



DRY TYPE TRANSFORMERS

TTR | TTH

TRANSFORMING THE FUTURE



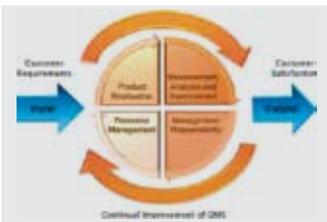
SEA has been designing and manufacturing liquid immersed, cast resin and air insulated transformers, positioning itself among the industry leaders since 1959

IQTRAFOTEC®

Innovative construction solutions, modern and technologically advanced processes, detailed checks throughout the entire design and construction chain assure the total quality of the product. SEA has established procedures to assure the TOTAL QUALITY of its products availing itself on its own know-how and adapting it to innovative manufacturing processes and strict control procedures. This type of technology has been identified by SEA with the name IQTRAFOTEC®, a brand guaranteeing a continual commitment to improve the product and its manufacture, considering 4 main areas such as:

- Safety of the working environment
- Quality of the product
- Saving of materials and reduction of waste
- Lowest environmental impact during manufacture, maintenance and after use

TTR | TTH High Quality Standards



MANAGEMENT SYSTEM

The Quality of our products is achieved by processes that are continuously refined, combining experience in the electromechanical sector since 1959 with the most modern technologies, and approved in accordance with the most important Standards concerning the Quality (EN ISO 9001) and Environmental (EN ISO 14001) Management System. Moreover, TTR - TTH transformers comply with the IEC and DIN Standards, with the possibility of correspondence with other International Standards or Customer Specifications (BS, ANSI, IEE, GOST, etc...).



PRODUCTION QUALITY

The high reliability of the products results from a continuous perseverance in achieving high quality standards during all “supply chain” phases. Especially during the production cycles there is a strict compliance with the implemented control parameters, which assure both the suitability of the assembled components and the performance of the finished product, all this even through tests carried out at our internal laboratories equipped with the most modern instruments available for type-testing or special testing, if the customer requests it.



HEALTH PROTECTION AND MAXIMUM SAFETY

All the materials used for the construction meet safety Standards set by the Environmental Fire & Climatic CEI EN IEC 60076-11 regulations or agreed in the contract, guaranteeing in the event of both fire non-propagation and the emission of toxic gases, all this to fully protect the health of the users and the environment.

Designed to meet our Customer's needs, from small to large industrial users

TTR TRANSFORMERS WITH CAST RESIN MV WINDINGS

Since 1975, SEA has been designing and producing this type of transformers and is among the leading companies in the sector, thanks to the constructive solutions adopted, the unification of details and modern and technologically advanced equipment. Safety and reliability are guaranteed by the high quality of the materials used and the careful supervision of all the stages of the production process, which is extensively tested. The standard catalog covers a range with voltages up to BIL 200 kV. Our design and manufacturing capacity can satisfy the most varied needs.



TTH TRANSFORMERS WITH AIR INSULATED MV WINDINGS (USUALLY WITH NOMEX® INSULATION)

In these transformers, the percentage of insulating material on the total weight of the transformer is very small. They can be used as an alternative to TTR type cast resin transformers when you wish to further reduce fire risk. Particularly cost-effective are the TTH transformers when both windings are at low voltage.



INSTALLATION AND OPERATING ECONOMY

The absence of insulating liquids allows the elimination of oil collection tanks, thus allowing reduced overall dimensions with an optimal weight distribution. The use of high quality raw materials and the high technological content of the designs minimize maintenance, obtaining substantial savings on the following operating costs.



MAXIMUM RELIABILITY

Reliability is assured by a total quality system supported by a continual improvement process, as well as by the high technology used by the computerized control of all the manufacture, thermal, embedding processes and by verification of compliance of the chemical-physical characteristics of raw materials with the corporate standards.



FLEXIBILITY AND PERFORMANCE

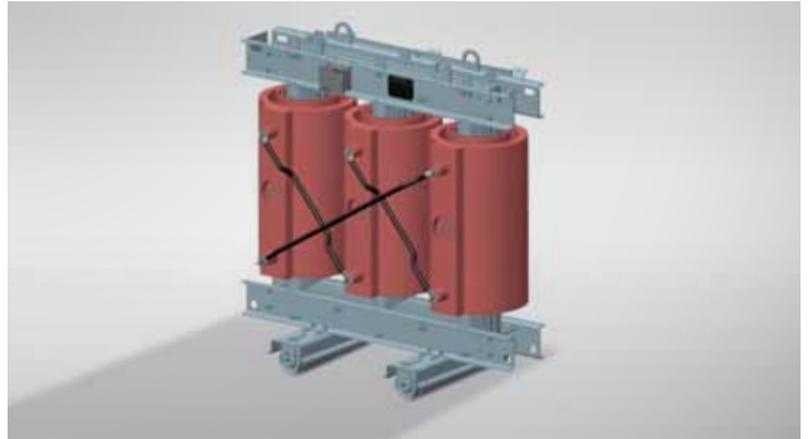
TTR and TTH transformers are the best solution to all technical problems of the installations; specifically, they provide for both a high overload capacity and an excellent resistance to impulse voltages and short circuit. The design skills, know-how and experience gained in the most various applications offer a wide range of application:

- CIVIL: hospitals, theaters, airports, subways, amusement parks
- INDUSTRIAL: metallurgic, chemical, converters, motor starters, test rooms
- OIL&GAS: mines, oil platforms
- GENERATION: hydroelectric, thermoelectric, cogeneration, nuclear power stations, solar energy, wind power
- TRACTION: trains, railways, subways
- SPECIAL

THE DESIGN

From concept to realization

Years of experience developed into strict calculation procedures, modern design and verification programs are the basis of the technology that allows the engineers of SEA to face successfully any technological development and the most complicated design solutions requested by our customers. SEA avails itself of technologies, machinery and equipment for realizing all possible technical and construction solutions involving transformer with cast resin windings, going from class F to H, to the use of wire or strip conductors, to the cell conformation or using CTC in copper or aluminum. This versatility allows optimizing the thermal sizing, insulation and resistance to overloads or heavy usage cycles for maximum application reliability and flexibility required by customers or by the design firms.



THE MAGNETIC CORE

Low vibrations, low losses, a beating heart with high performance

The continuous research of the best materials is focused on efficiency increase, as well as on reducing vibrations and, consequently, the noise level of the transformers during their use. To achieve these objectives, the core consists of magnetic metal sheet plates with oriented grain, high-permeability and low specific losses, separated from each other by an inorganic insulating means. In particular, the cut and assembly of the core are made in such a way as to create junctions according to the "STEP-LAP" way to reduce noise, as well as no-load losses and current. The magnetic pack is pressed by bent sheet metal profiles and suitable connections with or without through hull bolts when it is necessary to further reduce losses and the localized heating of the core. The overall result is a high dimensional accuracy, low loss factor values and an excellent space factor. Moreover, SEA is also able to propose solutions with amorphous sheet metal at very low no-load losses. When the size requires it, axial channels are created within the core in order to obtain a uniform temperature field.

THE WINDINGS

High mechanical strength, high electrical performance, advanced equipment

For low voltage windings, it is possible to use aluminum or copper conductors. The selected insulating materials and the technology available assure a high reliability along the time, thanks to the cooling efficiency in both the impregnated and embedded executions. For medium voltage windings, aluminum or copper are used and processed by modern, automatic and numerical control coiling machines with computerized controllers. The technology used assures an excellent resistance to low temperatures proven by tests at -50°C . The entire coil is reinforced with glass fiber meshes, dried in depth and subsequently incorporated under vacuum with epoxy resin suitably mixed with quartz and alumina trihydrate. In this way, an excellent mechanical strength and the compliance with the climate classes C1 and C2, to the environmental classes E0, E1 and E2, and to those relating to fire resistance F0 and F1 is obtained. The experience that has been gained since 1975 and the use of automatic equipment (monitoring and recording all critical process parameters) allow us to assure an extremely low level of partial discharges, which is an essential requirement for manufacturing coils featuring quality, reliability and durability.

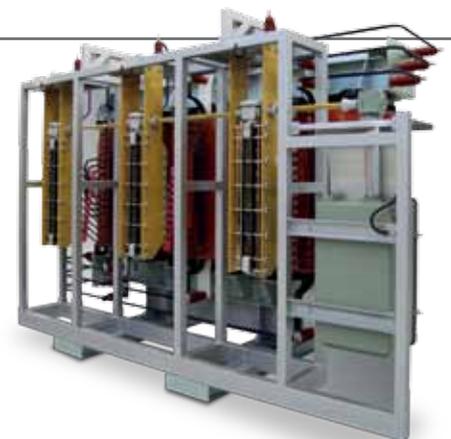
THE SWITCHING: THE NEED TO ADAPTING TO THE NETWORK CONDITIONS

NLTC Tap changer

TTR and TTH transformers can be adapted to the voltage adjustment needs of the final user with great flexibility by idle switching of the primary or multiple voltages on the secondary winding.

OLTC Tap changer

In those cases of applications requiring both civil and industrial underload adjustment, it is possible to equip the transformer with an on load tap changer as already made by SEA several times.





BOX-TERMINALS

One customization for each installation requirement

The INDOOR and OUTDOOR maximum installation flexibility - from the offshore, up to the lowest temperatures or desert environments - is available with a full range of BOXES with all degrees of protection and all cooling options. The protection degrees range is from IP20 AN to IP66 AFWF; there is also the possibility to study customized solutions to cover any need that may arise.



TESTING ROOM

Quality beyond the test

SEA has 3 modern testing rooms as well as of special equipment for performing routine, type and special tests according to the regulations or as required in the specifications of the customers. Moreover, SEA has a large archive of type tests and special tests (short circuit, thermal tests, behavior at very low temperatures) performed on many transformers delivered to customers all around the world.



OUR TARGETS



Performance and overload

Efficiency studied to optimize the system.



Silence

Often these transformers are installed close to towns.



Eco+POWER

Specifically designed to meet the new requirements in the renewable energy production.



Economy

During the operations, purchasing and maintenance.



Compactness

Designed for very low dimensions in width.



Resistance

Very robust and treated to withstand to extreme conditions.

Solutions studied to cover all the production requirements in terms of both construction and installation, bearing in mind that the objective of the transformer manufacturers and a precise need of end users is to anticipate any faults and limit the possible consequences in case of failure of the transformer itself:

- More than 20 types of accessories for the safety of the transformer
- Several types of insulators
- Various types of protections for the achievement of the desired IP degree
- Various types of off-load and on-load tap changers in order to meet the customer's various needs
- The possibility of a complete range of products suitable for the C5 corrosiveness class in offshore environments through special surface treatments

We list now the most commonly used accessories identified according to their function and use.

STANDARD AND ADDITIONAL ACCESSORIES

TTR and TTH transformers, in their standard version, with IP00 protection degree, are supplied with the following accessories:

- 4 bidirectional wheels
- 2 ground sockets
- 1 rating plate
- 4 lifting hooks
- 4 connection for haulage
- Switching terminal board on the MV side
- Threaded pins equipped with bolt for MT terminal connection

The following additional accessories may be required in case of need:

- Dial thermometer with two contacts for central column temperature monitoring
- Resistance Temperature Detectors PT 100 in LV windings
- Resistance Temperature Detectors PT 100 on the core
- PTC thermal probes on LV windings
- Relay contacts for alarm and tripping to be combined with PTC
- Plug-in bushings, "ELASTIMOLD" type or similar on MV terminals (fixed or mobile part)
- Antivibration supports
- Plexiglas protection of the switching strip
- Auxiliary service terminal board, protected type
- Set of electric fans for air forced cooling
- Electrostatic screen between primary and secondary winding
- Digital thermometer control unit with: visual check of the monitored temperatures, additional contact for the operation of electric fans, 220 VAC-24 VDC supply voltage, alarm and tripping contacts

For further information please contact our customer service.

THE TRANSPORT AND THE SITE ASSEMBLING

SEA can deliver the transformer everywhere in the world

Thanks to the experience gained over many years and to its qualified personnel SEA performs the shipping and reassembling on site, agreeing from time to time with the customer on the most appropriate approach.

For shipments carried out to particularly critical sites or if requested by the customer SEA can equip the transformers with a sophisticated "impact recorder" that allows to keep the quality of the transport monitored.



SERVICE

SEA is able to meet your needs with a modular and flexible intervention plan through which you can take care of your transformer, keeping it in perfect working order

In addition you can count on a clear and defined price, including labor and spare parts, which shelters you from any surprise. A qualified Technical Service is made available for any questions or needs that may arise during assembly or operation of all our products.

■ Transport, unloading and positioning on site

Thanks to its team of technicians SEA is able to deliver the transformer in a "turnkey" solution to the end customer.

■ Assistance to commissioning

One of our technicians will personally assist you during normal control operations prior to the first commissioning of the machine. The verification of the correct assembly of all accessories and some simple routine checks are essential for a reliable operation and the long life of the transformer.

■ Hiring of transformers

■ Diagnostics and Consultancy

Using sophisticated portable equipment, SEA is capable of monitoring and recording the most relevant electrical quantities for the transformer and the system: voltage, currents, harmonics, impulsive overvoltages and noise, oil dielectric strength, temperature and noise. Data recording can be of great help in the diagnosis of a failure or to suggest to the customer changes and improvements to its system.

■ Routine and extraordinary maintenance

Many repairing and assistance works (replacement of accessories and seals, repairs of small leaks that require welding without the need to empty the oil tank, oil checking and processing, paint touch-up, oil top-ups) can be performed directly on site, thus saving time and avoiding the risks and inconveniences that may result from the movement of the transformer.

■ Supply of spare parts

Supply or supply and assembly on site of transformer accessories.

■ Support Services

Specifically designed to give the customer the possibility to get always the best performance from its transformer.

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