

MEDIUM VOLTAGE RESIN TRANSFORMERS



- TYPE
 - POWER
 - HV PRIMARY VOLTAGE
 - LV SECONDARY VOLTAGE
 - VECTOR GROUP
 - PROTECTION DEGREE
 - CLIMATIC DESIGN
 - FLAMMABILITY CLASS
- ETR
 - up to 2500 kVA
 - up to 15 kV
 - upon request
 - upon request
 - IP00; IP23; IP44; IP54
 - C2/E2
 - F1

DESIGN AND PRODUCTION: **ELHAND TRANSFORMATORY Sp. z o.o.**
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The ETR transformers have HV windings which are wound with the use of rowing technology (wet winding). The product is made of non-flammable and flame-retardant materials which is confirmed by appropriate tests and certificates. Therefore it is a perfect solution for industrial installations susceptible to fire hazard, as well as public utility buildings. They are also suitable for indoor use as a replacement for oil transformers.

In order to ensure the ability to operate under difficult environmental and climatic conditions, as well as the compliance with national and international standards, the ETR resin transformers were designed and tested according to the following environmental classes:

- **C2** – resistance to thermal shock. ETR transformers are resistant to significant changes in load and overload.
- **E2** – resistance to corrosive environments. The transformers may operate in difficult conditions: high humidity and polluted environments.
- **F1** – flame-retardant or non-flammable and self-extinguishing materials. During the combustion there occurs no emission of toxic gases and they self-extinguish after the source of fire is removed.

Advantages:

- High resistance to the moisture of insulation
- Non-flammable and flame-retardant airtight sealed insulation of windings
- High dielectric resistance
- High short-circuit resistance
- High resistance to the external factors according to C2, E2, F1 class
- The level of partial discharge <10pC

Construction:

The cores of transformers are made of magnetic sheet cold-rolled with low loss. The accurate design of the core is possible thanks to the use of innovative STEPLAP cutting technology and the application of mechanized tables for assembling and lifting the core to its vertical position.

The LV winding, depending on the Customer's requirements, is made with the use of aluminum or copper tape or with a few parallel shaped wires in varnish insulation class H. NOMEX or ERGOPREG are applied as an insulation between the windings. ERGOPREG is a special composite material which glues the adjacent windings made of tape together. Such a solution ensures a high resistance to short circuit tension and provides for an airtight sealing of the winding preventing the penetration of humidity and chemical vapors, as well as high dielectric resistance.

The HV winding is made according to the rowing technology (wet winding). The successive windings are wound with copper conductors with round or rectangular intersection in double varnish insulation, class H. The interlayer insulation is made of fiberglass impregnated with resin which create a compact monolith after the thermal hardening process. A winding made in such a way is characterized by a high mechanic and dielectric resistance.

Operating conditions:

The ETR transformers may stand in ventilated closed rooms meeting the following requirements:

- Maximum temperature of the cooling air: 40°C
- Minimum ambient temperature: -25°C
- The average annual temperature of the cooling air: 25°C
- Maximum relative air humidity: up to 95% at 20°C
- Operating altitude: up to 1000 m above sea level

Quality control:

To ensure the highest quality of our products, ETR power transformers are subject to product, type and special tests:

Product tests (performed on each transformer):

- insulation strength with testing voltage
- insulation strength with induced voltage
- measurement of winding resistance
- measurement of insulation resistance,
- measurement of voltage ratio and check of phase displacement
- measurement of no-load loss and no-load current,
- measurement of short-circuit impedance and load loss,
- measurement of partial discharges level

Type tests:

- temperature rise test
- measurement of emitted noise level

Special tests:

- other tests to be agreed with the customer.

All tests performed on our testing station are carried out with the use of the most modern equipment of world-class manufacturers: HAEFELY-HIPOTRONICS and TETTEX.

Research has shown that the ETR transformer's windings, tested in accordance with the flammability class F1, do not produce harmful gases in high temperatures and the emission of fumes is also minimized.