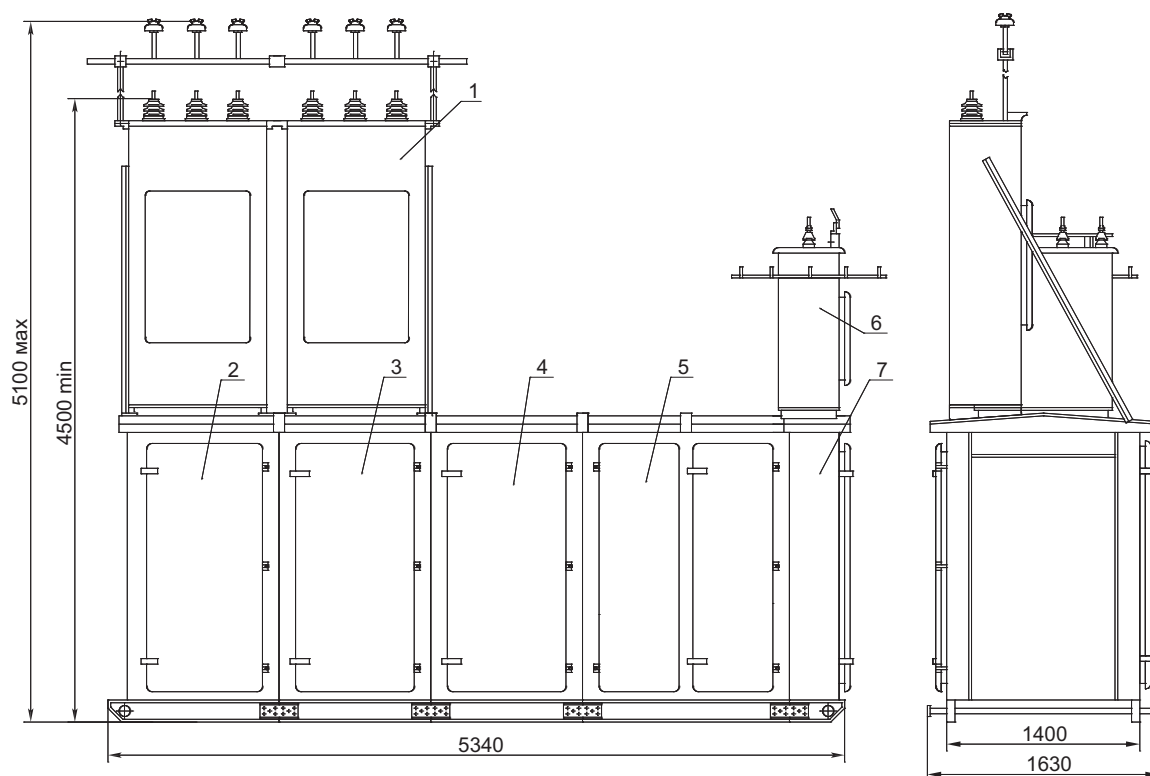
Overall dimensions and mass of КТППАС rating 63-250 kV·A (HV inlet devices are installed in separated cabinets)



Notes:

- 1 - HV air-type input cabinets (for КТП with air-type lead-in only);
- 2 - HV input cabinet N1;
- 3 - HV input cabinet N2;
- 4 - transformer input cabinet;
- 5 - cabinet for transformer; and LV distributing gear;
- 6 - LV air-type outputs cabinet (for КТП with air-type lead-outs only).

Overall dimensions and mass of КТППАС rating 400 kV·A (HV inlet devices are installed in separated cabinets)



Notes:

- 1 - HV air-type input cabinets (for КТП with air-type lead-in only);
- 2 - HV input cabinet N1;
- 3 - HV input cabinet N2;
- 4 - transformer input cabinet;
- 5 - cabinet for transformer;
- 6 - LV air-type lead-outs cabinet (for КТП with air-type lead-outs only);
- 7 - cabinet for LV distributing gear.

Unitized Transformer Substations of КТП ТАС-М, КТП ПАС-М type (modernised)

rating 630 кV·A, with a voltage 6(10) кV

Special features of these КТП are the next:

- Lead-outs of outgoing lines are of cable-type..
- Maximum quantity of outgoing lines – 8.
- Presence of protection (Emergency Circuit Breaker) in interior lighting circuits, against electric-shock hazard of personal in case of contact with current-conducting parts of electrical accessories or when the insulation of these is damaged.
- КТП furnishing with counter devices of active and reactive energy (on customer's request is possible the installation of active energy counter device only).

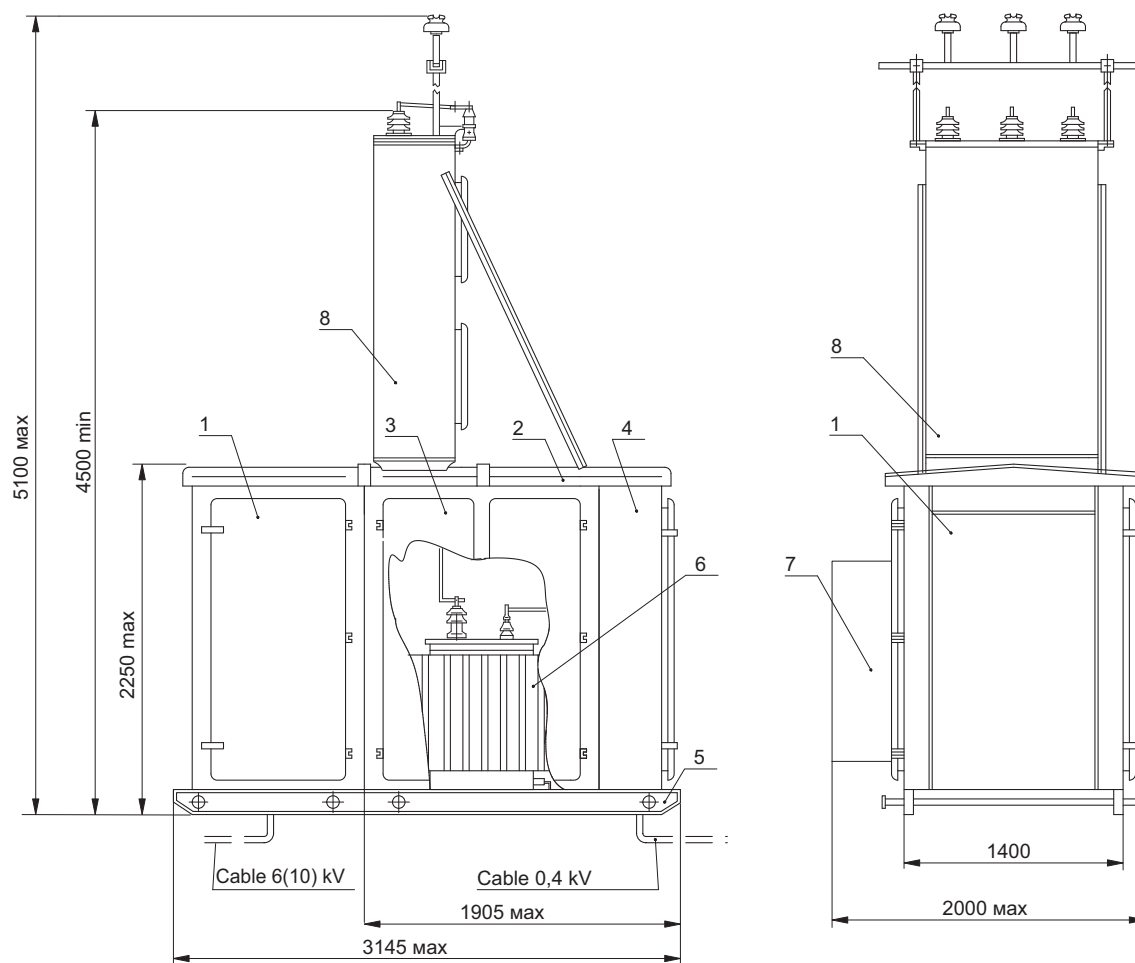
Main technical parameters

Transformer type	TMГ
Transformer connection / vector group	Y/YH-0 or Δ/YH-11
Transformer rated power, кV·A	630
LV rating, кV	0.4
Rated current of outgoing lights, A:	
N 1	100
N 2	160
N 3	160
N 4	100
N 5	200
N 6	250
N 7	250
N 8	200
Lightning line	16(25*)

Notes:

1. * - in accordance with the customer's option.
2. Transformer connection/vector group, as well as currents and number of outgoing feeders may be selected as per customer's will.

Overall mounting dimensions and mass of КТПТАС-M rating 630 kV·A



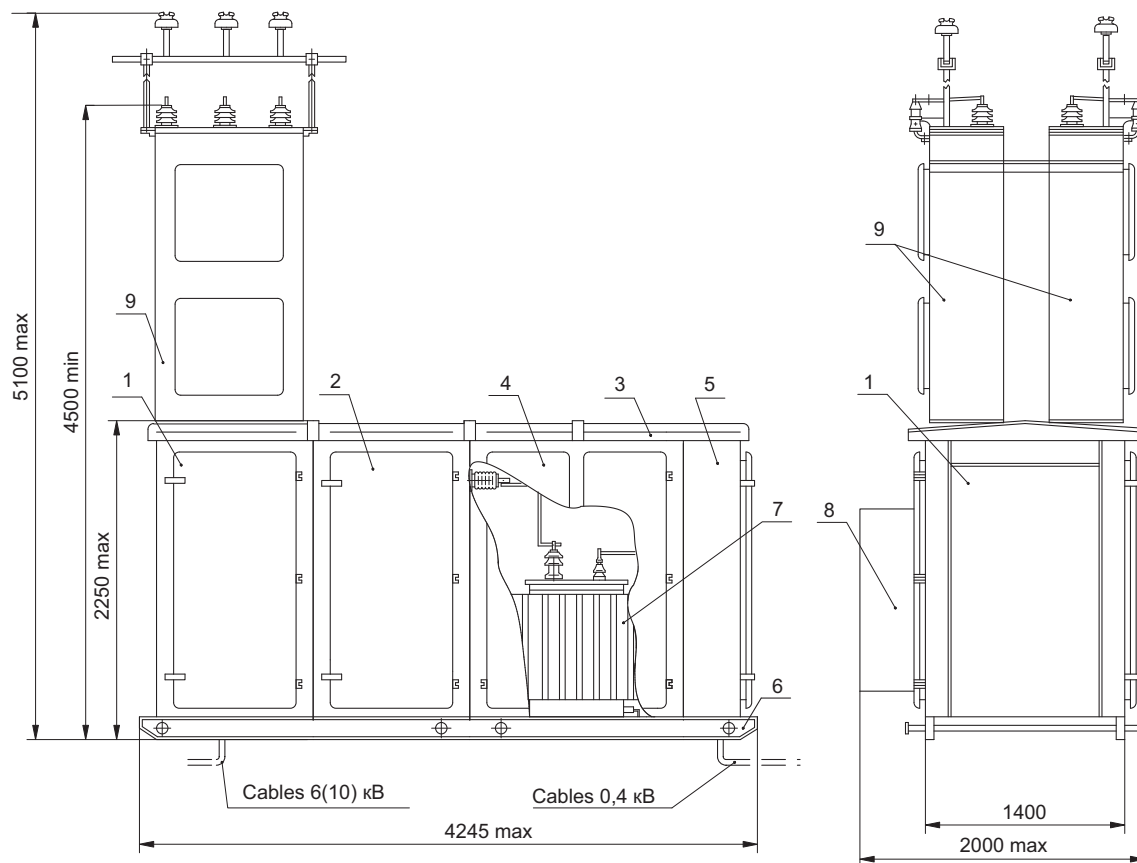
Notes:

Mass of КТП (transformer excluded) at most, kg:

- with air-type lead-in – 1300 kg
- with cable-type lead-in – 1880 kg

- 1 - transformer input cabinet (for КТП with cable-type lead-in);
- 2 - cabinet for transformer and LV distributing gear;
- 3 - transformer compartment;
- 4 - compartment for LV distributing gear;
- 5 - sleds;
- 6 - transformer (if ordered);
- 7 - casing;
- 8 - HV air-type lead-in cabinet (for КТП with air-type lead-in only).

Overall mounting dimensions and mass of КТППАС-М rating 630 kV·A



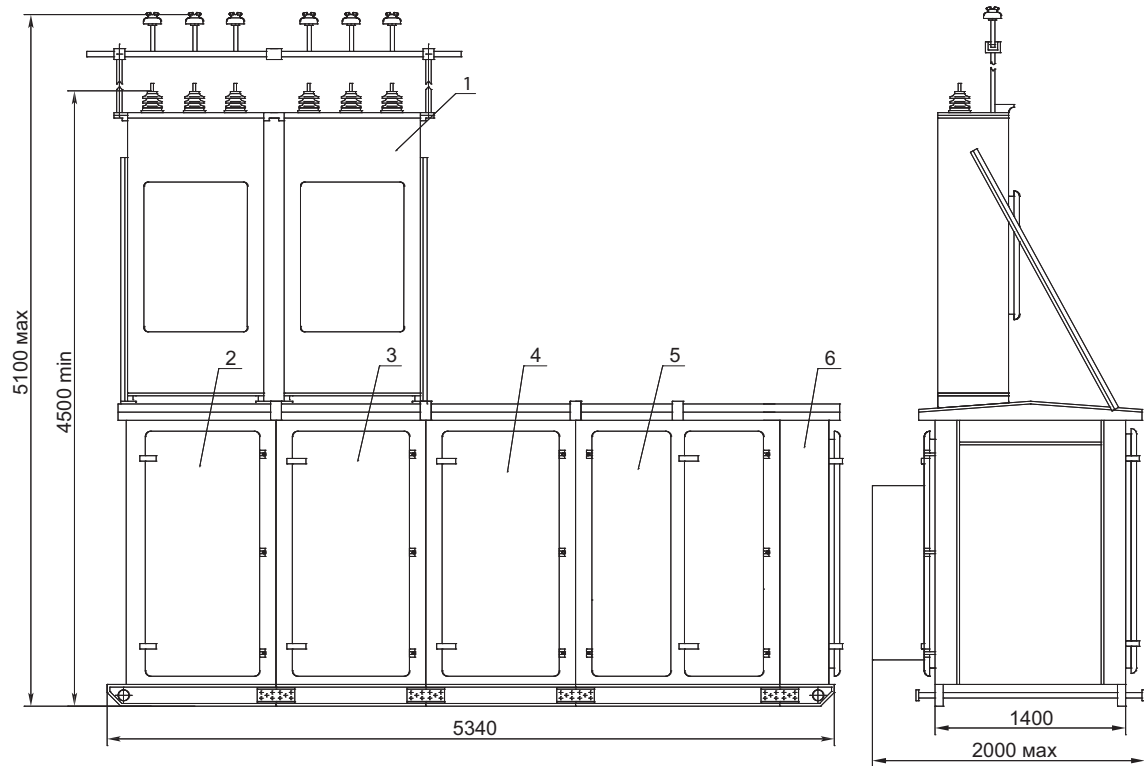
Notes:

Mass of КТП (transformer excluded) at most, kg:

- with air-type lead-in – 3100 kg
- with cable-type lead-in – 2680 kg

- 1 - HV input cabinet;
- 2 - transformer input cabinet;
- 3 - cabinet for transformer and LV distributing gear;
- 4 - transformer compartment;
- 5 - compartment for LV distributing gear;
- 6 - sleds;
- 7 - transformer (if ordered);
- 8 - casing;
- 9 - HV air-type lead-in cabinet (for КТП with air-type lead-in only).

Overall dimensions and mass of КТППАС-М rating 630 kV·A (HV inlet devices are installed in separated cabinets)



Notes:

- 1 - HV input cabinets (for КТП with air-type lead-in only);
- 2 - HV leading-in cabinet N1;
- 3 - HV leading-in cabinet N2;
- 4 - transformer input cabinet;
- 5 - cabinet for transformer;
- 6 - LV distributing gear cabinet.

Unitized Transformer Substations of КТП ТАС-М type (modernized)

rating 63-250 кV·A, with a voltage 6(10) кV

Special features of these КТП are the next:

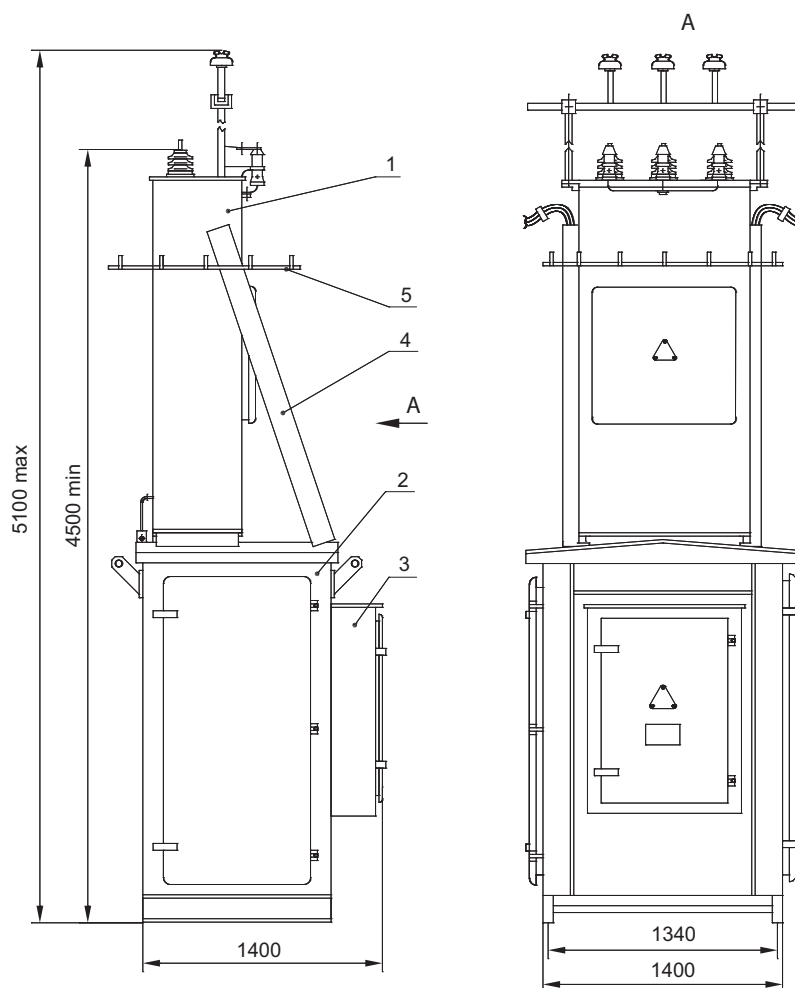
- HV lead-in into substation is of air-type. Lead-outs of outgoing lines are of air-type or of cable-type.
- Maximum quantity of outgoing lines – 3.
- Active energy record keeping on 0.4 кV input terminal is realized by active energy meter which is connected to current transformer and phases of network trough testing box.

Main technical parameters

Transformer type	ТМГ							
Rated power of power transformer, кV·A	63		100		160		250	
Transformer connection/vector group	Y/YH-0							
HV rating, кV	6	10	6	10	6	10	6	10
Rated current of transformer on HV side, A	6,06	3,64	9,62	5,77	15,4	9,25	24,1	14,4
Rated current of fuse link on HV side, A	16	10	20	16	31,5	20	50	31,5
LV rating, кV	0,4		0,4		0,4		0,4	
Rated current of transformer on LV side, A	91,1		144,3		231,0		361,0	
Rated current of outgoing lines, A:								
N 1	40		40		80		100	
N 2	40		80		100		100	
N 3	63		100		160		250	
street lightning	16 (25*)							

Notes:

1. * - in accordance with the customer's option.
2. Transformer connection/vector group, as well as currents and number of outgoing feeders may be selected as per customer's will.

Overall dimensions and mass of КТПТАС rating 63-250 kV·A**Notes:**

- 1 - HV air-type lead-in cabinet;
- 2 - cabinet for transformer;
- 3 - cabinet for LV distributing gear;
- 4 - angle bar;
- 5 - support (for КТП with air-type lead-in only).

Unitized Transformer Substations of КТП ТАС type

rating 1000 кV·A, with a voltage 6(10) кV

Special features of these КТП are the next:

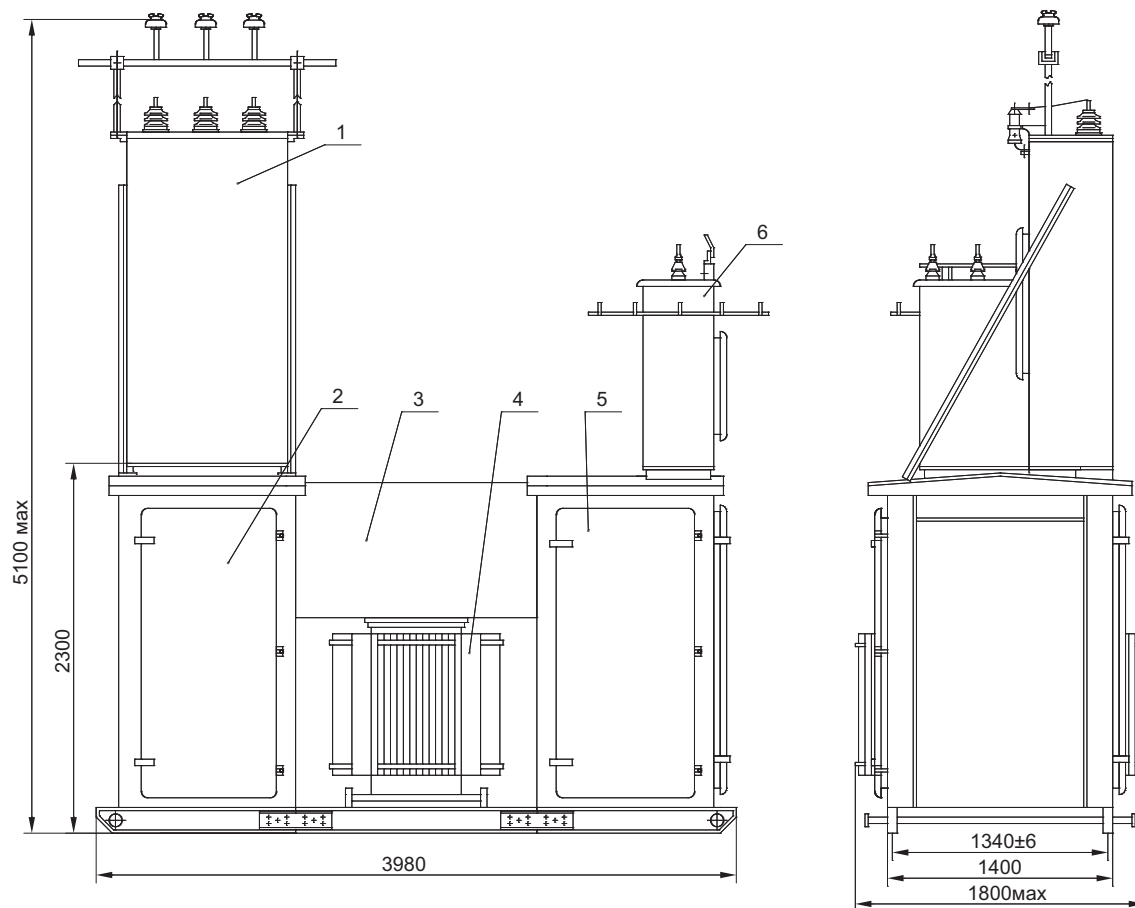
- КТП furnishing with counter devices of active and reactive energy (on customer's request is possible the installation of active energy counter device only).
- Open-faced installation of transformer, under housing.
- Transformers complete with electronic pressure-vacuum gauge as per customer's request.
- Maximum quantity of outgoing lines – 10 (ten).

Main technical parameters

Transformer rated power, кV·A	1000	
Transformer connection/vector group	Y/YH-0 or Δ/YH-11	
HV rating, кV	6	10
Rated current of transformer on HV side, A	96,2	57,7
Rated current of HV fuse link, A	125	100
LV rating, кV	0,4	0,4
Rated current of transformer on LV side, A	1443,4	1443,4
Rated current of outgoing lines, A:		
N 1	160	
N 2	250	
N 3	100	
N 4	160	
N 5	100	
N 6	100	
N 7	630	
N 8	250	
N 9	320	
N 10	400	
Lighting line	25	

Note: Transformer connection/vector group, as well as currents and number of outgoing feeders may be selected as per customer's will.

Overall dimensions and mass of KТПTAC rating 1000 kV·A



Notes:

KТП mass(without transformer) not more than 2000 kg;

- 1 - HV air-type lead-in cabinet (for KТП with air-type lead-in only);
- 2 - transformer input cabinet;
- 3 - casing;
- 4 - power transformer;
- 5 - LV distributing gear cabinet;
- 6 - LV outputs cabinet (for KТП with air-type lead-out only).

Unitized Transformer Substations of КТП ТАС type

rating 630 кV·A, with a voltage 6(10) кV

Special features of these КТП are the next:

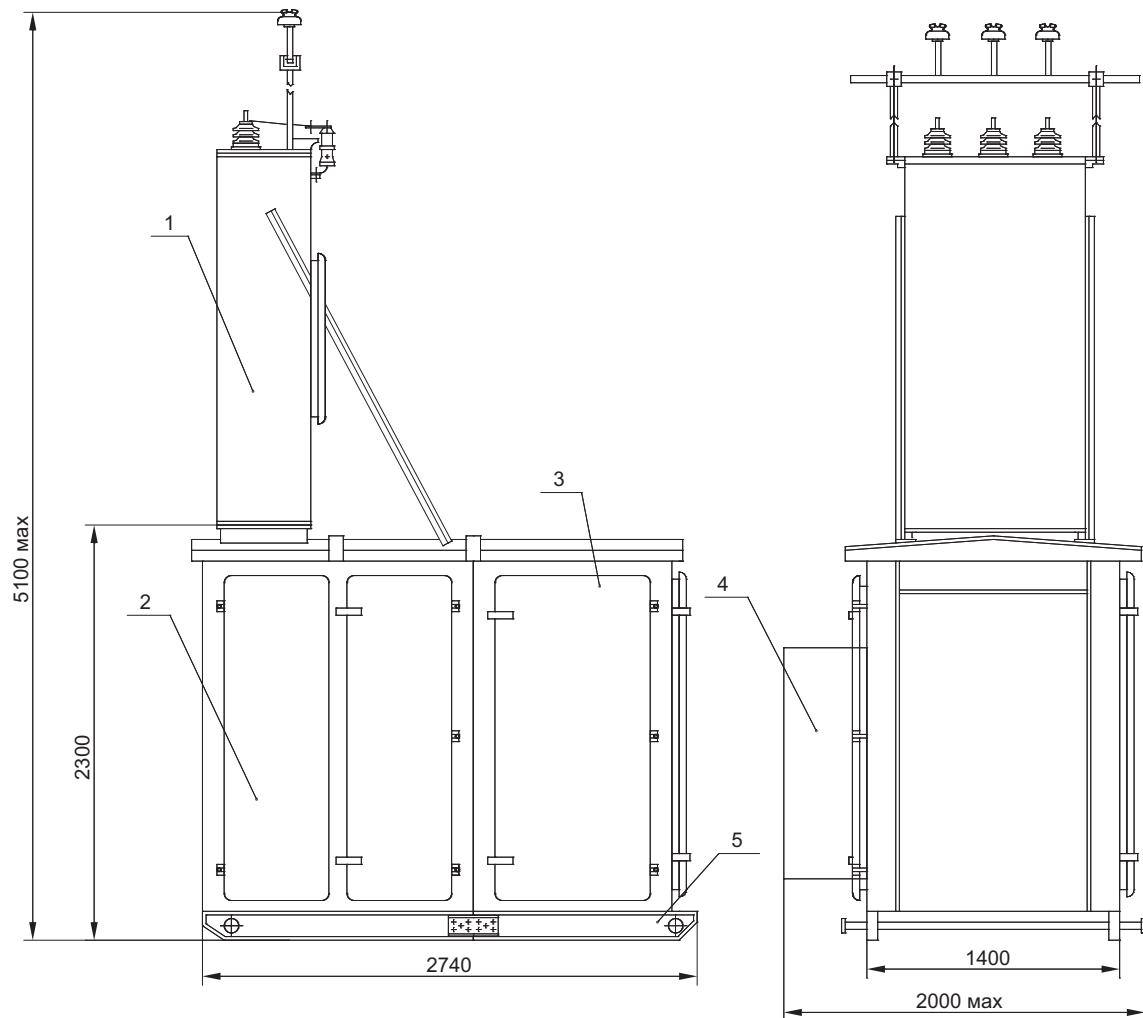
- HV lead-in into substation is of air-type.
- Lead-outs of outgoing lines are of cable-type.
- Maximum quantity of outgoing lines – 10.
- КТП furnishing with counter devices of active and reactive energy (on customer's request).

Main technical parameters

Transformer type	ТМГ	
Transformer rated power, кV·A	630	
Transformer connection/vector group	Y/YH-0 or Δ/YH-11	
HV rating, кV	6	10
Rated current of transformer on HV side, A	60,69	36,4
Rated current of HV fuse link, A	100	80
LV rating, кV	0,4	0,4
Rated current of transformer on LV side, A	910,4	910,4
Rated current of outgoing lines, A:		
N 1	160	
N 2	250	
N 3	100	
N 4	160	
N 5	100	
N 6	100	
N 7	250	
N 8	250	
N 9	320	
N 10	250	
Lighting line	16 (25*)	

Notes:

1. * - in accordance with the customer's option.
2. Transformer connection/vector group, as well as currents and number of outgoing feeders may be selected as per customer's will.

Overall dimensions and mass of КТПТАС rating 630 kV·A**Notes:**

КТП mass (without transformer) not more than 1550 kg.

- 1 - HV air-type lead-in cabinet;
- 2 - cabinet for transformer;
- 3 - cabinet for LV distributing gear;
- 4 - casing;
- 5 - sleds.

KТП with KY (with compensation of reactive power)

Most of electric devices together with active power, expend also reactive power.

Unitized transformer substations with compensation of reactive power, in process of compensating the reactive component of power, reduce the total power, at that:

- objectives for transmission line capability are reduced. (transformer design power and cable cross-sections are smaller);
- electric power losses in wires are reduced;
- technical data of the network are bettered by appropriate voltage changing in its nodes;
- the service life of using equipment is extended;
- the sum of payment for energy consumption is lowered.

Use of capacitor banks in unitized transformer substations with compensation of reactive power guarantees:

1. exact accuracy of pre-set power factor;
2. maintenance of optimum reactive power compensation condition depending on load;
3. selective connection of capacitor banks steps.

KТП with KY (with compensation of reactive power)

rating 63-400 кV·A, with a voltage 6(10) кV

Special features of these KТП are the next:

- Lead-outs of outgoing lines on LV side are of cable-type.
- Presence of socket with plug cutout for maintenance feeder line power supply.

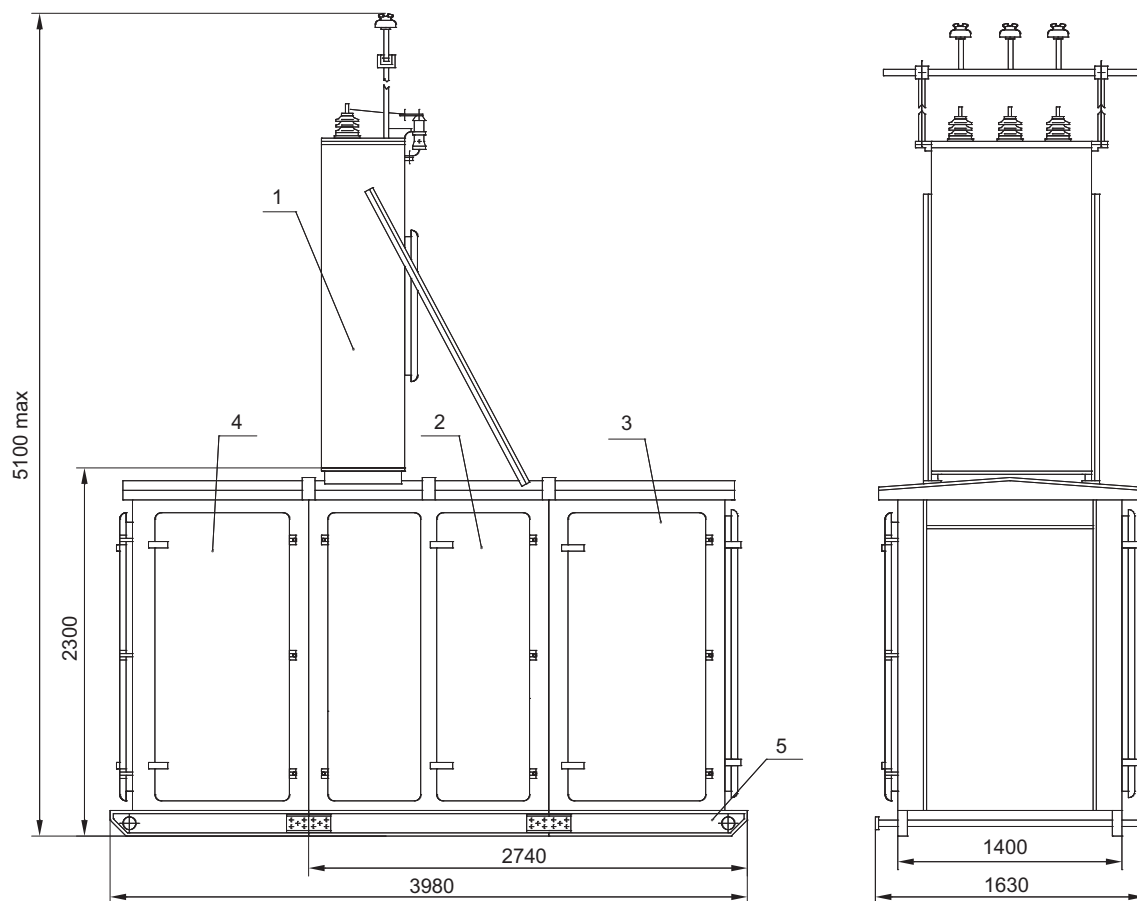
Main technical parameters

Transformer type	ТМГ				
Transformer rated power, кV·A	63	100	160	250	400
Transformer connection/vector group	Yyn-0			Δ/YH-11	
HV rating, кV	6 (10)				
LV rating, кV	0,4				
Rated current of outgoing lines, A:					
N 1	25	40	80	100	100
N 2	25	40	80	100	160
N 3	63	100	160	160	200
N 4	40	80	100	200	200
N 5	40				
N 6 (maintenance feeder)	63				
street lightning	16 (25 ^{***})				
Rated power of capacitor device **, кV·A (reactive kilovolt-ampere)	25*	50*	75*	100*	150*

Notes:

1. * - the power of capacitors may be changed as per customer's will.
2. ** - capacitor devices with hand or automatic control may be used as per customer's will.
3. *** - in accordance with the customer's option.
4. Transformer connection/vector group, as well as currents and number of outgoing lines may be selected as per customer's will.

Overall mounting dimensions and mass of КТПТАС with КУ, rating 63-400 kV·A



Notes:

КТП mass (without transformer) not more than:

- with air-type lead-in - 2550 kg
- with cable-type lead-in - 3200 kg

- 1 - HV air-type lead-in cabinet (for КТП with air input);
- 2 - cabinet for transformer;
- 3 - cabinet for LV distributing gear with compensation of reactive power;
- 4 - transformer input cabinet (for КТП with cable-type lead-in);
- 5 - sleds.

2КТП with ABP (with automatic load transfer)

2КТП are intended for power supply of 1-category consumers as per power supply reliability.

2КТП consist of two one-transformer substations.

In normal operating regime, every power transformer operates for its bus-bars. By deficiency of voltage in one of the sections (of bus-bars), the automatic load transfer starts up and all the consumers are powered from power transformer which remains in service. It is possible because on LV substation side of the sections 1 and 2 load transfer carries out (with the help of automatic cut-out).

Control of automatic cut-outs, providing input in 0.4 kV LV switchgear (disconnect switch) and of section switch is possible in manual mode (by push buttons).

Visual disconnection of contacts, during 2КТП erection and its maintenance, provides by installing of disconnect automatic and section switches of pull-out version, or stationary version complete with bladed switches.

2КТП substations may be completed on basis of terminal and double-ended КТП types of different design and power (25-1600 kV·A) as per customer's demand.

2КТП ТАС with ABP (with automatic load transfer)

rating 630 кV·A, with a voltage 6(10) кV

Special features of these КТП are the next:

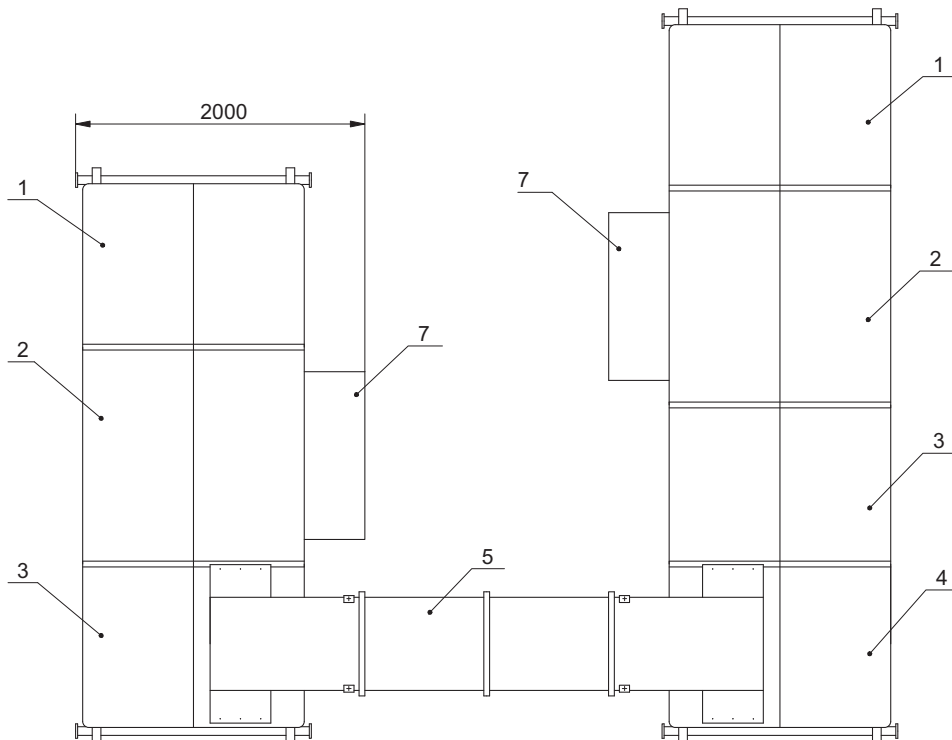
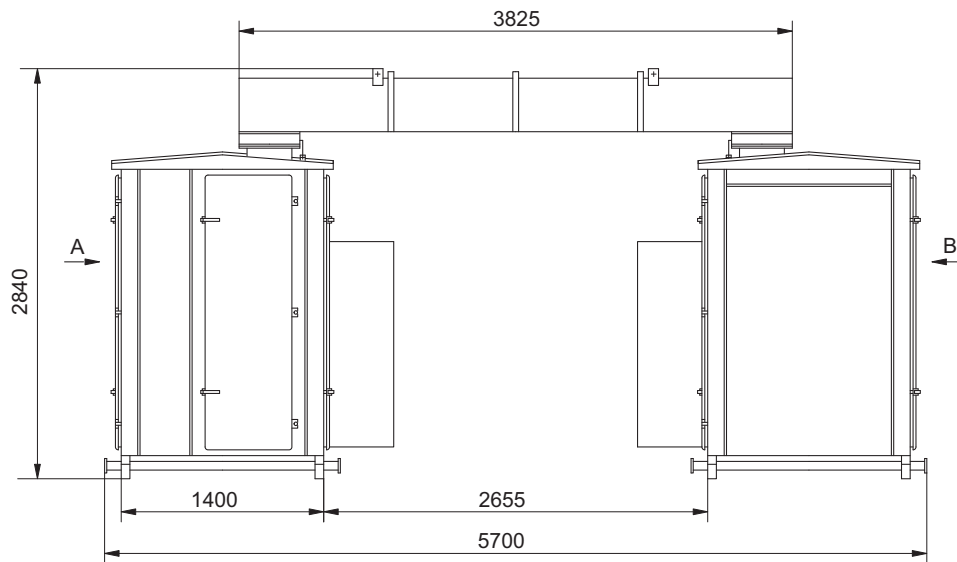
- HV lead-in into substation is of cable-type.
- 0.4 кV outlets are of cable-type.
- Constructively the substation consists of two one-transformer substations connected on 0.4 кV side by bus-bar bridge.
- Disconnect and section switches are of pull-out version.
- КТП furnishing with counter devices of active and reactive energy (on customer's request is possible the installation of active energy counter device only).

Main technical parameters

Transformer type	ТМГ
Transformer rated power, кV·A	2x630
Transformer connection/vector group	Y/YH-0 or Δ/YH-11
HV rating, кV	6 (10)
LV rating, кV	0,4
Rated current of outgoing lines, A (sections N1, N2):	
N 1	160
N 2	250
N 3	100
N 4	160
N 5	100
N 6	100
N 7	250
N 8	250
N 9	320
N 10	250
Lighting line	25

Notes:

1. Transformer connection/vector group, as well as currents and number of outgoing feeders may be selected as per customer's will.

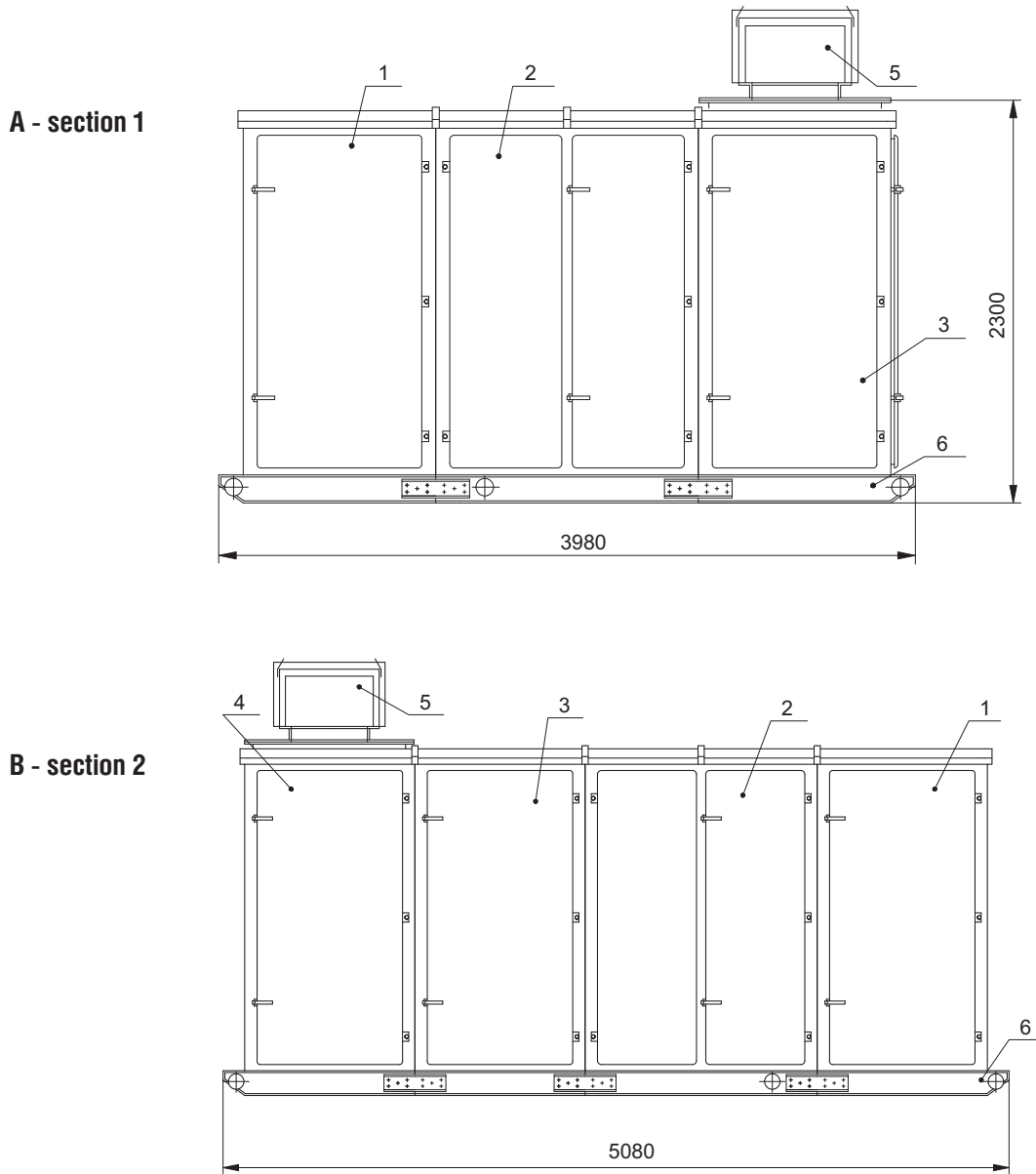
Overall mounting dimensions and mass of 2KTΠTAC with ABP, rating 630 kV·A**Note:**

It is possible the manufacturing of 2KTΠ of unilinear design version (without bus-bar bridge).

(continuation is on the page 30)

Overall mounting dimensions and mass of 2KTPTAC with ABP, rating 630 kV·A

(start of text is on the page 29)



Notes:

Mass of the unit 1 (without transformer)
Not more than 1860 kg.

Mass of the unit 2 (without transformer)
Not more than 2355 kg.

- 1 - transformer input cabinet;
- 2 - cabinet for transformer (with transformer by its order);
- 3 - cabinet for LV distributing gear with compensation;
- 4 - automatic load transfer cabinet;
- 5 - LV bus-bar bridge;
- 6 - sleds;
- 7 - housing.

2ΚΤΠΤΑΣ with ABP; 2 ΚΤΠΠΑΣ with ABP

rating 630 κV·A, with a voltage 6(10) κV

Special features of these ΚΤΠ are the next:

- HV lead-in into substation is of air-type or cable-type.
- Lead-outs of outgoing lines are of cable-type.
- Constructively 2ΚΤΠ consists of two one-transformer substations of unilinear design version.

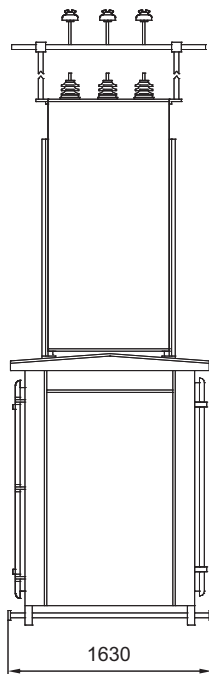
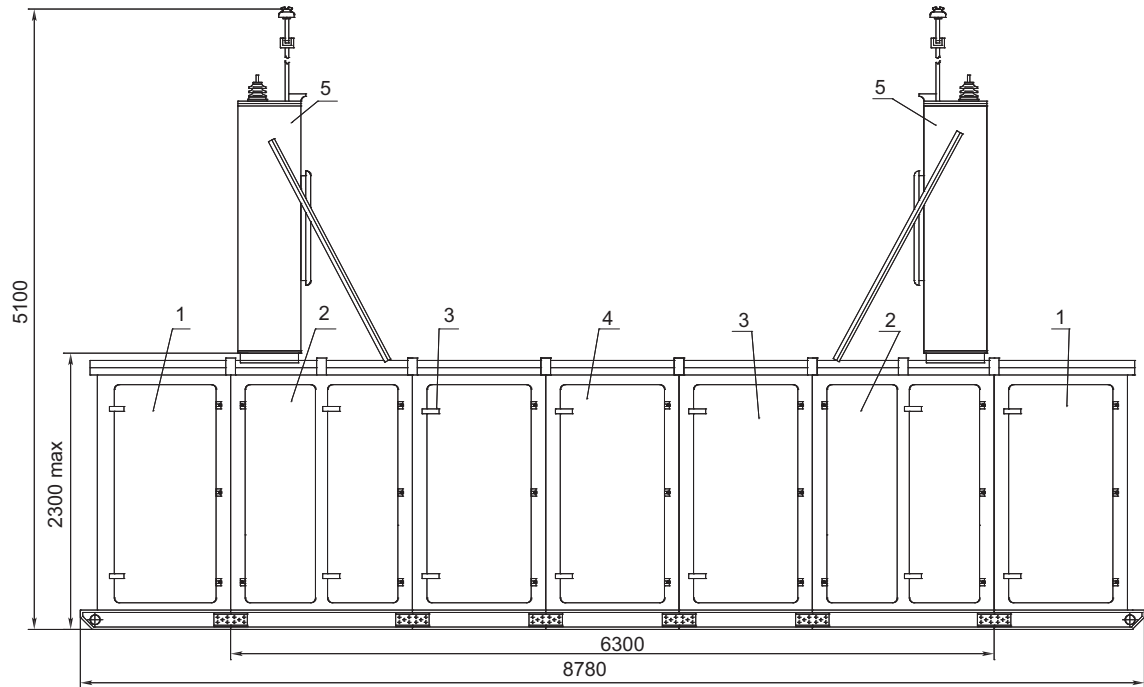
Main technical parameters

Transformer type	TMΓ									
Transformer rated power, κV·A	63		100		160		250		400	
Transformer connection/vector group	Y/YH-0					Y/YH-0 or Δ/YH-11				
HV rating, κV	6	10	6	10	6	10	6	10	6	10
Rated current of safety device on HV side, A	16,0	10,0	20,0	16,0	31,5	20,0	50,0	31,5	80	50
LV rating, κV	0,4									
Rated current of outgoing lines, A (sections N1, N2):										
N 1	25		40		80		100		100	
N 2	25		40		80		100		160	
N 3	63		100		160		160		200	
N 4	40		80		100		200		200	
N 5	40									
N 6 (maintenance feeder)	63									
street lightning	16 (25*)									

Notes:

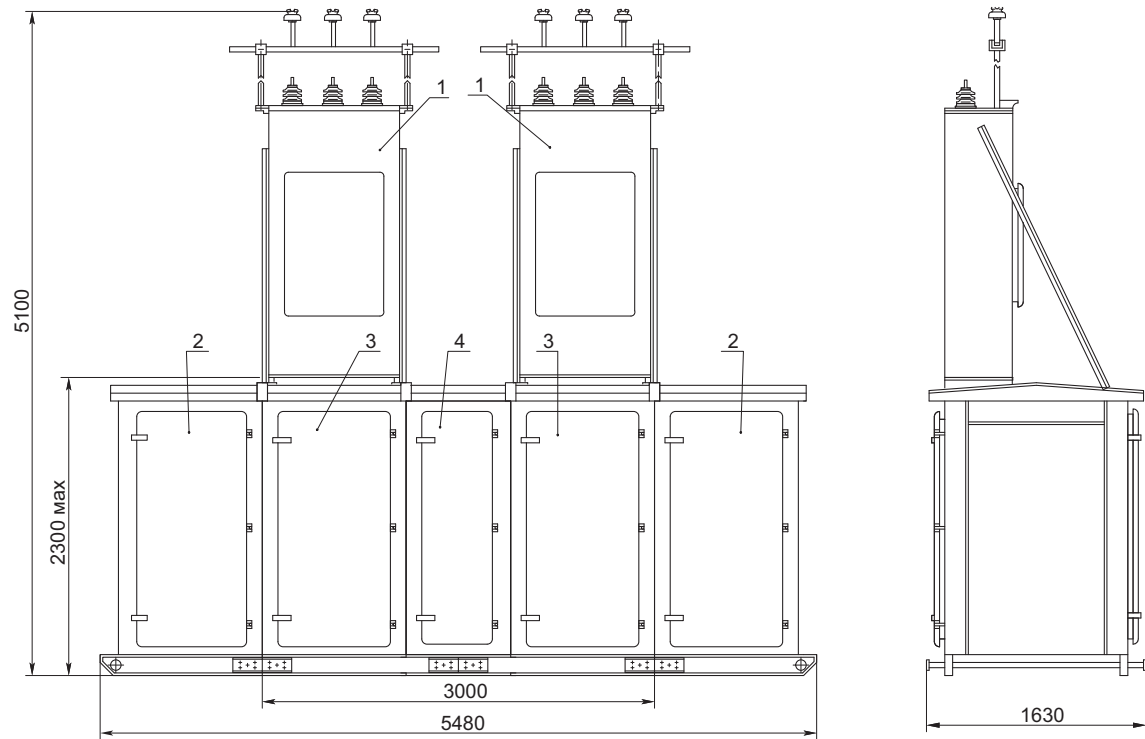
1. * - in accordance with the customer's option.
2. Transformer connection/vector group, as well as currents and number of outgoing feeders may be selected as per customer's will.

Overall dimensions of 2KTPTAC with ABP, rating 400 kV·A



Notes:

- 1 - transformer input cabinet (for 2KTΠ with cable-type lead-in);
- 2 - cabinet for transformer;
- 3 - cabinet for LV distributing gear;
- 4 - automatic load transfer cabinet;
- 5 - HV air-type lead-in cabinets (for 2KTΠ with air-type lead-in).

Overall dimensions of 2KTΠTAC with ABP, rating 63-250 kV·A**Notes:**

- 1 - HV air-type input cabinets;
- 2 - transformer input cabinet (only for 2KTΠ with transformer input);
- 3 - cabinet for transformer and for LV distributing gear;
- 4 - compartment for automatic load transfer.

TRANSFORMER SUBSTATIONS

for power supply of users in agricultural branch, small industrial and other units

Transformer substations (ТП) are one-transformer substations of terminal type for outdoor installation. ТП substations are designed to receive electric energy – alternative current of 6 (10) kV, to convert it into 0.4 (0.23) kV for energy supply of consumers under moderate climatic conditions (from – 45°C to +40°C).

ТП substations are intended for power supply for power supply and protection of agricultural users (including farm enterprises and household plots), as well as of separate populated localities, of small industrial units and so on.

- High voltage input lead into substation is air.
- ТП is connected to power transmission line through disconnecting switch which is supplied complete with substation and is mounted on the transmission line nearest pole.
- ТП has function of active power consumption metering. Installation of energy counter of any modification (combined, electronic, etc.) is possible as per customer's request.
- ТП design provides the next protection types:
 - against lighting overvoltage;
 - against interphase short circuit;
 - against overload and short circuits of 0.4 kV power lines;
 - against short circuits of ТП heating and lighting circuits.
- ТП are equipped with electrical and mechanical interlocking (complete outfit) ensuring safety of attending personnel.
- ТП advantages:
 - non-hazardous for environment;
 - design allows prompt assembling and starting at the operation place and prompt disassembling by changing of mounting location.
 - have rubber seals on doors and on abutting assembled joints;
 - have attractive aesthetic appearance;
 - are completed with ТМГ series modern hermetically sealed transformers of own production.

Unitized Transformer Substations of КТП type КТП-02, КТП-04 и КТПР types

rating 25-250 кV·A with a voltage 6(10) кV

Special features of these КТП are the next:

- Lead-outs of outgoing lines are:
 - КТП-02 – of air-type (excluding the line №4, connection to which is realized only by cable);
 - КТП-04 – of cable-type;
 - КТПР – of air-type.
- On 0,4 кV outgoing feeders are installed:
 - КТП-02, КТП-04 –automatic circuit breakers;
 - КТПР - bladed-type switch – protection device units.
 - Complete with КТП, КТПР is delivered the operating deck of LV distributing gear cabinet (by its order).

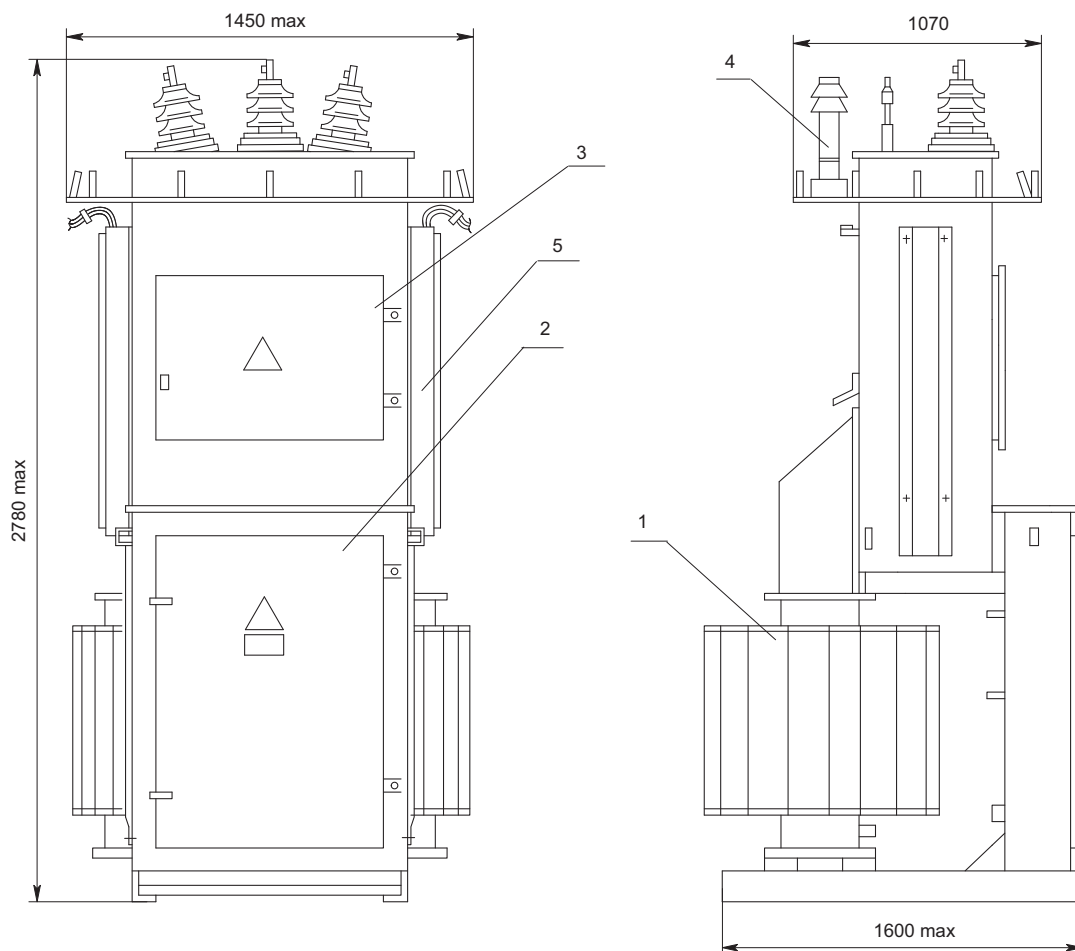
Main technical parameters

Transformer power, кV·A	25		40		63		100		160		250	
HV rating, кV	6	10	6	10	6	10	6	10	6	10	6	10
Of fuse-link on HV side, A	8	5	10	8	16	10	20	16	31,5	20	40	31,5
Rated current on LV side, A:												
Of fuse-link	8	5	10	8	16	10	20	16	31,5	20	40	31,5
Of transformer	36,1		57,5		91,0		144,3		231,0		361,0	
N 1	31,5		31,5		40		40		80		80	
N 2	31,5		63		63		100		160		250	
N 3	-		-		40		80		100		100	
N 4	-		-		-		-		-		250	
Exterior lighting lines	16 (25*)											

Notes:

1. * - in accordance with the customer's option.
2. Transformer connection/vector group, as well as currents and number of outgoing feeders may be selected as per customer's will.

Overall dimensions and mass of КТП-02, КТП-04, КТПР



Notes:

Mass (without transformer), not more:

КТП 25-160 kV·A - 350 kg;

КТП 250 kV·A - 400 kg.

- 1 - transformer (by its order);
- 2 - cabinet for LV distributing gear;
- 3 - HV device cabinet;
- 4 - PBO – nonlinear resistance arrester (lightning discharger, over-voltage limiter);
- 5 - case (only for КТП with air-type lead-outs).

МТП-type pole-mounted transformer substations

rating 25-100 кV·A with a voltage 6(10) кV

Special features of МТП are the next:

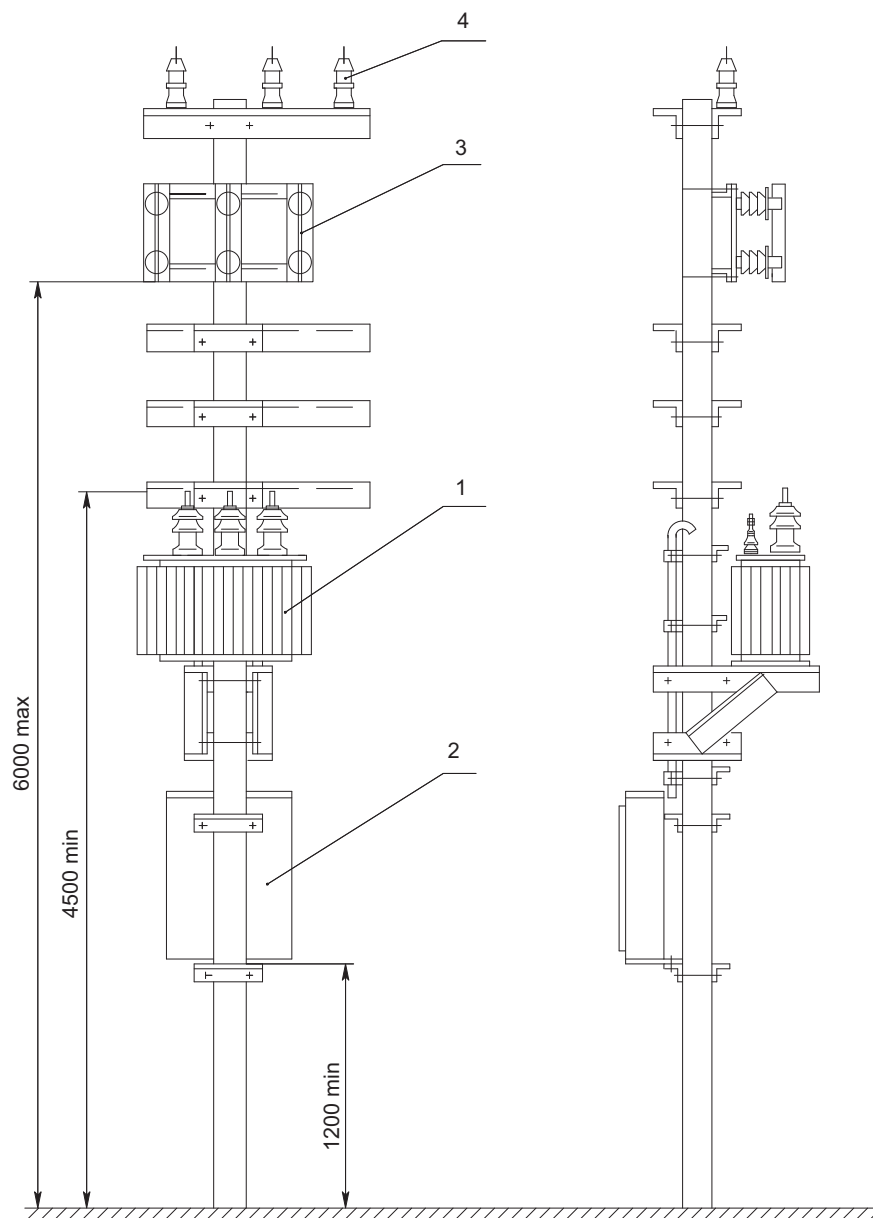
- LV lead-outs of outgoing lines are of air-type; on customer's demand – are of cable-type.
- On 0,4 kV outgoing feeders are installed:
 - МТП-2000 – cut-out chopper-switches;
 - МТП-2010 – automatic circuit breaker .
- Mounting, assembly and connection to network carry out on one pole (in accordance with efficient type plans).
- Cabinet outer cover protection degree – PYHH-IP34.
- МТП HV circuits are resistant to 10 kA short circuit currents during 3 seconds.

Main technical parameters

Transformer type	ТМГ			
Transformer power, кV·A	25	40	63	100
Transformer connection/vector group	Y/YH-0			
HV rating, кV	6 (10)			
LV rating, кV	0,4			
Rated current of outgoing lines, A:				
N 1	31,5	31,5	40	40
N 2	31,5	63	63	100
N 3	-	-	40	80
Street lighting	16 (25*)			

Notes:

1. * - in accordance with the customer's option.
2. Transformer connection/vector group, as well as currents and number of outgoing lines may be selected as per customer's will.

Overall mounting dimensions of MTP1 rating 25-100 kV·A**Notes:**

- 1 - Transformer;
- 2 - LV distributing gear;
- 3 - HV protection device;
- 4 - Nonlinear resistance arrester (over-voltage limiter).

МТП-type pole-mounted transformer substations

rating 160, 250 kV·A with a voltage 6(10) kV

Special features of МТП are the next:

- LV lead-outs of outgoing lines are of air-type; on customer's demand – are of cable-type.
- On 0,4 kV outgoing feeders are installed:
- МТП-0,4 – cut-out chopper-switches;
- МТП-2010 – automatic circuit breaker .
- Mounting, assembly and network connection carry out on one pole (in accordance with efficient type plans).
- Cabinet outer cover protection degree – PYHH-IP34.
- МТП HV circuits are resistant to 10 kA short circuit currents during 3 seconds.

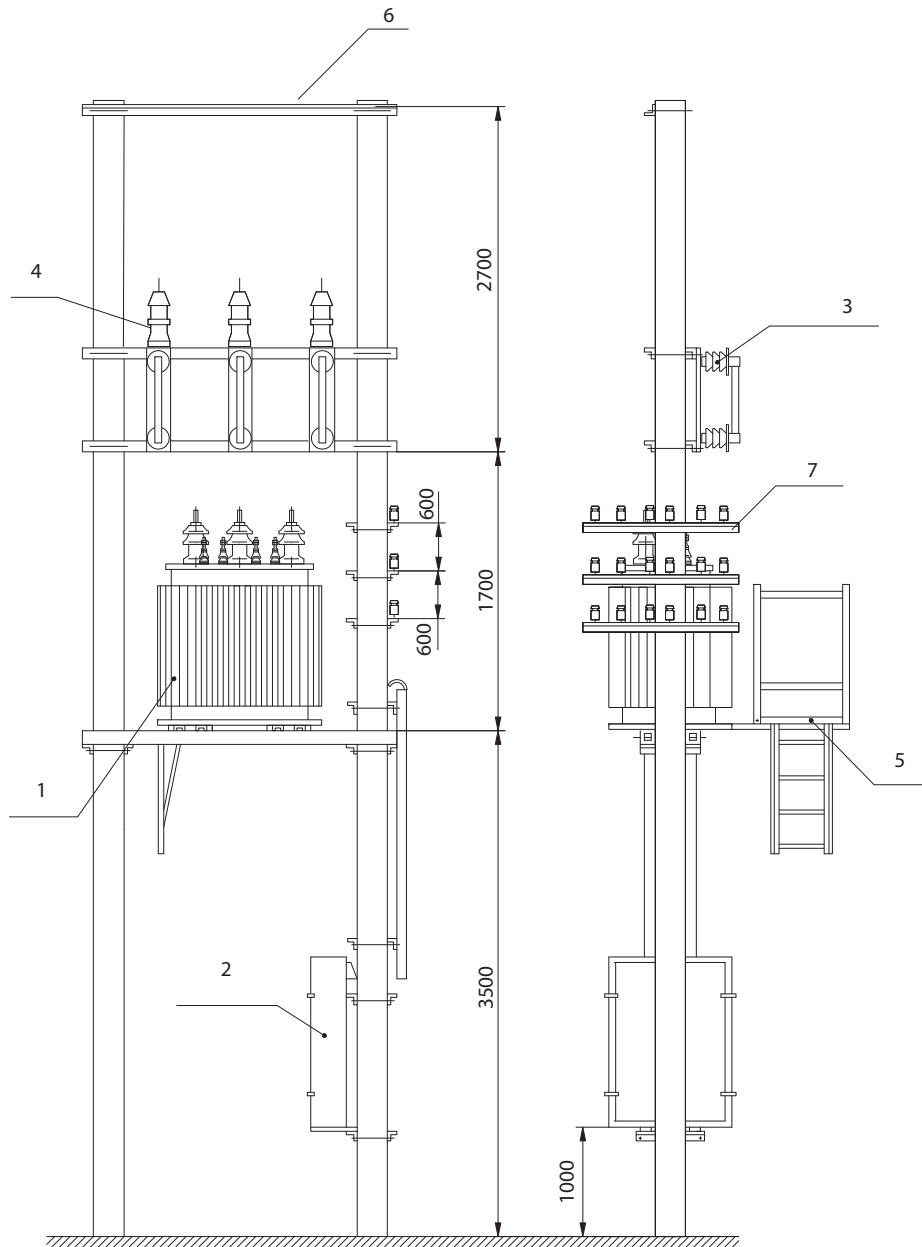
Main technical parameters

Transformer type	ТМГ			
Transformer connection/vector group	Y/YH-0			
HV rating, kV	6	10	6	10
LV rating, kV	0,4			
Substation type	МТП-04		МТП-2010	
Transformer power, kV·A	160	250	160	250
Rated current of outgoing lines, A:				
N 1	80	80	80	80
N 2	160	250	160	160
N 3	100	100	100	100
N 4	-	-	-	250
Street lighting	16 (25*)			

Notes:

1. * - in accordance with the customer's option.
2. Transformer connection/vector group, as well as currents and number of outgoing lines may be selected as per customer's will.

Overall mounting dimensions of MTP-04 (MTP-2010) rating 160, 250 kV·A



Notes:

- 1 - Transformer;
- 2 - LV distributing gear;
- 3 - HV protection device;
- 4 - Nonlinear resistance arrester (over-voltage limiter);
- 5 - Operating deck;
- 6 - Traverse beam 6(10) kV;
- 7 - Traverse beam 0,4 kV.

МТПО-type pole-mounted single phase transformer substations

rating 4 and 10 кV·A with a voltage 6(10) кV

Special features of МТПО are the next:

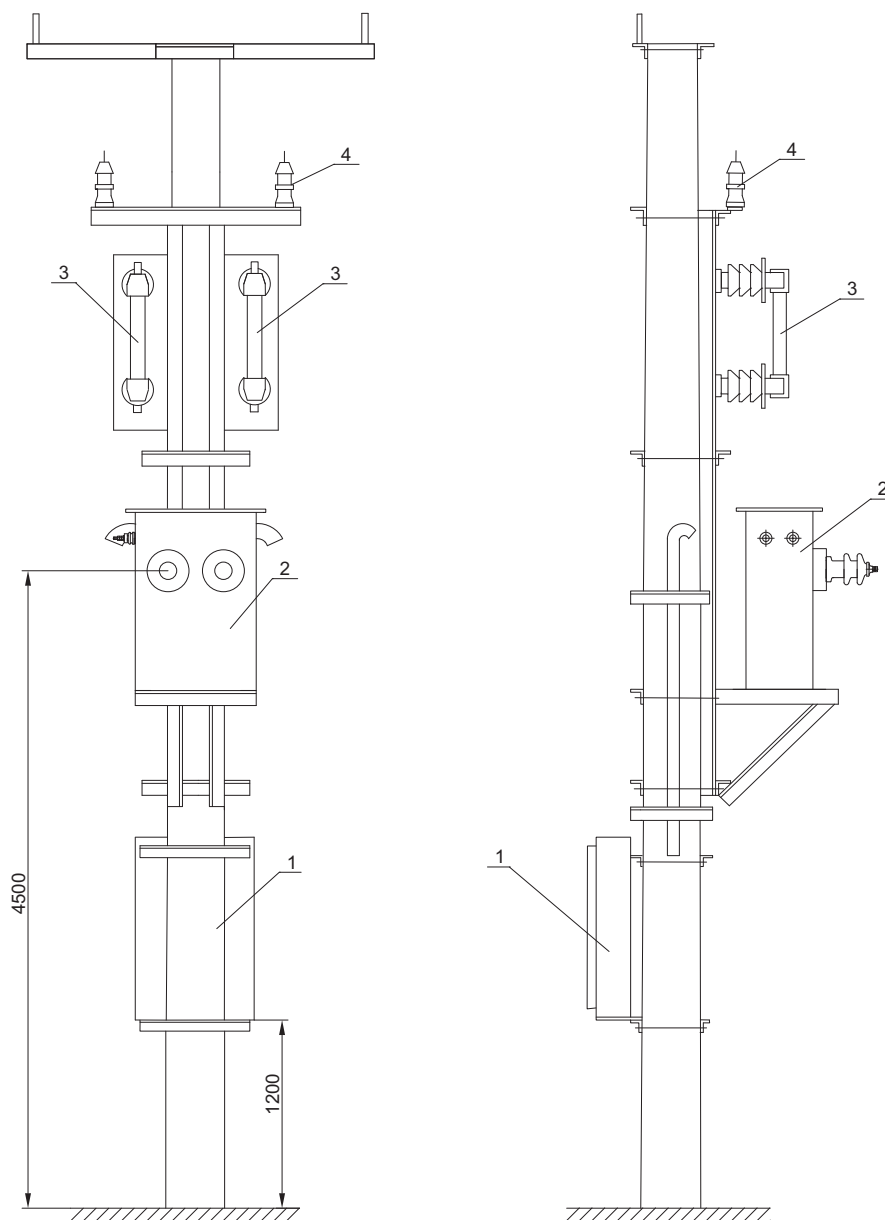
- Substations are intended to receive electric energy of single-phase alternative current.
- Layout of LV distributing gear cabinet and HV equipment (fuses, arresters and power transformer) is realized in accordance with efficient type plans.
- Metal wares for LV distributing gear cabinet, for power transformer, for HV nonlinear resistance arresters and for HV protection devices are delivered complete with МТПО.

Main technical parameters

Transformer power, кV·A	4		10	
Transformer connection/vector group	Y/YH-0			
HV rating, кV	6 (10)			
LV rating, кV	0,23			
LV rated current of transformer, A	17,4		43,5	
Rated current of outgoing lines, A				
N 1	25	16	40	25
N 2	-	16	-	25
Street lighting	16 (25*)			

Notes:

1. * - in accordance with the customer's option.
2. Currents and number of outgoing lines may be selected as per customer's will.

МТПО equipment layout on pole**Notes:**

- 1 - LV distributing gear cabinet;
- 2 - power transformer;
- 3 - HV protection device;
- 4 - nonlinear resistance arrester.

TRANSFORMER SUBSTATIONS for railway needs

Transformer substations (ТП) are one-transformer substations for outdoor installation and are intended to receive a.c. electric energy of 6 (10) or 27.5 kV, to convert it into 0.4 (0.23) kV as well as for power supply and protection of current-using equipment on railroads (tracks for passing, signaling devices, automatic blocking systems etc.) under moderate climatic conditions (from – 45°C to +40°C).

- ТП for needs of railroads are fabricated in following design versions:

Pole mounted transformer substations, rating 1,25-10 kV·A, with a voltage 6 (10) and 27,5 kV are intended for power supply of signaling devices, DNC control, automatic blocking systems, lighting and other low-powered current-using equipment on railroads. As far as all the equipment is mounted on pole, an access of any person (unrelated to attending personnel) is limited to a minimum.

T-shaped reinforced-concrete pole mounted transformer substations, rating 25 - 400 kV·A are intended for power supply of tracks for passing, roadside stations, crossings, railway structures that is to say of high-powered current-using equipment on railroads. Mounting on poles does not require constructing of special areas and concrete footings.

- HV lead-in into substation is of air-type; Lead-outs of outgoing lines are of cable-type.
- ТП is connected to power line through disconnecting switch (is supplied complete with substation) and is mounted on the nearest transmission line tower.
- Substations of all design versions have a number of advantages in comparison with analogous substations produced by other manufacturing works:
 1. ТП have electrical and mechanical blockings (complete outfit), that provide safety work of attending personnel;
 2. automatic circuit breakers installed on outgoing lines instead bladed switches with fuses;
 3. ТП are provided the power consumption metering. It is possible to install energy counter of any modification, as per customer's request;

4. presence of atmospheric-disturbance protections (over-voltages, overloads and short circuits);
5. safety for ecological environment;
6. substation's design lets rapid erection and setting in operation at worksite and rapid dismantling in the case of worksite changing;
7. substation has attractive aesthetic look;
8. substations are completed with TMГ type hermetically-sealed modern transformers of own production.

Unitized Transformer Substations of КТПЖ type

rating 25; 100; 250; 400 кV·A with a voltage 27.5 кV

Special features of КТПЖ are the next:

- 100-400 кV·A rating substations are provided active and reactive electrical energy consumption metering, 25 кV·A rating substations are provided only active electrical energy consumption metering.
- Stationary automatic breakers installed on outgoing lines.
- КТПЖ type three-phase substations with a voltage 27.5/0.4 кV are powered by TCR (two conductor- rail) system.

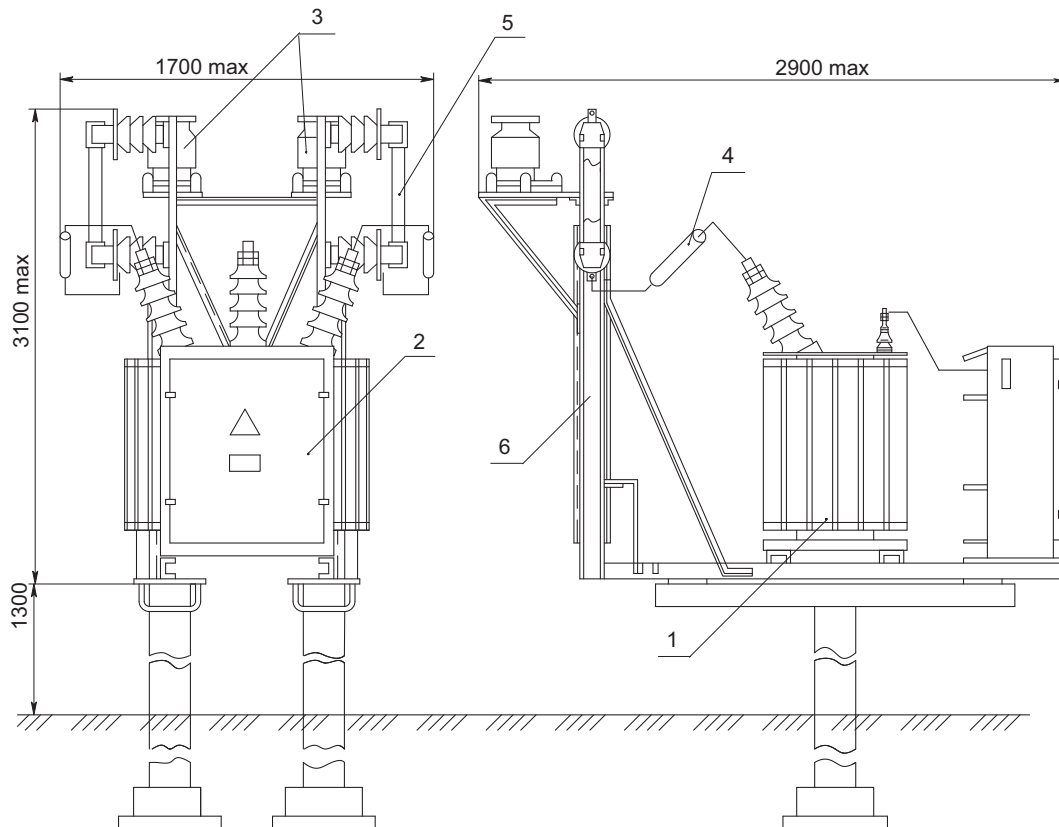
Main technical parameters

Transformer type	ТМГ			
Transformer power, кV·A	25	100	250	400
Transformer connection/vector group	Y/YH-0			
Rated current of outgoing lines, A				
N 1	16	63	250	400
N 2	16	63	100	100
N 3	16	100	100	250
N 4	-	-	250	400

Note:

Currents and number of outgoing lines may be selected as per customer's will.

Overall mounting dimensions and mass of КТПЖ



Power, kV·A	25	100	250	400
Mass of КТПЖ	1300	1650	2060	2670
Mass of transformer and LV distributing gear	1000	1350	1760	2370

Notes:

- 1 - power transformer;
- 2 - LV distributing gear cabinet;
- 3 - nonlinear resistance arrester;
- 4 - building-out network;
- 5 - protection device 35kV;
- 6 - metalware for high-voltage equipment attachment.

МТПЖ type pole-mounted transformer substation

rating 10 кV·A with a voltage 27.5 kV

Pole mounted transformer substation of МТПЖ type is single-phase, one-transformer substation for outdoor installation with two conductor-rail power system and is intended to receive electric energy of 27.5 kV, to convert it into 0.23 kV, for energy distribution, for protection and power supply of single-phase current collectors of railroad facilities under moderate climatic conditions.

Special features of МТПЖ are the next:

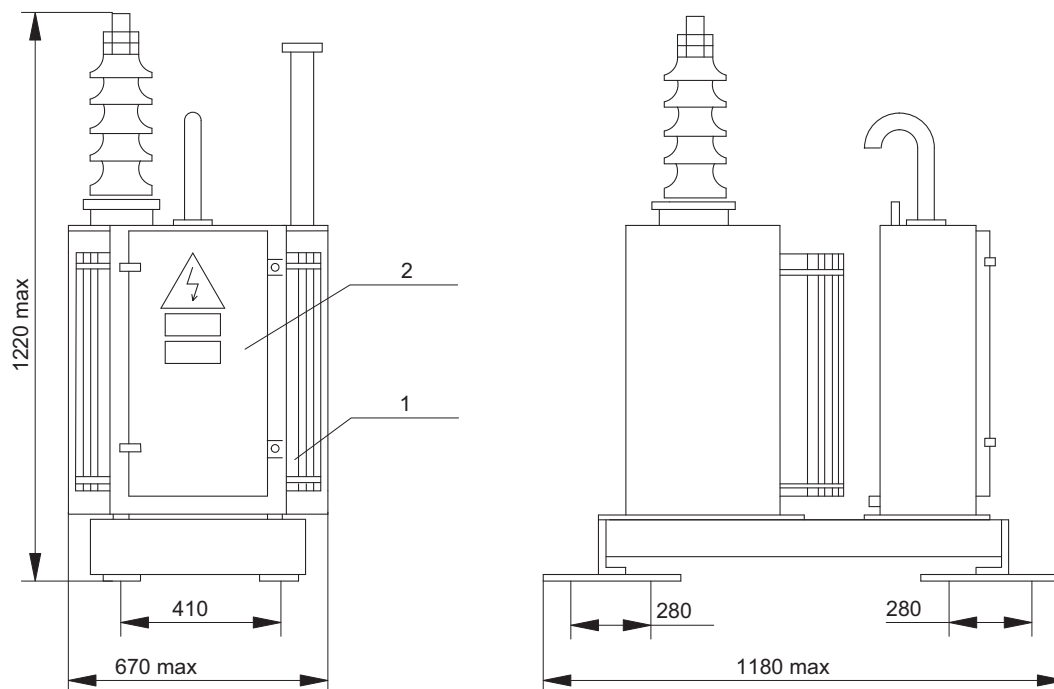
- МТПЖ is single-phase substation.
- МТПЖ design provides its installation on reinforced-concrete poles in accordance with efficient typical plan.

Main technical parameters

Power transformer rated power, кV·A	10
HV rating, kV	27,5
LV rating, kV	0,23
Transformer connection/vector group	1/1-0
Rated current of outgoing lines, A:	
N 1	25
N 2	25
N 3	25

Notes:

Currents and number of outgoing feeders may be selected as per customer's will.

Overall mounting dimensions and mass of MTPX rating 10 kV·A with a voltage 27.5 kV**Note:**

- 1 - Power transformer;
- 2 - LV distributing gear compartment.

HV equipment is delivered in sets.

МТПЖ type pole-mounted transformer substation

rating 1,25-10 kV·A with a voltage up to 27,5 k

МТПЖ rating 1,25; 2,5; 4; 10 kV·A are intended to receive electric energy of 6 (10) kV, to convert it into 0.23 kV, and for power supply of single-phase current collectors of railroad facilities under moderate climatic conditions (from – 45 °C to +40 °C). The metalware for МТПЖ fastening on pole is delivered in complete set.

Special features of МТПЖ are the next:

- МТПЖ are single-phase substations;
- Equipment arrangement:
 - version 1** – all apparatus on one tower of transmission line.
 - version 2** - all apparatus (except disconnector) on one tower of transmission line, disconnector – on the other nearest tower.

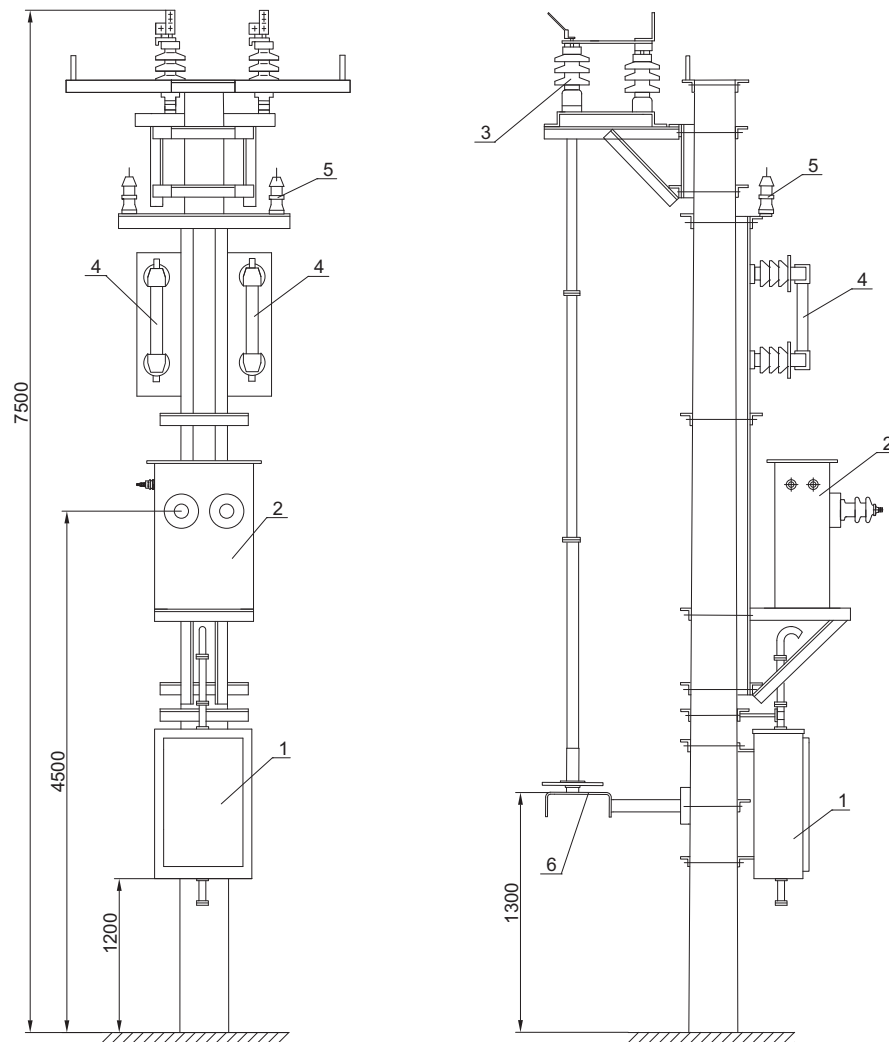
Main technical parameters

Power transformer rated power, kV·A	1,25	2,5	4,0	10,0	
HV rating, kV	6 (10)	6 (10) or 27,5		6 or 10	
LV rating, kV	0,23				
Transformer connection/vector group	1/1-0				
Rated current of outgoing lines, A:					
N 1	6	4	6	16	25
N 2	-	4	6	16	25

Note:

Currents and number of outgoing feeders may be selected as per customer's will.

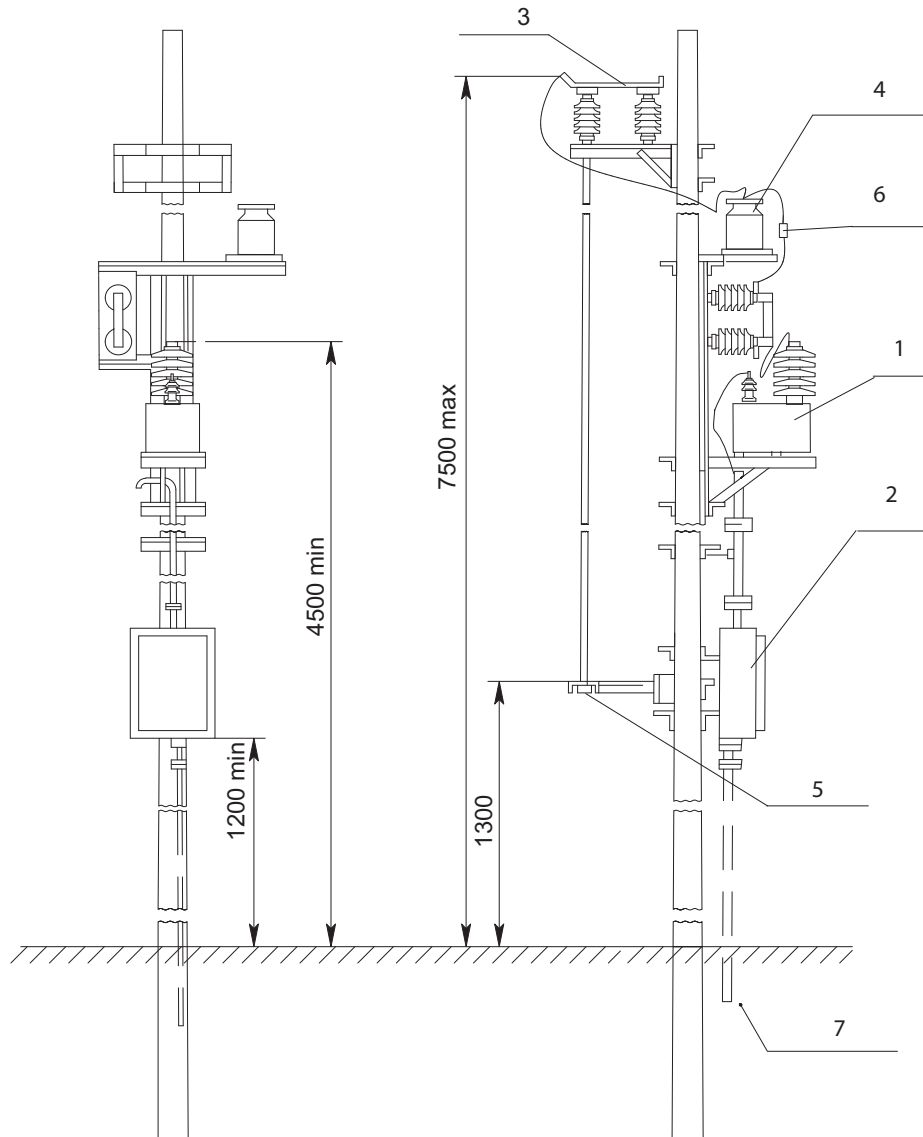
МТПЖ Equipment arrangement diagram, with a voltage 6(10) kV, on pole



Notes:

- 1 - LV distributing gear cabinet;
- 2 - power transformer;
- 3 - disconnector;
- 4 - HV protection device;
- 5 - over-voltage limiter (nonlinear resistance arrester);
- 6 - throw rod.

МТПЖ Equipment arrangement diagram, with a voltage 27,5 kV, on pole



Notes:

- 1 - power transformer;
- 2 - LV distributing gear cabinet;
- 3 - disconnector;
- 4 - over-voltage limiter;
- 5 - throw rod;
- 6 - building-out network;
- 7 - outlets 0,23 kV.

КТПОС type unitized transformer substations

rating 25; 40; 63 кV·A with a voltage 6(10) kV

Unitized transformer substations are used to receive electric energy – three-phase, 50 Hz a.c. of 6 or 10 kV, to convert it into 0.23 kV for power supply of consumers in networks with insulated neutral. Substations are intended for power supply of electric heating circuits of railway pointworks under moderate climatic conditions (from – 45°C to +40°C). Substations are provided the active power consumption metering.

Special features of КТПОС are the next:

- КТПОС is made with HV air-type lead-in and with cable lines of 0.23 kV.
- КТПОС is one-transformer substation for outdoor installation.
- КТПОС is connected to 6 (10) kV power transmission line through disconnecting switch (is supplied complete with substation) and is mounted on the nearest transmission line tower.
- Stationary automatic circuit breakers installed in КТПОС on outgoing lines.
- HV fuse holders are installed in HV device cabinet.
- КТПОС has electrical and mechanical blockings that provide safety work of attending personnel.

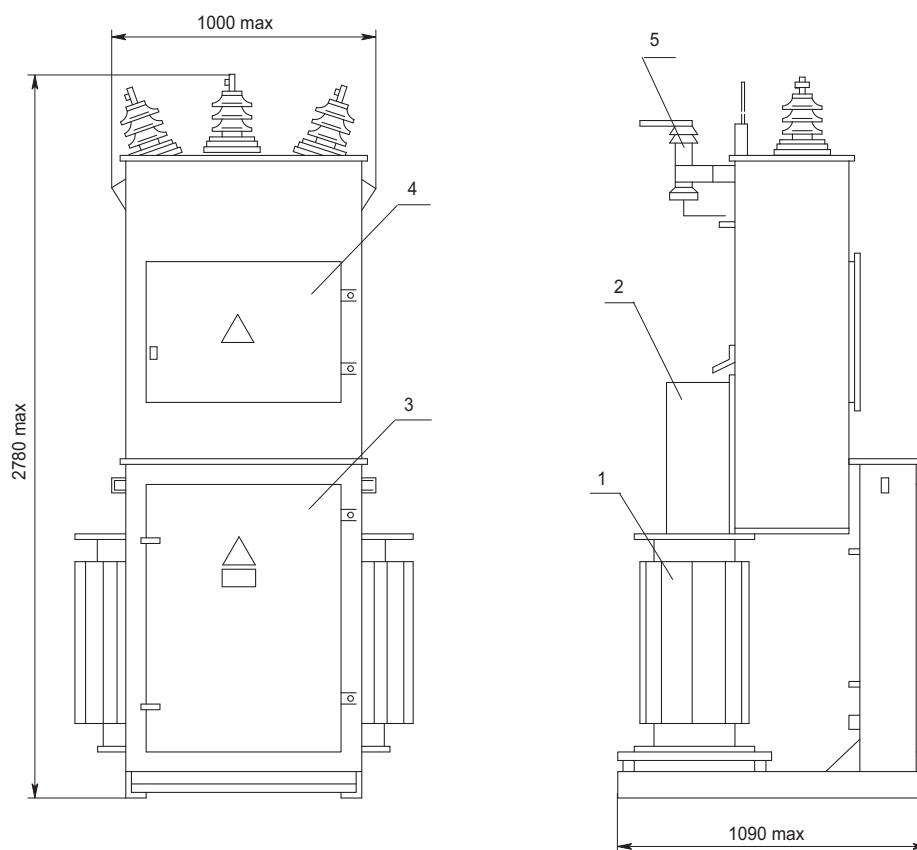
Main technical parameters

Power transformer rated power, кV·A	25		40		63	
Rated voltage on HV side, кV	6	10	6	10	6	10
Rated current on HV side, A:						
of transformer	2,40	1,44	3,85	2,31	6,06	3,64
of fuse link	8	5	10	8	16	10
Rated voltage on LV side, кV	0,23					
Rated current on LV side, A:						
of transformer	62,8		100,5		158,3	
N 1	80		125		80	
N 2	40		63		160	

Note:

Connection/vector group, currents and number of outgoing feeders may be selected as per customer's will.

Overall dimensions of КТПОС



Notes:

Mass (without transformer) 300 kg.

- 1 - transformer;
- 2 - transformer enclosure;
- 3 - LV distributing gear cabinet;
- 4 - HV device cabinet;
- 5 - nonlinear resistance arrester (over-voltage limiter).

UNITIZED TRANSFORMER SUBSTATIONS of special purpose

КТПТО-80 type unitized transformer substation

rating 80 kV·A with a voltage 380/55-95 V

Unitized transformer substations for outdoor installation of КТПТО-type are intended for electric heating of concrete and frozen soil and have manual and automatic function of temperature regulation. The substations are also used for power supply of temporary lighting systems and of three-phase handheld tools with a voltage 42 V under building sites conditions. Normal functioning of КТПТО is ensured within ambient temperature from - 40°C to + 10°C.

Substations are equipped with ТМТО-80/0.38 three phase triplewound transformers of natural cooling.

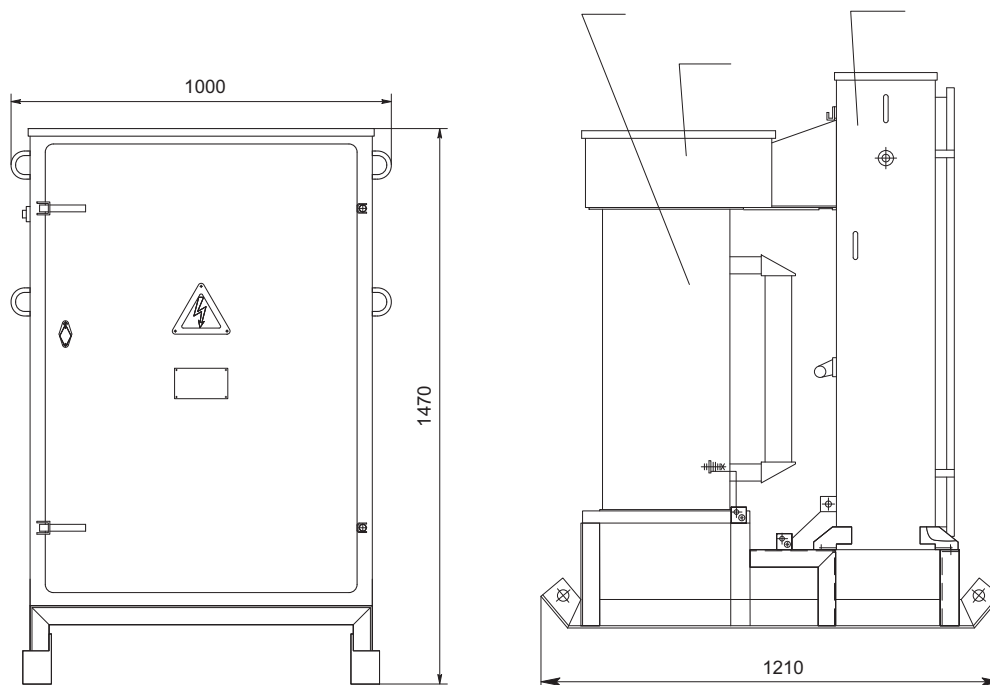
КТПТО are equipped with interlockings ensuring safety of attending personnel.

Interlockings close out:

- changing-over of voltage regulation steps of power transformer on voltage;
- opening out of control unit desk by powered-on automatic disconnect switch of the main circuit.

Main technical parameters

Power transformer rated power, kV·A	80				
HV rating, V	380				
No Load current voltage steps on MV side, V	55	65	75	85	95
Medium voltage current, A	520		471		
Rated power of LV winding of power transformer, kV·A	2,5				
Power transformer LV rating, V	42				
Temperature range (setting up in temperature detector), °C	0-100				


Overall dimensions and mass of КТПТО-80-07**Notes:**

Mass (with transformer) not more, than 560 kg.

- 1 - transformer;
- 2 - enclosure;
- 3 - control cabinet.

DEKRA Certification

CERTIFICATE



ISO 9001:2008




DEKRA Certification Sp. z o.o. hereby certifies that the company
**Minsk Elektrotechnical Plant
 Named After V.I. Koslov**

Scope of certification:
 Designing development, manufacturing and delivery of:
 - three-phase power transformers with voltage rating up to 35 kV and power up to 2500 kVA,
 - complete transformer substations with voltage rating up to 35 kV and power up to 2500 kVA,
 - low power transformers with voltage rating up to 1,5 kV and power up to 25 kVA.

Certified location:
 4, Uralskaya str. • 220037 Minsk, Belarus
 10, Babuszkina str. • 220037 Minsk, Belarus (branch)

has established and maintains a quality management system according to the above mentioned standard. The conformity was adduced with audit report no. UT-A 601311/A3/P/T/7601.

This certificate is valid from 2012-01-09 to 2013-12-30 Certificate registration no.: 321201008 duplicate


DEKRA Certification Sp. z o.o.
 Wrocław, 2012-01-09

DEKRA Certification GmbH • Handwerkerstraße 15 • D-70565 Stuttgart • www.dekra-certification.com

page 1 of 1

CERTIFICATE

ISO 14001:2004



hereby certifies that the company



**Industrial Republican Unitary Enterprise
 "MINSK ELEKTROTECHNICAL PLANT NAMED
 AFTER V.I. KOZLOV"**

business field:
 Designing, production and shipment of power, transformers rating up to 2500 kVA of up to 35 kV voltage class; complete transformer substations rating up to 2500 kVA of up to 35 kV voltage class; transformers rating up to 16 kVA of up to 1,5 kV voltage class.

location:
 4, Uralskaya st. • Minsk 220037
subsidiary:
 4, Babuszkina st. • Minsk 220037

has successfully implemented the above mentioned environmental management system according to the standard and applies it effectively. The conformity was inspected during the surveillance audit documented in audit report no. W-A 601311/A3/P/T/14001. This certificate is only valid in connection with the successful performance of the surveillance audits.

This certificate is valid from:	2011-04-18	Date of the first certification:	2000-01-01
This certificate is valid until:	2014-04-01	Certificate registration no.:	000411031 duplicate
Last audit day:	2011-04-15		

DEKRA Certification Sp. z o.o.
 Wrocław, 2011-04-18

UMS-TGA-ZM-05-91-60



EVPU Electrotechnical Research and Projecting Institute j.s.c.,
 SKTC 101 Nová Dubnica, Slovakia

ES CERTIFICATE OF CONFORMITY

No. 00547/101/1/2005

Holder: EU "Minsk Elektrotechnical Plant after V.I. Kozlov"
 Uralskaya St., 4, 220037 Minsk, Republic of Belarus

Product: Power Transformer

Trademark: -----

Types: TMG (power 16-250 kVA)

Test report: 1001/2005

Tested acc. to: EN 60076-1: 1997 +A11: 1997 +A1: 2000 +A12: 2002
 EN 60076-2: 1997
 EN 60076-3: 2001
 EN 60076-4: 2002
 EN 60076-5: 2000
 EN 60076-10: 2001

The certificate of conformity refers to the above mentioned product. This is to certify that the specimen is in conformity with the standards mentioned above. This certificate does not imply assessment of the production of the product and does not permit the use of a EVPU, a.s., SKTC 101 mark of conformity.

Nová Dubnica, December 22nd, 2005




EVPU, a.s., SKTC 101
 Trenčianska 19,
 018 51 Nová Dubnica
 Slovakia
 003759

Tel: ++421 (0)42 4403 600, 4403 500
 Fax: ++421 (0)42 4403 502
 e-mail: sktc101@evpu.sk



EVPU Electrotechnical Research and Projecting Institute j.s.c.,
 SKTC 101 Nová Dubnica, Slovakia

ES CERTIFICATE OF CONFORMITY

No. 00548/101/1/2005

Holder: EU "Minsk Elektrotechnical Plant after V.I. Kozlov"
 Uralskaya St., 4, 220037 Minsk, Republic of Belarus

Product: Power Transformer

Trademark: -----

Types: TMG (power 400-1600 kVA)

Test report: 1002/2005

Tested acc. to: EN 60076-1: 1997 +A11: 1997 +A1: 2000 +A12: 2002
 EN 60076-2: 1997
 EN 60076-3: 2001
 EN 60076-4: 2002
 EN 60076-5: 2000
 EN 60076-10: 2001

The certificate of conformity refers to the above mentioned product. This is to certify that the specimen is in conformity with the standards mentioned above. This certificate does not imply assessment of the production of the product and does not permit the use of a EVPU, a.s., SKTC 101 mark of conformity.

Nová Dubnica, December 22nd, 2005




EVPU, a.s., SKTC 101
 Trenčianska 19,
 018 51 Nová Dubnica
 Slovakia
 003756

Tel: ++421 (0)42 4403 600, 4403 500
 Fax: ++421 (0)42 4403 502
 e-mail: sktc101@evpu.sk



4, Uralskaya str.

220037, Minsk

Republic of Belarus

Phone/Fax: (+37517) 230-32-93

Phone: (+37517) 245-80-92, 230-31-62

E-mail: oved@metz.by

<http://www.metz.by>