TRANSFORMER 10/0.4 kV FOR POWER SUPPLY OF RESIDENTIAL INFRASTRUCTURE OBJECT IN ACCORDANCE WITH CURRENT APPLICABLE STANDARDS

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Introduction. The development of the power supply project for the residential and office infrastructure with public, social and household objects, industrial purposes and underground parking at the stages of reconstruction, construction and sustainable operation involves, in particular, the construction of a 10/0.4 kV transformer substation of individual development, which built into the customer's building. Adopted technical decisions must meet the requirements of current regulatory documents, namely: Rules for the arrangement of electrical installations [1], DSTU 2267-93 "Electrical products. Terms and definitions" [2], DSTU 3465-96 "General purpose power supply systems. Terms and definitions" [3], State Building Regulations A.2.2-3-2012 "Composition and content of design documentation for construction" [4], Industry Guideline Document 34.20.507-2003 "Technical operation of power stations and networks Rules" [5].

The initial data for design in the electrical load section provides that the temporary point of connection of consumers is installed on the ends of the power cables of the high-voltage distribution device of the object. In accordance with the technical conditions for power supply to consumers of the object, construction of a 10/0.4 kV transformer substation with power supply according to the two-beam scheme is provided.

The number and power of power transformers must be selected based on the conformity of the reliability category of the power supply to consumers and according to the load calculation. The electrical receivers of the facility belong to the I and II power supply categories. For the needs of the electrical installation, a two-section switchgear of 10 kV, consisting of one-way service chambers, was designed. In normal mode, the sections work separately, power transformers are supplied from different sections of the switchgear.

The aim of the work is to justificate the choice of a 10/0.4 kV transformer for powering a residential and office infrastructure object with public, social and domestic, industrial objects in accordance with the current applicable standards, technical conditions regarding the electricity supply of consumers of the object, the category of reliability of the electricity supply of consumers and according to the load calculation.

Materials of research. Two power transformers of 1000 kVA–10/0.4 kV of the "Ekodesign" series with molded insulation and reduced losses Δ / Y_N – 11, overload up to 140% are installed in the electrical installation (Fig. 1).

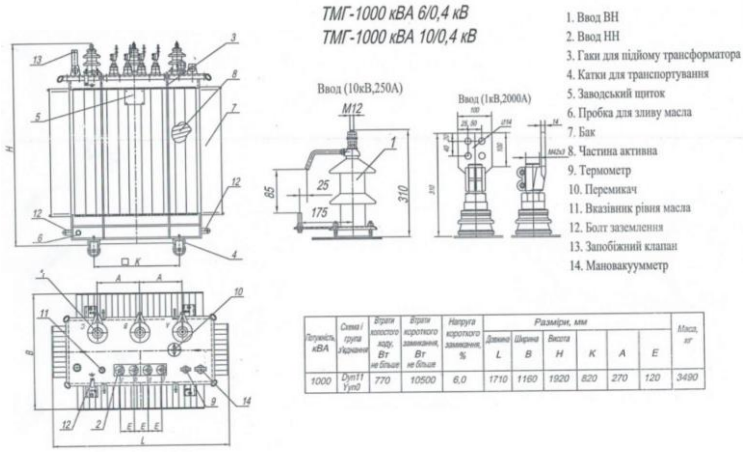
Transformers of the "Ecodesign" series are produced in accordance with the technical regulations of the EU. The oil transformer has a rectangular shape, the windings are located in a corrugated tank, transformer oil is used to cool the windings. Transformers are made with upper inputs and outputs, without an

expansion tank. A float-type oil gauge is used to control the oil level. the voltage adjustment switch is located on the top cover. Hooks in the upper part of the transformer are used for installation and movement.

The transformers work in the mode of full mutual redundancy in the event of an accident of one transformer from the pair.

Transformers are equipped with blowing fans, temperature sensors and devices of the T154 and VRT200 series to provide thermal protection.

Transformers are installed in separate chambers with guide and anchor devices for moving transformers, protective barriers restricting access from the door side. Transformers are connected to the switchgear using aluminum busbars. The switchgear is connected to the power transformers by bus bridges of 0.4 kV.



Потужність, кВА	Схема і група з'єднання обмоток	Втрати холостого ходу, Вт, не більше	Втрати короткого замикання, Вт, не більше	Напруга короткого замикання, %	Розміри, мм						Маса, кг
					Довжина L	Ширина B	Висота H	K	A	E	
1000	Dyn11 Yyn0	770	10500	6,0	1710	1160	1920	820	270	120	3490

Figure 1 – Transformer 1000 kVA-10/0.4 kV of the "Ecodesign" series (information from the manufacturer's website [6])

For the needs of the electrical installation, a two-section switchgear is designed, in which sectioning is performed with the help of an automatic switch. In the input panels of the switchgear, maximum-current protection against one-two-three-phase short circuits and bus overloads of 0.4 kV is provided, which is performed by automatic switches.

On the facades of the panels, signaling devices for the operation of the installations and control and measuring devices for measuring the parameters of the electrical network are provided.

It is planned to install a self-needs panel with a meter for technical accounting of electric energy, a circuit breaker and a fuse, a built-in step-down transformer of grounded ultra-low voltage 220/12 V and automatic switches for consumers of own needs. A box for temporary connections of repair equipment with a meter for technical accounting of electric energy, a circuit breaker and fuses is installed.

Ensuring the normalized temperature in the room for the normal functioning of automation devices and for comfortable maintenance of the equipment is carried out with the help of the heating control panel. For the premises of the electrical installation, 220V working electric lighting and 220V emergency electric lighting on the cable floor are additionally provided.

The grounding system of TN-S in accordance with the current building regulations B.2.5-27-2006 [4]. The resistance of the grounding device of the

electrical installation is no more than 4.0 Ohm. The grounding device consists of a grounding line, a grounding circuit and auxiliary elements. The grounding main is made of a 40×3 mm steel staff around the perimeter of the premises with fastening on embedded elements at a height of 400 mm from the planning mark of the clean floor of the premises.

Metal housings of electrical equipment, structural elements, door frames, housing and neutral of power transformers are connected to the grounding line. The ground bus is connected to the external ground loop in at least two places. As an external grounding circuit, natural grounding devices are used, for example, reinforced concrete foundations of buildings.

If the resistance of natural grounding devices is not enough, then it is necessary to make an artificial external grounding circuit from vertical and horizontal grounding electrodes embedded in the ground. The external grounding circuit is common to the lightning protection system, 10 kV and 0.4 kV electrical networks. The grounding device must be put into operation after appropriate measurements of the resistance of the external grounding loop.

The lightning protection device is integrated with the structure in which the electrical installation is built.

Setup and testing of the equipment should be carried out in accordance with the requirements of current regulatory documents, and the facility should be put into operation only after the specified measures have been taken.

Conclusions. In accordance with the task, two 1000 kVA-10/0.4 kV power transformers with reduced losses were selected for placement in the electrical installation of a residential and office infrastructure facility with public, social, domestic and industrial facilities. Adopted technical decisions meet the requirements of current regulatory documents, namely: Rules for the arrangement of electrical installations, DSTU 2267-93 "Electrical products. Terms and definitions", DSTU 3465-96 "General purpose power supply systems. Terms and definitions", State construction regulations "Composition and content of project documentation for construction", Industry guidance document 34.20.507-2003 "Technical operation of electrical stations and networks. Regulations".

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