



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 electric engineering equipment. History of the Plant started in 1956. Since then we have obtained great experience and tradition. Our basic products are:

- \* power transformers (oil-immersed and dry-type, rating up to 2500 kVA);
- \* unitized transformers substations;
- \* devices and converters for soil-corrosion protection of metal structures;
- \* assembled switchgear;
- \* multifunctional (low-power) transformers;
- \* welding equipment;
- \* household electric appliances.

We produce goods ready fully to meet high requirements of the users. When demanded by a Customer the Plant is able to develop and manufacture items with parameters and characteristics differing from those given in this data sheet.

In production of low-power multifunctional transformers modern technological equipment is used. Magnetic cores are wound with the help of integrated automatic lines. Assembled transformers are impregnated with wet-strong insulating compound in vacuum impregnation chambers. Transformer parts are painted using powder-coating line of NORDSON Company (USA). Transformer name-plates are prepared employing laser engraving by means of Duet device. Plastic parts are fabricated with the help of automatic molding machines (Japan).

At our Plant great attention is given to development of new updated products. For many years we have been accumulating engineering and manufacturing skills. Design and characteristics are constantly upgraded. Our research and testing labs are equipped with all facilities providing product necessary testing.

**Our products meet interstate standards and carry Certificates of conformance (of quality) awarded by national certification bodies of the Republic of Belarus and of the Russian Federation. Quality System of the Plant has got certification in accordance with ISO-9001 Standard from international certification body "DEKRA" (Germany) as well as from the State certification body of the Republic of Belarus**

# TABLE OF CONTENTS

<b>UNITIZED TRANSFORMER SUBSTATIONS OF KIOSK TYPE for power supply of industrial facilities</b> .....	<b>8</b>
<b>ΚΤΠΤΑC, ΚΤΠΠΑC SUBSTATIONS</b>	
rating 63 – 400 kVA, of 6 (10) kV voltage .....	<b>10</b>
<b>ΚΤΠΤΑC-M, ΚΤΠΠΑC-M SUBSTATIONS (modernized)</b>	
rating 630 kVA, of 6 (10) kV voltage .....	<b>17</b>
<b>ΚΤΠΤΑC-M SUBSTATIONS (modernized)</b>	
rating 630 – 250 kVA, of 6 (10) kV voltage .....	<b>21</b>
<b>ΚΤΠΤΑC SUBSTATIONS</b>	
rating 1000 kVA, of 6 (10) kV voltage .....	<b>23</b>
<b>ΚΤΠΤΑC SUBSTATIONS</b>	
rating 630 kVA, of 6 (10) kV voltage .....	<b>25</b>
<b>SUBSTATIONS EQUIPPED WITH CAPACITOR BANKS (with reactive power compensation function)</b> .....	<b>27</b>
<b>ΚΤΠΤΑC SUBSTATIONS EQUIPPED WITH CAPACITOR BANKS (with reactive power compensation function)</b>	
rating 63 – 400 kVA, of 6 (10) kV voltage .....	<b>28</b>
<b>2ΚΤΠ SUBSTATIONS WITH AUTOMATIC LOAD TRANSFER FUNCTION</b> .....	<b>30</b>
<b>2ΚΤΠ SUBSTATIONS WITH AUTOMATIC LOAD TRANSFER FUNCTION</b>	
rating 630 kVA, of 6 (10) kV voltage .....	<b>31</b>
<b>2ΚΤΠΤΑC, 2ΚΤΠΠΑC SUBSTATIONS WITH AUTOMATIC LOAD TRANSFER FUNCTION</b>	
rating 63 – 400 kVA, of 6 (10) kV voltage .....	<b>34</b>

<b>TRANSFORMER SUBSTATIONS for power supply of users in agricultural sector and at various small-scale facilities</b> .....	<b>37</b>
<b>КТП-02, КТП-04, КТП SUBSTATIONS</b> rating 25 – 250 кVA, of 6 (10) кV voltage .....	<b>38</b>
<b>МТП POLE-MOUNTED SUBSTATIONS</b> rating 25 – 100 кVA, of 6 (10) кV voltage .....	<b>40</b>
<b>МТП POLE-MOUNTED SUBSTATIONS</b> rating 160, 250 кVA, of 6 (10) кV voltage .....	<b>42</b>
<b>МТПО POLE-MOUNTED SINGLE-PHASE SUBSTATIONS</b> rating 4, 10 кVA, of 6(10) кV voltage .....	<b>44</b>
<b>TRANSFORMER SUBSTATIONS for railway applications</b> .....	<b>46</b>
<b>КТПЖ SUBSTATIONS</b> rating 25, 100, 250, 400 кVA, of 27.5 кV voltage .....	<b>48</b>
<b>МТПЖ POLE-MOUNTED SUBSTATIONS</b> rating 10 кVA, of 27.5 кV voltage .....	<b>50</b>
<b>МТПЖ POLE-MOUNTED SUBSTATIONS</b> rating 1,25–10 кVA, of up to 27,5 кV voltage .....	<b>52</b>
<b>КТПОС SUBSTATIONS</b> rating 25, 40, 63 кVA, of 6 (10) кV voltage .....	<b>55</b>
<b>SPECIAL-PURPOSE SUBSTATIONS</b> .....	<b>57</b>
<b>КТПТО-80 SUBSTATIONS</b> rating 80 кVA, of 380/55 – 95 V voltage .....	<b>57</b>



**KTPTAC type substation**



**KTPIAC type substation**



**KTPTAC-M type substation**



**KTPTAC type substation**



**KTPTAC type substation**



**KTPTAC type substation with reactive power compensation function**



**2KTPTAC substation with automatic load transfer function**



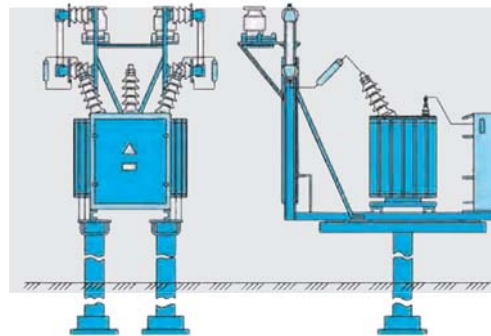
**KTP-02, KTP-04, KTPR type substation**



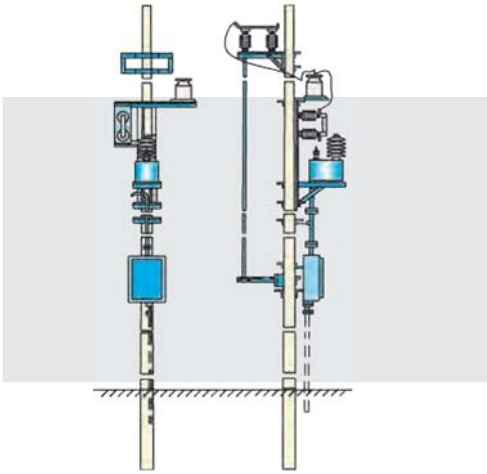
**MTP type substation**



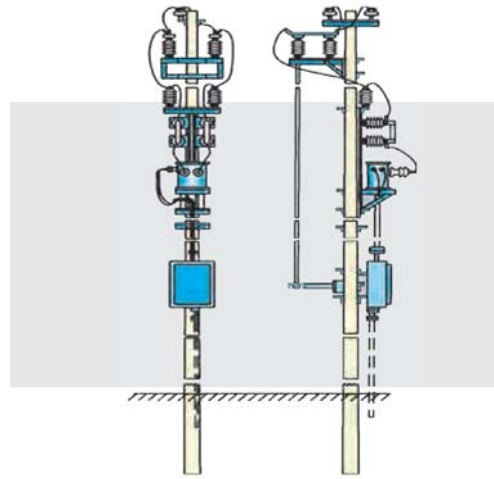
**MTP type substation**



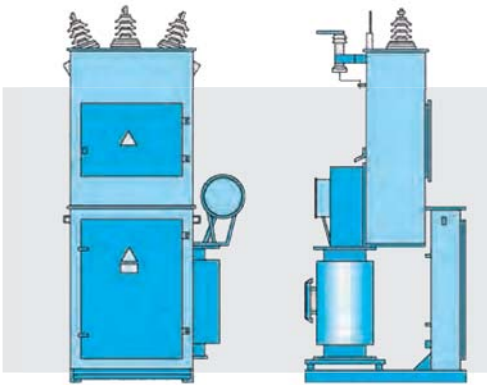
**KTPZH type substation**



**MTPZh type substation**



**MTPZh type substation**



**KTIOS type substation**



**KTIPO-80 type substation**

# UNITIZED TRANSFORMER SUBSTATIONS OF KIOSK TYPE

## for power supply of industrial facilities

Substations of kiosk type are one- or two-transformer outdoor substations intended to receive electric energy – three-phase, 50 Hz, of 6 or 10 kV a.c., to transmit it through (in case of a double-ended substation), and/or to transform into 0.4 kV to provide supply/protection of power users in urban areas, at industrial and other facilities – in temperate climatic regions ( – 45 °C to + 40 °C).

Substation 6 (10) kV high-voltage (lead-in) incoming lines are cable or overhead type; 0.4 kV outgoing feeders are cable- or cable-overhead type.

- Substation outgoing feeders are fitted with fixed or drawout circuit-breakers (as per customer option).
- Structurally, substation is of a sectioned design. Main component parts are bolt-assembled.
- Substation design provides its arrangement on a foundation, tamped footing, or on concrete bricks 600 mm high (not included in delivery set).
- Overhead lead-in substation is connected to power transmission line through a disconnecter (included in delivery set) which is mounted on the line adjacent pole.
- Substation is provided with active energy metering function. As per customer option, a reactive energy meter, or any desirable modification meter (combined, electronic, etc.) may be included.
- To maintain normal operation conditions, substation circuit design provides interior lighting and apparatus heating functions. Electric heaters may be enabled by manual or automatic control.
- Substation is fitted with exterior lighting feeder with manual/automatic switching. As per customer option, exterior lighting feeder may be excluded.
- Substation circuit design provides 0.4 kV-side current and voltage control.
- Substation is provided with protection systems as follows:
  - against lightning overvoltage (in case of overhead lines);
  - against phase-to-phase short-circuit;
  - against power transformer overload;



- against 0.4 kV lines overloads and faults;
  - against lighting or heating circuits faults;
  - transformer vacuum–manometric protection (for 1000 kVA substations; for 630 kVA substations – as per customer option).
- Substations are provided with electrical and mechanical lockings ensuring safety of attending personnel.
- 63 – 630 kVA substations HV–circuits withstand (within 1 s) short–circuit currents as follows:
  - as to dynamic stability – 16 kA, as to thermal stability – 6.3 kA;
  - 1000 kVA substations HV–circuits;
  - as to dynamic stability – 32 kA, as to thermal stability – 12.5 kA.
- Substation outer shell is of IP 34 protection degree (transformer cabinet – of IP 23 protection degree).
- Design of transformer cabinet and of transformer lead–in cubicle provides arcing action (of faulty circuit) localization within these sections. Localization ability is provided under 6.3 A short–circuit current for 1 s.
- Substations:
  - are environmentally friendly;
  - are of structural design allowing prompt erection and start–up on worksite, as well as easy dismantling in the event of relocation.
  - are fitted with rubber packing on doors and on mated assembled joints;
  - are easy–on–the–eyes;
  - are furnished with advanced TМГ–series hermetically–sealed transformers of the Plant own produce.

As per customer option the Plant is able to manufacture substations of any desirable configuration, including those with vacuum circuit–breakers.

# ΚΤΠΤΑΣ, ΚΤΠΠΑΣ SUBSTATIONS

rating 63 - 400 kVA, of 6 (10) kV voltage

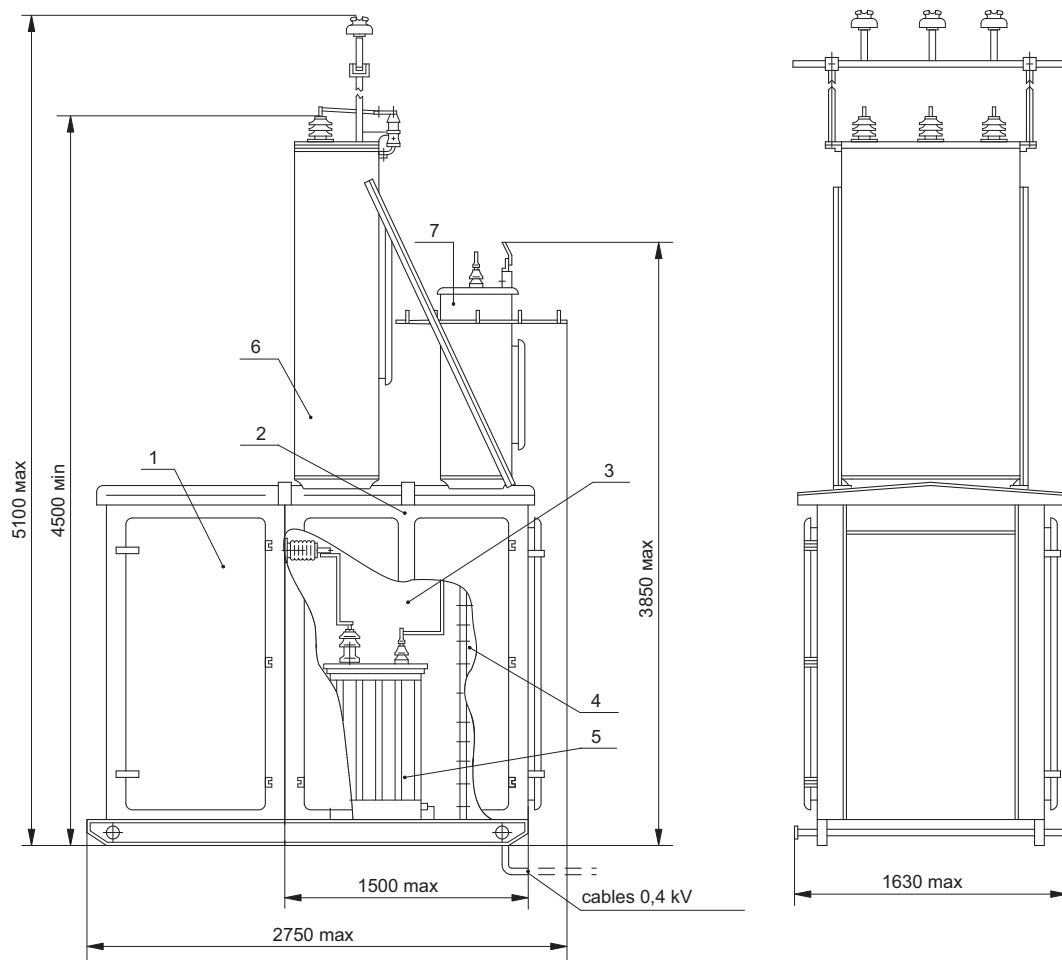
## Main technical parameters

Power transformer type	TMΓ									
Transformer rated power, kVA	63		100		160		250		400	
Transformer connection/vector group	Yyn-0								Yyn-0 or Dyn-11	
HV-side rated voltage, kV	6	10	6	10	6	10	6	10	6	10
HV fuse current rating, A	16.0	10.0	20.0	16.0	31.5	20.0	50.0	31.5	80.0	50.0
LV-side rated voltage, kV	0.4		0.4		0.4		0.4		0.4	
Outgoing lines rated current, A:										
No. 1	25		40		80		100		100	
No. 2	25		40		80		100		160	
No. 3	63		100		160		160		200	
No. 4	40		80		100		200		200	
No. 5	40									
No. 6	63									
Lighting line	16 (25*)									

### Notes:

- \* – As per customer option
- Transformer connection/vector group, as well outgoing feeders number and currents thereof may be changed/selected as per customer option

## KTITAC 63-250 kVA SUBSTATION OVERALL DIMENSIONS AND MASS

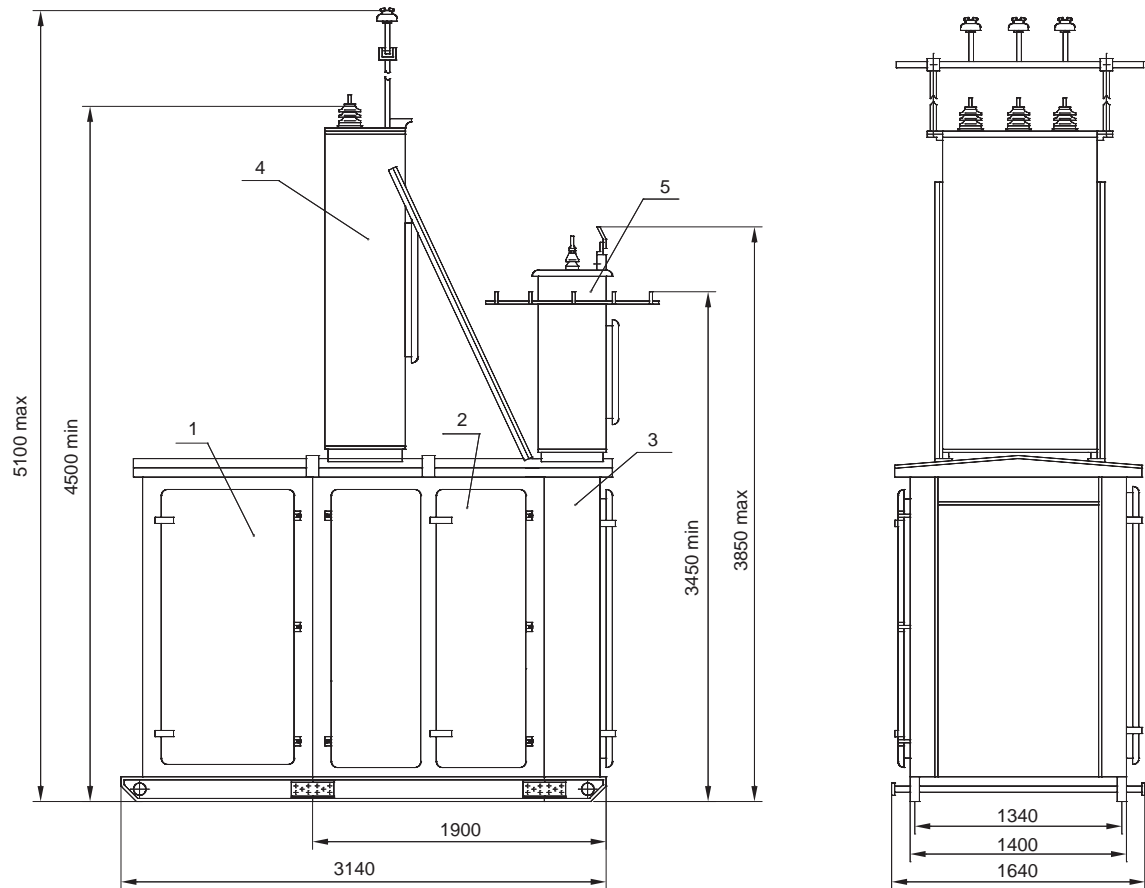


Mass (transformer excluded):

- with cable lead-in – 1880 kg max
- with overhead lead-in – 1630 kg max

### Keys:

- 1 - transformer lead-in cubicle (for substations with cable lead-in);
- 2 - cabinet for transformer and LV switchgear;
- 3 - transformer compartment;
- 4 - LV switchgear compartment;
- 5 - transformer (if included);
- 6 - HV overhead lead-in cubicle (for substations with overhead lead-in);
- 7 - LV lead-out cubicle (for substations with overhead-cable outgoing feeders).

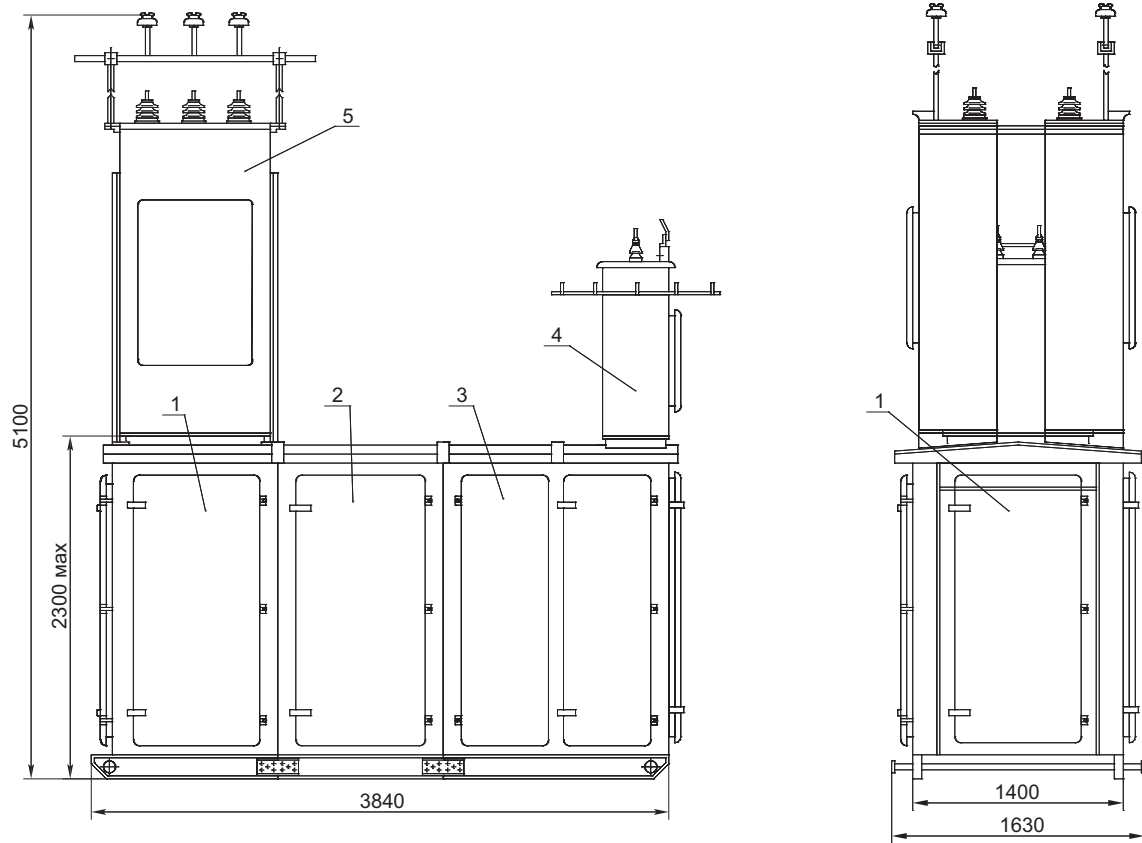
**KTITAC 400 kVA SUBSTATION OVERALL DIMENSIONS AND MASS**

Mass (transformer included):

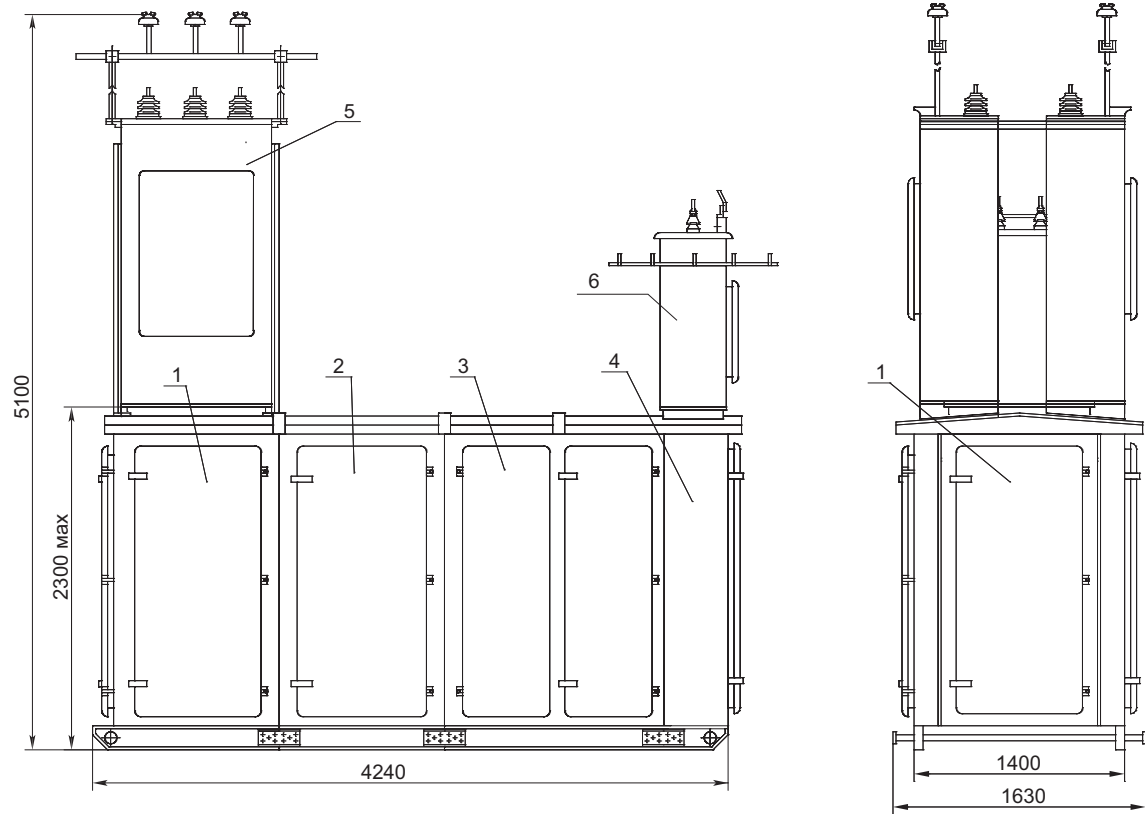
- with overhead lead-in – 2850 kg max
- with cable lead-in – 3350 kg max

**Keys:**

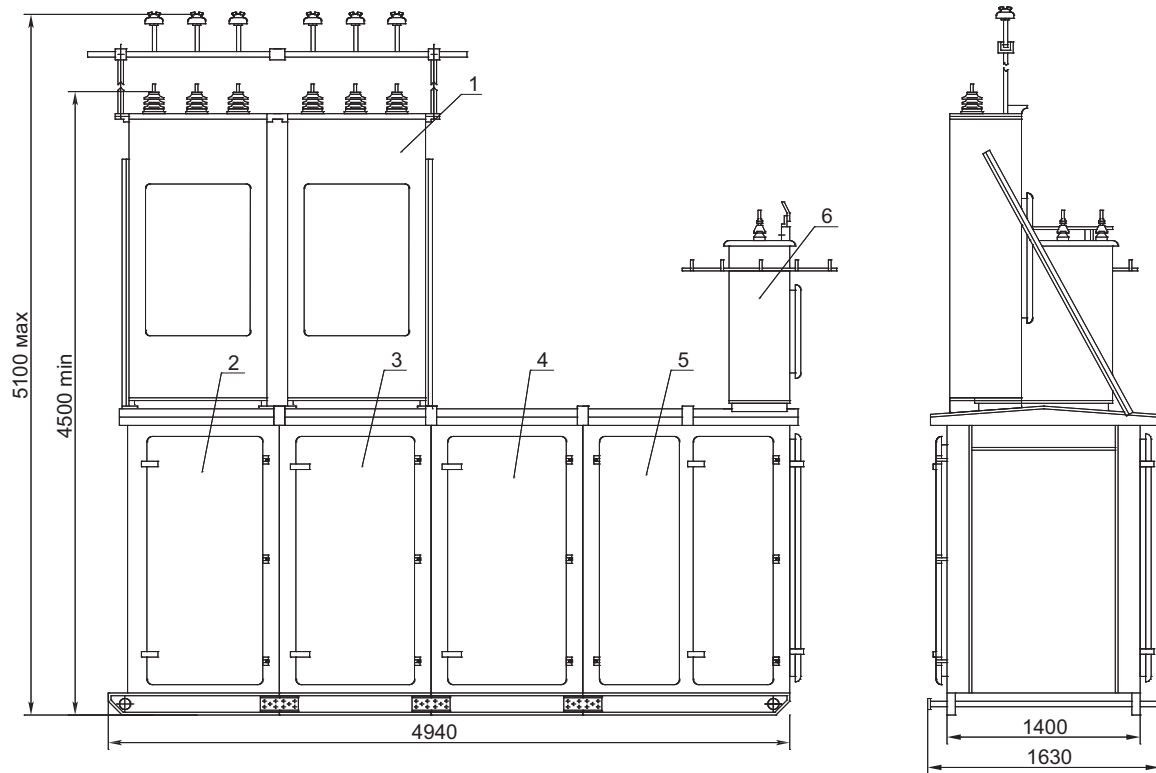
- 1 - transformer lead-in cubicle (for substations with cable-lead-in);
- 2 - cabinet for transformer;
- 3 - LV switchgear cubicle;
- 4 - HV overhead lead-in cubicle (for substations with overhead lead-in);
- 5 - LV overhead lead-out cubicle (for substations with overhead outgoing feeders).

**КТППАС 63 - 250 kVA SUBSTATION OVERALL DIMENSIONS****Keys:**

- 1 - HV lead-in cubicle;
- 2 - transformer lead-in cubicle;
- 3 - cabinet for transformer and LV switchgear;
- 4 - LV overhead lead-out cubicle (for substations with overhead outgoing feeders);
- 5 - HV overhead lead-in cubicles (for substations with overhead lead-in).

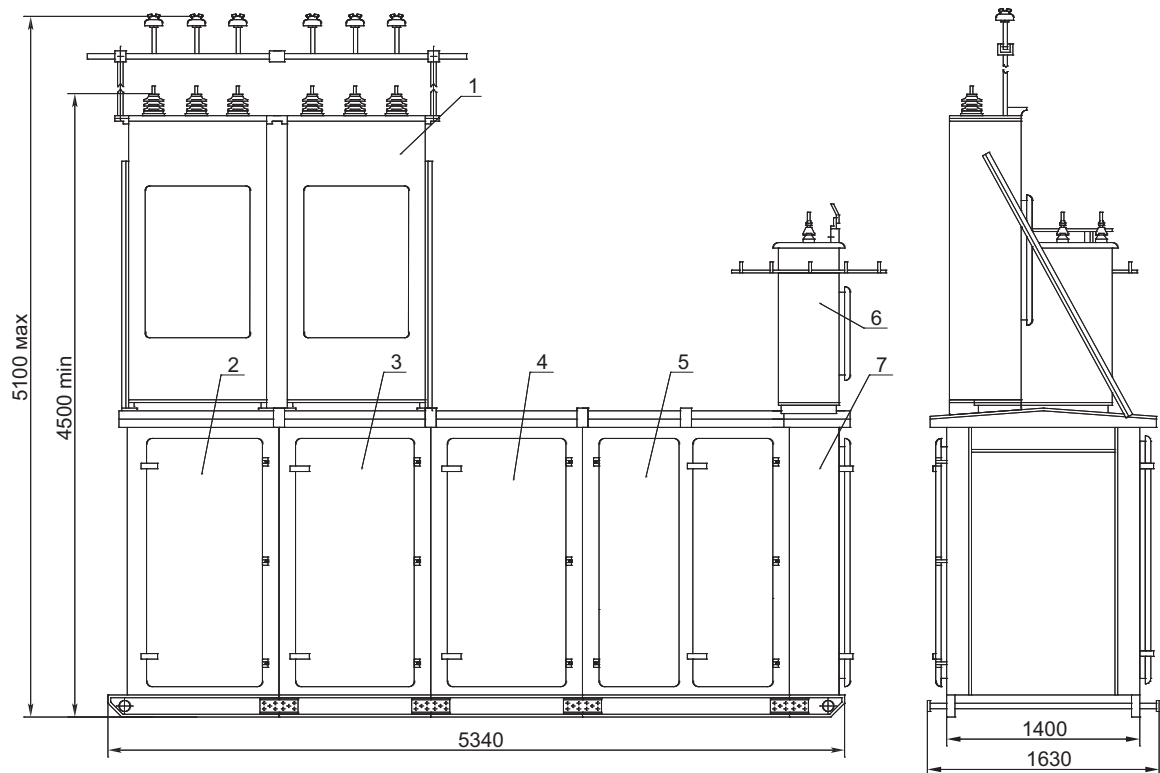
**ΚΤΠΠΑΣ 400 kVA SUBSTATION OVERALL DIMENSIONS****Keys:**

- 1 - HV lead-in cubicle
- 2 - transformer lead-in cubicle;
- 3 - cabinet for transformer;
- 4 - LV switchgear cubicle;
- 5 - HV overhead lead-in cubicles (for substations with overhead lead-in);
- 6 - LV overhead lead-out cubicle (for substations with overhead outgoing feeders).

**КТППАС 63 - 250 kVA SUBSTATION OVERALL DIMENSIONS****(HV lead-in apparatus are arranged in separate cubicles)****Keys:**

- 1 - HV overhead lead-in cubicles (for substations with overhead lead-in);
- 2 - HV lead-in cubicle No. 1;
- 3 - HV lead-in cubicle No. 2;
- 4 - transformer lead-in cubicle;
- 5 - cabinet for transformer and LV switchgear;
- 6 - LV overhead lead-out cubicle (for substations with overhead outgoing feeders).

**КТППАС 400 kVA SUBSTATION OVERALL DIMENSIONS**  
**(HV lead-in apparatus are arranged in separate cubicles)**



**Keys:**

- 1 – HV overhead lead-in cubicles (for substations with overhead lead-in);
- 2 – HV lead-in cubicle No. 1;
- 3 – HV lead-in cubicle No. 2;
- 4 – transformer lead-in cubicle;
- 5 – cabinet for transformer;
- 6 – LV overhead outgoing feeders cubicle (for substations with overhead outgoing feeders);
- 7 – LV switchgear cubicle.



# ΚΤΠΤΑΣ-Μ, ΚΤΠΠΑΣ-Μ SUBSTATIONS (modernized)

rating 630 κVA, of 6 (10) κV voltage

## Main features:

- Outgoing lines are cable type.
- Outgoing lines max number – 8.
- Interior lighting circuits provided with shutoff protection to avoid electric shock in case of casual touch to live or faulty insulated parts of electric devices.
- Availability of active– and reactive energy meters (as per customer option, only active energy meter may be included).

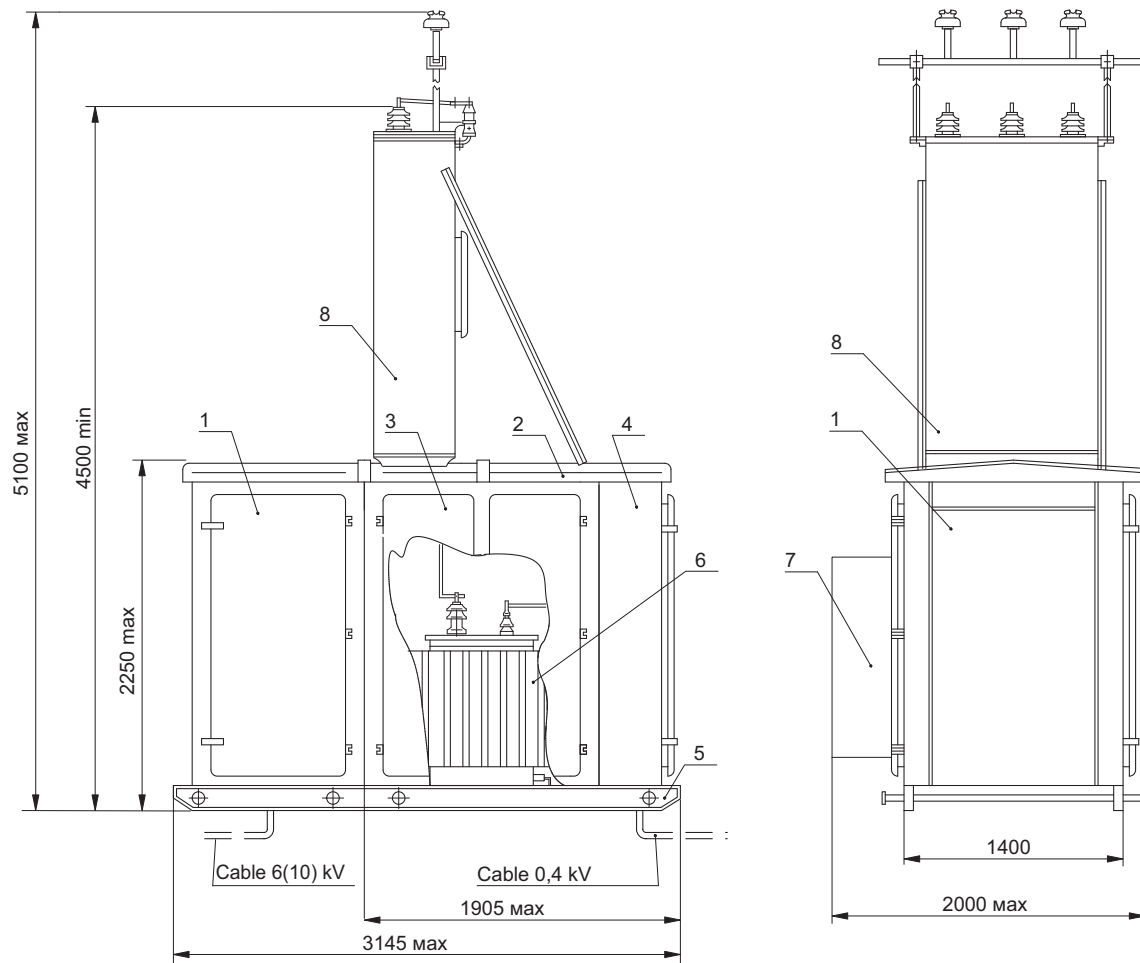
## Main technical parameters

Power transformer type	TMΓ
Transformer connection/vector group	Yyn-0 or Dyn-11
Transformer rated power, kVA	630
LV-side rated voltage, κV	0.4
Outgoing lines rated current, A:	
No. 1	100
No. 2	160
No. 3	160
No. 4	100
No. 5	200
No. 6	250
No. 7	250
No. 8	200
Lighting line	16(25*)

## Notes:

1. \* – As per customer option
2. Transformer connection/vector group, as well as outgoing feeders number and currents thereof may be changed/selected as per customer option

### КТПТТAC-M 630 kVA SUBSTATION OVERALL DIMENSIONS AND MASS



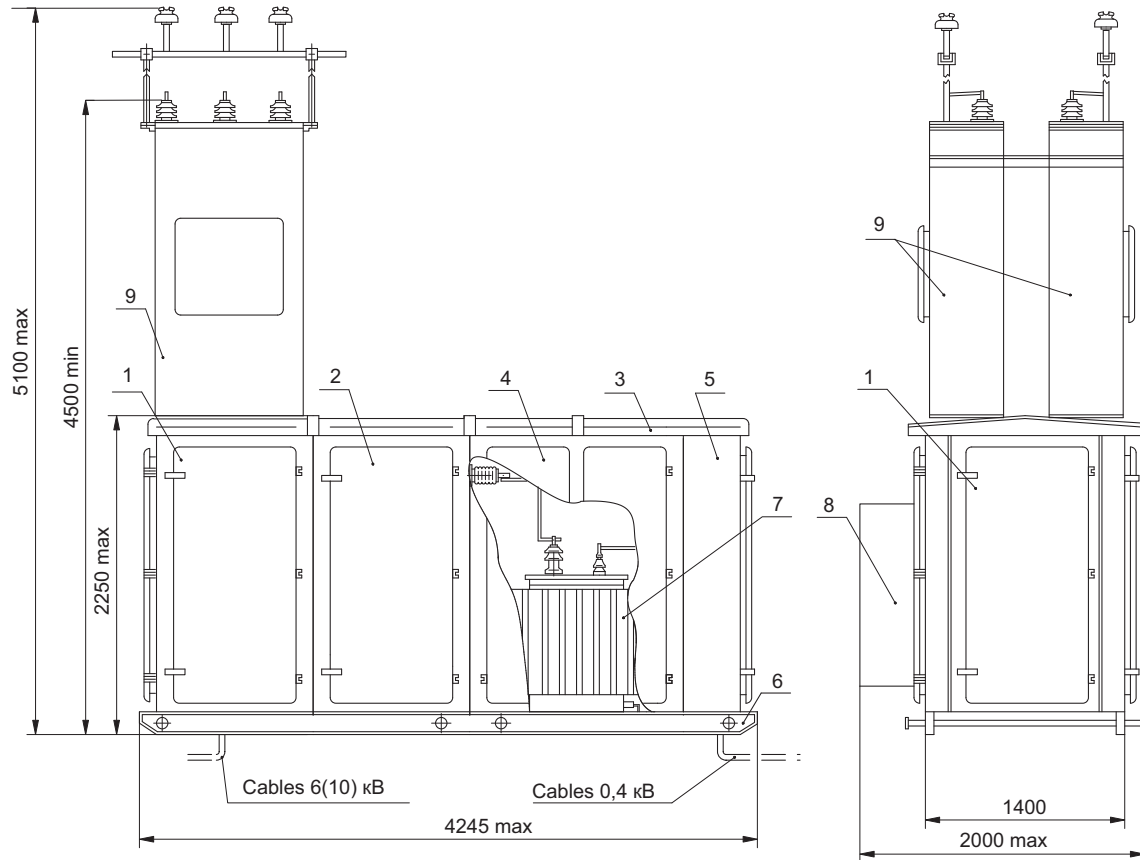
Mass (transformer excluded):

- with overhead lead-in – 1300 kg max
- with cable lead-in – 1750 kg max

#### Keys:

- 1 - transformer lead-in cubicle (for substations with cable lead-in);
- 2 - cabinet for transformer and LV switchgear;
- 3 - transformer compartment;
- 4 - LV switchgear compartment;
- 5 - sleds;
- 6 - transformer (if included);
- 7 - enclosure;
- 9 - HV overhead lead-in cubicle (for substations with overhead lead-in).

### КТПАС-М 630 kVA SUBSTATION OVERALL DIMENSIONS AND MASS



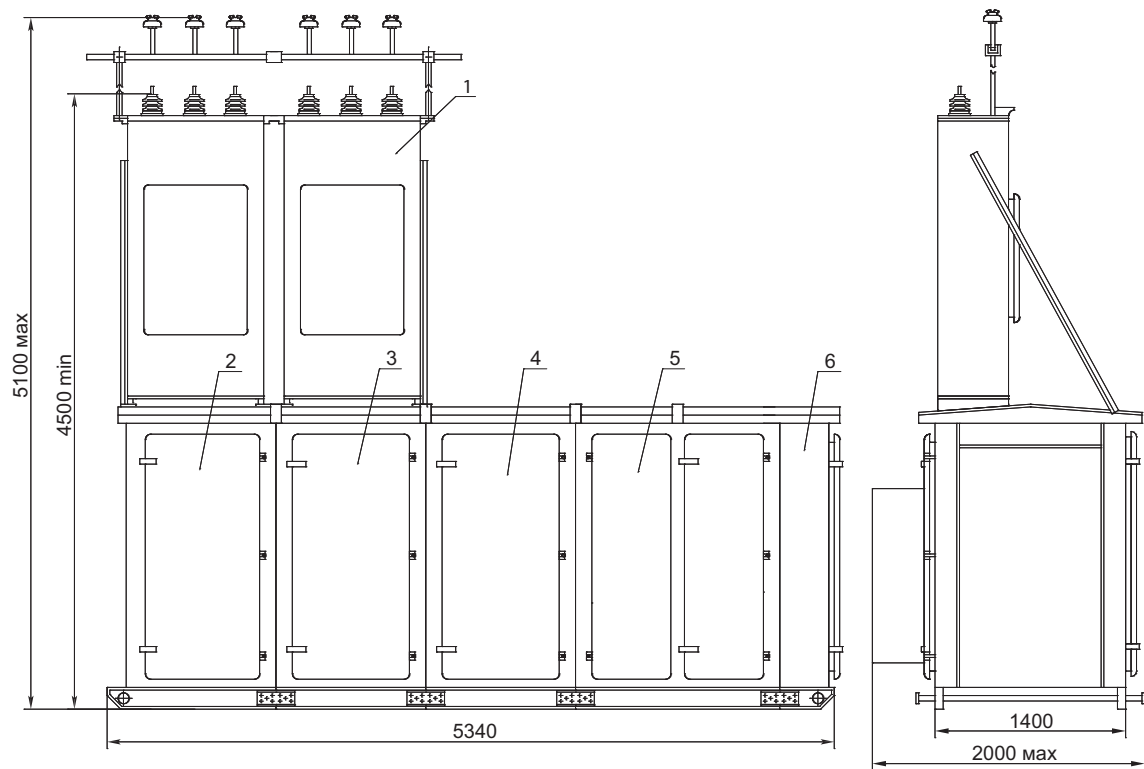
Mass (transformer excluded):

- with overhead lead-in – 3100 kg max
- with cable lead-in – 2680 kg max

#### Keys:

- 1 - HV lead-in cubicle;
- 2 - transformer lead-in cubicle;
- 3 - cabinet for transformer and LV switchgear;
- 4 - transformer compartment;
- 5 - LV switchgear compartment;
- 6 - sleds;
- 7 - transformer (if included);
- 8 - enclosure;
- 9 - HV overhead lead-in cubicle (for substations with overhead lead-in).

### КТПАС-М 630 KVA SUBSTATION OVERALL DIMENSIONS (HV lead-in apparatus are arranged in separate cubicles)



#### Keys:

- 1 – HV overhead lead-in cubicles (for substations with overhead lead-in);
- 2 – HV lead-in cubicle No. 1;
- 3 – HV lead-in cubicle No. 2;
- 4 – transformer lead-in cubicle;
- 5 – cabinet for transformer;
- 6 – LV switchgear cubicle.

# ΚΤΠΤΑC-M SUBSTATIONS (modernized)

rating 63 – 250 kVA, of 6 (10) kV voltage

## Main features:

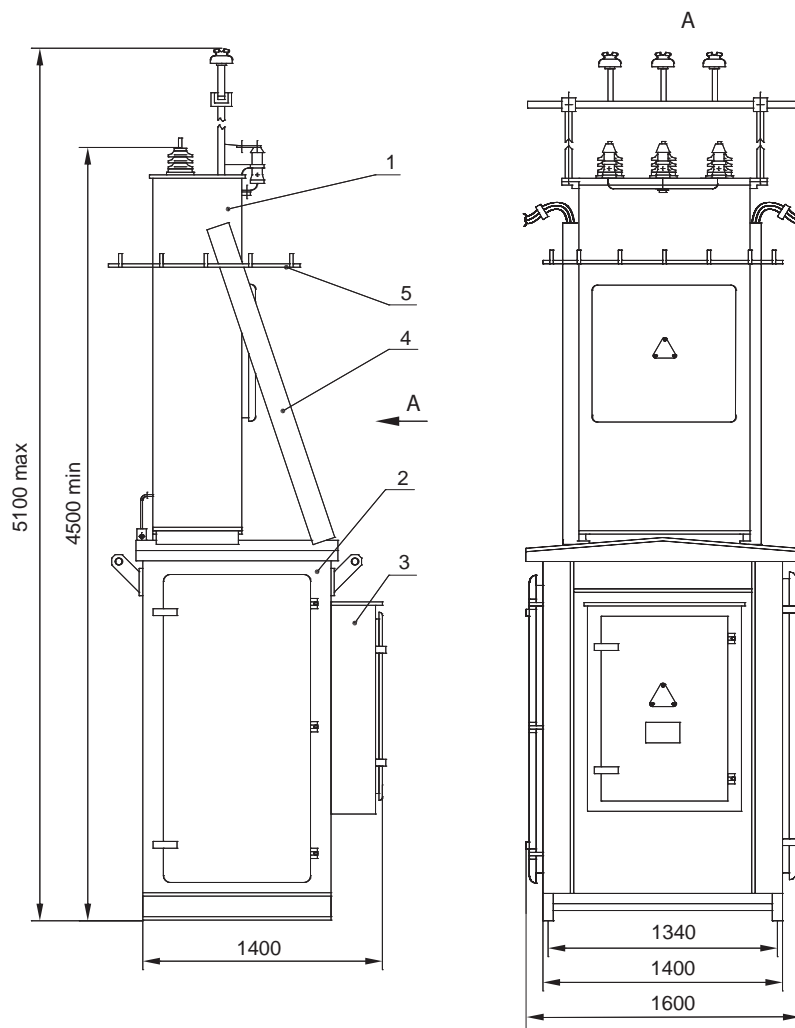
- Substation HV lead-in is overhead type; outgoing lines are overhead or cable type.
- Outgoing lines max number – 3.
- Available active energy metering on 0.4 kV-side by means of electronic counter connected to current transformers and network phases via test box.

## Main technical parameters

Power transformer type	TMΓ							
Transformer rated power, kVA	63		100		160		250	
Transformer connection/vector group	Yyn-0							
HV-side rated voltage, kV	6	10	6	10	6	10	6	10
Transformer HV-side rated current, A	6.06	3.64	9.62	5.77	15.4	9.25	24.1	14.4
HV fuse current rating, A	16	10	20	16	31.5	20	50	31.5
LV-side rated voltage, kV	0.4		0.4		0.4		0.4	
Transformer LV-side rated current, A	91.1		144.3		231.0		361.0	
Outgoing lines rated current, A:								
No. 1	40		40		80		100	
No. 2	40		80		100		100	
No. 3	63		100		160		250	
Lighting line	16 (25*)							

## Notes:

1. \* – As per customer option
2. Transformer connection/vector group, as well as outgoing feeders number and currents thereof may be changed/selected as per customer option

**КТПТАС-М 63 - 250 kVA SUBSTATION OVERALL DIMENSIONS****Keys:**

- 1 - HV overhead lead-in cubicle;
- 2 - cabinet for transformer;
- 3 - LV switchgear cubicle;
- 4 - angle bar;
- 5 - bracket arm (for substations with overhead lead-out).

# ΚΤΠΤΑC SUBSTATIONS

rating 1000 κVA, of 6 (10) κV voltage

## Main features:

- Availability of active– and reactive energy meters (as per customer option, only active energy meter may be included).
- Transformer is mounted open (without a cabinet), under an enclosure.
- As per customer option, transformer is fitted with an electric–contact vacuum manometer.
- Outgoing lines max number – 10.

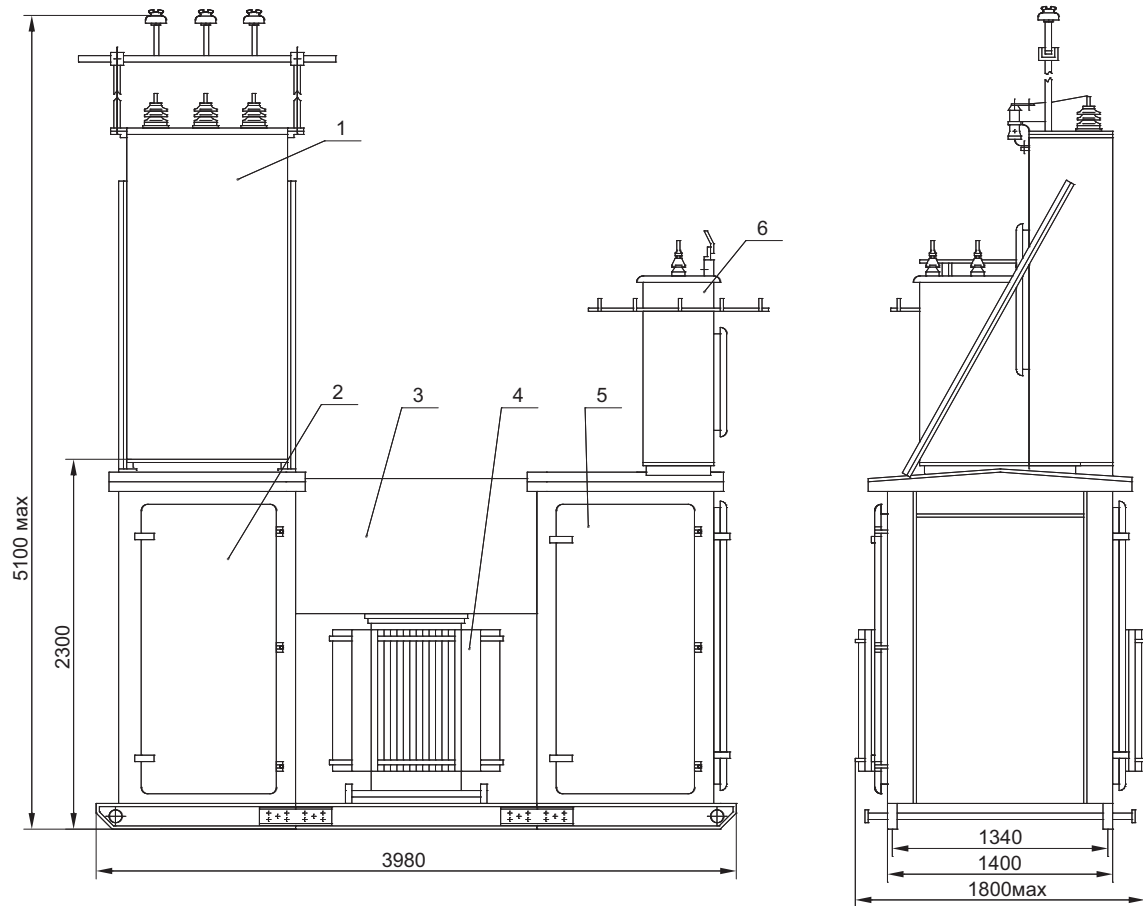
## Main technical parameters

Transformer rated power, kVA	1000	
Transformer connection/vector group	Yyn–0 or Dyn–11	
HV–side rated voltage, kV	6	10
Transformer HV–side rated current, A	96.2	57.7
HV fuse current rating, A	125	100
LV–side rated voltage, kV	0.4	0.4
Transformer LV–side rated current, A	1443.4	1443.4
Outgoing lines rated current, A:		
No. 1	160	
No. 2	250	
No. 3	100	
No. 4	160	
No. 5	100	
No. 6	100	
No. 7	630	
No. 8	250	
No. 9	320	
No. 10	400	
Lighting line	25	

## Note:

Transformer connection/vector group, as well as outgoing feeders number and currents thereof may be changed/selected as per customer option

### KTPTAC 1000 kVA SUBSTATION OVERALL DIMENSIONS AND MASS



Mass (transformer excluded): 2000 kg max

#### Keys:

- 1 - HV overhead lead-in cubicle (for substations with overhead lead-in);
- 2 - transformer lead-in cubicle;
- 3 - enclosure;
- 4 - power transformer;
- 5 - LV switchgear cubicle;
- 6 - LV outgoing feeders cubicle (for substations with overhead lead-out).



# ΚΤΠΤΑC SUBSTATIONS

rating 630 κVA, of 6 (10) κV voltage

## Main features:

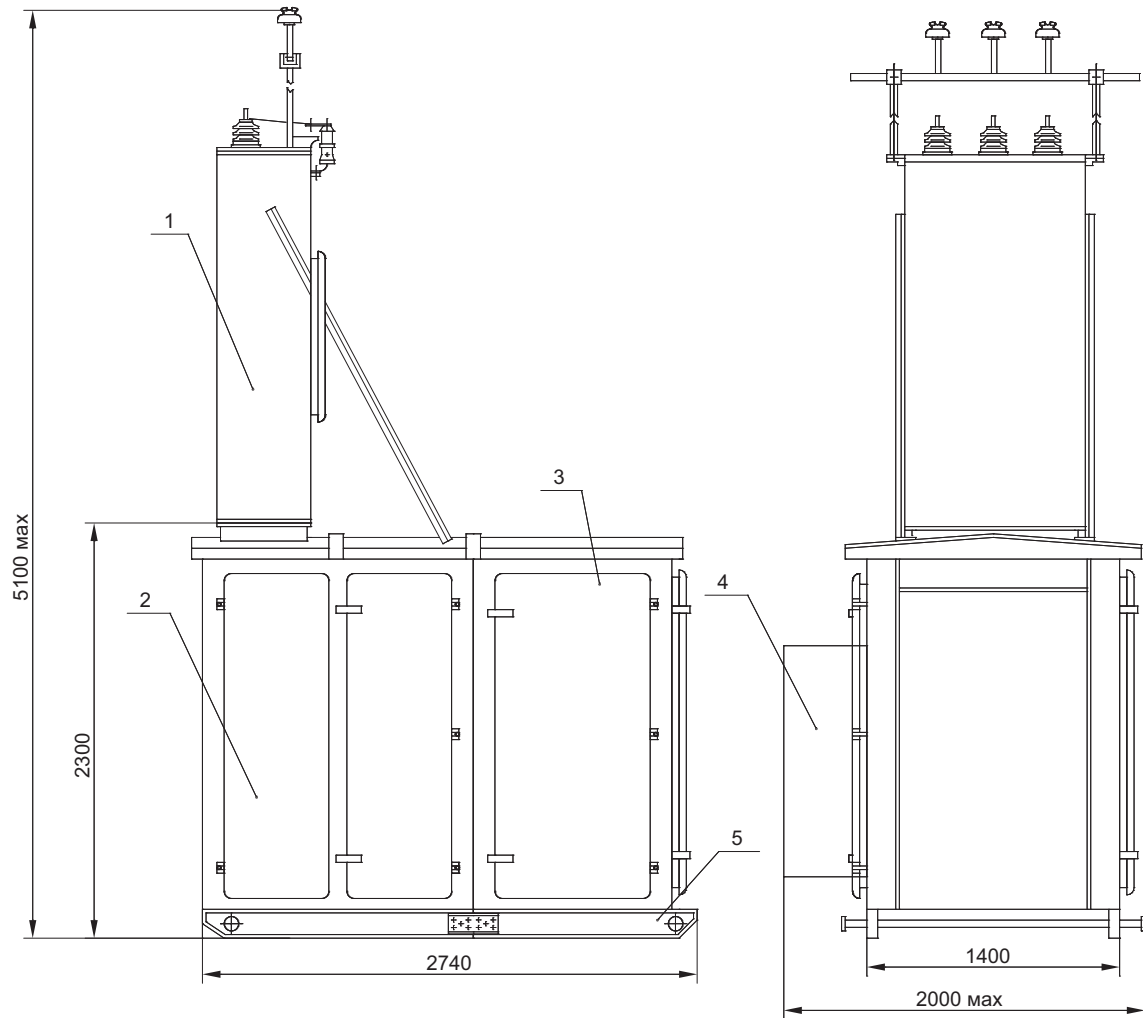
- Substation HV lead-in is overhead type.
- Outgoing feeders are cable type.
- Outgoing lines max number – 10.
- Availability of active- and reactive energy meters (as per customer option).

## Main technical parameters

Power transformer type	TMΓ	
Transformer rated power, kVA	630	
Transformer connection/vector group	Yyn-0 or Dyn-11	
HV-side rated voltage, kV	6	10
Transformer HV-side rated current, A	60.69	36.4
HV fuse current rating, A	100	80
LV-side rated voltage, kV	0.4	0.4
Transformer LV-side rated current, A	910.4	910.4
Outgoing lines rated current, A:		
No. 1	160	
No. 2	250	
No. 3	100	
No. 4	160	
No. 5	100	
No. 6	100	
No. 7	250	
No. 8	250	
No. 9	320	
No. 10	250	
Lighting line	25 (16*)	

## Notes:

1. \* – As per customer option
2. Transformer connection/vector group, as well as outgoing feeders number and currents thereof may be changed/selected as per customer option

**КТПТАС 630 kVA SUBSTATION OVERALL DIMENSIONS AND MASS**

Mass (transformer excluded): 1550 kg max

**Keys:**

- 1 - HV overhead lead-in cubicle;
- 2 - cabinet for transformer;
- 3 - LV switchgear cubicle;
- 4 - enclosure;
- 5 - sleds.

## **SUBSTATIONS EQUIPPED WITH CAPACITOR BANKS (with reactive power compensation function)**

Most of electric devices along with active power consume also reactive power.

Substations equipped with capacitor banks, due to power reactive component compensation, reduce total consumed power. As this takes place, results are as follows:

- mitigation of requirements for the transmission line capability (transformer power ratings may be lower, cable cross-sections – smaller);
- reduced losses in conducting wires;
- network improved performance due to appropriate voltage changes in network nodes;
- extended service life of the equipment in use;
- reduced costs for power consumption.

Capacitor banks with reactive power automatic control used in substations provide for:

1. high accuracy of pre-set power factor;
2. maintaining of optimum reactive power compensation modes according to load demands;
3. selective adjustment of capacitor bank control steps.

# ΚΤΠΤΑC SUBSTATIONS EQUIPPED WITH CAPACITOR BANKS (with reactive power compensation function)

rating 63 – 400 kVA, of 6 (10) kV voltage

## Main features:

- LV outgoing lines are cable type.
- Availability of a socket to plug a feeder for repair tools.

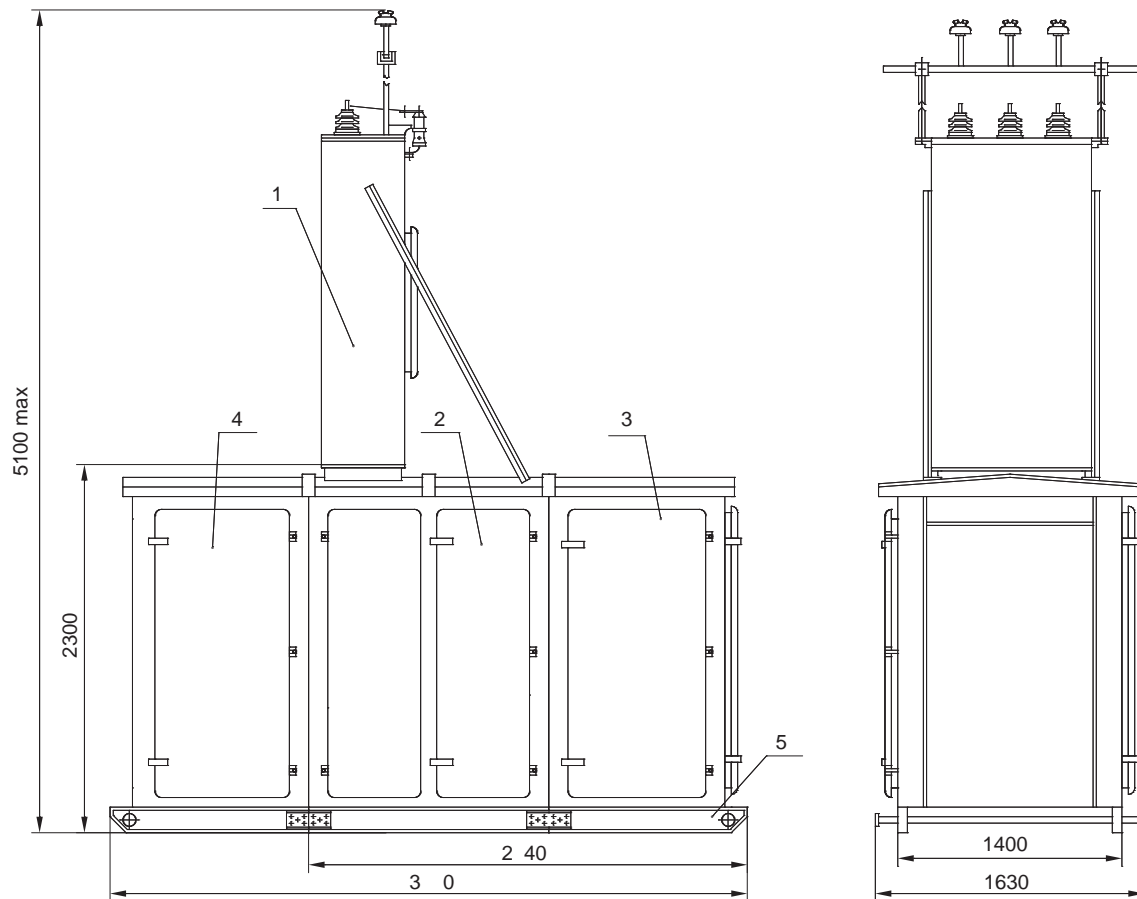
## Main technical parameters

Power transformer type	TMΓ				
Transformer rated power, kVA	63	100	160	250	400
Transformer connection/vector group	Yyn-0				Dyn-11
HV-side rated voltage, kV	6 (10)				
LV-side rated voltage, kV	0.4				
Outgoing lines rated current, A:					
No. 1	25	40	80	100	100
No. 2	25	40	80	100	160
No. 3	63	100	160	160	200
No. 4	40	80	100	200	200
No. 5	40				
No. 6 (feeder for repair tools)	63				
Lighting line	16 (25 <sup>***</sup> )				
Capacitor bank power capacity <sup>**</sup> , (reactive kilovolt-ampere)	25*	50*	75*	100*	150*

## Notes:

1. \* – Power capacity may be changed/selected as per customer option
2. \*\* – Capacitor banks with reactive power manual or automatic control – as per customer option
3. \*\*\* – As per customer option
4. Transformer connection/vector group, as well as currents and number of outgoing lines may be changed/selected as per customer option

### KTITAC 63 - 400 kVA SUBSTATION WITH CAPACITOR BANK OVERALL DIMENSIONS AND MASS



Mass (transformer excluded):

- with overhead lead-in – 2550 kg max
- with cable lead-in – 3200 kg max

#### Keys:

- 1 - HV overhead lead-in cubicle (for substations with overhead lead-in);
- 2 - cabinet for transformer;
- 3 - LV switchgear and capacitor bank cubicle;
- 4 - transformer lead-in cubicle (for substations with cable lead-in);
- 5 - sleds.

## 2KTP SUBSTATIONS WITH AUTOMATIC LOAD TRANSFER FUNCTION

Substations are intended for power supply of energy users belonging to I category users as to power supply reliability degree.

A substation consists of two one-transformer substations.

In normal operating mode every power transformer runs with its associated set of busbars. If with one set of busbars a voltage loss occurs, a standby circuit for automatic load transfer is activated and all power users are supplied from the transformer remaining operable. It is effected due to backup (by means of a circuit-breaker) on LV-side of sections 1 and 2 of the substation.

0.4 kV LV-switchgear lead-in circuit-breaker and sectionalizing circuit-breaker may also be operated manually (with the help of push-buttons).

During substation mounting or maintenance a visible disconnection is provided by use of drawout circuit-breakers, or of fixed circuit-breakers fitted with blade-switches.

As per customer option, substations may include terminal type or double-ended type composing substations of various modifications and ratings (25 to 1000 kVA).

# 2KTP SUBSTATIONS WITH AUTOMATIC LOAD TRANSFER FUNCTION

rating 630 kVA, of 6 (10) kV voltage

## Main features:

- Structurally, substation consists of two one-transformer substations interconnected through a busbar bridge on 0.4 kV-side.
- Substation HV lead-in is cable type.
- 0.4 kV outgoing lines are cable type.
- Main circuit-breaker and sectionalizing circuit-breaker are drawout type.
- Availability of active- and reactive energy meters (as per customer option, only active energy meter may be included).

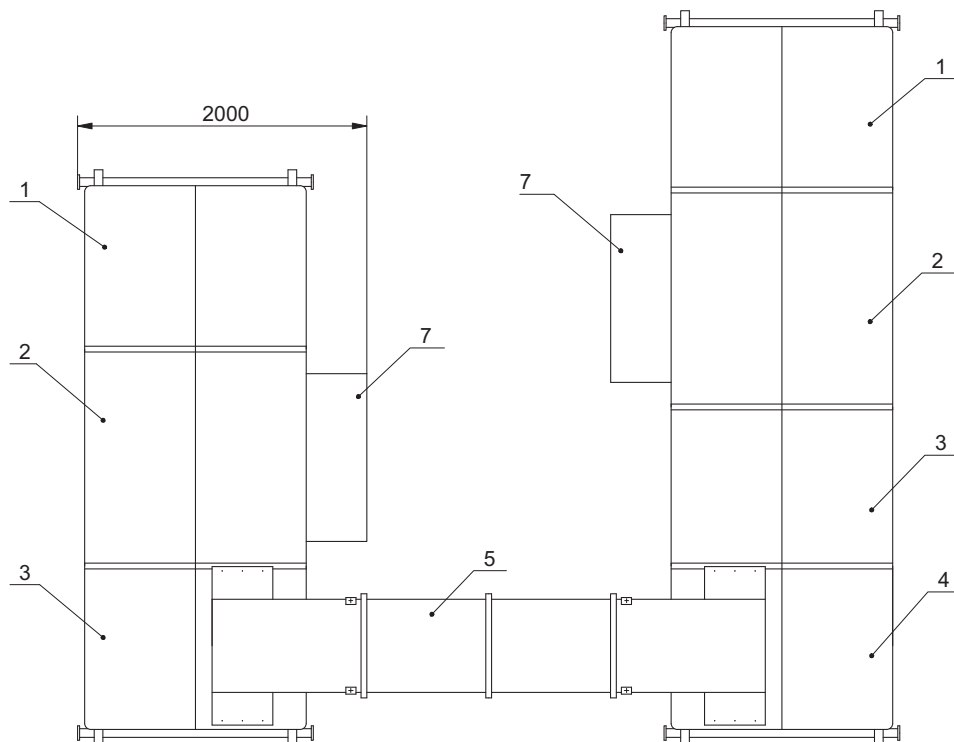
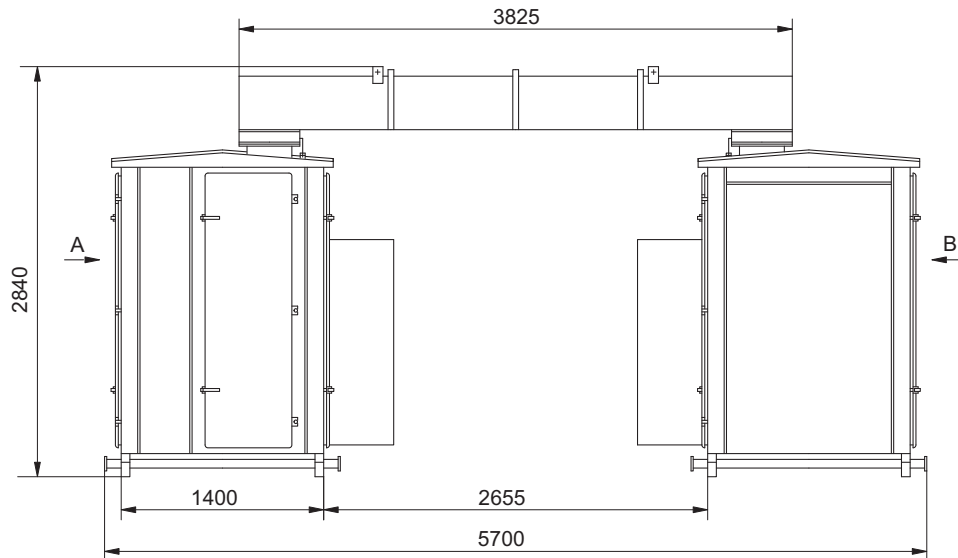
## Main technical parameters

Power transformer type	TMГ
Transformer rated power, kVA	2x630
Transformer connection/vector group	Yyn-0 or Dyn-11
HV-side rated voltage, kV	6 (10)
LV-side rated voltage, kV	0.4
Outgoing lines rated current, A (section Nos. 1, 2):	
No. 1	160
No. 2	250
No. 3	100
No. 4	160
No. 5	100
No. 6	100
No. 7	250
No. 8	250
No. 9	320
No. 10	250
Lighting line	25

## Notes:

1. Transformer connection/vector group, as well as outgoing feeders number and currents thereof may be changed/selected as per customer option

## 2KTΠTAC 630 kVA SUBSTATION WITH AUTOMATIC LOAD TRANSFER FUNCTION OVERALL DIMENSIONS

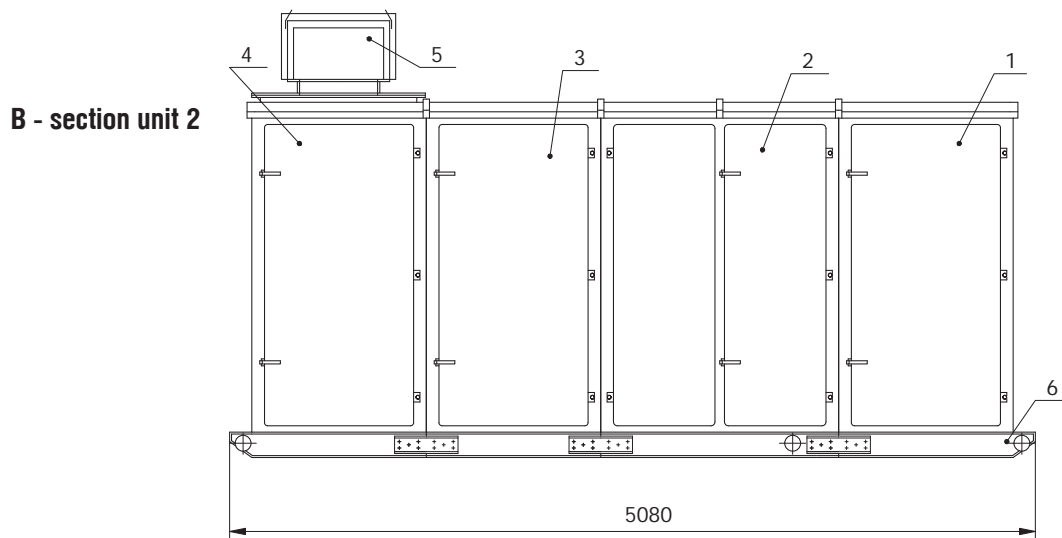
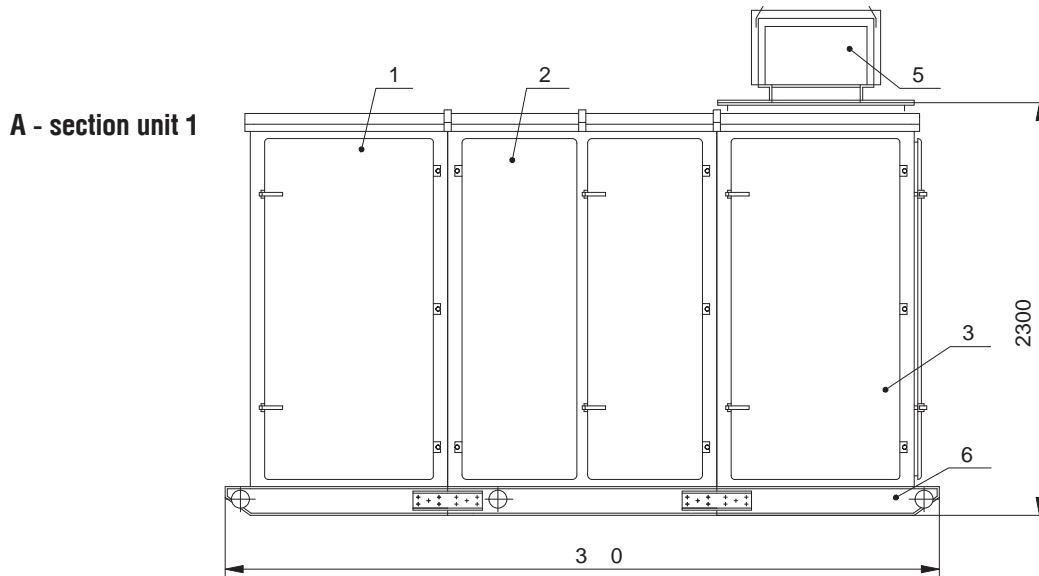


### Note:

Substation may be configured as a single-line one, without a busbar bridge



**2KTΠTAC 630 kVA SUBSTATION  
WITH AUTOMATIC LOAD TRANSFER FUNCTION  
OVERALL DIMENSIONS AND MASS**



Section unit 1 mass (transformer excluded):  
1860 kg max

Section unit 2 mass (transformer excluded):  
2355 kg max

**Keys:**

- 1 - transformer lead-in cubicle;
- 2 - cabinet for transformer (with transformer, if included);
- 3 - LV switchgear cubicle;
- 4 - automatic load transfer apparatus cubicle;
- 5 - LV busbar bridge;
- 6 - sleds;
- 7 - enclosure.

# 2ΚΤΠΤΑΣ, 2ΚΤΠΠΑΣ SUBSTATIONS WITH AUTOMATIC LOAD TRANSFER FUNCTION

rating 63 – 400 kVA, of 6 (10) kV voltage

## Main features:

- Structurally, substation represents two one-transformer substations of a single-line design version.
- Substation HV lead-in is overhead or cable type.
- Outgoing lines are cable type.

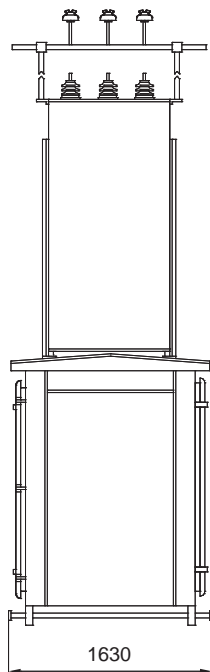
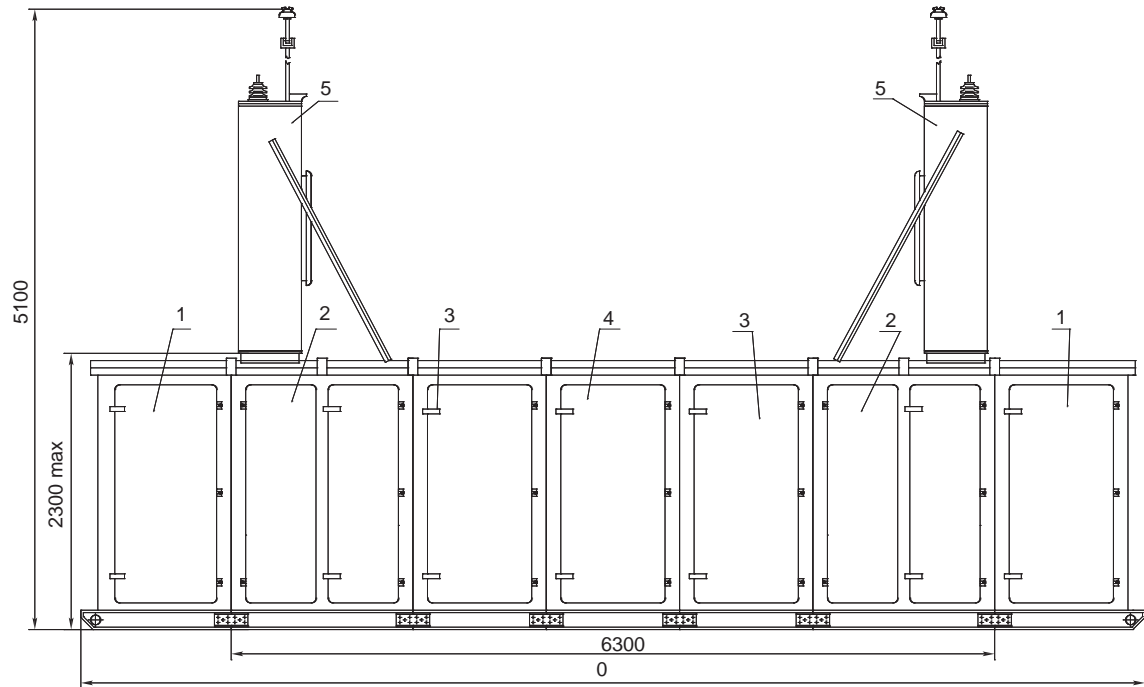
## Main technical parameters

Power transformer type	TMΓ									
Transformer rated power, kVA	63	100	160	250	400					
Transformer connection/vector group	Yyn-0								Yyn-0 or Dyn-11	
HV-side rated voltage, kV	6	10	6	10	6	10	6	10	6	10
HV-side fuse current rating, A	16.0	10.0	20.0	16.0	31.5	20.0	50.0	31.5	80	50
LV-side rated voltage, kV	0,4									
Outgoing lines rated current, A (section Nos. 1, 2):										
No. 1	25	40	80	100	100					
No. 2	25	40	80	100	160					
No. 3	63	100	160	160	200					
No. 4	40	80	100	200	200					
No. 5	40									
No. 6	63									
Lighting line	16 (25*)									

## Notes:

1. \* – As per customer option
2. Transformer connection/vector group, as well as outgoing feeders number and currents thereof may be changed/selected as per customer option

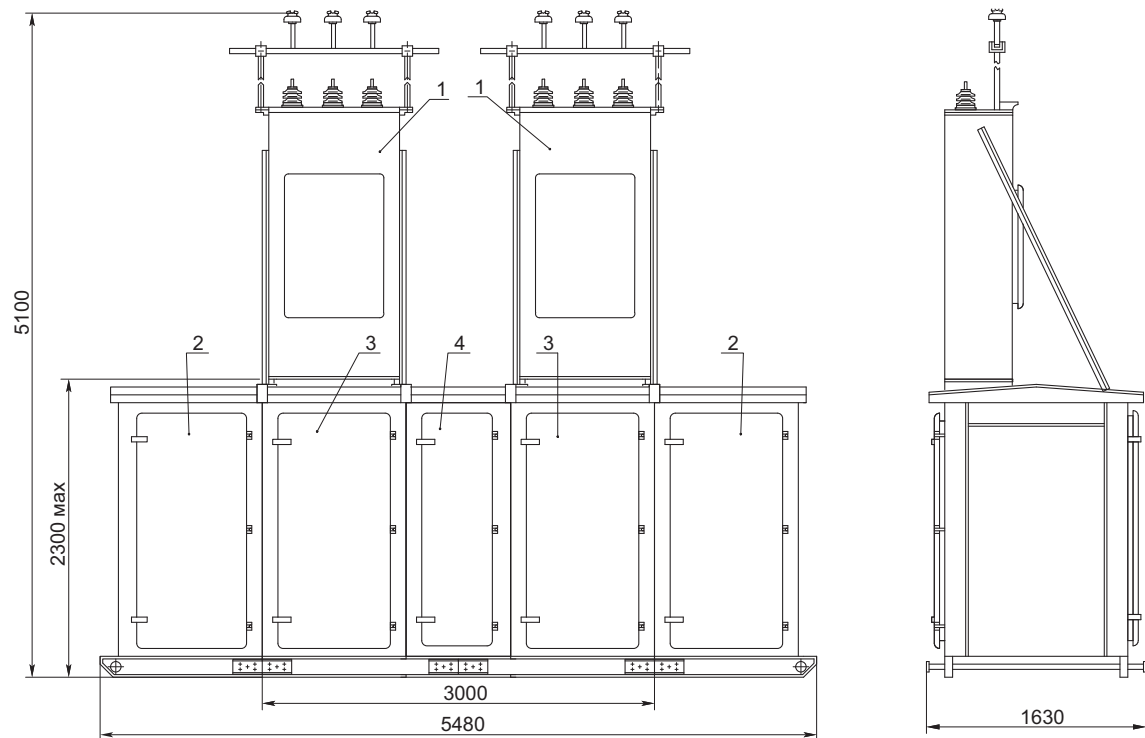
**2КТПТАС 400 kVA SUBSTATION  
WITH AUTOMATIC LOAD TRANSFER FUNCTION  
OVERALL DIMENSIONS**



**Keys:**

- 1 - transformer lead-in cubicle (for substations with cable lead-in);
- 2 - cabinet for transformer;
- 3 - LV switchgear cubicle;
- 4 - automatic load transfer apparatus cubicle;
- 5 - HV overhead lead-in cubicles (for substations with overhead lead-in).

## 2KTTTAC 63-250 kVA SUBSTATION WITH AUTOMATIC LOAD TRANSFER FUNCTION OVERALL DIMENSIONS



### Keys:

- 1 - HV overhead lead-in cubicles;
- 2 - transformer lead-in cubicle (for substations with transformer lead-in);
- 3 - transformer and LV switchgear cabinet;
- 4 - automatic load transfer apparatus cubicle.

# TRANSFORMER SUBSTATIONS

## for power supply of users in agricultural sector and at various small-scale facilities

One-transformer terminal-type outdoor substations designed to receive 6 (10) kV a.c. energy, to transform it into 0.4 (0.23) kV to supply power users in temperate climatic regions ( - 45 °C to + 40 °C).

Substations are intended for supply/protection of energy users of agricultural sector (including farming enterprises, horticultural household plots, etc.), as well as of separate populated localities and small-scale facilities – those users belonging to III category as to power supply reliability degree.

- Substation HV lead-in is overhead type.
- Substation is connected to power transmission line through a disconnecter (included in delivery set) which is mounted on the line adjacent pole.
- Substations are provided with active energy metering function. As per customer option, any desirable modification meter may be included.
- Substation is fitted with exterior lighting feeder with manual/automatic control. As per customer option, exterior lighting feeder may be excluded.
- Substation is provided with protection systems as follows:
  - against lightning overvoltage;
  - against phase-to-phase short-circuit;
  - against 0.4 kV lines overloads and faults;
  - against lighting or heating circuits faults.
- Substations are provided with electrical and mechanical lockings ensuring safety of attending personnel.
- Substations:
  - are environmentally friendly;
  - are of structural design allowing prompt erection and start-up on worksite, as well as easy dismantling in the event of relocation.
  - are fitted with rubber packing on doors;
  - are easy-on-the-eyes;
  - are furnished with TMГ-series advanced hermetically-sealed transformers of the Plant own produce.

# КТП-02, КТП-04, КТПР SUBSTATIONS

rating 25 – 250 kVA, of 6 (10) kV voltage

## Main features:

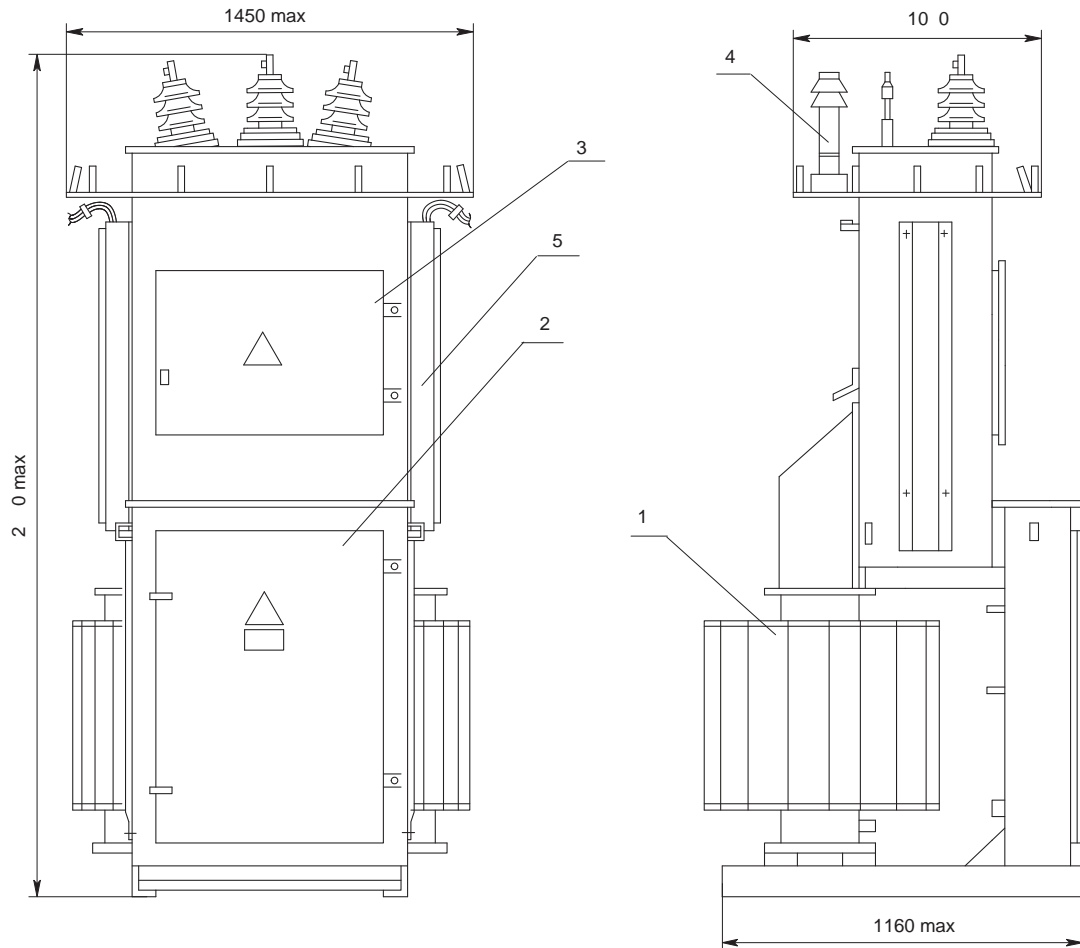
- Outgoing lines are:
  - of КТП-02 substation – of overhead type (except line No. 4 – connected only through a cable);
  - of КТП-04 substation – of cable type;
  - of КТПР substation – of overhead-type.
- 0.4 kV outgoing feeders are fitted with:
  - of КТП-02, КТП-04 substations – with circuit-breakers;
  - of КТПР substations – with fused blade-switches.
- КТП, КТПР substation may include an operating deck for LV switchgear cubicle (as per customer option).

## Main technical parameters

Power transformer rated power, kVA	25		40		63		100		160		250	
HV-side rated voltage, kV	6	10	6	10	6	10	6	10	6	10	6	10
HV-side fuse current rating, A	8	5	10	8	16	10	20	16	31.5	20	40	31.5
Transformer rated current, A	36.1		57.5		91.0		144.3		231.0		361.0	
Outgoing lines rated current, A:												
No. 1	31.5		31.5		40		40		80		80	
No. 2	31.5		63		63		100		160		160	
No. 3	–		–		40		80		100		100	
No. 4	–		–		–		–		–		250	
Lighting line	16 (25*)											

## Notes:

1. \* – As per customer option
2. Transformer connection/vector group, as well as outgoing feeders number and currents thereof may be changed/selected as per customer option

**КТП-02, КТП-04, КТПР SUBSTATION OVERALL DIMENSIONS AND MASS**

Mass (transformer excluded):

25 – 160 kVA substation – 350 kg max

250 kVA substation – 400 kg max

**Keys:**

- 1 - power transformer (if included);
- 2 - LV switchgear cubicle;
- 3 - HV-gear cubicle;
- 4 - overvoltage limiter (valve arrester);
- 5 - cable tray (for substations with overhead outgoing feeders).

# МТП POLE-MOUNTED SUBSTATIONS

rating 25 – 100 kVA, of 6 (10) kV voltage

## Main features:

- LV outgoing lines are overhead type (cable-type – as per customer option).
- 0.4 kV outgoing feeders are fitted with:
  - of МТП-2000 substations – with fused blade-switches;
  - of МТП-2010 substations – with circuit-breakers.
- Mounting and connection to network – using one pole (pursuant to a specific project).
- LV switchgear cubicle outer shell is of IP34 protection degree.
- Substation HV-circuits withstand 10 kA short-circuit current within 3 s.

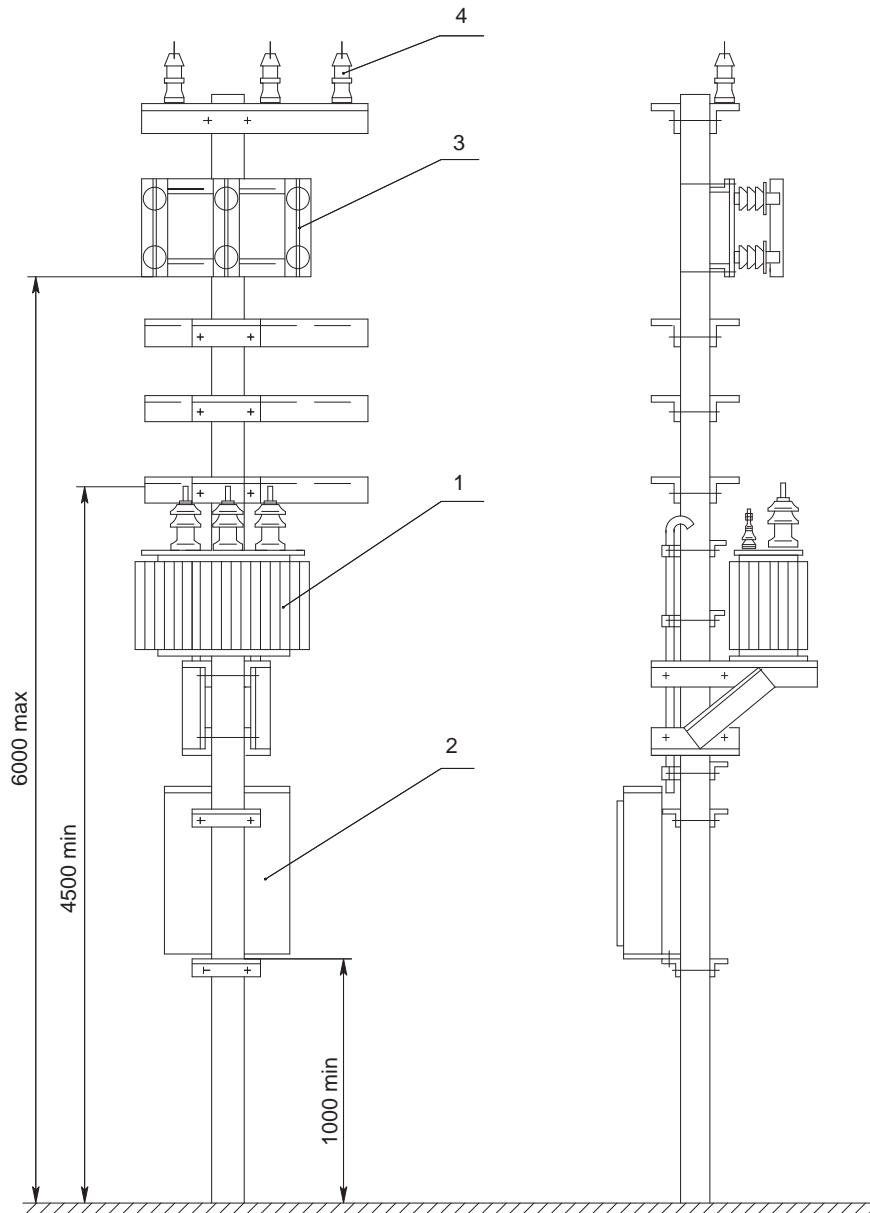
## Main technical parameters

Power transformer type	ТМГ			
Transformer rated power, kVA	25	40	63	100
Transformer connection/vector group	Yyn-0			
HV-side rated voltage, kV	6 (10)			
LV-side rated voltage, kV	0.4			
Outgoing lines rated current, A:				
No. 1	31.5	31.5	40	40
No. 2	31.5	63	63	100
No. 3	-	-	40	80
Lighting line	16 (25*)			

## Notes:

1. \* – As per customer option
2. Transformer connection/vector group, as well as outgoing feeders number and currents thereof may be changed/selected as per customer option



**МТП 25 - 100 kVA SUBSTATION OVERALL DIMENSIONS****Keys:**

- 1 – power transformer;
- 2 – LV switchgear cubicle;
- 3 – HV fuse;
- 4 – overvoltage limiter (valve arrester).

# МТП POLE-MOUNTED SUBSTATIONS

rating 160, 250 kVA, of 6 (10) kV voltage

## Main features:

- LV outgoing lines are overhead type (cable-type – as per customer option).
- 0.4 kV outgoing feeders are fitted with:
  - of МТП-04 substations – with fused blade-switches;
  - of МТП-2010 substations – with circuit-breakers.
- Mounting and connection to network – using two poles (pursuant to a specific project).
- LV switchgear cubicle outer shell is of IP34 protection degree.
- Substation HV-circuits withstand 10 kA short-circuit current within 3 s.

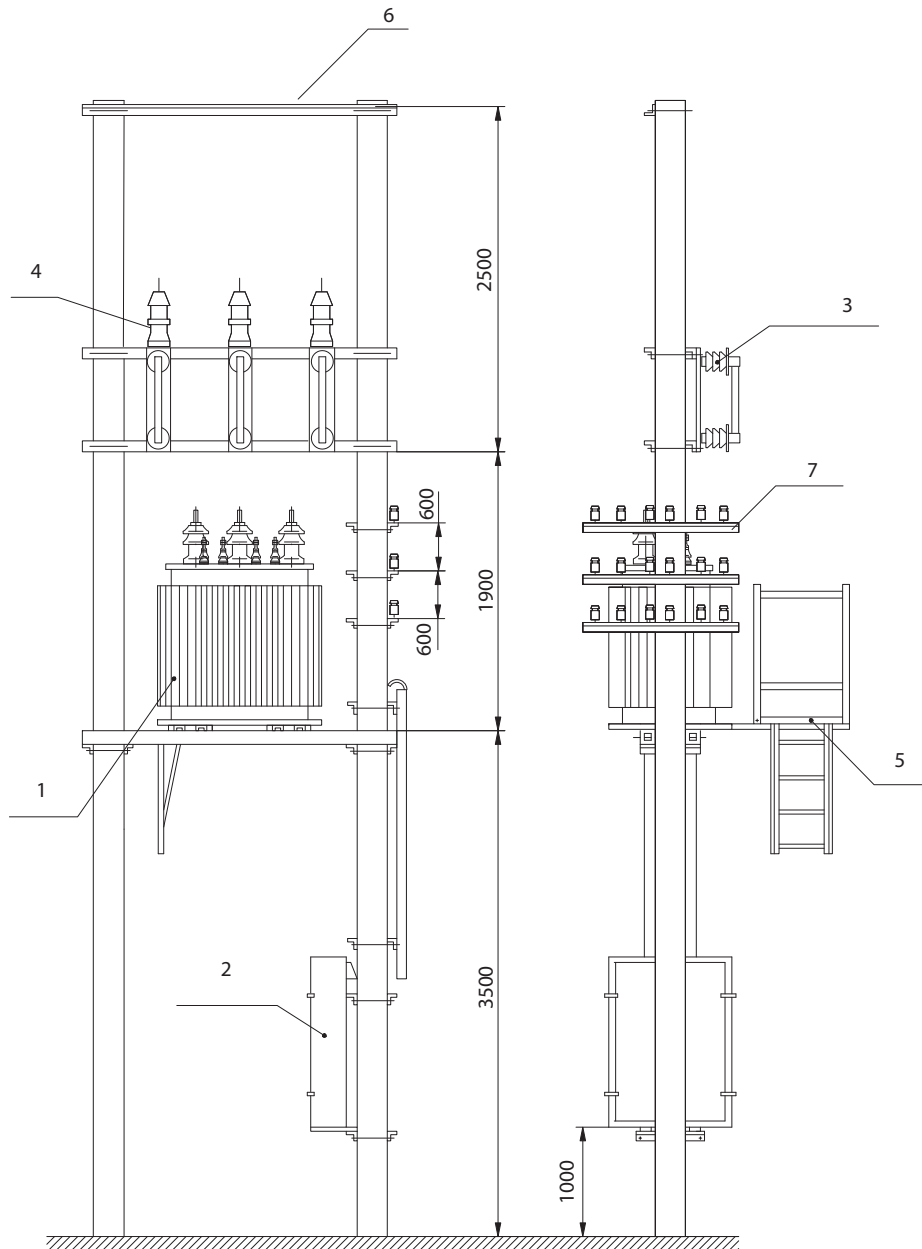
## Main technical parameters

Power transformer type	ТМГ			
Transformer connection/vector group	Yyn-0			
HV-side rated voltage, kV	6 (10)	6 (10)	6 (10)	6 (10)
LV-side rated voltage, kV	0.4			
Substation type	МТП-04		МТП-2010	
Transformer rated power, kVA	160	250	160	250
Outgoing lines rated current, A:				
No. 1	80	80	80	80
No. 2	160	250	160	160
No. 3	100	100	100	100
No. 4	-	-	-	250
Lighting line	16 (25*)			

## Notes:

1. \* – As per customer option
2. Outgoing feeders number and currents thereof may be changed/selected as per customer option

### МТП-04 (МТП-2010) 160, 250 kVA SUBSTATION OVERALL DIMENSIONS



#### Keys:

- 1 – power transformer;
- 2 – LV switchgear cubicle;
- 3 – HV fuse;
- 4 – overvoltage limiter (valve arrester);
- 5 – operating deck;
- 6 – 6 (10) kV traverse beam;
- 7 – 0.4 kV traverse beam.

# MTΠO POLE-MOUNTED SINGLE-PHASE SUBSTATIONS

rating 4, 10 κVA, of 6(10) κV voltage

## Main features:

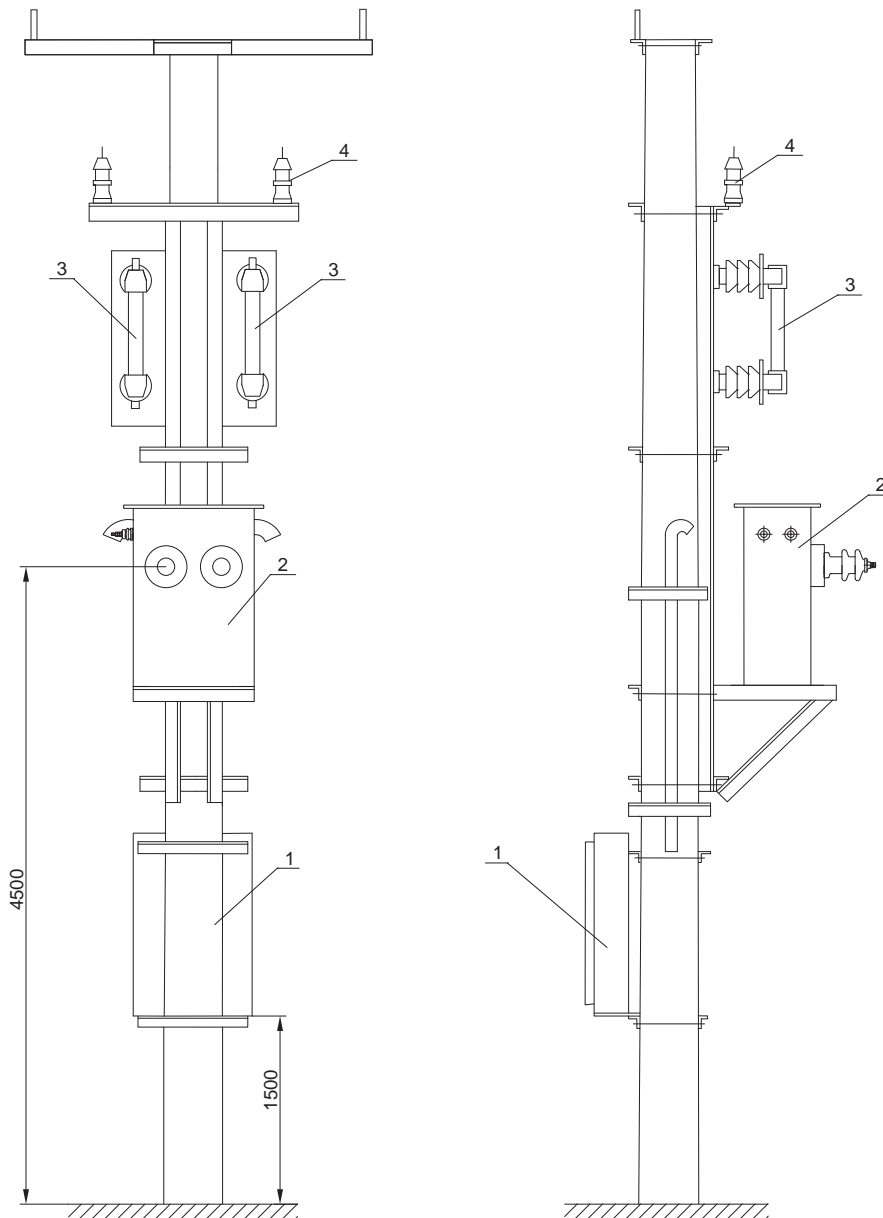
- Substations are intended to receive electric energy of single-phase alternative current.
- LV switchgear cubicle, HV apparatus (fuses, arresters), power transformer are arranged pursuant to a specific project.
- Substation delivery set includes metalware for mounting of: power transformer, LV switchgear cubicle, overvoltage limiters, HV fuses, etc.

## Main technical parameters

Power transformer rated power, kVA	4		10	
Transformer connection/vector group	Yyn-0			
HV-side rated voltage, kV	6 (10)			
LV-side rated voltage, kV	0.23			
Transformer LV-side rated current, A	17.4		43.5	
Outgoing lines rated current, A				
No. 1	25	16	40	25
No. 2	-	16	-	25
Lighting line	16 (25*)			

## Notes:

1. \* – As per customer option
2. Outgoing feeders number and currents thereof may be changed/selected as per customer option

**МТПО SUBSTATION MODULES POLE-MOUNTING****Keys:**

- 1 – LV switchgear cubicle;
- 2 – power transformer;
- 3 – HV fuse;
- 4 – overvoltage limiter (valve arrester).

# TRANSFORMER SUBSTATIONS

## for railway applications

One-transformer outdoor substations intended to receive electric energy of 6 (10) or 27.5 kV a.c., to transform it into 0.4 (0.23) kV for supply/protection of current-using equipment at railways (service tracks, signaling devices, automatic blocking systems, etc.) – in temperate climatic regions ( – 45 °C to + 40 °C).

- Substations for railway applications are manufactured in following design versions:

**Pole-mounted substation.** 1.25 – 10 kVA, of 6 (10) and 27.5 kV voltage substations are intended for power supply of signaling devices, concentration point controls, automatic blocking systems, lighting, and other railway low-power demands. As all the equipment is mounted on a pole, an unauthorized access is minimized.

**Substation mounted on T-shaped reinforced-concrete supports.** 25 – 400 kVA substations are intended for power supply of service tracks, roadside stations, crossings, i.e. of users with a higher power demand. Mounting on supports allows to avoid constructing of special footings and concrete foundations.

- Substation HV lead-in is overhead type; outgoing feeders are cable type.
- Substation is connected to power transmission line through a disconnecter (included in delivery set) which is mounted on the line adjacent pole.
- Substations of all modifications have got a number of advantages in comparison with similar substations by other manufacturers.
- Substations are provided with electrical and mechanical lockings ensuring safety of attending personnel.
- Substation outgoing lines are equipped with circuit-breakers – instead of fused blade-switches.
- Substations are provided with electric energy metering function. As per customer option, any desirable modification meter may be included.
- Substations are provided with protection systems against lightning overvoltages, overloads and short-circuits.
- Substations are environmentally friendly.
- Substations structural design allows prompt erection and start-up on worksite, as well as easy

dismantling in the event of relocation.

- Substations are easy-on-the-eyes.
- Substations are furnished with TMГ-series advanced hermetically-sealed transformers of the Plant own produce.

## ΚΤΠΧ SUBSTATIONS

rating 25, 100, 250, 400 kVA, of 27.5 kV voltage

### Main features:

- Three-phase 27.5/0.4 kV substations energized through a two-conductor-rail system.
- 100–400 kVA substations are provided with a function of active- and reactive energy metering, 25 kVA substations – only of active energy metering.
- Substation outgoing lines are fitted with fixed circuit-breakers.

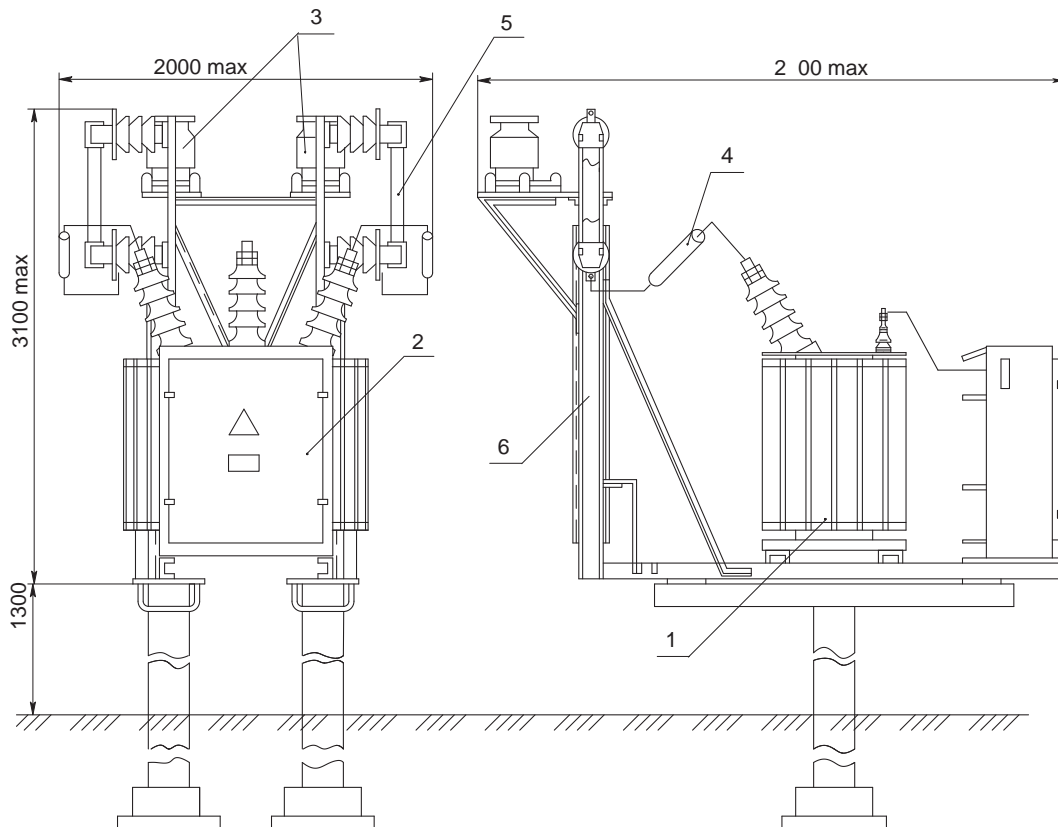
### Main technical parameters

Power transformer type	TMΓ			
Transformer rated power, kVA	25	100	250	400
Transformer connection/vector group	Yyn-0			
Outgoing lines rated current, A				
No. 1	16	63	100	100
No. 2	16	63	100	100
No. 3	16	100	100	250
No. 4	–	–	250	400

### Note:

Outgoing feeders number and currents thereof may be changed/selected as per customer option



**KТПИХ SUBSTATION OVERALL DIMENSIONS****Keys:**

- 1 – power transformer;
- 2 – LV switchgear cubicle;
- 3 – overvoltage limiter (valve arrester);
- 4 – anti-interference circuit;
- 5 – 35 kV fuse;
- 6 – metalware for HV-gear mounting.

## МТПЖ POLE-MOUNTED SUBSTATIONS

rating 10 kVA, of 27.5 kV voltage

Single-phase, one-transformer outdoor substations energized through a conductor-rail system, intended to receive 27.5 kV electric energy, to transform it into 0.23 kV, for energy distribution/protection and power supply of single-phase current collectors of railway facilities – in temperate climatic regions.

### Main features:

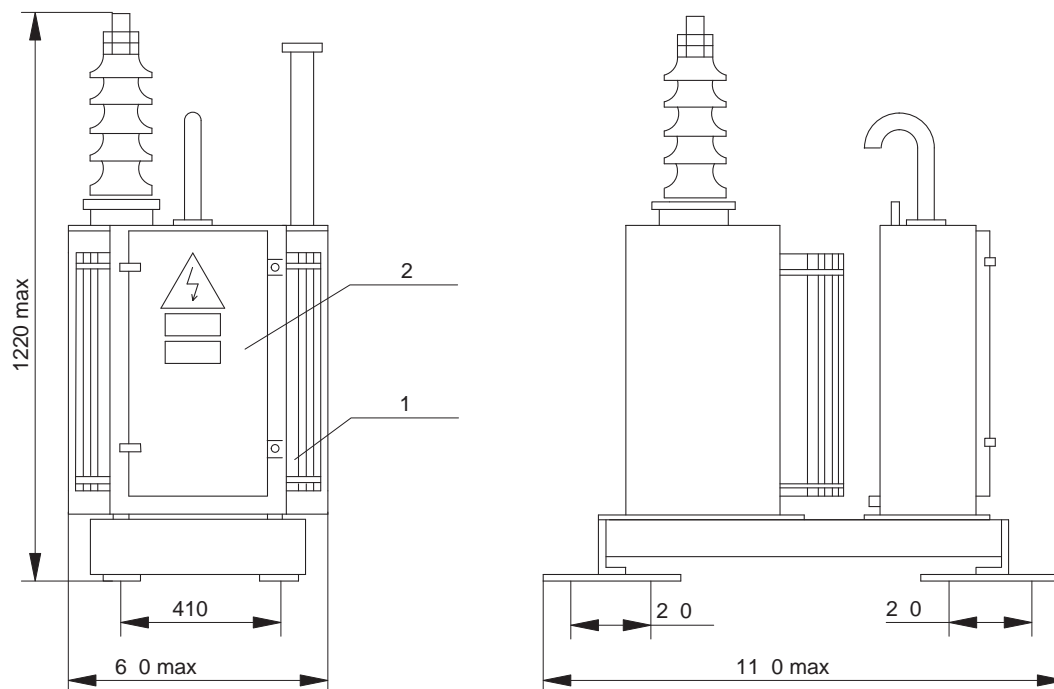
- A single-phase substation.
- Substation design provides its mounting on reinforced-concrete supports in accordance with a specific project.

### Main technical parameters

Power transformer rated power, kVA	10
HV-side rated voltage, kV	27.5
LV-side rated voltage, kV	0.23
Transformer connection/vector group	1/1-0
Outgoing lines rated current, A:	
No. 1	25
No. 2	25
No. 3	25

### Note:

Outgoing feeders number and currents thereof may be changed/selected as per customer option

**МТПЖ (10 kVA, 27.5 kV) SUBSTATION OVERALL DIMENSIONS****Keys:**

- 1 – power transformer;
- 2 – LV switchgear cubicle.

High-voltage gear is included in delivery set

# МТПЖ POLE-MOUNTED SUBSTATIONS

rating 1.25–10 kVA, of up to 27.5 kV voltage

1.25; 2.5; 4; 10 kVA substations are intended to receive 6 (10) kV electric energy, to transform it into 0.23 kV, for power supply of single-phase current collectors of railway facilities – in temperate climatic regions ( – 45 °C to + 40 °C).

Metalware for substation pole-mounting is included in delivery set.

## Main features:

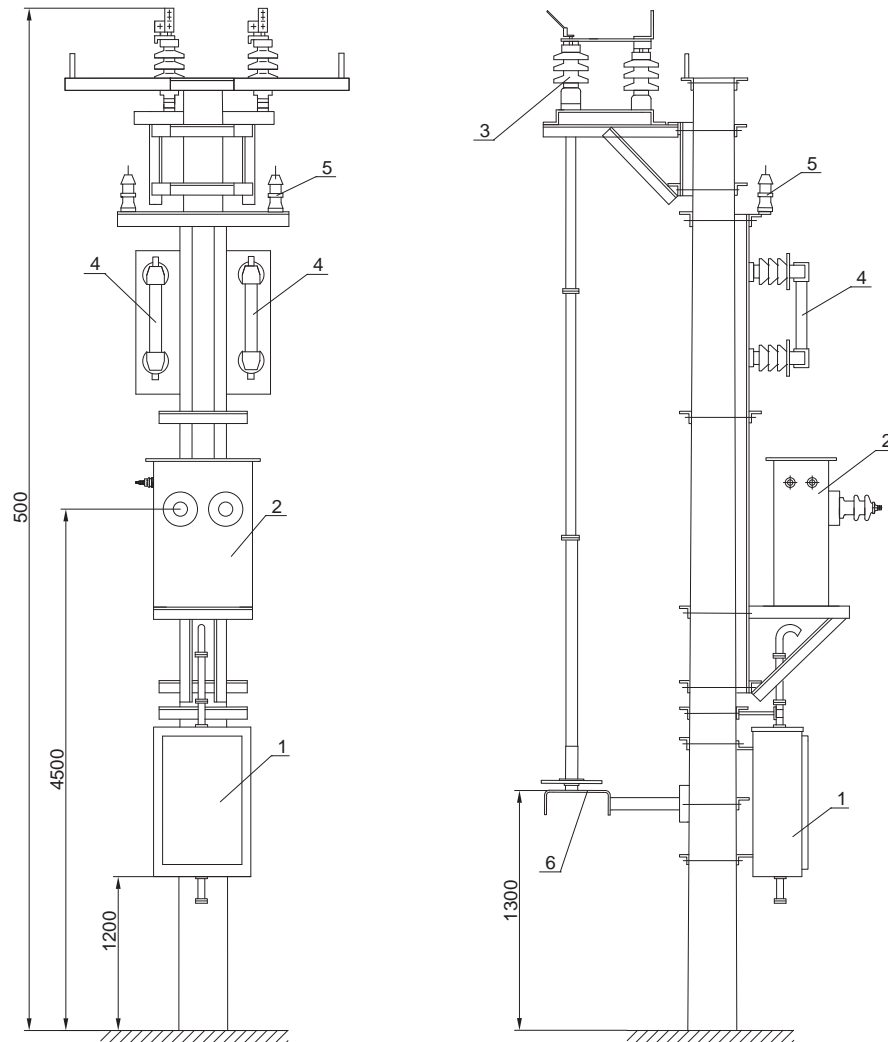
- A single-phase substation;
- Equipment arrangement:
  - version 1** – all apparatus mounted on one transmission line pole.
  - version 2** – all apparatus (except disconnector) mounted on one pole, disconnector – on another (adjacent) pole (separately).

## Main technical parameters

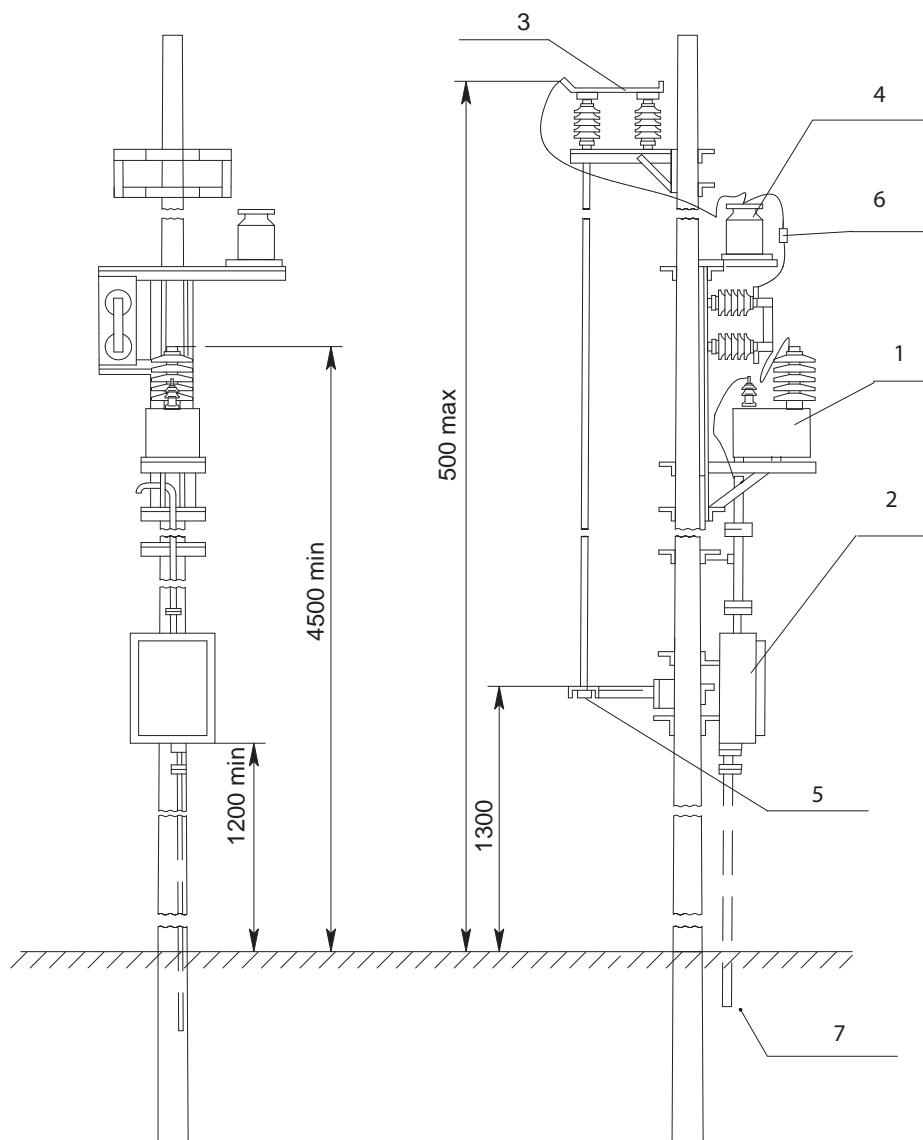
Power transformer rated power, kVA	1.25	2.5	4.0	10.0	
HV-side rated voltage, kV	6 (10)	6 (10) or 27.5		6 or 10	
LV-side rated voltage, kV	0.23				
Transformer connection/vector group	1/1-0				
Outgoing lines rated current, A:					
No. 1	6	4	6	16	25
No. 2	-	4	6	16	25

## Note:

Outgoing feeders number and currents thereof may be changed/selected as per customer option

**6 (10) kV MTTIX SUBSTATION MODULES POLE-MOUNTING****Keys:**

- 1 – LV switchgear cubicle;
- 2 – power transformer;
- 3 – disconnector;
- 4 – HV fuse;
- 5 – overvoltage limiter (valve arrester);
- 6 – actuator.

**27.5 kV МТПЖ SUBSTATION MODULES POLE-MOUNTING****Keys:**

- 1 – power transformer;
- 2 – LV switchgear cubicle;
- 3 – disconnector;
- 4 – overvoltage limiter (valve arrester);
- 5 – actuator;
- 6 – anti-interference circuit;
- 7 – 0.23 kV outgoing lines.

## ΚΤΠΟΣ SUBSTATIONS

rating 25, 40, 63 κVA, of 6 (10) kV voltage

Substations are used to receive electric energy – three–phase, 50 Hz of 6 or 10 kV a.c., to transform it into 0.23 kV, for supply of power users in networks with insulated neutral. Substations are intended for power supply of electric heating circuits of railway pointworks – in temperate climatic regions ( – 45 °C to + 40 °C). Substations are provided with a function of active energy metering.

### Main features:

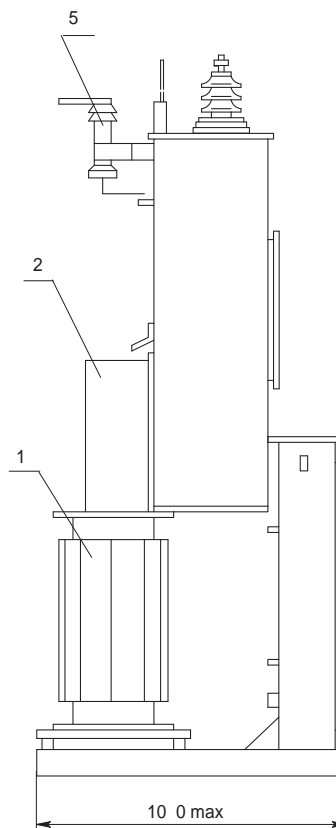
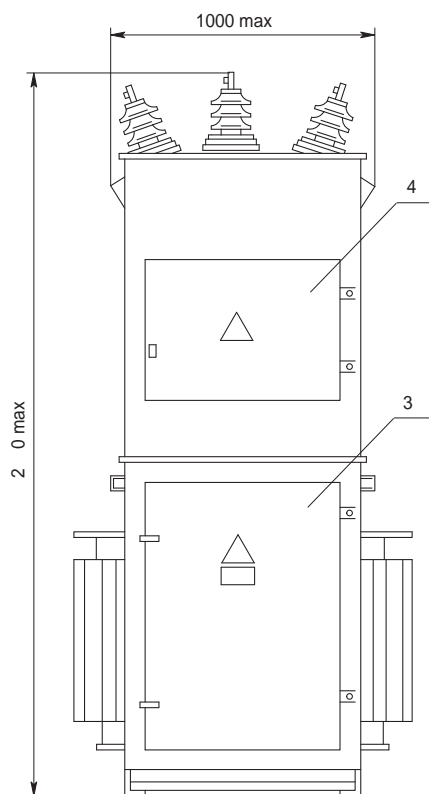
- A one–transformer outdoor substation.
- Substation with HV overhead lead–in and 0.23 kV cable outgoing lines.
- Substation is connected to 6 (10) kV power transmission line through a disconnecter (included in delivery set) which is mounted on the transmission line adjacent pole.
- Substation outgoing lines are fitted with fixed circuit–breakers.
- HV fuse holders are arranged in HV–gear cubicle.
- Substation is provided with electrical and mechanical lockings ensuring safety of attending personnel.

### Main technical parameters

Power transformer rated power, kVA	25		40		63	
HV–side rated voltage, kV	6	10	6	10	6	10
HV–side rated current, A:						
of transformer	2.40	1.44	3.85	2.31	6.06	3.64
of fuse	8	5	10	8	16	10
LV–side rated voltage, kV	0.23					
LV–side rated current, A:						
of transformer	62.8		100.5		158.3	
of line No. 1	80		125		80	
of line No. 2	40		63		160	

### Note:

Transformer connection/vector group, as well as outgoing feeders number and currents thereof may be changed/selected as per customer option

**КТПОС SUBSTATION OVERALL DIMENSIONS AND MASS**

Mass (transformer excluded): 300 kg max

**Keys:**

- 1 - power transformer;
- 2 - enclosure;
- 3 - LV switchgear cubicle;
- 4 - HV-gear cubicle;
- 5 - overvoltage limiter (valve arrester).



## SPECIAL - PURPOSE SUBSTATIONS

### KTΠΤΟ-80 SUBSTATIONS

rating 80 kVA, of 380/55 – 95 V voltage

Outdoor substations intended for electric heating of concrete or frozen soil, with manual or automatic heating temperature control. Substations are also used for power supply of temporary lighting systems and of three-phase 42 V handheld tools (on building sites). Substations normal operation is achieved within – 40 °C to + 10 °C ambient temperature.

Substations are furnished with TMTO–80/0.38 three-phase triple-wound transformers with natural cooling.

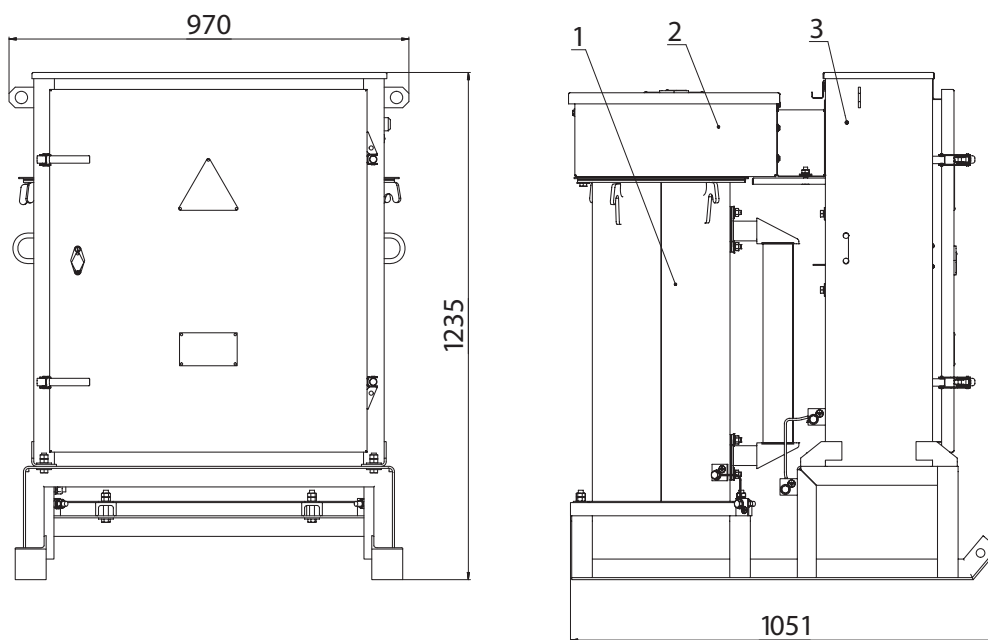
Substations are provided with locking systems ensuring safety of attending personnel.

Locking systems serve to prevent:

- voltage change-over when power transformer is energized;
- opening of control cubicle panel when main circuit-breaker is on.

#### Main technical parameters

Power transformer rated power, kVA	80				
Transformer HV-side rated voltage, V	380				
MV-side voltage levels under no-load, V	55	65	75	85	95
MV-side current, A	520		471		
Transformer LV-winding rated power, kVA	2.5				
Transformer LV-side rated voltage, V	42				
Temperature detector preset range, °C	0–100				

**KTT1TO-80 SUBSTATION OVERALL DIMENSIONS AND MASS**

Mass (transformer included): 495 kg max

**Keys:**

- 1 - power transformer;
- 2 - enclosure;
- 3 - control cubicle.

