

PRODUCT CATALOG



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ABOUT US WHO ARE WE?

We are pleased to introduce **ECO TRANSFORMER LLC MONTENEGRO**, a leading manufacturer specializing in the design and production of high-quality oil-type distribution transformers.

Our team has more than 15 years of experience in the power distribution industry, so we take pride in delivering reliable and efficient solutions that meet the demands of modern energy systems.

ECO TRANSFORMER LLC MONTENEGRO handles the needs and expectations of customers in an open, transparent, fast and secure manner; performs all processes before and after sales with a customer-oriented approach.

This new facility is designed to increase our capacity to produce high-quality transformers while enhancing the efficiency, flexibility, and sustainability of energy distribution worldwide.



VISION

To be a global leader in transformer manufacturing, delivering innovative, energy-efficient, and sustainable solutions that power the world's industries, infrastructure, and communities.

MISSION

- 1. Quality Excellence:** To manufacture high-performance transformers that meet international quality and safety standards.
- 2. Innovation & Technology:** To invest in cutting-edge technology and continuous research to enhance efficiency and reliability.
- 3. Customer Satisfaction:** To provide customized and cost-effective transformer solutions that exceed customer expectations.
- 4. Sustainability:** To promote environmentally friendly manufacturing processes and energy-efficient products.
- 5. Workforce Development:** To empower employees with skills, training, and a safe work environment to drive excellence.
- 6. Global Expansion:** To expand our market reach by maintaining strong partnerships and delivering world-class products.

POWERING A SUSTANIABLE FUTURE

The shift toward energy efficiency is inevitable, and businesses that embrace it today will be the leaders of tomorrow. Our Tier 2 transformers are designed to help you reduce costs, improve reliability, and contribute to a more sustainable world.

The electrical and mechanical properties of Eco transformers are guaranteed under the environmental conditions given in Table (2).

Ambient temperature	5°C to +45°C (50°C as option according to ...EDC) (35°C monthly average of the hottest month, 25°C yearly average)
Maximum relative humidity	0.95
Altitude	Up to 1000 m above sea-level

DESIGN CRITERIA

Vector Groups for Tier 2 ECO TRANSFORMERS

The **Vector Group** of a transformer defines the **phase relationship between the primary and secondary windings**, influencing system design, fault management, and compatibility. For **Tier 2-compliant transformers**, the selection of an appropriate vector group ensures optimal efficiency and grid integration.

Dyn11 Delta (Primary) – Star (Secondary) + 30° Phase Shift	Industrial, Distribution Networks (Most Common)
Dyn5 Delta (Primary) – Star (Secondary) + 150° Phase Shift	

RATED POWER

Rated Power (or kVA Rating) of a transformer defines the **maximum apparent power** it can handle **without exceeding thermal limits**. It is typically given in **kilovolt-amperes (kVA)** or **megavolt-amperes (MVA)** and determines the transformer's suitability for different applications.

25 kVA – 500 Kva	Small industrial loads, commercial buildings, residential distribution
500 kVA – 2500 kVA (2.5 MVA)	Medium commercial facilities, small substations, renewable energy
2.5 MVA – 4 MVA	Large commercial facilities, small substations, renewable energy

VOLTAGE RATIO

Power transformers are designed with standardized voltage ratios to efficiently step up or step down voltages in electrical grids, industrial applications, and commercial power distribution. These ratios ensure compatibility with **transmission, distribution, and end-user systems**.

Standard Voltage Ratios for Transformers (≤ 4 MVA)			
Rated Power (MVA)	Primary Voltage (V ₁)	Secondary Voltage (V ₂)	Application
0.25 – 1 MVA	11 kV	400V / 230V	Industrial & Commercial Distribution
0.5 – 2 MVA	22 kV	400V / 230V	Industrial Power Supply, Commercial Use
0.5 – 2 MVA	33 kV	400V / 230V	Large Industrial Loads, Rural Power Supply
1 – 4 MVA	11 kV	6.6 kV / 3.3 kV	Industrial Motors & Processing Plants
2 – 4 MVA	33 kV	11 kV	Substations, Utility Distribution



TEMPERATURE RISE LIMITS

The transformer should be able to deliver its maximum continuous ratings without exceeding the following permissible temperature rise limits:

- Top oil level temperature rise 45 °C
- Winding temperature rise measured by resistance method 55 °C
- Hot spot 60 °C

COOLING

Cooling is done by the natural circulation of the internal insulating oil and the external air i.e. ONAN cooling. (ONAF cooling is an option according to requirements).

Our oil meet the requirements of the. **REACH Regulation (EC) No. 1907/2006 and IEC 60296: Insulating Liquids – Unused Mineral Insulating Oils for Electrical Equipment**



INSULATION LEVEL

The **insulation** level of a transformer refers to the ability of the transformer's insulation system to withstand electrical stresses without failure. It is a critical specification that ensures the transformer can safely operate under various voltage conditions, including during faults or other abnormal operating scenarios.

Importance of Insulation Level

- **Safety:** A higher insulation level means the transformer is less likely to fail under extreme conditions, ensuring safer operation and preventing accidents or equipment damage.
 - **Reliability:** Proper insulation ensures the transformer can withstand operational voltage fluctuations, transient surges, and faults without degradation.
 - **Longevity:** Transformers with higher insulation levels tend to have longer operational lives, as they are less prone to damage from electrical stresses.
- The following test voltages are applicable to the transformers:
- High voltage impulse withstand voltages: 125 kV
 - Power frequency withstand voltage: 50 kV / 1 minute
 - Low voltage Power frequency withstand voltage: 3 kV / 1 minute

IMPEDANCE VOLTAGE

The short-circuit impedance (or impedance voltage Z% expressed as a percentage of rated voltage) measured at mid-tap at 95 °C are as follows:

- 4 % for transformers of power rates (from 25 kVA up to 630 kVA)
- 5 % for transformers of power rates (800 – 1000 – 1250 kVA)
- 6 % for transformers of power rates (1500 – 1600 – 2000 – 2500 kVA)
- 7 % for transformers of power rates (3000 – 3500 – 4000 – 5000 kVA)

– **According to IEC 60076-1, the measured short-circuit impedance is subjected to a tolerance of $\pm 10\%$ of the specified value.**



BUSHINGS

The transformer bushings are made of porcelain.

Generally, it comply with the requirements of IEC 60137.

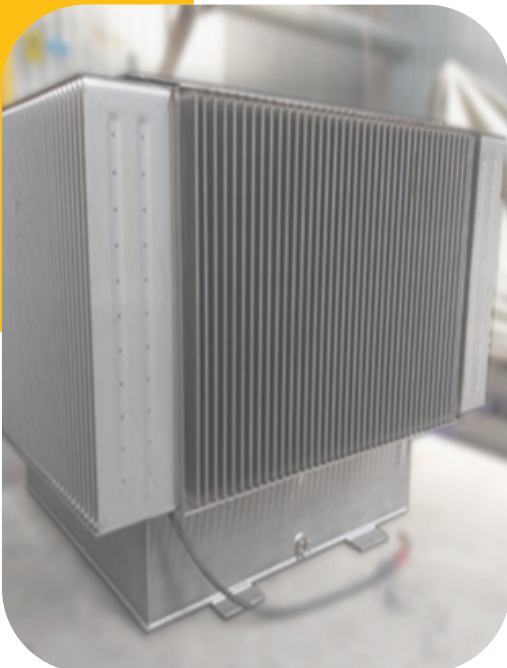
- The creepage distance is not be less than 2 cm/kV for indoor transformers and 4 cm/kV (4.5 cm/Kv optional according to requirements) for outdoor transformers.
- To avoid overvoltage damage each high voltage bushing is fitted with duplex arcing horn electrodes made of steel. The vertical distance of the arcing horn is set at 155 mm according to VDE0111/261. – .For transformers with power rates from 500 kVA and higher, the low-voltage bushing is provided with copper flags. For the transformers with power rates below 500 kVA, the low voltage bushing is provided with suitable copper bars or copper flags.
- MV bushings are labeled U, V, and W by using indelible black color paint on the tank cover (metal plate fixed by rivets, bolts, or accepted way so that they cannot be removed).
- Surge arrester for outdoor transformers (Option as per requirements):
- A surge arrester should be fixed to the medium voltage bushing. It should meet the requirements of the latest revision of EDMS 11-400.



OIL-EXPANSION CONSERVATOR

The oil-expansion conservator is made of sheet steel with an adequate capacity to allow extreme changes in the oil level e.g. when the transformer is off-circuited at 0°C and when the transformer is fully loaded at 45°C ambient.

The quantity of oil is plainly marked on the conservator. The conservator is provided with oil level indicator (sight glass at low voltage side), a dehydrated breather with silica-gel, oil filling and drain plugs and a connection pipe for connecting the oil to the transformer.



DISTRIBUTION TRANSFORMERS

– The transformer tank is made of best quality plate steel with a bolted cover fitted with neoprene cork seals suitable for the specified temperatures.

The tank is rigid enough to withstand, without deformation, the mechanical stresses arising from transformer lifting, transport, or due to short-circuit effects inside the transformer.

– Radiators are welded to the tank.

➤ The radiator fins shall be welded with stiffening rods (horizontally and diagonally). In addition, suitable ironwork is fitted to the radiator groups to prevent vibration during the operation of the transformers.

➤ The design of the radiators fulfills demanding so that dust and sand cannot accumulate and block or restrict the circulation of the air.

➤ Each radiator is provided with an air release vent and drain plug.

➤ The radiators withstand the pressure and vacuum conditions specified for the tank.

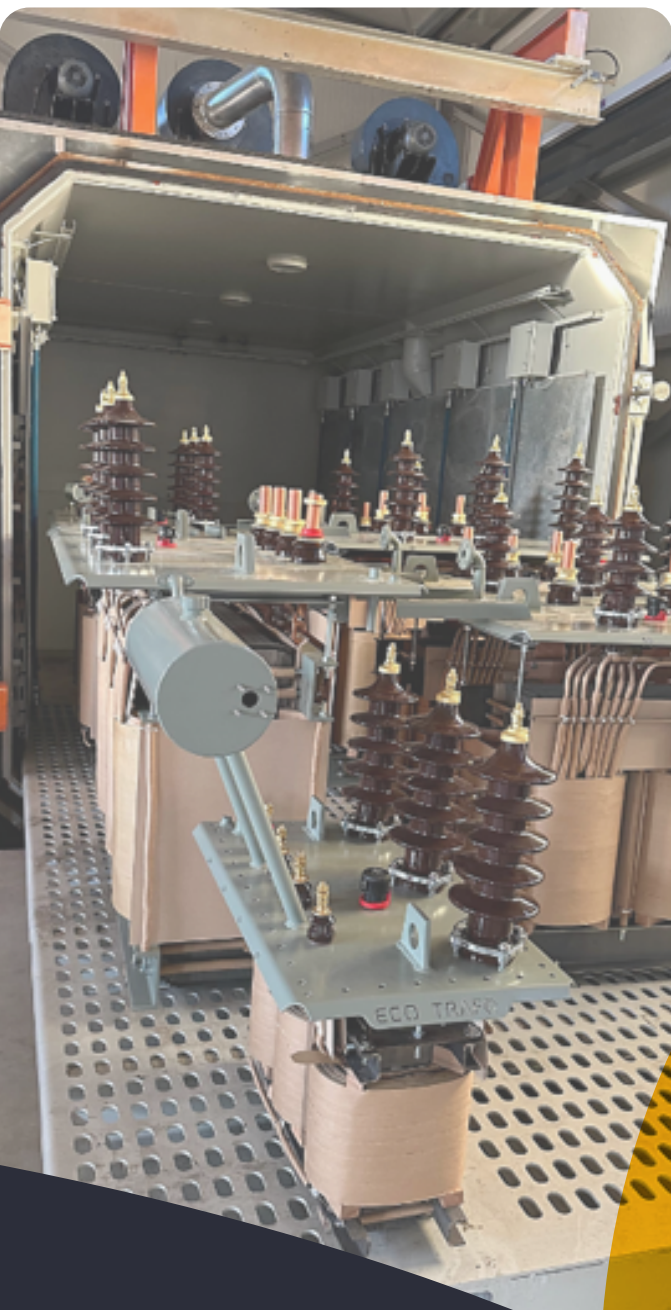
Radiator interior are with corrosion-proof painting and the outer surface is either hot-dip galvanized or painted per EDMS 29-301-1.

TRANSFORMER LOSSES

ECO TRANSFORMERS are designed for minimum losses.

UNLOCKING EFFICIENCY: WHY OUR TIER 2 TRANSFORMERS LEAD THE INDUSTRY

In today's energy-conscious world, efficiency is not just a goal—it's a necessity. As industries, utilities, and businesses strive for sustainable solutions, the demand for high-performance power distribution systems has never been greater. That's why we are proud to introduce our Tier 2 ECO transformer, designed to set new benchmarks in efficiency, reliability, and sustainability.



TRANSFORMER LOSSES

Tier 2 transformers are the next evolution in power distribution technology. They comply with the **latest DOE and IEC efficiency standards**, offering significantly reduced energy losses compared to their Tier 1 counterparts. This means **lower operational costs, reduced environmental impact, and a better return on investment** for businesses and utilities.

OIL-EXPANSION CONSERVATOR

At ECO TRANSFORMER we have engineered our Tier 2 transformers to exceed industry expectations. Here's what sets our products apart:

- **Superior Efficiency** – Our designs incorporate advanced core materials, including amorphous metal and optimized winding structures, to minimize energy losses and maximize performance.
- **Cost Savings** – While Tier 2 transformers may have a higher initial investment, they offer substantial long-term savings through reduced electricity consumption and maintenance costs.
- **Environmental Responsibility** – With lower energy waste, our transformers help reduce carbon footprints, supporting global sustainability initiatives and helping businesses meet their ESG goals.
- **Built for the Future** – Our Tier 2 transformers are designed to integrate seamlessly with modern electrical grids, smart systems, and renewable energy sources such as wind and solar power.

WHO BENEFITS FROM TIER 2 TRANSFORMERS?

- Utility Companies – Ensuring stable, energy-efficient power distribution
- Industrial Facilities – Reducing operational expenses through minimized energy losses
- Commercial Buildings – Lowering long-term energy costs and improving sustainability
- Renewable Energy Projects – Maximizing the efficiency of green power sources



WHY CHOOSE US?

With years of expertise in power solutions, **ECO TRANSFORMER** is dedicated to delivering **high-quality, high-efficiency transformers** that meet and exceed the latest regulatory standards. Our team of experts works closely with clients to provide customized solutions that fit their unique energy needs.

THE VALUES OF LOSSES							
POWER (Kva)	No load losses (W) at 400V	Load losses (W) at 95°C	%Z (Tolerance ±10%)	Length (mm)	Width (mm)	Height (mm)	Total weight (Kg)
50	83	870	4	1190	700	1060	370
100	138	1370	4	1200	760	1220	530
160	195	1950	4	1210	780	1220	730
200	247	2115	4	1435	785	1420	790
315	292	2900	6	1515	790	1495	1020
400	387	4100	6	1280	890	1540	1810
500	472	4600	6	1530	960	1605	1360
630	563	5100	6	1410	980	1650	1680
800	595	7200	6	1820	1060	1800	1950
1000	696	8755	6	1880	1090	1735	2290
1250	874	10400	6	1940	1790	1820	3030
1600	1050	13110	6	2145	1850	1795	3430
2000	1325	16845	6	2260	1940	1855	4050
2500	1675	19800	6	2250	1230	185	4520
3150	1990	14640	6	2680	1250	2220	5040

TESTING and INSPECTION

Our transformer test laboratory is a facility equipped to conduct a variety of electrical, thermal, mechanical, and performance tests on transformers. These tests ensure that transformers meet design specifications, regulatory standards, and operational reliability before deployment.

ECO TRANSFORMER TEST LABARATORY			
EQUIPMENT	CODE	TESTING METHODE	STANDARD
TRANSFORMER TESTING SYSTEM	MTTS-5	MEASUREMENT OF NO LOAD LOSSES AND CURRENT	60076-1 IEC:2011
TRANSFORMER TESTING SYSTEM	MTTS-5	MEASUREMENT OF SHORT CIRCUIT IMPEDANCE NO LOAD LOSSES AND CURRENT	60076-1 IEC:2011
TRANSFORMER TESTING SYSTEM	MTTS-5	INDUCED VOLTAGE TEST (DVDF)	IEC 60076-3
TRANSFORMER TESTING SYSTEM	MTTS-5	WITHSTAND VOLTAGE TEST (APPLIED VOLTAGE)	IEC 60076-3
TRANSFORMER TESTING SYSTEM	MTTS-5	MEASUREMENT OF NO LOAD LOSSES AND CURRENT AT 90% AND 110% OF RATED VOLTAGE	60076-1 IEC:2011
TRANSFORMER TESTING SYSTEM	MTTS-5	TEMPERATURE RISE TEST (MT-8AU)	60076-1 IEC:2011
INSULATION OIL DIELECTRIC STRENGHT TEST	MTH-OB DV-80	INSULATION OIL DIELECTRIC STRENGHT TEST	60076-1 IEC:2011
MULTI CHANNEL TEMPERATURE TESTER	MT-8AU	TEMPERATURE RISE TEST (WORK WITH MTTS-5)	60076-1 IEC:2011
5 Kv INSULATION TESTER	MTS-5K	DIELECTRIC TYPE TESTS	IEC 60076-3
TRANSFORMATOR TURN RATIO TESTER	MT-TRT3000	MEASUREMENT OF VOLTAGE RATIO AND CHEK OF PHASE DISPLACEMENT	60076-1 IEC:2011
DC RESISTANCE TESTER	MTH-B-TWR-10	MEASUREMENT OF WINDING RESISTANCE	60076-1 IEC:2011



PRODUCTS

MEDIUM POWER AND DISTRIBUTION TRANSFORMERS

Our medium power transformers are used in electricity in European, Balkan and African countries. Their availability and longevity, grid reliability and product-price availability have a major impact on preference.

ECO Transformer realizes hundreds of medium power transformers with high quality philosophy in accordance with customer needs and international standards.



DISTRIBUTION TRANSFORMERS

ECO Transformer produces distribution transformers in the power range of 25 - 3150 kVA, with high voltage up to 36 kV.

All transformers manufactured by us are subjected to routine tests specified IEC standards. In addition, special tests are carried out according to customer demand.

OIL-IMMERSED TRANSFORMERS

Oil-immersed transformers are made with two different methods as stored hermetic type according to the current technology and production techniques.

It is ordered in one or three phases.

It is produced ONANI (oil-natural-air-natural), ONAF (oil-natural-air manda-tory-fan) OFAF(ois-forced-air fan) cooling systems.

It is produced with neutral stage charger or stage charger at load.

The cable is produced boxed or unboxed.

It is produced with porcelain insulator or plug-in.

Accessories can be changed according to the customer's request and the standards of the countries.



GROUNDING TRANSFORMERS

It creates a neutral point to perform the grounding process by connecting to the mains directly or via external impedance.

Supply regional loads.

Transmits tje fault current to the ground where it is used.

Stabilizes the grounding system of the network.

Limits the arc wave voltage generated in the network.

TRANSFORMER OVEN

Our TRANSFORMER OVEN is specialized industrial oven designed for the drying, curing, or processing of transformer components, such as transformer windings, cores, and insulation materials. This oven play a critical role in ensuring the reliability and efficiency of electrical transformers by removing moisture and curing insulation materials effectively.

Transformer oven is used to eliminate moisture from transformer windings and cores. Moisture removal is essential to prevent dielectric breakdown and ensure proper electrical performance.

Transformer oven preheat components during assembly or repair processes to ensure proper bonding and minimize thermal stress during operation.

Our oven feature vacuum systems to dry components more efficiently, especially for high-voltage transformers requiring minimal residual moisture.

Precise Temperature Control: Allows consistent heating to ensure uniform drying or curing.

Vacuum Technology: Ensures faster and more efficient moisture removal.

Large Capacity: Designed to accommodate heavy and bulky transformer parts.

Energy Efficiency: Modern ovens are optimized for lower energy consumption.

Safety Mechanisms: Equipped with sensors and fail-safes to protect against overheating and ensure operator safety.

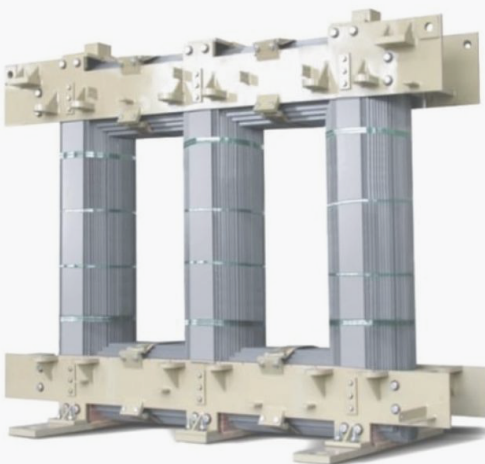


CORE

– The core, framework, clamping arrangement and general structure is mechanically robust to withstand any shocks during transportation, installation, operation, or faults.

– The core construction ensures the efficient cooling of its internal parts, the elimination of core vibration when loaded, and the minimization of harmonic voltage especially the third harmonics.

– The core joints are properly interleaved. precautions are taken to keep the noise at the level of 48-56 dB,



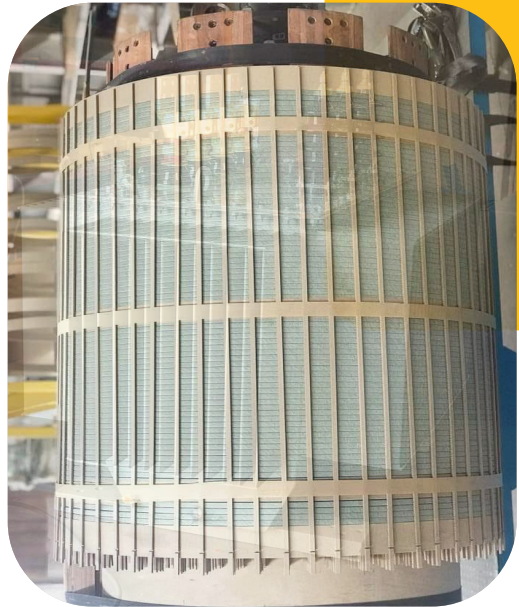


COILS

1) LV WINDING: This winding, which consists of copper in various sizes, is sometimes formed from flat copper and tape windings, together with technological developments. The copper or aluminum material, which is wound in layers, is directly connected with the LV bushings, the transformer output voltage and power are formed in these windings.

2) HV WINDING: It is wound on the LV winding as a layered winding made of round insulated wire between 0.3 mm - 3.00 mm, depending the power and voltage of the transformer. Various insulation materials are placed between these floors and provide insulation and cooling.

In addition, the commutator terminals come out of the project-appropriate points of this winding deactivate a part of the winding with the help of the commutator.



MEDIUM POWER TRANSFORMER

The term "medium voltage transformer" refers to medium voltage (MV) transformers that typically operate at voltage levels between 1 kV and 36 kV. These transformers are used in the transmission and distribution of electrical energy.

Medium voltage transformers reduce (or sometimes increase) the voltage from the grid to levels suitable for industrial plants, factories, large buildings or city distribution systems.

PRODUCTION

WINDINGS

The winding conductors should be made of the best quality and high conductivity electrolytic copper or aluminium.

- The windings are clamped effectively to withstand any shocks, vibrations and forces produced by the most severe short circuit currents.



MECHANICAL PARTS (BOILER/COVER)

Tanks and top covers are made of mild steel. The base plate, sides and frame are cut with a special laser machine. It is then sealed and welded by or expert team. The whole process is carried out within the body of a ECO :Transformer. We also serve other factories in different parts of the world as semi-finished products .

PRODUCTION

PAINTING

First, the mechanical components are sandblasted. Then, the painting process is carried out in our semi-automatic line with the best quality paint considering the customer demand and the relevant IEC standards. In addition, hot dip galvanized thans can be manufactured if desired.

ASSEMBLY

In other sectios, the winding, core and mechanical parts that are completed brought to this section.

After the assembly of the active part of the transformer is completed, it is dried under vacuum in an automatic smart oven. Then, the active section is placed in the pre-prepared transformer boilder an closed. It is placed in an oil-filled oven to press oil.

After the winding is finished in the dry type transformer, epoxy resin casting is made under vacuum with our sensitive and it ready for assembly.



PRODUCTION

R&D

As ECO Transformer, we desing and develop all types of transformers in accordance with the demands and specifications of the customers with our expert-experienced desing engineers and R&D team and offer alternative solutios .

Within the scope of product development projects in cooperation with .TUBITAK&KOSGEB, machinery and equipment designs are made to facilitate transformer production, and the developer on production methods contributes significantly to our R&D studies .

TEST & QUALITY

In the test laboraty, all routine tests of the distribution (oily type/dry type) and power transformers (up to 25 MVA) of the ECO Transformer are carried out with our high quality test equipment. In addition, special tests are carried out according to the customer's request. Our test laboratory is accredited bu TÜRKA .

Our transformers werw tested by KEMA LABORATORIES and Bogaziçi University in the Netherlands.



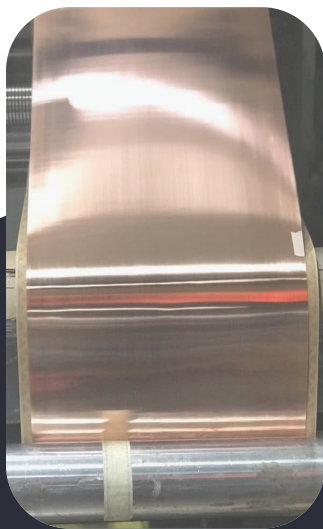
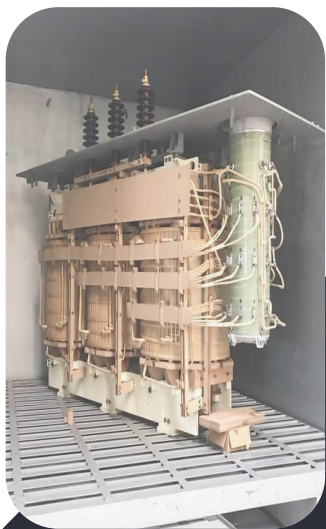
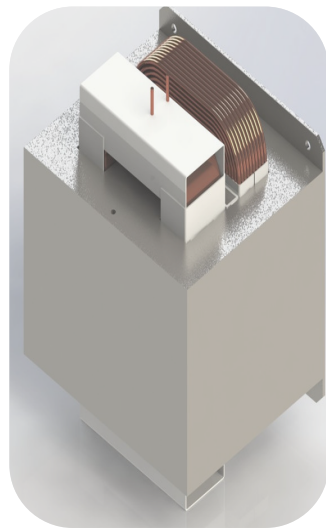
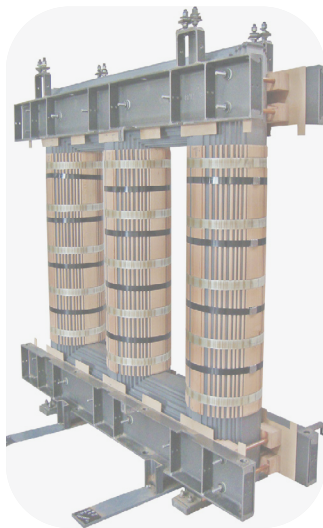
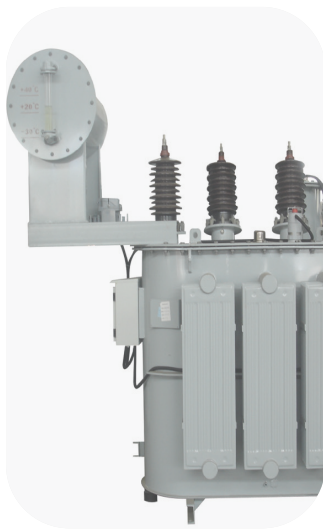


EXPORT

We're Energizing the World!

ECO Transformers exports almost all of its production to more than 30 countries mainly Germany, Britain, France, Spain, Kosova, Bulgaris, Romania, Bosnia and Herzegovina, Albania, Georgia, Azerbaijan, Turkmenistan, Afghanistan, Iraq, Jordan, Morocco, Nigeria, Congo, Kenya, Ghana, Tanzania, Uganda, Senegak, Mauritania, Zimbabwe, Cameroon, Madagascar, Ivory Coast, Rwanda, Burkina Faso, Benin, Togo .







Phone:

+382 687 484 50

Mail:

Info@ecotransformer.me

Sales@ecotransformer.me

Address:

Tuzi bb, Podgorica,
81000 Montenegro

Web Site:

www.ecotransformer.me