



Transformers

Efacec is the largest industrial portuguese company of the electric and electromechanical sector

developing high technology products, solutions and systems used every day by millions of people worldwide.

Creating value with energy solutions, environment and transport

that improve the peoples daily life, through the integration of different skills and more innovative technologies;

Developing people

in an organization that values learning and continuous improvement.



Focusing in the clients success;



Promoting the efficiency for maximize competitiveness;



Learning and adapting for excellence;



Building confidence to act with safety and integrity;



Surpassing challenges and delivering results.



Efacec works every day to anticipate solutions for a sustainable world in the new energy era.

CORE - 126 MVA | 220/63/10 kV – Portugal



Efacec Power Transformers Lab

DESIGN AND DEVELOPMENT

Efacec always favoured technological development as a main factor to ensure competitiveness and high quality of its transformers.

An Integrated Management System of all the required information for the design and manufacture of Power Transformers has been developed by Efacec.

The system used for the development of power transformers includes all the specific software for electric and magnetic field as well as overload and short-circuit analysis, providing multiple solutions, thus allowing a selection of the most reliable and competitive design.

Power transformers design is fully integrated with the calculation and CAD system, allowing automatic edition of the instructions and drawings required for the manufacture, as well as the purchasing of all materials and components.

To support design and manufacturing of transformers, we emphasize the following, home developed:

- Integrated Management Systems of technical and manufacturing information
- Electrical and electro-magnetic field analysis (2D and 3D)
- Overload and short-circuit analysis
- RLC model analysis for high frequency voltage variations (Impulse)

When the transformer design is concluded, all the necessary information for the manufacturing process will then be selectively available at each working station, the access to this information is assured by a local area network.

This policy, together with the continuous development in quality and technical product upgrading, has led Efacec Power Transformers to prestige and excellence among its worldwide customers.

Prepared to perform all test to power transformers according to the International Standards (IEC 60076, IEEE C57) except Short Circuit test at full power:

C+PF@10kV, Insulation Resistance, Windings Resistance, Turns Ratio test, CT amplitude and phase error, CT excitation curves, No Load losses and current with harmonics contents, Load-Losses and Impedance Voltage, Zero sequence impedance, Temperature-Rise, Noise level, Switching Impulse, Lightning Impulse, Separate-Source, Induced Voltage with Partial Discharges, SFRA, FDS.

Limits:

- Three phase Transformers up to 1500 MVA / 550kV

Tested Transformers:

- 35MVA / 352kV GSU Three phase
- 750MVA / 525kV GSU Three phase
- 760MVA / 230kV GSU Three phase
- 1200MVA / 400kV Auto Transformer Three phase
- 450MVA / 500kV Auto Transformer Single phase
- 650MVA / 400kV Auto Transformer Phase Shifter

World-class facilities for testing power transformers to meet the more exigent quality demands.

OUR COMPANY HAS ISO 9001-2008, ISO 14001-2004 AND OHSAS 18001-2007 CERTIFICATION, ALWAYS PURSUING THE GUARANTEE OF TOTAL CUSTOMER SATISFACTION.

The goals of our Quality Assurance System are:

- To ensure compliance with all state-of-the-art rules, in accordance with the contractual clauses;
- To supply reliable transformers and ensure customer full satisfaction with minimum maintenance costs.



SHELL TYPE TRANSFORMER

1500 MVA

525 kV
(BIL 1675 kV)

SPECIAL TRANSFORMERS

- Phase-Shifters
- Reactors
(Shunt and Series)
- Traction
- Furnace
- Rectifiers

Main characteristics

- Interleaved windings, composed by rectangular coils. Coils with narrow width and a large surface. All coils are interleaved between pressboard washers with the surface in contact with the coil covered with small pressboard spacers, assuring coil cooling.
- Rectangular shape magnetic core, composed by one single steel width and assembled in horizontal position. Core totally protected by an electrostatic shield connected to earth.
- Upper tank (bell type), assure the compression of the core and phase(s). This particular construction assures the transportation in vertical or horizontal position.
- Possibility of construction in dissociated phases configuration - three-phase transformer formed by 3 single-phase parts connected by a common cover, which receives the bushings and the connections between phases and the on-load tap changer.
- High reliability and inherent design flexibility
- Excellent dielectric strength to impulse voltages due to large series capacitance of the windings and low capacitance to ground
- High mechanical strength due to short-circuit stresses produced during through fault conditions or seismic stresses produced during earthquakes
- Windings with high air core reactance allow reduced value of the inrush currents
- Excellent cooling capability allows a lower hot spot temperature due to the vertical arrangement of the coils
- Low noise level
- The design flexibility allows the construction of dissociated phases separate transport of phases and common cover makes transport of large units possible at lower prices

The most modern equipment is installed in this production line, such as:

- Phase assembly drying by "Vapour-Phase"
- Multi-task machine for pressboard cutting and scarfing
- Robot for pasting spacers on pressboard washers
- Transformer and components handling plant, using an air-cushion system
- Manufacturing areas with environment control (Temperature, Humidity and Particles)
- Semi-automatic oil drying and transformers filling plant



CORE TYPE TRANSFORMERS

Main characteristics

Concentric windings formed by cylindrical coils of thin thickness and large surface. All the coils are insulated by pressboard barriers with pressboard spacers allowing the cooling by insulating mineral oil

Magnetic circuit with circular cross section is formed by vertical positioned sheets

The tightening structure of core and windings is designed to support the short circuit stress and to allow not only the active part untanking but also the lifting of the complete transformer

350 MVA

400 kV
(BIL 1425 kV)

SPECIAL TRANSFORMERS

Regulation
Traction
Furnace
Rectifiers
Reactors
(Shunt and Series)

The most modern equipment is installed in this production line, such as:

- Automatic magnetic steel cutting machine
- Automatic 'Hot-Oil Spray' drying plant
- Automatic 'Vapour-Phase' drying plant
- Semi-automatic oil drying and transformers filling plant
- Manufacturing areas with environment control (Temperature, Humidity and Particles)

MOBILE SUBSTATIONS

Main characteristics

▼
CORE or SHELL

▼
90 MVA

▼
245 kV
(BIL 1050 kV)

▼
Mobile Substations and
Transformers
Mobile Traction Substations
Mobile Units of HV MV or LV

Efacec Mobile Substations design, assembling and commissioning are the result of Efacec large experience in the fields of manufacturing power equipment and/or integrating complete electrical systems.

Research and development is carried out at all levels, to continuously improve Efacec deliveries.

The high level of qualification and experience of Efacec engineering assures high quality of Efacec Mobile Substations meeting all applicable international standards.

Efacec Mobile Substations are always customer engineered, resulting in a flexible and reliable design.

The main advantages for the use of a Mobile Substation are:

- Reserve unit for energy supply
- High Mobility
- Flexibility
- Reduced costs
- Reduced time of delivery
- Connecting & energizing time: approximately 12 hours



DISTRIBUTION TRANSFORMERS

Main characteristics

Three-phase hermetically sealed integrally filled distribution transformers in accordance with the requirements of IEC 60076 1-5 and Regulation (EU) No. 548/2014 (Eco-design).

IMMERSED

Hermetic, mineral oil immersed three-phase distribution transformers from 50 kVA up to 6300 kVA, up to 36 kV, for indoor or outdoor installation.

DRY

Cast Resin Dry Type Three-phase Distribution Transformers from 250 kVA to 6300 kVA, up to 36 kV, commercially known as PowerCast.

LARGE DISTRIBUTION TRANSFORMERS

Oil immersed three-phase transformers up to 20 MVA and 66 kV for indoor and outdoor installation with conservator and radiator cooling.

Transformers in this range can be manufactured with off-circuit tap changer (DETC) or on-load tap changer (OLTC).



CORE Type – 100 MVA | 235/155/10 kV - France



LDT Type – 12,5 MVA | 63/31,5 kV - Portugal



CORE Type – 170 MVA | 220/66/10 kV - France



SHELL Type – 224MVA | 345/120/13.8 kV - USA



SHELL Type – 505 MVA | 416/20 kV - Portugal



SHELL Type – 760 MVA | 230 /22.8 kV - USA

Efacec Energia, Máquinas e Equipamentos Eléctricos, S.A.
Transformers Business Unit

mod. CS38311710B1

Due to the continuous development, the characteristics may change without notice. Not valid as a contractual item.



Parque empresarial Arroiteia (Poente)
Apartado 1018
4466-952 S. Mamede de Infesta

PORTUGAL

Phone: +351 229 562 300

dcp-trf_comercial@efacec.com
efacec.com