

Customer Centric Mentality
Everlasting Quality

ELTAS

Transformatör Sanayi ve Ticaret A.Ş.

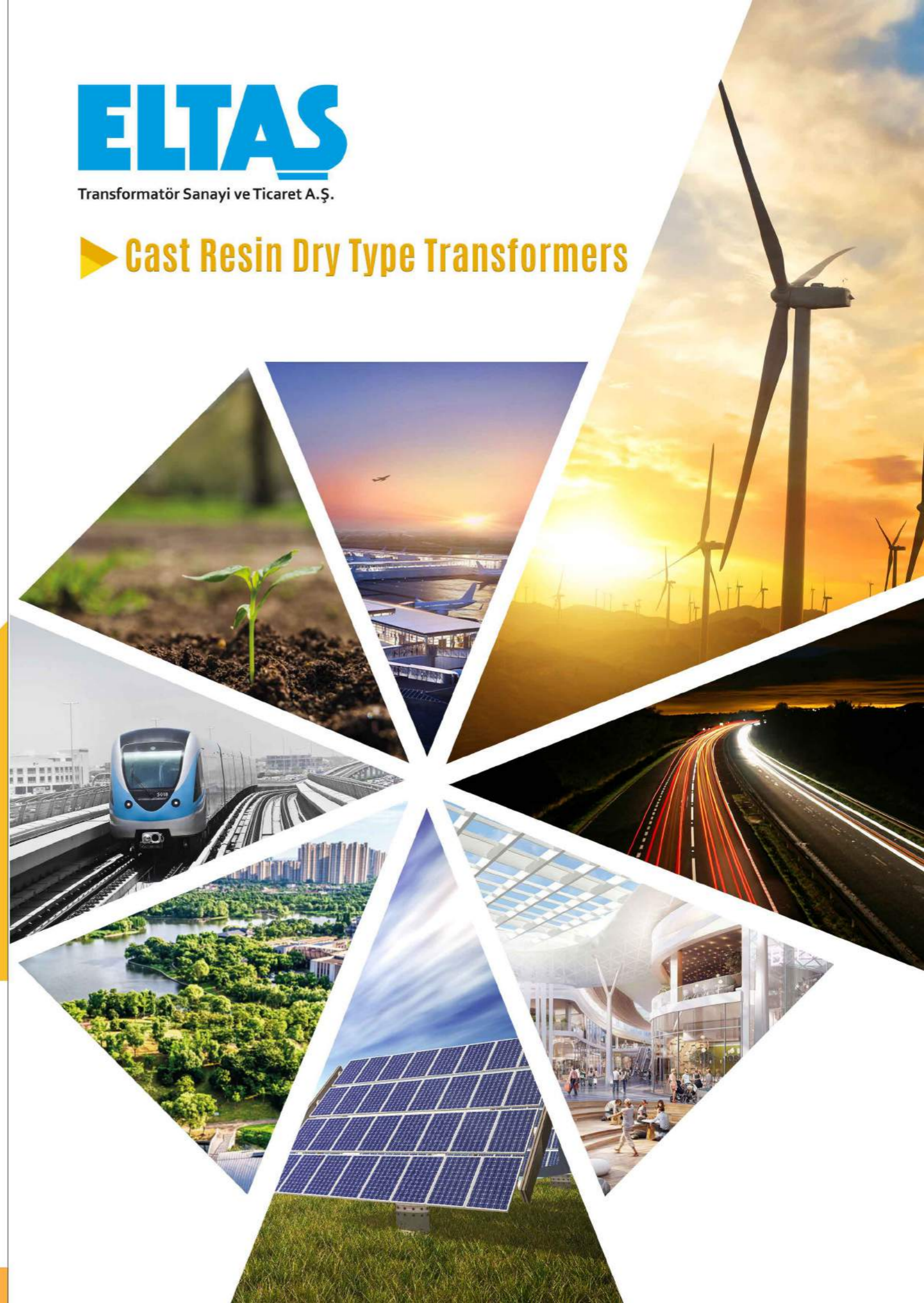
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ELTAS

Transformatör Sanayi ve Ticaret A.Ş.

► Cast Resin Dry Type Transformers



ELTAŞ is one of the leading transformer manufacturer of Turkey with 40 years of experience.

Today with more than 10.000 transformers we produced,
We are in more than 80 countries;
We are in everywhere where energy exist.

ELTAŞ strengths are unique engineering and design features and flexibility to meet all the customer requirements on time. Each transformer is designed according to its required specification and suitable to its application area.



Production Groups

- Oil Immersed Power Transformers (up to 420 kV 250 MVA)
- Oil Immersed Distribution Transformers
- Cast Resin Dry Type Transformers (up to 36 kV 25 MVA)
- Special Transformers
- Earthing Transformers
- 6-12-18-24 Pulse Rectifier Transformers (Oil Immersed & Dry Type)
- Reactors (Oil Immersed & Dry Type)
- Auto Transformers

Business Sectors

- Power Transmission & Distribution
- Industrial Facilities
- Renewable Energy (Solar, Wind, Hydroelectric, Geothermal Energy)
- Iron & Steel Industry
- Mining Industry
- Marine and Ports
- Railways

Vision

to be a transformer supplier that admired to its quality and performance in the relevant sector all over the world, respects the values of the environment and life, and shows continuous development.

Mission

- to contribute to the development of the sector and the perfection of quality in our country with innovative scientific practices by adhering to our values.
- to seek excellence in the solutions we offer to our customers' needs and expectations.
- to create a healthy and reliable work environment for our employees.
- to meet the demands of our customers at the highest level in transformer design, production and after-sales service by considering their effects on the environment.
- to efficiency based work without wasting resources.
- to support our society and the environment, aware of their social responsibilities.

Principles

- Knowledgeable, Responsive, Hardworking, Honest and Transparent Management
- Customer Focused
- Never Compromising on Quality
- Continuous Development
- Give Importance to Job Security
- Environmental Awareness
- Sustainability

Cast Resin Dry Type Transformers

ELTAŞ manufactures dry type cast resin transformers which comply with international standards up to 25000 kVA with maximum voltage rating of 36 kV; 200 kV impulse level.

Some applied standards are;
IEC 60076-11, NEMA ST 20, BS EN 50541-1, CSA C9-02
IEEE C57.12.01, VDE 0532 / DIN 42523, TS 267, etc.
Also, customer requests and tailor-made solutions can be applied.



Some of the areas that cast resin transformers are commonly used;



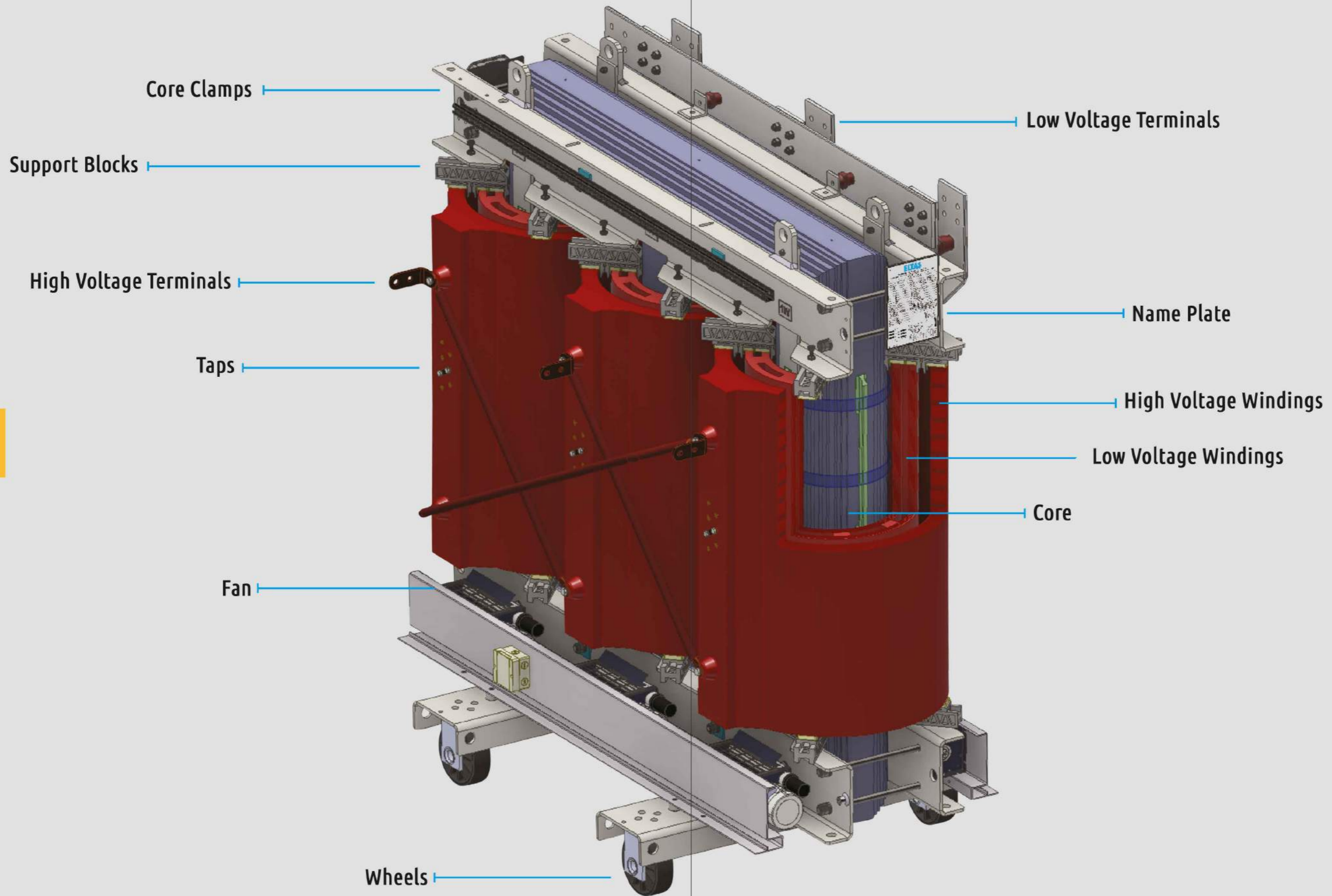
- Indoor and outdoor substations
- Industrial and petrochemical
- Oil platforms
- Power plants
- Mining operations
- Public areas (schools, hospitals, airports, shopping malls)
- Passenger cruise ships and bulk cargo vessels
- Railway Systems
- Wind mill turbines
- Mobile power / substations

Advantage of Dry Type Transformers;

- Safety
- Installation close to the load and near people
- Non-flammable and self extinguishing
- Can be smaller than area of oil filled transformers
- Maintenance free
- Excellent resistance to pollution and humidity
- Low Noise level
- Naturally resistant to explosion and fire
- High capacity supporting overload
- Excellent seismic strength - seismic design available
- No need for drying after deactivation for a long period
- Coils can be changed on-site for any reason
- Supports more efficient systems with lower cable losses (placement close to loads)
- Nominal power can be increased 50 % with cooling fans
- Environmental friendly - no toxic chemical used
- Resistance to high impulse voltage,
- Excellent short-circuit strength

Production Types;

- Distribution transformers
- Single-phase transformers
- Grounding transformers
- Power transformers
- Transformers with on load tap changer (OLTC)
- Auto transformers
- Generator transformers
- Rectifier transformers (with 3 or 4 windings)
- Transformers with heat exchanger cooling (for ship application)
- Motor starting transformers





High Voltage Windings

High voltage windings are manufactured in accordance with customer request by using F or H Class Insulated Copper and Aluminium Conductors.

High voltage windings are manufactured entirely under vacuum with resin in order to ensure void-free structure.

Coils forming in mould with resin are all balanced with same temperature during casting process under vacuum. In order to get rid of contaminated gases, resin and hardener are constantly poured from wider surface and circulated during the process.

Thus, via epoxy resin that is casted under vacuum provides;

- Lowest possible partial discharge is ensured thanks to enhanced casting technology.
- A moist-proof structure is obtained; plus, resistance against hard environments is ensured.



ELTAŞ HV fiberglass reinforced winding technology allows for superior cooling without additional size and weight; by add cooling ducts, which are integrated into coils, increasing the cooling capability in heavily polluted environments.

The standard designs, which must cool the transformer with the inner and outer surface of coils or by increasing the dimension of windings. This advantage (adding cooling ducts) can help to have the transformers placed closer to the loads, which is important in project design, as the size and weight of transformers invariably influence where they can be placed within the system.



Core

The core is made of highest quality, low loss (0.75, 0.80, 0.85 W/kg @ 1.70 T) grain oriented silicon steel is slit and cut on the best quality Georg and Tuboly machines.

The core is stacked with step lap technology providing low magnetic induction which provides lower no-load losses, lower noise level and exciting current.

Cores are coated with epoxy resin in order to ensure protection against vibration; and later they are painted via special paint in order to ensure protection against corrosion.

Cores are grounded in accordance with required standards.



Low Voltage Windings

It is possible to cast low voltage windings at fiberglass reinforced system same as the way of high voltage windings. But, it is also common that, low voltage windings are wound by F or H class impregnated interlayer insulations called prepreg.

In both systems, after casting, allow excellent dielectric characteristics and strength to heavy environmental conditions.



Casting

Two different technologies are used while performing casting operation.

- Quartz - Filled Technology
Quartz is used as a filler material in resin system. Windings are manufactured with double-layer paper insulation systems by using aluminium or copper conductor tapes in Quartz - Based Technology.
- Fiberglass-reinforced resin technology (per customer request)
Fiberglass is used as a filler material. Flat or round shaped aluminium/copper conductors can be used and with fiberglass reinforced resin, mechanical strength is unmatched.



In both technologies, high voltage windings are moulded and cast under vacuum. Casting provides strength to short circuit. Coils forming in mold with resin are all temperature balanced, during the casting process under vacuum.

In order to get rid of contaminated gases, resin and hardener are constantly poured from wider surface and circulated during the process.

This epoxy resin casting process, under vacuum provides:

- Lowest possible partial discharge ≤ 5 pC
- A water-proof structure.
- Resistance against the hardest environments.

Assembly

Tightening the core in cast resin dry type transformers, requires lower and upper metal frames. Once upper core is installed, metal frames are installed to hold core in place. Coils are mounted together with fiberglass supports, which protect them against short circuit forces and vibration.

Wheels are designed in such a way that they help in moving the transformer forward, back, right and left. All steel components are painted with epoxy paint to provide protection against corrosion.

Painting technique must be determined in accordance with atmospheric conditions.





Accessories

Temperature Control System (Standard)

Temperature control systems have been standardized, which will not allow over temperature, which can be caused by higher ambient temperature and or overloading. The temperature sensors (PT 100 or PTFE) are placed in the hottest area in the LV winding. The sensors must be connected to the temperature relay, installed on the transformer. The relay has alarm, trip and fan on/off contacts, which are active when the temperature reaches the set value for each function.

Forced Ventilation System (Optional)

ELTAŞ cast resin dry type transformer's capacity can be increased 50 % when fans are installed along with the Temperature Control System. The fans are switched on and off automatically via temperature sensors in the LV winding.

Anti-Vibration Pad (Optional)

It is recommended to insulate the transformer body from noise transmission into the facility (source or load).

Seismic Construction (Optional)

Seismic ratings are manufactured for areas that require seismic endurance. Our transformers have passed seismic endurance tests, performed at Virlab in Spain. In this laboratory, seismic test is carried out on a biaxial platform, dimensions of which are 2500x2500mm. This platform is equipped with two cylinders, each of which works independently with a force of 150 kN. Seismic forces are applied by two multi frequency generators, one for each direction.

The test was first applied for each direction horizontally, and then it is applied vertically. Before commencing the test, transformer is fixed on the platform via the use of bolts. Afterwards, accelerometers are mounted on the following points for measurement.

- Transformer's center of gravity
- Top point of transformer
- Any specific point specified by the customer

Ground accelerations in Turkey are requested as 0.5 g in the horizontal direction and 0.4 g in the vertical direction by Turkish Electric Authority (TEDAŞ). Also, as it is defined in TS EN 60068-3-3 standard, as direction factor "D" is 0.5 in the vertical direction, the acceleration to be applied as per the formula should be 0.25 g. The test was carried out in accordance with both the standards. The test is applied on two levels as S1 and S2. S1 is the simulation of foreshock while S2 simulates the actual earthquake.

During S1, horizontal acceleration is 0.25 g and vertical acceleration is 0.2 g. On the other hand, the horizontal acceleration is 0.5 g and vertical acceleration is 0.4 g for S2. This test is first applied on the X axis on the horizontal direction, and 90 right angle and Z axis at the same time. Afterwards, the same test was applied on the Y axis and 90 right angle and Z axis at the same time.

As a result of the test applied on the transformer as per the criteria specified in TS EN 600068-3-3 standard;

- Any visual deformation was not seen on the transformer,
- Any interruption was not observed in the current to be transmitted to the transformer



Enclosures (Optional)

Upon customer request, transformers are equipped with the proper enclosure, according to IEC 60529 standard.

Most common enclosures uses are;

- IP 20 / 23 / 33 indoor,
- IP 44 indoor and outdoor.

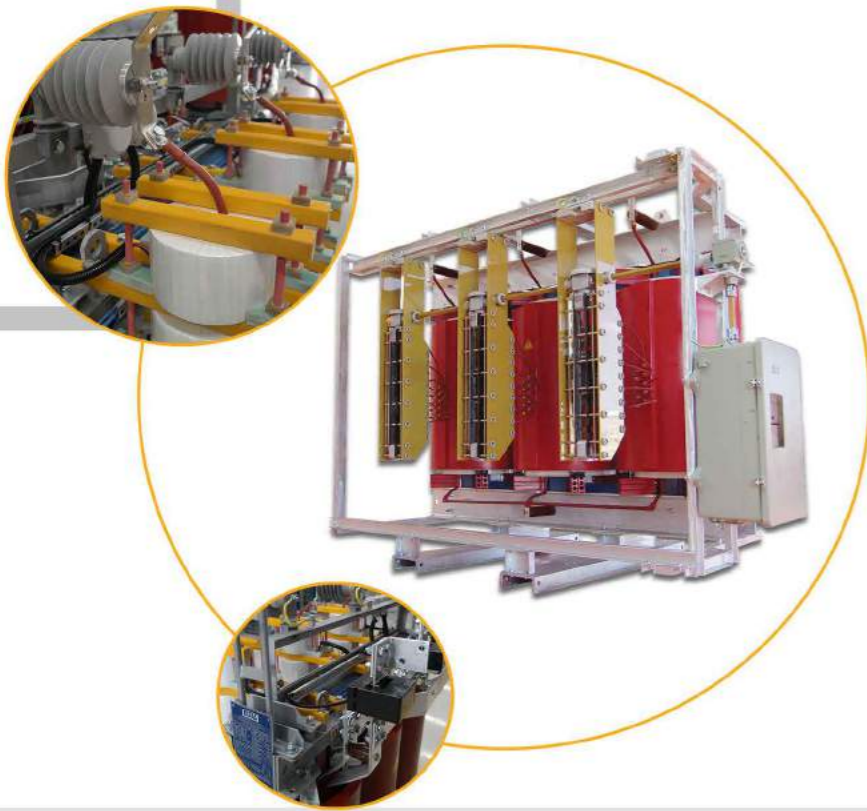
Higher protection classes are designed with special cooling method.



IP 23

| 1. Number | Commentary | 2. Number | Commentary |
|-----------|---|-----------|---|
| 1. | Protected against solid objects larger than 50 mm (1.96 inch) | 1. | Protected against water dripping vertically |
| 2. | Protected against solid objects larger than 12.5 mm (0.49 inch) | 2. | Protected against water dripping vertically to 15 degrees |
| 3. | Protected against solid objects larger than 2.5 mm (0.09 inch) | 3. | Protected against water dripping vertically to 60 degrees |
| 4. | Protected against solid objects larger than 1 mm (0.03 inch) | 4. | Protected against water dripping from each side |
| 5. | Protected against dust | 5. | Protected against water jet sprayed from each side |
| 6. | Dust-proof | 6. | Protected against strong water jet sprayed from every direction |
| | | 7. | Protected against the effects of temporary immersion |
| | | 8. | Protected against the effects of submersion |



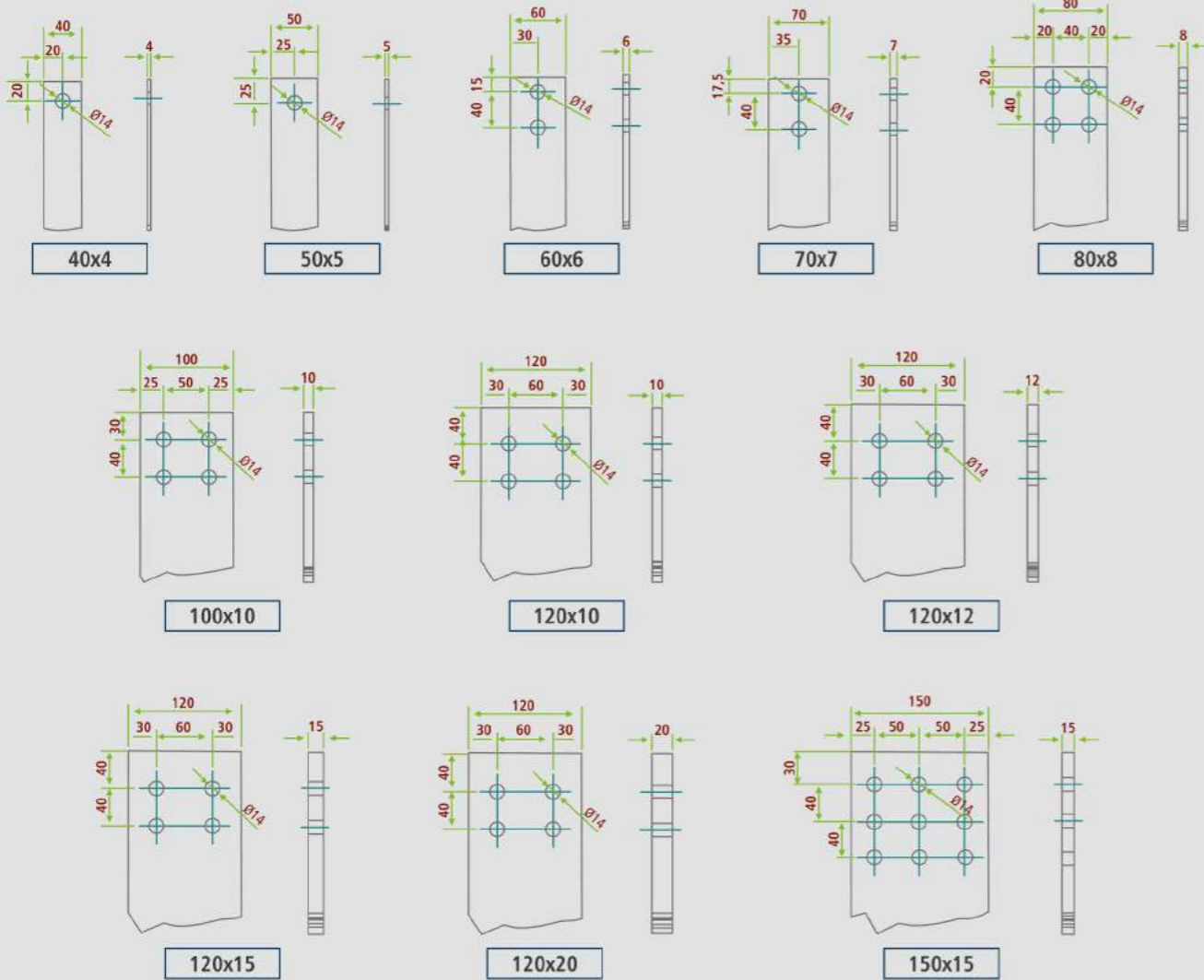


Electrical Connections

High voltage and low voltage terminals are placed longitudinally in the transformer, high voltage connections are supplied from the top as standard.

Low voltage connections are supplied from the top with the help of bus bars.

Standard bus bar measures are given below.



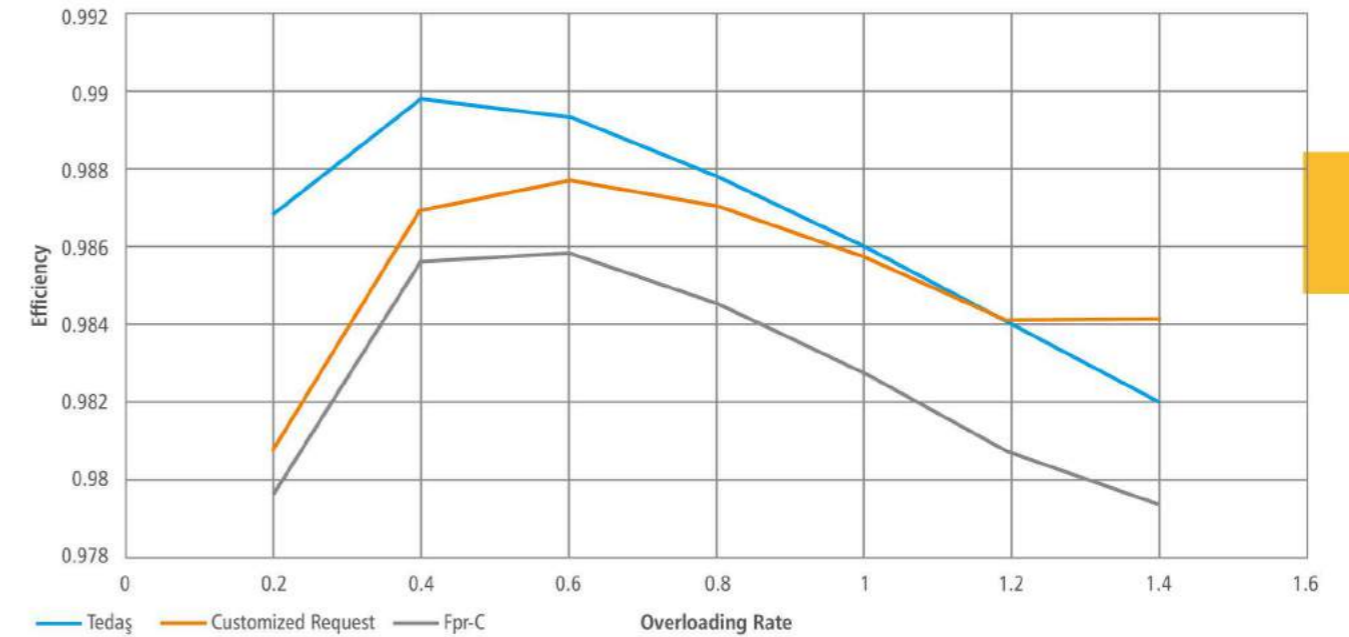
Efficiency

Transformers are long-lasting electrical equipment. For this reason, it is important to get higher efficiency from the transformer during its life time.

Within optimized designs, using higher grade electrical steel, core weight is decreased while keeping no load losses to a minimum. Hence, the noise level is decreased along with all measurements related to environmental concerns.

Load losses are changed proportionally with the square of transformer winding current. Therefore, the load rate factor of the transformer is essential.

As an example, this yield graph shows different requests acc. to load rate of transformers with standard of Fpr-C / Tedaş / Customized requests.



Noise Level

Noise originates from core steel's vibration. In the case of distribution transformers noise does not depend on load, but depends on induction. Noise level will increase on some transformers due to Variable Frequency Drives and harmonics. In this case, noise level can be decreased if induction is decreased.

Also, compressed electromagnetic forces produce axial vibrations and consequently in insufficiently supported coils can produce a major source of noise. Proper core cutting, leg and yoke combination methods can reduce noise level and losses.

Noise pressure LPA(dB)

Noise power LWA (dB)

LWA= LPA + LS

2 LS=1.25h x pm ve So=1 m

Pm=4MA + (DWA + 2 x So)

MA= Distance between coil axes of transformer

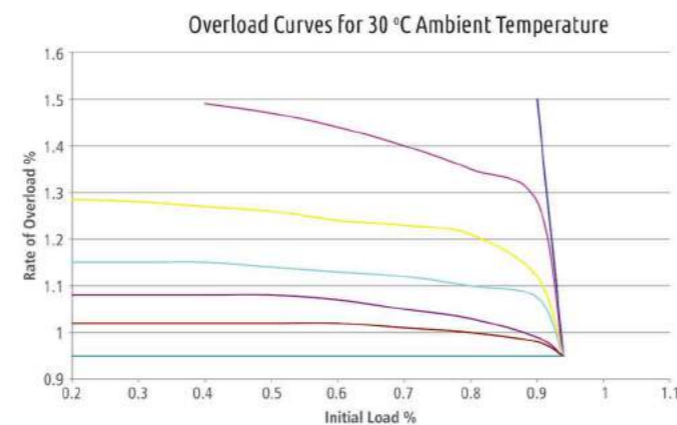
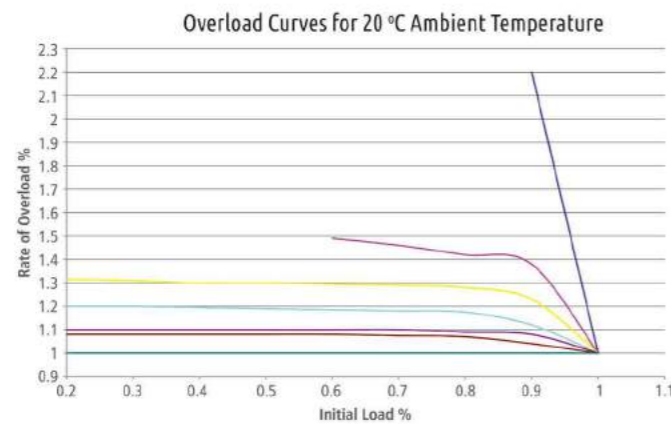
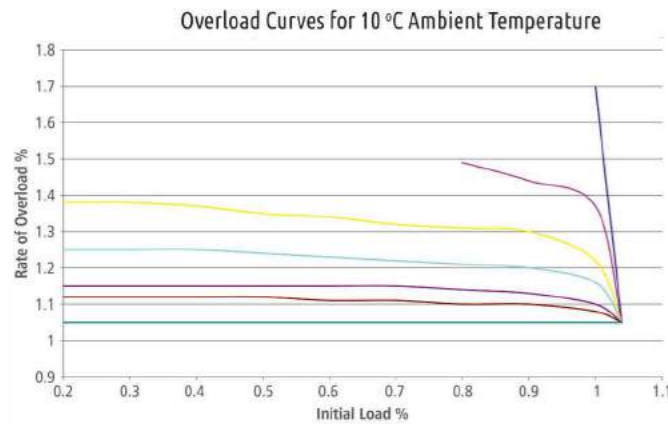
DWA= Outside winding diameter



Overload Protection

The lifetime of a dry type transformer depends on the overload applied during the operational time. These overloads wear the insulation due to thermal aging and can cause heat fluctuation in the windings. Thanks to the use of glass fibre reinforced windings and cooling ducts used in ELTAŞ cast resin dry type transformers, transformers can allow particularly short term overloads. It is specified in IEC standard that a transformer of insulation class F or H is supposed to endure a short term ootemperature of 180C° without immediate damage.

Our design calculations comply with the relevant TS IEC 60905 guide for dry type transformers standard. The overload curves of the dry type transformers we manufacture are given below.



Testing

Dry Type Transformer Test Laboratory is able to do routine, type & special tests of transformers & shunt reactors up to 25 MVA 36 kV, according to IEC, IEEE, ANSI standards, domestic & foreign customer specifications.

Dry Type Distribution transformers, medium power transformers, earthing transformers, rectifier transformers, booster transformers, single-phase transformers & shunt reactors can be tested in Dry Type Transformer Test Laboratory. Because of the transportation of transformers to the test room by air cushion, floor of test room was covered by steel plate.

For Determination of Sound level, Test room is insulated for keeping background noise level as low as possible and designed as a faraday cage for partial discharge measurement.

In order to obtain the grounding resistance value below 0,5 Ω , grounding rods that connected to each other, piled under test room. Surface of test room was covered by steel plate that connected to grounding rods via accessible different points.



Our laboratories have been accredited under the TS EN ISO 17025 standard as independent laboratory since 2005.

The following equipments are used in dry type transformer test laboratory for routine, type & special tests of transformers;

- 100kV, 30kVA 0,3A single-phase testing transformer
- 400 kV, 20 kJ 4 stages lightning impulse generator.
- 380Vac supplied, 120 kVA 0-380 Vac Variac
- 630 kVA 0,38/0-5,0kV step-up transformer.
- 37 kW – 75 kVA 50-150 Hz frequency converter generator.
- 5 kV 400 A Transformer loss measurement system.
- 160 kVA 36/0,4 kV step-up transformer.
- 50 kV MPS Capacitive Voltage dividers.
- MPS-TMG PD Measurement System.



List of routine tests for dry type transformers in our test laboratory:

- 1.Measurement Of Winding Resistances (IEC 60076-11 Clause 14.2.1)
- 2.Measurement Of Voltage Ratio & Check Of Phase Displacement (IEC 60076-11 Clause 14.2.2)
- 3.Measurement Of Short-Circuit Impedance And Load Loss (IEC 60076-11 Clause 14.2.3)
- 4.Measurement Of No-Load Loss And Current (IEC 60076-11 Clause 14.2.4)
- 5.Applied Voltage Test (AV) (IEC 60076-11 Clause 14.2.5)
- 6.Induced Voltage Withstand (IVW) IEC 60076-11 Clause 14.2.6)
- 7.Partial Discharge Measurement.(IEC 60076-11 Clause 14.2.7)

List of type and special tests for dry type transformers in our test laboratory:

- 1.Full Wave Lightning Impulse Test (LI) (IEC 60076-11 Clause 14.3.1)
- 2.Temperature-Rise Test (IEC 60076-11 Clause 14.3.2)
- 3.Measurement of Sound Level (IEC 60076-11 Clause 14.4.2)





Certificates

Quality Certificates

- Quality Management System Certificate (TS EN ISO 9001:2015)
- International Accreditation Certificate (TS EN ISO IEC 17025)
- Environmental Management System Certificate (TS EN ISO 14001:2015)
- Occupational Health and Safety Management System Certificate (TS 18001:2014)
- CE Conformity to Ecodesign Regulation (548-2014_IEC 60076-11)
- Certificate of Conformity to Turkish Standards - Dry Type (TS EN 60076-11)
- Service Qualification Certificate (TS 12809)
- Wind Turbine Component Certificate & Design Evaluation Conformity Statement
- GOST-Russia Certificate

International Test Certificates that ELTAŞ have from Independent Laboratories

- Ability to withstand the Dynamic Effects (Thermal and Mechanical) of Short Circuit (KEMA & CESI & IPH)
- Thermal Ability to Withstand Short Circuits (KEMA)
- Seismic (Earthquake Resistance) Test (VIRLAB)
- Fire Behavior Test - F1 class which is an accord with expected behaviors from transformer that is exposed to fire (CESI)
- Environment Test - E2 class which is an accord with atmospheric conditions that has excessive air pollution and condensation (KEMA)
- Climate Test - C2 class which is an accord with operation, carriage and storage terms under - 25°C weather conditions (KEMA)
- Vibration Test (CESI)
- Temperature Rise Test (LCOE)



Eco Design Transformers

ELTAŞ, with its years of experience in transformer industry, supports Eco Design Regulation in the world. As a part of this regulation we design, manufacture our transformers according to Eco Design.

After Kyoto protocol ratification, EU's new environment focused and assertive target is to reduce greenhouse gas emissions by 20%. Under the catchphrase, objectives which are to be achieved by 2020 are as follows: "20-20-20"

- 20% reduction in energy consumption
- 20% of the energy production from renewable sources
- 20% reduction in greenhouse gas emissions



In order to succeed, concept of "Eco Design Transformer" has been implemented. Main two objectives of this concept are:

- Reduction in transformer electrical losses (First step in July 2015, second step in July 2021)
- Significant improvement in transformer performance

Reduction of transformer losses is a major step in low greenhouse gas emissions.

European Commission has issued a new regulation no EU 548/2014 to commence Eco Design transformers and all manufacturers are subject to this directive.

According to a research by the European Commission, more than 2.5% of the consumed power in Europe is caused by the transformer losses. Approximately 16 TWh annual energy saving is planned with this regulation.

Based on more than 15 years experience in the construction of cast resin transformers, ELTAŞ was able to adapt its cast resin transformers to the requirements of the regulation with proven quality features and the extraordinary reliability of its transformers.

Transformers acc. to ECO design ($U_m \leq 12$ kV)
 High voltage (HV): $U_m \leq 12$ kV Low voltage (LV): $U_m \leq 1,1$ kV Vector group: Dyn 11/5

According to Eco Design Norm Tier-1 (10-0,4 kV)

| Type | S | U_k | $\max P_k$ 120 °C | $\max P_0$ | Loss Class | Length (A) | Width (B) | Height (C) | Roller Distance(D) | Total Weight |
|------------------|------|-------|----------------------|------------|---------------|---------------|--------------|---------------|-----------------------|-----------------|
| | kVA | % | W | W | | mm | mm | mm | mm | kg |
| ELT-K 400-10-6E | 400 | 6 | 5500 | 750 | Bk A0 | 1410 | 800 | 1510 | 670 | 1440 |
| ELT-K 630-10-6E | 630 | 6 | 7600 | 1100 | Bk A0 | 1520 | 810 | 1500 | 670 | 1750 |
| ELT-K 800-10-6E | 800 | 6 | 8000 | 1300 | Ak A0 | 1580 | 990 | 1650 | 820 | 2170 |
| ELT-K 1000-10-6E | 1000 | 6 | 9000 | 1550 | Ak A0 | 1710 | 990 | 1740 | 820 | 2660 |
| ELT-K 1250-10-6E | 1250 | 6 | 11000 | 1800 | Ak A0 | 1790 | 990 | 1780 | 820 | 3030 |
| ELT-K 1600-10-6E | 1600 | 6 | 13000 | 2200 | Ak A0 | 1820 | 990 | 2040 | 820 | 3670 |
| ELT-K 2000-10-6E | 2000 | 6 | 16000 | 2600 | Ak A0 | 1860 | 1280 | 2270 | 1070 | 4290 |
| ELT-K 2500-10-6E | 2500 | 6 | 19000 | 3100 | Ak A0 | 2010 | 1280 | 2470 | 1070 | 5550 |

Transformers acc. to ECO design ($U_m \leq 24$ kV)
 High voltage (HV): $U_m \leq 24$ kV Low voltage (LV): $U_m \leq 1,1$ kV Vector group: Dyn 11/5

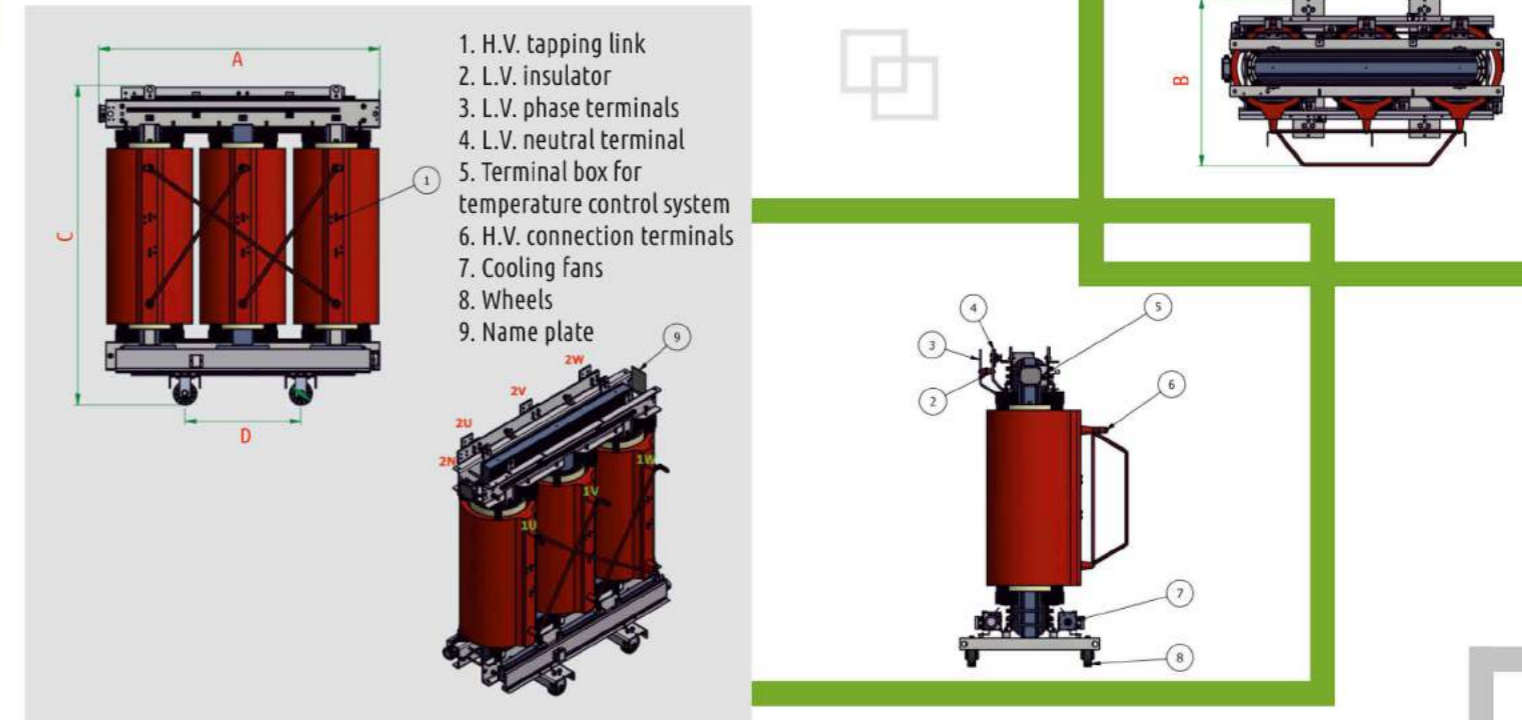
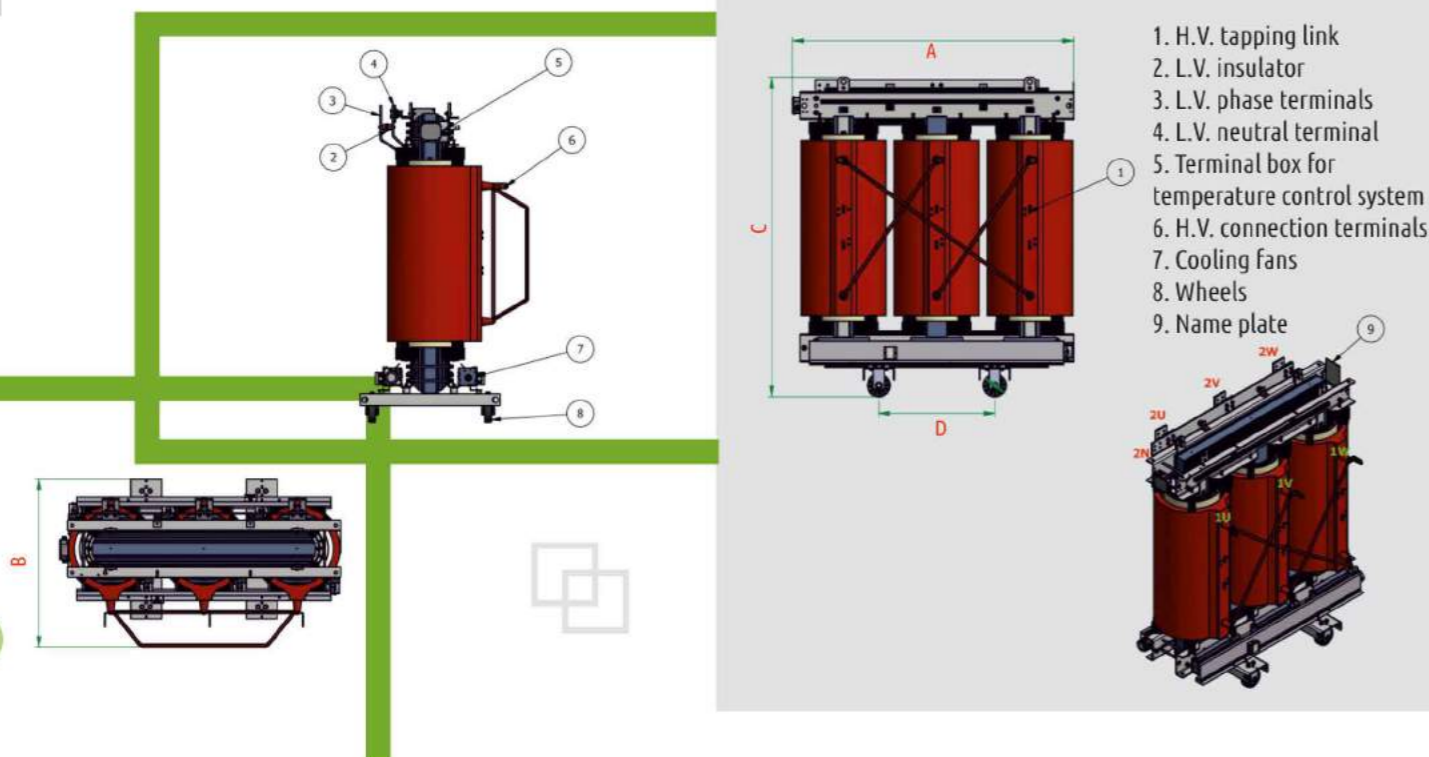
According to Eco Design Norm Tier-1 (20-0,4 kV)

| Type | S | U_k | $\max P_k$ 120 °C | $\max P_0$ | Loss Class | Length (A) | Width (B) | Height (C) | Roller Distance(D) | Total Weight |
|------------------|------|-------|----------------------|------------|---------------|---------------|--------------|---------------|-----------------------|-----------------|
| | kVA | % | W | W | | mm | mm | mm | mm | kg |
| ELT-K 400-20-6E | 400 | 6 | 5500 | 750 | Bk A0 | 1510 | 800 | 1660 | 670 | 1710 |
| ELT-K 630-20-6E | 630 | 6 | 7600 | 1100 | Bk A0 | 1540 | 800 | 1810 | 670 | 2060 |
| ELT-K 800-20-6E | 800 | 6 | 8000 | 1300 | Ak A0 | 1610 | 990 | 1940 | 820 | 2570 |
| ELT-K 1000-20-6E | 1000 | 6 | 9000 | 1550 | Ak A0 | 1730 | 990 | 2030 | 820 | 3100 |
| ELT-K 1250-20-6E | 1250 | 6 | 11000 | 1800 | Ak A0 | 1810 | 990 | 2170 | 820 | 3760 |
| ELT-K 1600-20-6E | 1600 | 6 | 13000 | 2200 | Ak A0 | 1970 | 990 | 2260 | 820 | 4610 |
| ELT-K 2000-20-6E | 2000 | 6 | 16000 | 2600 | Ak A0 | 2050 | 1280 | 2370 | 1070 | 5340 |
| ELT-K 2500-20-6E | 2500 | 6 | 19000 | 3100 | Ak A0 | 2170 | 1280 | 2500 | 1070 | 6410 |

The following applies regarding the Tables shown here:

- Design of transformers for operation in rooms: IP00
- Dimensions and weights may differ depending on design
- Transformer design acc. to IEC 60076-11

We will be pleased to offer you further models according to your specific application requirements.



Transformers acc. to ECO design ($U_m \leq 12$ kV)
 High voltage (HV): $U_m \leq 12$ kV Low voltage (LV): $U_m \leq 1,1$ kV Vector group: Dyn 11/5

According to Eco Design Norm Tier-2 (10-0,4 kV)

| Type | S | U_k | $\max P_k$ 120 °C | $\max P_0$ | Loss Class | Length (A) | Width (B) | Height (C) | Roller Distance(D) | Total Weight |
|------------------|------|-------|----------------------|------------|---------------|---------------|--------------|---------------|-----------------------|-----------------|
| | kVA | % | W | W | | mm | mm | mm | mm | kg |
| ELT-K 400-10-6E | 400 | 6 | 4500 | 675 | Ak A0-10% | 1460 | 800 | 1560 | 670 | 1650 |
| ELT-K 630-10-6E | 630 | 6 | 7100 | 990 | Ak A0-10% | 1520 | 810 | 1500 | 670 | 1790 |
| ELT-K 800-10-6E | 800 | 6 | 8000 | 1170 | Ak A0-10% | 1580 | 990 | 1650 | 820 | 2220 |
| ELT-K 1000-10-6E | 1000 | 6 | 9000 | 1395 | Ak A0-10% | 1710 | 990 | 1760 | 820 | 2790 |
| ELT-K 1250-10-6E | 1250 | 6 | 11000 | 1620 | Ak A0-10% | 1790 | 990 | 1780 | 820 | 3150 |
| ELT-K 1600-10-6E | 1600 | 6 | 13000 | 1980 | Ak A0-10% | 1820 | 990 | 2060 | 820 | 3790 |
| ELT-K 2000-10-6E | 2000 | 6 | 16000 | 2340 | Ak A0-10% | 1860 | 1280 | 2270 | 1070 | 4370 |
| ELT-K 2500-10-6E | 2500 | 6 | 19000 | 2790 | Ak A0-10% | 2060 | 1280 | 2490 | 1070 | 5860 |

Transformers acc. to ECO design ($U_m \leq 24$ kV)
 High voltage (HV): $U_m \leq 24$ kV Low voltage (LV): $U_m \leq 1,1$ kV Vector group: Dyn 11/5

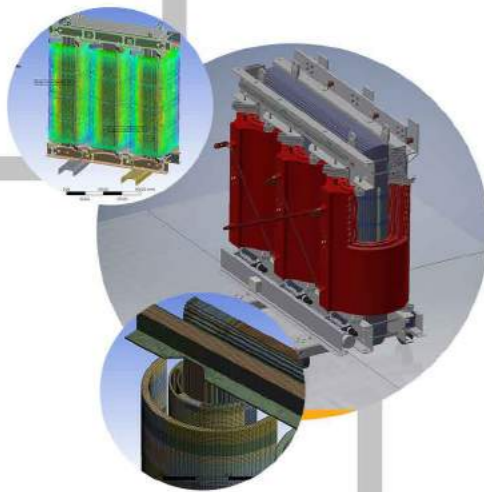
According to Eco Design Norm Tier-2 (20-0,4 kV)

| Type | S | U_k | $\max P_k$ 120 °C | $\max P_0$ | Loss Class | Length (A) | Width (B) | Height (C) | Roller Distance(D) | Total Weight |
|------------------|------|-------|----------------------|------------|---------------|---------------|--------------|---------------|-----------------------|-----------------|
| | kVA | % | W | W | | mm | mm | mm | mm | kg |
| ELT-K 400-20-6E | 400 | 6 | 4500 | 675 | Ak A0-10% | 1550 | 800 | 1780 | 670 | 2050 |
| ELT-K 630-20-6E | 630 | 6 | 7100 | 990 | Ak A0-10% | 1560 | 800 | 1830 | 670 | 2190 |
| ELT-K 800-20-6E | 800 | 6 | 8000 | 1170 | Ak A0-10% | 1640 | 990 | 1960 | 820 | 2720 |
| ELT-K 1000-20-6E | 1000 | 6 | 9000 | 1395 | Ak A0-10% | 1780 | 990 | 2030 | 820 | 3280 |
| ELT-K 1250-20-6E | 1250 | 6 | 11000 | 1620 | Ak A0-10% | 1870 | 990 | 2170 | 820 | 4060 |
| ELT-K 1600-20-6E | 1600 | 6 | 13000 | 1980 | Ak A0-10% | 1970 | 990 | 2260 | 820 | 4770 |
| ELT-K 2000-20-6E | 2000 | 6 | 16000 | 2340 | Ak A0-10% | 2050 | 1280 | 2370 | 1070 | 5540 |
| ELT-K 2500-20-6E | 2500 | 6 | 19000 | 2790 | Ak A0-10% | 2170 | 1280 | 2520 | 1070 | 6640 |

The following applies regarding the Tables shown here:

- Design of transformers for operation in rooms: IP00
- Dimensions and weights may differ depending on design
- Transformer design acc. to IEC 60076-11

We will be pleased to offer you further models according to your specific application requirements.



Research & Development

ELTAŞ has maintained its distinctive status in the market for 40 Years because of management enthusiasm, and continuous training of young engineers and personnel, which are very important elements in our manufacturing capabilities.

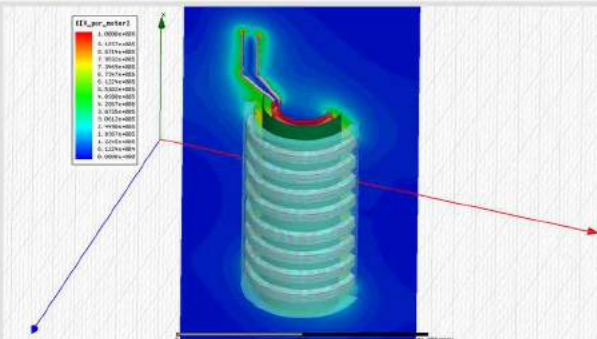
People make the difference.

Embedded in ELTAŞ' philosophy from inception, is to strive for superior knowledge, science, and technology. Our experienced design and R&D teams design and develop all types of transformers and offer optimal solutions according to the needs and desires of our customers.

As a result of our process for developing prototype products, using transformer software that we own, our capabilities are unmatched. 100% Accuracy can be achieved with our team of engineers use of our library of software, some of which was developed in house.

Machine and equipment design projects facilitating transformer manufacturing and the product development projects that we conduct with TÜBİTAK have significant contributed to our continuous R&D activities on product and production methods.

As a one of R&D Center ELTAŞ is on the top 100 company list which spent the most on Research & Development in Turkey. We are proud to contribute the development of the transformer industry.

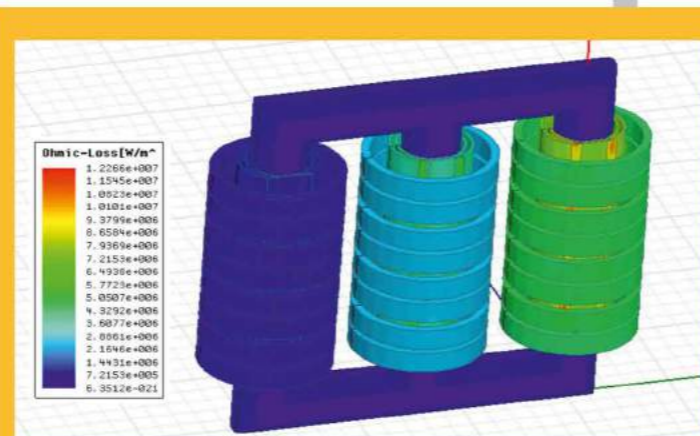


With the ANSYS Structural program;

- Mechanical strength analysis of transformer construction against short circuit forces
- Mechanical strength analysis of transformer boiler under vacuum
- Earthquake simulation

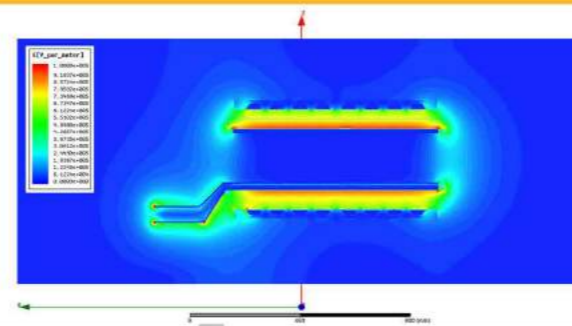
With ANSYS Fluent program the following information can be obtained:

- Temperature distribution of transformer windings



As ELTAŞ Transformer, we use ANSYS 14.5 simulation tools Maxwell, Structural and Fluent programs in our R&D activities. The followings are carried out as Electromagnetic and Electrostatic analyses with Maxwell Software;

- Calculations of losses of no load and loaded transformers
- Calculations of short-circuit forces of transformers
- Jump and breakdown analyses of transformers



Customer Operations & Service

One of the principles of ELTAŞ is to provide long life transformers to the customer.

Our customers can still count on the support of our experts, even after the Transformer leaves the factory.

We gladly carry out shipment, installation and commissioning at the request of our customers.

In addition, we offer our customers many different services to ensure reliable, error-free operation throughout the life of our transformers.

Our professionals from ELTAŞ Academy can offer training courses in all aspects of our transformers, our Transformer Life Cycle management deals with all problems and questions such as fault diagnosis, online monitoring, maintenance and repair, quick and reliable spare parts supply, repair and retrofitting.



Services we can provide by our service team on site or in our production facilities;

- Supervision,
- Installation and de-energized,
- Site tests,
- Analysis and testing of mechanical parts of transformers.
- Repair or replacement of mechanical accessories,
- Insulation renewal.

Please do not hesitate contact with sending e-mail servis@eltas.com.tr to reach our Professional Service Team for your requests and detailed information.

