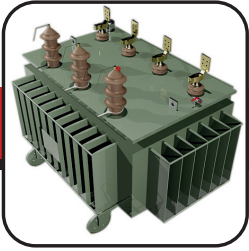




*Power to Energy, Value for The Future*





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*Our company, which has been in the energy sector since 1988, continues its journey with full determination towards new goals in transformer production by incorporating SMART GRUP TRANSFORMATÖR into its structure. It has set “Customer Satisfaction and Quality” as its main objective. For years, it has strived to achieve this goal by offering a rich product range, identifying customer problems on-site and effectively, and solving them with the right products and methods at the right cost.*

## **Our Sales Policy**

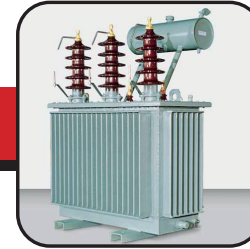
*Our goal is to identify and sell the right product, ensure its proper and efficient operation after the sale, and address any potential problems promptly and appropriately. We provide high-quality products at the most competitive prices, in a timely and efficient manner. We deliver high-quality products to our customers quickly and efficiently at the best prices.*

## **Our Vision**

*To make its success as a leading electrical company in the sector, a role model in its services, and the first choice of its customers, a lasting one.*

## **Our Mission**

*With our expert team, we aim to provide accurate, reliable, and ethically sound, solution-oriented services across a wide range of activities.*



## Products

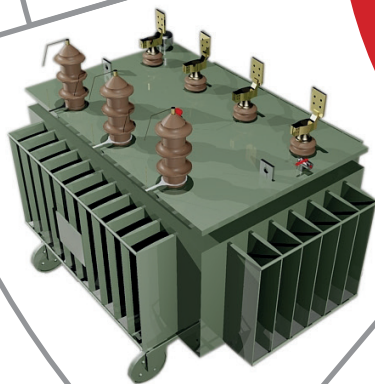
### *1. Distribution Transformers*

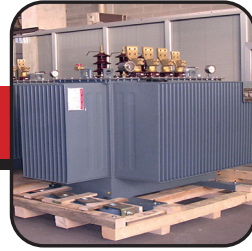
*1.1. Hermetic Type Distribution Transformers*

*1.2. Conservator Tank Type Distribution Transformers*

### *2. Power Transformers*

### *3. Special Types of Transformers*





## Hermetic Type Distribution Transformers

### Technical Specifications:

- **Power Range** : All standard and intermediate power options from 25 kVA to 2500 kVA.
- **Voltage Range** : For all voltage levels between 0-36 kV
- **Number of Phases** : 1-phase or 3-phase options
- **Step Changer Type** : Idle and under load tap changer
- **Cooling Type** : ONAN and ONAF
- **Place of Use** : External and/or Internal type
- **Lowest Class** : Standard production class A (AoAk ) Aplus(AooAk);  
*Customers who comply with TEDAŞ specifications and/or are on request according to their requirements*
- **Conductor Type** : Aluminum or copper
- **Terminal Type** : Porcelain insulator, Plug-in, with cable box, Side outlet.

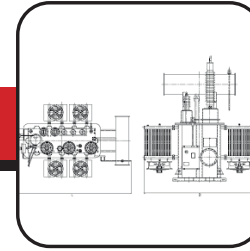
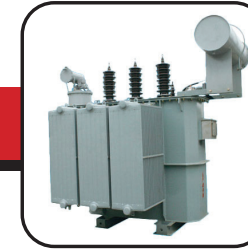
### Structure of a Transformer;

*It is designed to be completely sealed from the atmosphere. The internal pressure of the transformer is adjusted during oil injection using special equipment. When the transformer is loaded, the transformer oil, which has heat transfer properties for insulation and cooling, expands. This expansion is absorbed by the expansion and contraction of the wave wall, which has an elastic structure whose primary function is cooling. The oil is injected into special vacuum and pump-function chambers so that the transformer can be completely filled with oil (airless). The core and coil structure is the same as in conservator tank transformers.*

### Advantages

- *Because it is sealed from the atmosphere, the insulation oil does not come into contact with oxygen, eliminating the possibility of insulation degradation due to oxidation. This extends the lifespan of the transformer's insulation and therefore its service life.*
- *Under normal conditions and except for cleaning, it does not require periodic maintenance.*
- *Since there is no conservator tank, the transformer height is reduced, thus providing an advantage in substations where height is a concern.*





## Conservator Tank Type Distribution Transformers

### Technical Specifications:

*Power Range* : All standard and intermediate power options from 25 kVA to 2500 kVA.

*Voltage Range* : For all voltage levels between 0-36 kV

*Number of Phases* : 1-phase or 3-phase options

*Step Changer Type* : Idle and under load tap changer

*Cooling Type* : ONAN and ONAF

*Place of Use* : External and/or Internal type

*Lowest Class* : Standard production class A (AoAk ) Aplus(AooAk);  
Customers who comply with TEDAŞ specifications and/or are on request according to their requirements

*Conductor Type* : Aluminum or copper

*Terminal Type* : Porcelain insulator, Plug-in, with cable box, Side outlet.

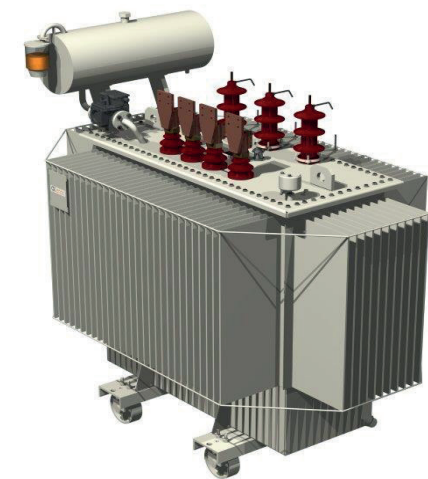
### Structure of a Transformer;

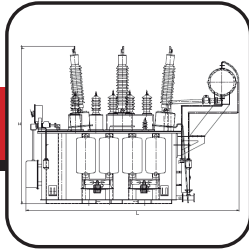
*It is designed to be open to the atmosphere. It does not require any pressure adjustment. It only requires level adjustment for the insulation oil.*

*The conservator tank is designed according to the maximum expansion of the insulation oil, and the level is adjusted according to this expansion amount during filling. To prevent the transformer oil from being affected by moisture in the air during air exchange, the expansion tank is equipped with a device containing silica gel, an air dryer that absorbs moisture from the air; on the air inlet path.*

### Advantages

*No dangerous pressure will build up in the transformer. Therefore, pressure problems will not occur under overload conditions. Since there is no expansion, metal deformation will be less. It has a structure more suitable for on-site maintenance/repair.*





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## Power Transformers

### Technical Specifications:

*Power Range* : All standard and intermediate power options from 2.5 MVA to 25 MVA.

*Voltage Range* : 20-36 kV at all voltage levels.

*Number of Phases* : 1-phase or 3-phase options

*Step Changer Type* : Idle and under load tap changer

*Cooling Type* : ONAN and ONAF

*Place of Use* : External and/or Internal Type

*Lowest Class* : According to customer needs

*Conductor Type* : Copper

*Terminal Type* : Porcelain insulated, with cable box, side exit.

### Structure of a Transformer;

*They are generally designed with expansion tanks. Removable radiator assemblies are preferred as cooling elements. Depending on their application and importance, they are equipped with more protective equipment than distribution transformers.*

## Special Type Transformers

### Technical Specifications:

*Power Range* : All standard and intermediate power options from 2.5 MVA to 25 MVA.

*Voltage Range* : 0-36 kV at all voltage levels.

*Number of Phases* : 1-phase or 3-phase options

*Step Changer Type* : Idle and under load tap changer

*Cooling Type* : ONAN and ONAF

*Place of Use* : External and/or Internal Type

*Lowest Class* : According to customer needs

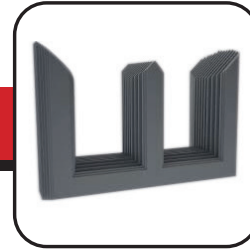
*Conductor Type* : Aluminum or copper

*Terminal Type* : According to customer needs

### Structure of a Transformer;

*We meet the specific transformer needs of our customers across industry, distribution, and all other sectors, addressing their ever-changing requirements. Our technical team works collaboratively with each customer, listening to all needs and suggestions, and then designs and implements solutions as needed.*





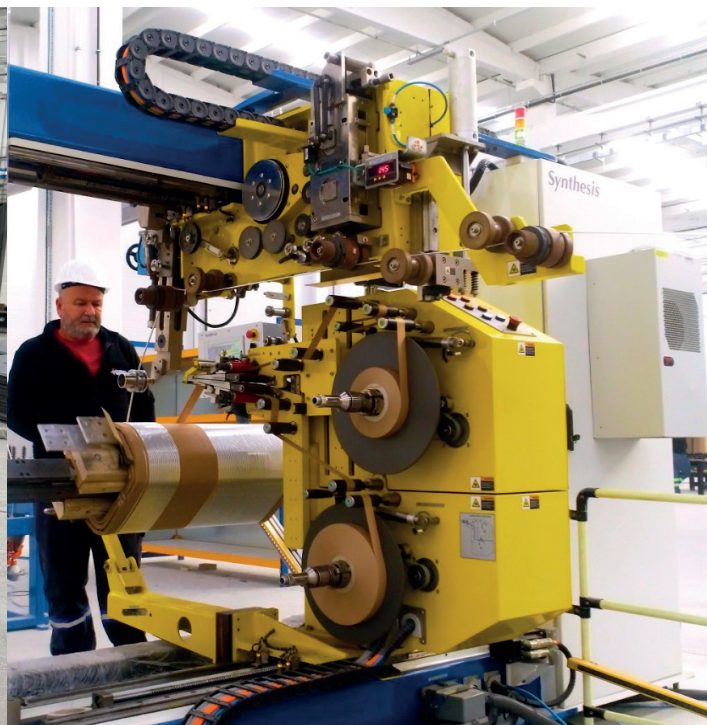
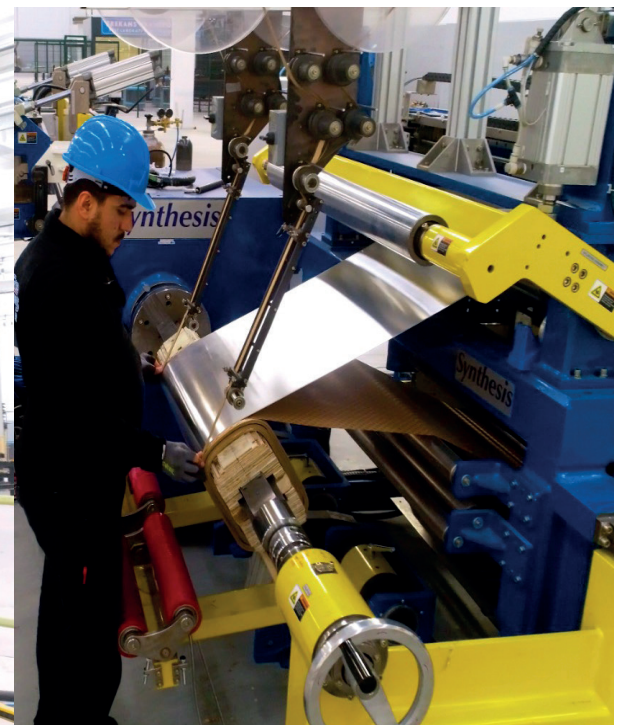
## PRODUCTION STAGES

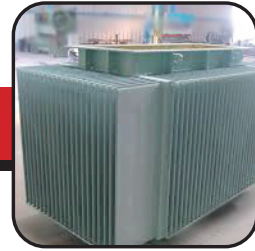
### DESIGN

*Designs are created using programs developed in-house by our own licensed professionals and experienced technical staff. Based on customer requests, our project team meticulously follows the order from the proposal stage to the order and delivery stage. Every design and implementation stage is approved by the customer. A meticulous and realistic approach during the proposal stage eliminates the need for revisions in production or design. Our design team gathers all necessary information regarding the work site and conditions, guiding the customer to avoid making incorrect choices.*

### CORE

*The core, used as a magnetic circuit element, is manufactured from high-quality, oriented, cold-rolled, low-loss, double-sided insulated material. According to the design specifications, the project utilized sheet metal with thicknesses of 0.23, 0.27, and 0.30 mm and various specifications. The magnetic circuit is constructed by slitting, cutting, and assembling the coils according to the project's technical details. The parts carrying the windings are called legs, and the parts connecting the legs at the top and bottom are called yokes. The yoke is clamped with a metal piece to ensure a robust structure and eliminate vibrations.*





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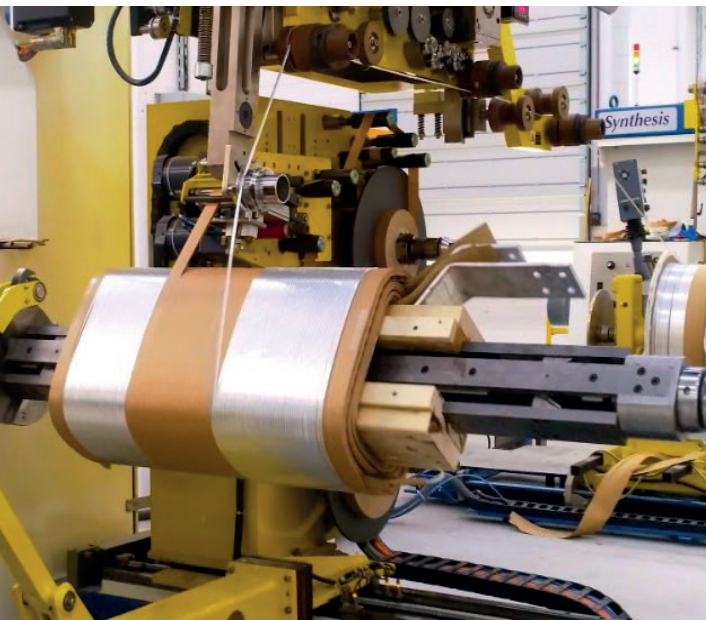
## WINDINGS

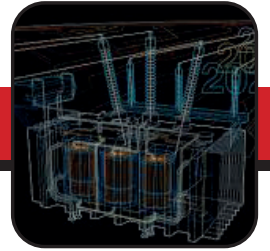
*Distribution transformers have two main sections: Low Voltage (LV) windings and High Voltage (HV) windings. Because the LV winding has a low voltage and high current, high-section conductors are used, usually wound inside near the core for better insulation distance. Because the HV winding has a high voltage and low current, smaller conductors are used, generally wound on top of the LV coil. Conductors are selected from electrolytic copper and aluminum materials with high conductivity and high purity. For insulation, high-density, high-insulation-value, mechanically resistant, oil-resistant insulation materials of European origin are used. The design is based on calculations for coil losses, overloads, and cooling, and the windings are constructed according to the project specifications.*

## COVER AND BOILER

*Transformer covers are manufactured from high-quality ST-37 and ST-52 steel materials. The cover, terminal outlets, and accessory locations are manufactured according to project specifications and dimensions. To prevent overheating at the LV terminal outlets, the phase-to-phase or phase-to-neutral current loop is reinforced with an antimagnetic plate, depending on the magnitude of the current passing through the terminals. Cover welds are made using leak-proof welding techniques, and after leak checks are performed, the covers are shipped for assembly.*

*The transformer tank is constructed from high-quality ST-37, ST-52 corrugated steel sheets with elastic properties or from radiators as cooling units. The corrugated wall or radiator sheet thickness is 1.2 mm or 1.5 mm. All equipment is assembled according to the project specifications. Tank welds are made using a very special leak-proof welding technique, where thin sheet metal is welded onto thick sheet metal. After production, the tank is pressurized by injecting a penetration fluid, a leak check is performed in the dark using a black light, and then it is shipped for assembly.*





## ASSEMBLY

*The coils are threaded onto the core feet. After the core is individually arranged in layers with an upper yoke and the magnetic circuit is closed, the coils are securely fixed by tightening the insulation blocks and yoke clamping irons and the studs between them. The core is fixed to the cover with the help of studs and brackets, and the active part is formed. After the insulation distances are tested before and after the drying process, the assembly stages are carried out according to the process and it is sent to the boiler assembly section.*

## OVEN AND OIL PRESSING

*As is known, removing moisture is crucial for the insulation life of transformers. Transformers with their active components mounted in furnaces where heat distribution is even and high vacuum levels can be achieved are baked at temperatures of 105-110 degrees Celsius. Insulation measurements are taken at the beginning and end of the baking process, and the baking quality is checked. Transformers that have been baked and fitted with a tank are then subjected to an oiling process under high vacuum. Mineral oils, which are generally reinforced in terms of temperature and insulation resistance, are used. Vegetable or non-flammable synthetic oils can also be used. The process is completed by adjusting the oil level settings of transformers with expansion tanks and the special pressure settings of hermetic transformers.*





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## PRODUCT QUALITY CONTROL

*Transformers undergo physical and electrical measurements at all stages of production before being sent to the next procedure. The process cannot be completed without measurement, inspection, and approval by production quality control personnel. This allows potential problems and malfunctions to be investigated and identified at the earliest possible stages.*

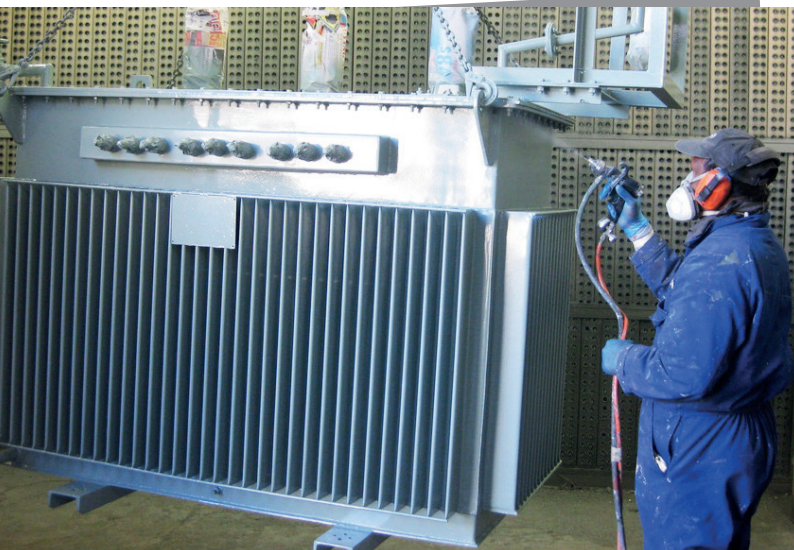
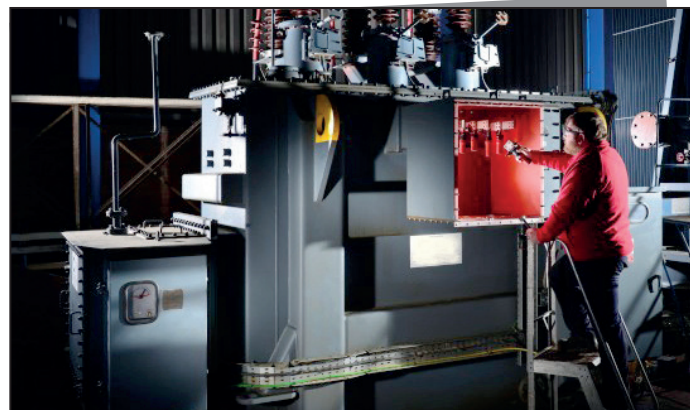
### Tests and Measurements Applied to Semi-Finished Products:

- *Dimensional Measurements*
- *Transformation Ratio Measurements*
- *Insulation Resistance Measurements*
- *DC Cold Resistance Measurements*
- *Leakage Checks*

*Routine tests are performed and reported on all transformers that have completed the production phase. Transformers that successfully pass all tests are shipped to the warehouse with an “okay” label.*

## PAINT

*Before painting, the lids and tanks are cleaned with special chemicals and dried. A rust-resistant, high-adhesion, and durable first coat of primer paint is applied. After the primer paint, the tanks undergo a drying process. To meet customer requirements for paint thickness, 2 or 3 coats of special topcoat paint are applied over the primer after drying. The topcoat paint colors used are RAL 7033 and RAL 9006. (This may vary depending on customer request)*





## TEST

### Routine Tests Applied to Transformers:

*All our routine tests are conducted and reported under TÜRKAK accreditation, which is internationally valid.*

- *Measuring winding resistance...*
- *Measuring voltage conversion ratio and checking voltage vector phase shift...*
- *Measuring short-circuit impedance and load loss...*
- *Measuring no-load loss and current...*
- *Routine dielectric tests*
  - *Induced voltage test*
  - *Applied voltage test*
- *Insulation resistance measurement*

### Type Tests Applied to Transformers:

- *Lightning Impact Test (outsourced)*
- *Sound level measurement*
- *Temperature rise test*
- *Short-circuit mechanical and thermal resistance testing (outsourced)*

### Special Tests

- *Zero-component impedance measurement in three-phase transformers.*
- *Measurement of harmonics of no-load current.*
- *Measuring the insulation resistance of the windings to the soil and measuring the loss factor of the insulation system capacity.*





# SMART GRUP TRANSFORMER ELECTRICAL MACHINERY CONSTRUCTION INDUSTRY AND TRADE LTD. CO.

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