



Electroshield-C° OOO

**CURRENT TRANSFORMER**

**TLO-10**

**MH30 and MH31 versions**

**OPERATION MANUAL**

EK.1.775.002.RE

Manufacturer's address:

24 Sovetskaya str. Babynino, Kaluga region, 249210 Russia

Telephone (48448) 2-17-51, fax (48448) 2-24-58

Moscow office: 26 Ryabinovaya Str., building 2,  
office 307

tel./fax: (495) 660-82-52

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## INTRODUCTION

The purpose of this Operation Manual is to provide guidance on the structure and technical details, and the Manual as well contains information on transportation, storage, mounting and operation of TLO-10 current transformer in MH30 and MH31 versions.

In addition to this Operation Manual, the transformer passport EK.1.775.002 PS should be referred to as well.

### 1 CORRECT USE

1.1 TLO-10 current transformer in MH30 and MH31 versions (hereinafter referred to as the “transformer”) is designed to transmit a measurement data signal to metering instruments, protection, automatic control, signal and controlling devices, for fiscal metering of electric power in electric alternating current circuits with frequency of 50 or 60 Hz for voltage class of 10 kV.

1.2 The transformer has the following climatic classes “N”, “NF” and “T”, placement category 1 under GOST 15150-69 and is engineered for operation under the following conditions:

- the upper operating value of ambient air temperature in operation for class “N” and “NF”: + 40°C, for class “T”: + 50°C;
- the lower operating value of ambient air temperature in operation for class “N” and “NF”: - 60°C, for class “T”: - 10°C;
- relative humidity, air pressure – according to GOST 15543.1-89;
- elevation above sea level not more than 1000m;
  
- the environment is non-explosive, contains no current-conducting dust, reactive gases and vapors in concentrations destroying metals - environment of type II under GOST 15150-69;
- creepage distance for pollution level IV under GOST 9920-89;
  
- transformer position in space – vertical;
- the transformer withstand aggregate mechanic load from wind of 40 m/s, ice with glaze of 20 mm and wire tension of not less than 500 N (50kgs);
- the transformer complies with the M1 operation conditions group under GOST 17516.1-90

### 2 TECHNICAL DATA

2.1 Basic technical data for the transformer are given in table 1.

2.2 Two insulation levels are available for the transformer “a” and “b” under GOST 1516.3-96.

2.3 Heat-resistance class of the transformer - «F» under GOST 8865-93.

*Table 1*

Parameter	Parameter value
1	2
Rated voltage, kV	10
Maximum operating voltage, kV	12
Rated primary current, A	5; 7,5; 10; 11; 12; 13; 14; 15; 16; 18; 20; 22; 25; 27,5; 30; 32,5; 35; 37,5; 40; 50; 55; 60; 65; 70; 75; 80; 90; 100; 150; 200; 250; 300; 350; 400; 500; 550; 600; 650; 700; 750; 800; 900; 1000; 1050; 1100; 1150; 1200; 1250; 1300; 1400; 1500; 1550; 1600; 1650; 1700; 1750; 1800; 1900; 2000;

	2100; 2200; 2250; 2300; 2500; 2550; 2600; 2650; 2700; 2750; 2800; 2900; 3000
Maximum operating primary current, A*	according to GOST 7746 (Table 10)
Rated secondary current, A	1; 5
Rated frequency, Hz	50; 60
Number of secondary windings	up to 5**
Accuracy classes of secondary windings: - for measurement; - for protection	0,2S; 0,2; 0,5S; 0,5; 1; 3 5P or 10P
Rated secondary burdens, VA: With power factor $\cos\varphi=0,8$ VA: of measuring winding of protection winding	from 1 to 50 from 1 to 50
Rated accuracy limit factor $ALF_{rat}$ of secondary protective winding	from 2 to 30
Rated instrument security factor $FS_{rat}$ of measuring windings	from 3 to 30
One-second short-time withstand current, kA, at rated primary current: from 5 to 20 A from 30 to 50 A from 75 to 100A 150 A 200 A 300 A from 400 to 3000 A	2,5; 5 5; 10; 20 10; 20; 31,5; 40 15; 20; 31,5; 40 20; 31,5; from 40 to 60 31,5; from 40 to 100 from 40 to 100
Short time electrodynamic current, kA, at rated primary current: from 5 to 20 A from 30 to 50 A from 75 to 100A 150 A 200 A 300 A from 400 to 3000 A	6,25; 12,8 12,8; 26; 52 26; 52; 81; 100 39; 52; 81; 100 52; 81; from 100 to 150 81; from 100 to 250 from 100 to 250
Weight, kg not more	150
Overall dimensions, mm	See annex A
Climatic version under GOST 15150-69	N1, NF1, T1
Notes 1 * – the transformers can be made with the maximum operating primary current equal to $2xI_{rat}$ with the same declared accuracy class (this requirement should be agreed when ordering); 2 ** – technical characteristics for transformers with 4 and more windings should be additionally agreed when ordering.	

### 3 CONFIGURATION

3.1 The transformer is configured as a support structure and has two design versions. The transformer overall view, overall, installation and mounting dimensions are given in Annex A. The case of the transformer is made of cycloaliphatic resin which simultaneously is the main

insulation and ensures protection of the windings against mechanic and climatic impacts.

3.2 The primary terminals are located on the transformer upper part. Secondary windings are located each on its own magnet core. Secondary terminals are located in the transformer lower part.

3.3 The transformer case is fixed to a metal frame which has four openings to fix the transformer at the installation place.

3.4 The transformers have earthing bolt which is located on the frame and a terminal box made with availability to seal the secondary terminals to protect from unauthorized access.

The schematic electrical diagram for the transformers is given in Annex B.

#### **4 INSTALLATION AND MOUNTING**

4.1 The transformer should be installed in outdoor switchgears in accordance with the switchgear drawings. The transformer is fixed at the installation place with the help of four M12 bolts.

4.2 During mounting, please take into consideration that if sense of current in the primary circuit is from J11 to J12, secondary current in the external circuit (appliances) flows from 1H1 to 1H2.

4.3 The earthing terminals of the cast block located in the terminal block and the earthing bolt on the frame should be connected to the earthing loop.

4.4 When operating the transformer, always avoid opening of the secondary circuits, as high voltage is induced on an open winding.

4.5 Secondary windings not used in operation should be short-circuited with a cross-section of at least 3 mm<sup>2</sup>.

4.6 The feeder buses should be connected to the primary contacts with the help of four bolts M12x40 A2.

When connecting the feeder buses, the primary contacts should experience no bending stresses.

4.7. When mounting, please observe:

fixing torque for M12 -200 N m;

fixing torque for M10-30N m;

fixing torque for M6- 2,5N m;

fixing torque for M5-0,2 N m.

4.8 Before commissioning, the transformer should undergo the tests specified by the Maintenance section of this Operation Manual.

4.9 The transformers passed electrical strength test on the base insulation according to GOST 7746-2001 and GOST 1516.3-96.

4.10 Repeated tests for electric strength of the winding insulation should be performed in accordance with Electrical Installation Regulations, Edition 7, Chapter 1.8.17 cl.3.1, table 1.8.16, the transformer should be in operating position.

#### **5 MARKING**

5.1 The transformer has a rating plate matching GOST 7746-2001 and a plate with a warning

sign on high voltage at open secondary terminals.

5.2 Markings on the primary winding J1, J2, K1, H2 secondary windings 1H1, 1H2, 2H1, 2H2 were applied with the help of case casting.

5.3 It is allowed to make the markings for the secondary terminals on all-weather waterproof dirt-resistant polyether labels.

5.4 Shipper containers are marked according to GOST 14192-96, the markings applied directly to the containers.

## **6 SAFETY MEASURES**

6.1 Transformer mounting and operation must comply with safety requirements specified in GOST 12.2.007.0-75 and GOST 12.2.007.3-75, Electrical Installation Regulations, Grid Code, Health and Safety Rules for Electrical Installations.

6.2 It is not allowed to perform any switching over in the transformer secondary circuits, if not have made sure that there is no voltage in the primary winding. When in operation, any chance of opening of the transformer secondary circuits should be precluded.

## **7 MAINTENANCE**

7.1 The rules of the Safety Measures section must be complied with during maintenance of the transformer.

7.2 Maintenance should follow the schedule specified for the installation the transformer is built into.

7.3 Maintenance scope shall be as follows:

- transformer surface cleaning off dust and dirt;
- transformer visual inspection for damages;
- measuring primary insulation resistance. It should be measured with a megaohmmeter of 2500V. Resistance should be at least 1000 MOhm;
- measuring secondary insulation resistance. It should be measured with a megaohmmeter of 1000 V. Resistance should be at least 50 MOhm;

7.4 The transformers in operation are subject to periodical verification according to the method specified in GOST 8.217-2003.

Reverification interval – 8 years.

Mean time to failure  $-40 \cdot 10^4$  h.

Transformer average service life -30 years.

## **8 PACKAGING, TRANSPORTATION AND STORAGE**

8.1 The transformers should be transported packed on pallets of 800x1200 or wooden box by any closed transportation means under the transportation conditions of “H” group according to GOST 23216-78.

Placing boxes and pallets with transformers in several tiers for transportation and storage is strictly forbidden.

8.2 The transformers should be lifted in accordance with the transformer lifting diagrams given in annex B. Transformer deviation from vertical position by more than 15° is not allowed. Strapping by transformer primary bushings is forbidden.

8.3 When performing lifting, it is necessary to take measures to prevent from possible damages

to transformer surface.

8.4 When performing lifting, it is recommended to strap the transformer in transportation frame according to the diagram given on pic. 1.

8.5. If performing lifting according to the strapping diagram without packaging (pic.2), the slings should have a rubber or another soft coverage which would not damage transformer surface, availability on the slings of a balancer preventing the transformer from turning over is mandatory.

8.6 Transformer storage conditions for supplies within Russia in terms of climatic impact should comply with the storage conditions group “9” GOST 15150-69.

8.7 The transformers can be stored and stocked in rooms or under shelter. Storage at outdoor areas is acceptable. If the transformers are stored and stocked without packaging, measures to prevent them from possible damages should be taken.

8.8 When transporting and storing transformers, avoid rapid temperature changes, especially shock cooling.

8.9 Transformer storage period without repeated preparation for prolonged storage – 2 years.

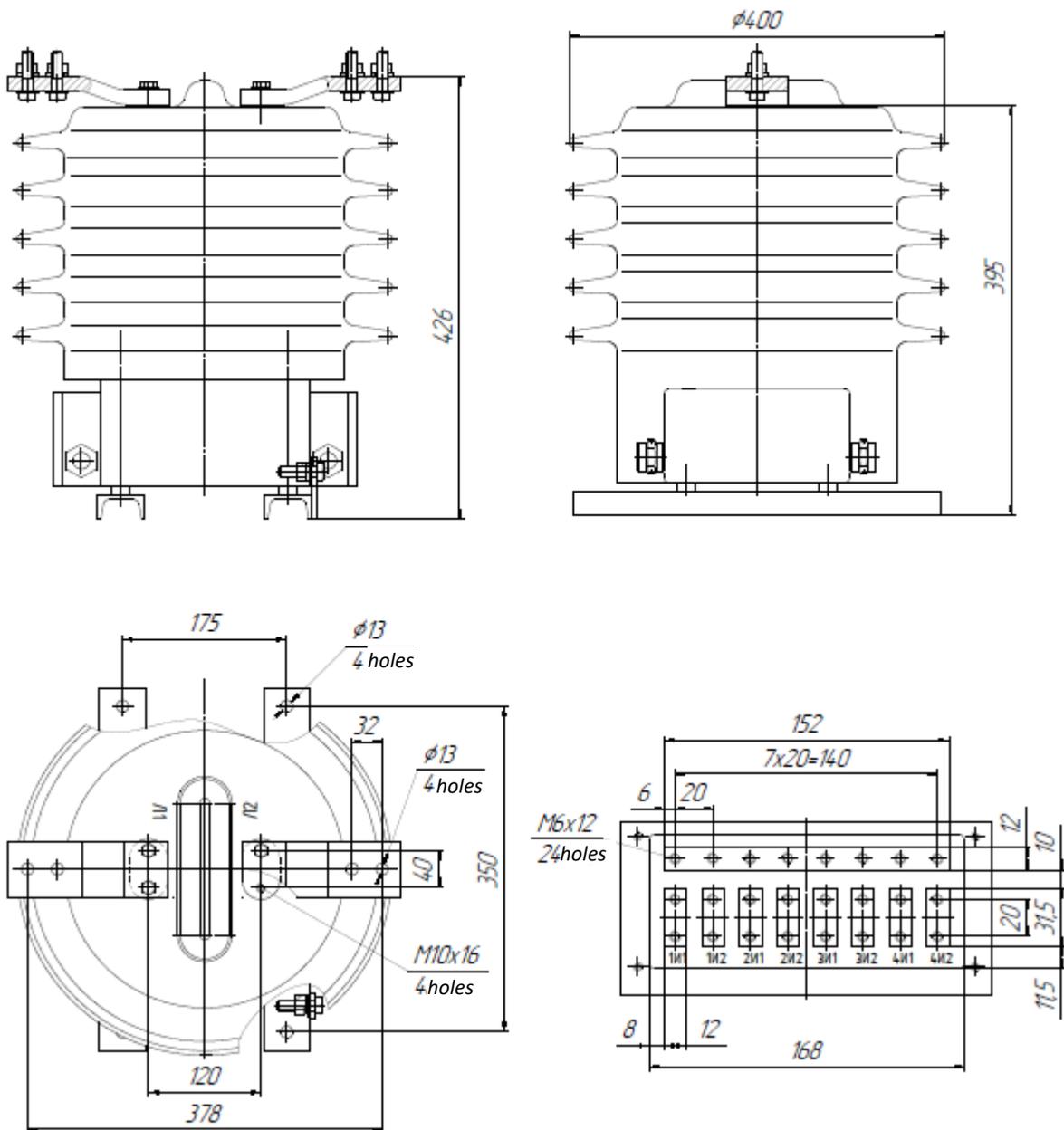
## **9 TRANSFORMER CONVENTIONS**

An example of a record to denote the support-type current transformer with cast insulation for rated voltage of 10 kV, of MH30 design variant, with secondary windings of accuracy class 0,2S and load of 10V·A for fiscal metering, of accuracy class 0,5 and load of 15 V·A to connect measurement circuits, accuracy class 10P and load of 30 V·A to connect protection circuits, for rated primary current of 300A, rated secondary current of 5 A, climatic version “NF”, placement category 1 according to GOST 15150-69 at the time of order and in documents for another product:

*Current transformer TLO-10 MH30-0,2S/0,5/10P-10/15/30-300/5 NF1  
TU 3414-003-52889537-01*

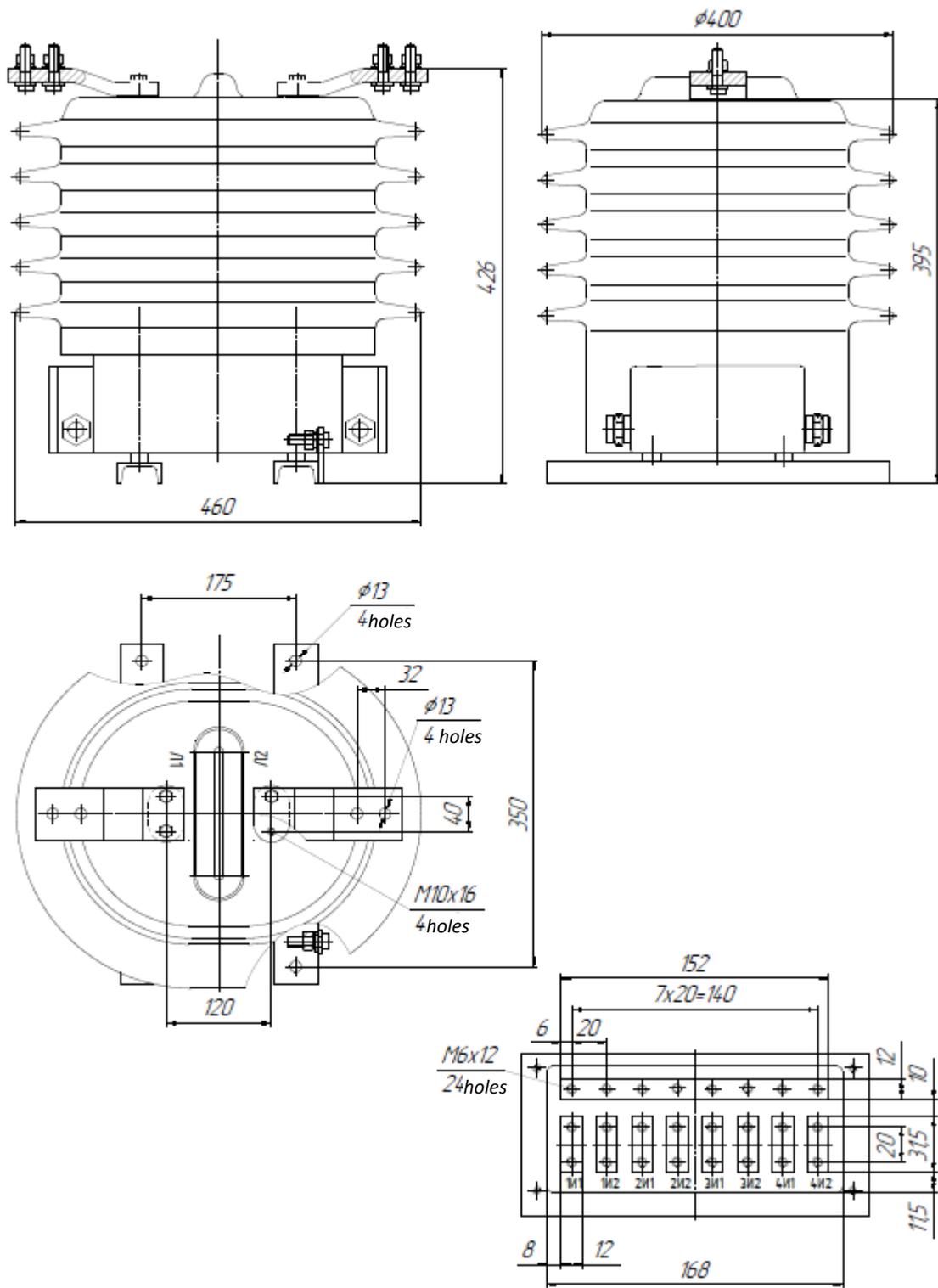
Annex A  
**Overall Dimensions for TLO-10 Instrument Current Transformer**

**Version MH30**



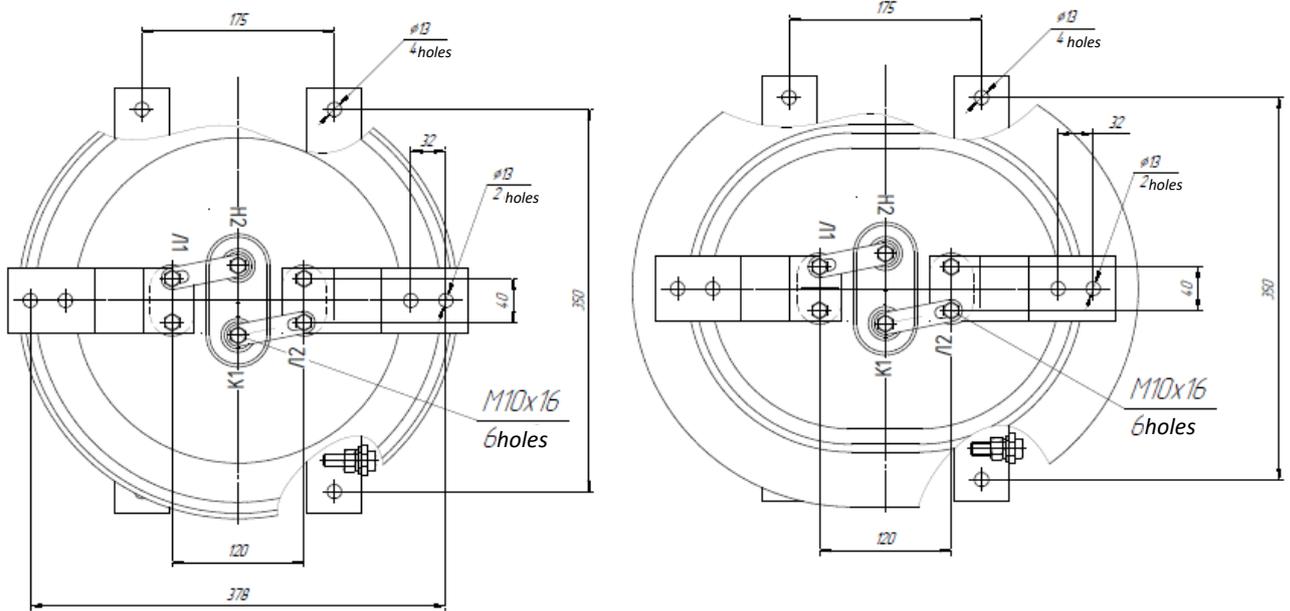
**Version MH31**

**For rated primary currents from 5 to 1500A**

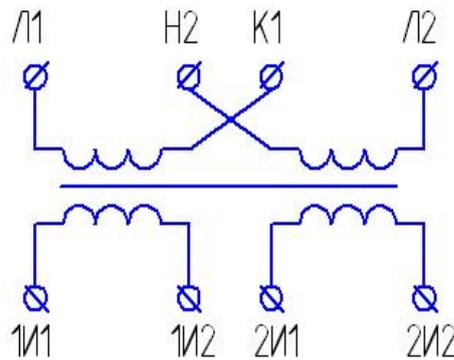




**Version F** – transformer with switching over on the primary winding.



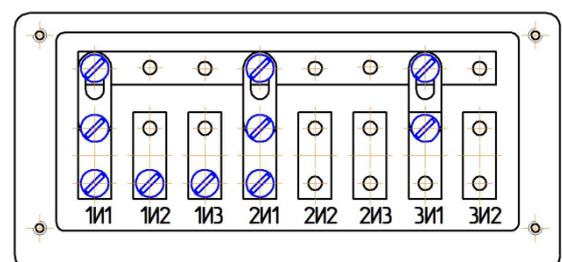
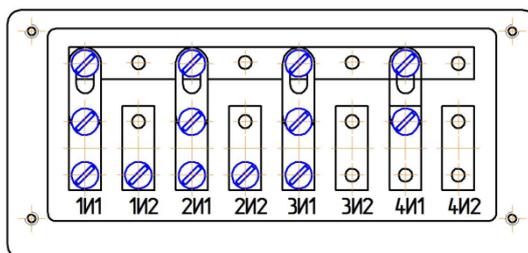
**Connection diagram for TLO-10 current transformer with switching over on the primary winding.**



**Location of secondary terminals**

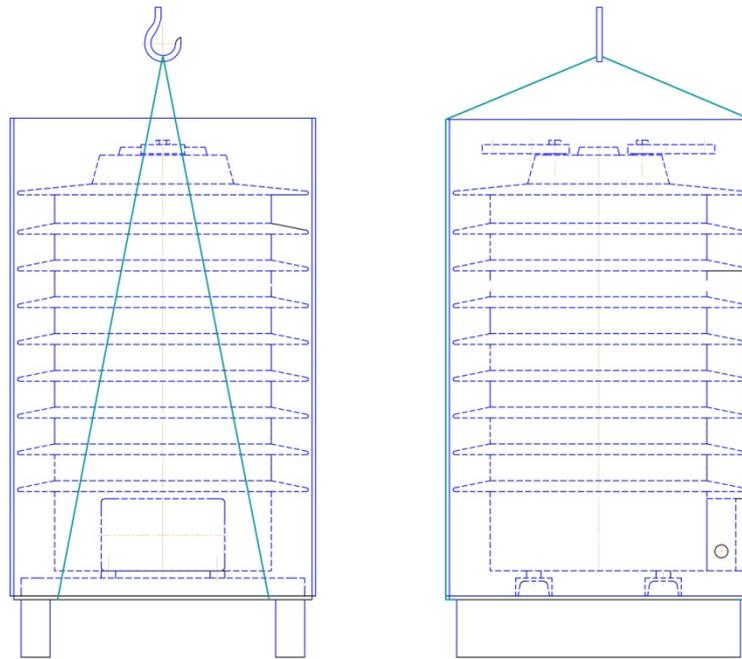
without taps

with tap



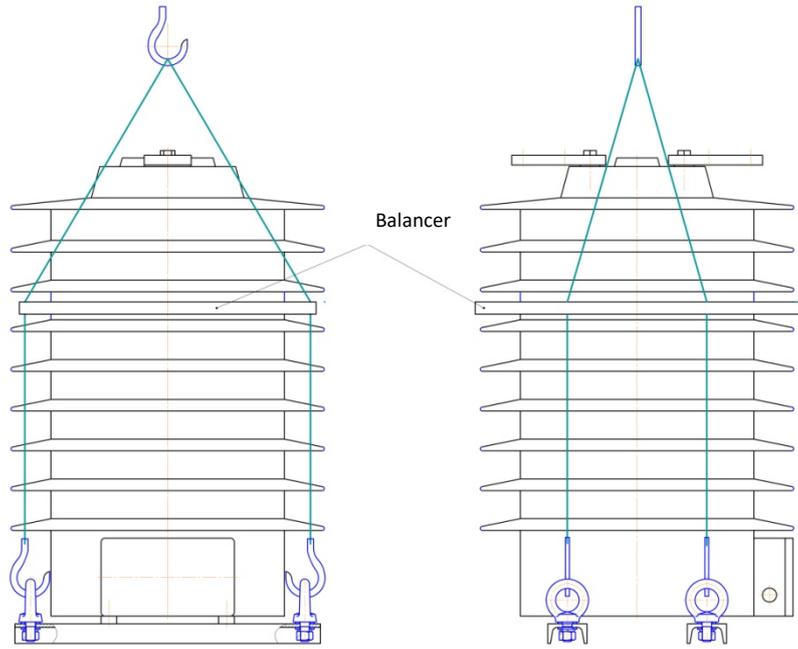
## Strapping diagram for TLO-10 current transformer

Strapping diagram in a package



Pic.1

Strapping diagram without packaging



Pic. 2