POWER TRANSFORMERS

Energy Solid Control

by ELSEWEDY ELECTRIC

ELSEWEDY TRANSFORMERS

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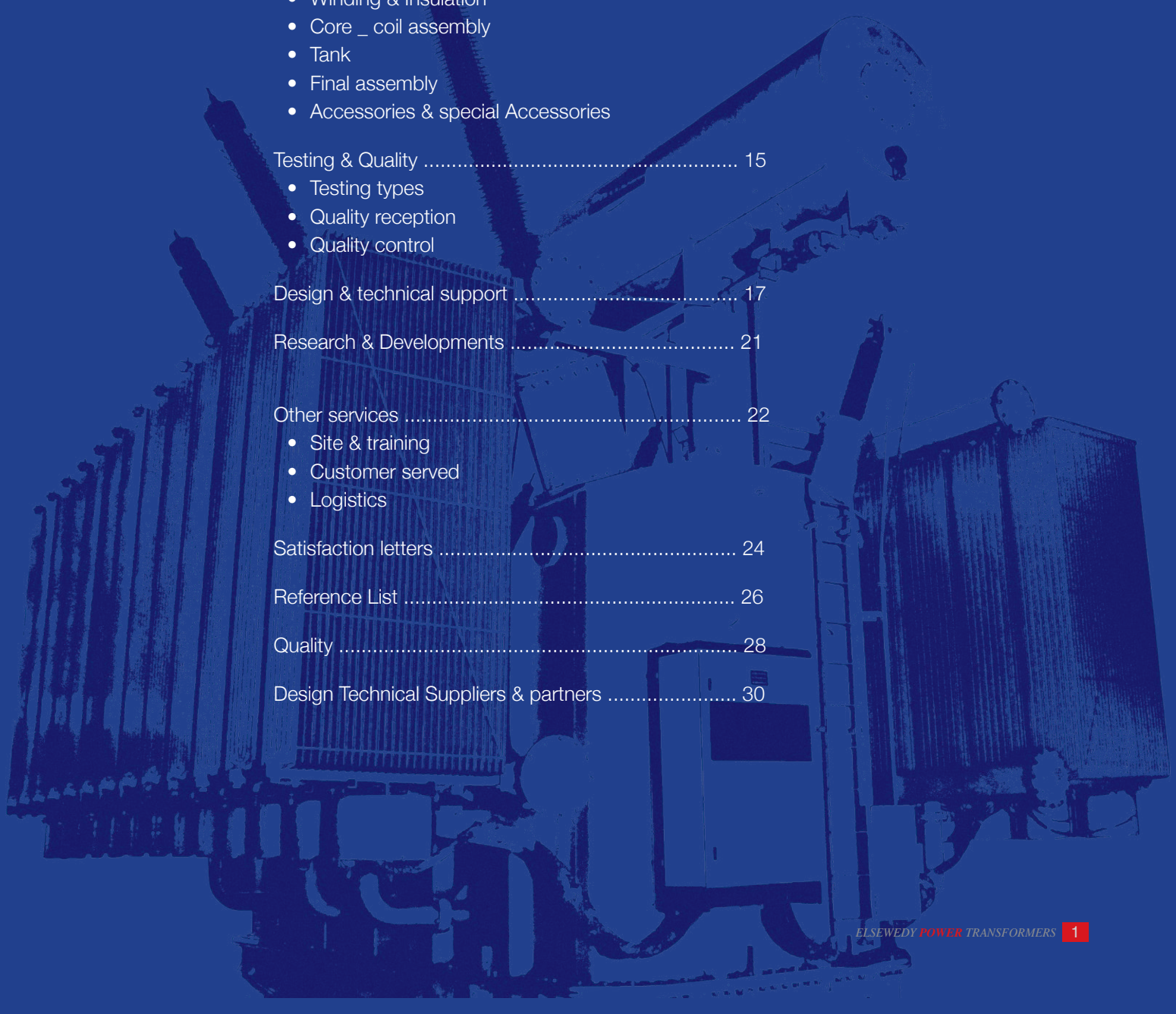


1938
ESTABLISHED

ELSEWEDY ELECTRIC

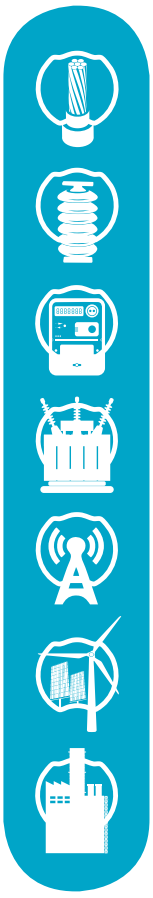
Integrated Energy Solutions

About Us

Our heritage, as energy solutions providers, runs deep. What began with Elsewedy Cables more than 30 years ago and became Elsewedy Electric has transformed into a global diversified company with more than 10,000 employees and 30 production facilities. We are one of the top Energy Solutions companies in Middle East and Africa operating in 5 diversified energy segments; Cables & Accessories, Electrical Products, Energy Measurement & Management, Transformers, Engineering & Construction.

We are proud of what we have achieved so far but recognize that there is much work to do to meet the aggressive goals we have set for ourselves. Elsewedy Electric has the capacity and the will to lead. We will continue to work and fight for those things that make the world a better place.

We remain dedicated to penetrate new markets with a vision of providing the best products and services to our clients and shareholders and create a good working environment for our employees. That's Performance with Purpose. That's what every business owner should strive for.



25 PRODUCTION FACILITIES IN

14 COUNTRIES EXPORTING TO

40 COUNTRIES WORLDWIDE

75 years ago, we started with a clear vision to position Elsewedy Electric for successful growth, inspired by innovation, determination and spirit of hard-working staff, empowered and liberated by a strong enterprise system.

At Elsewedy Electric, we focus on three pillars of sustainability: Human, Environment, and Technology. We are working to produce the best products and offer a wider selection of solutions in order to meet growing energy demands.
We are striving to reduce our impact on the environment, conserve natural resources, and reducing our operating costs in the process.

Elsewedy Transformers

Elsewedy factory is in 10th of Ramadan city – Egypt, and the operational area is built on 35,000 square meters; producing capacity is around 7000 MVA annually of Power & Distribution transformers.

Elsewedy Transformers manufactures Power Transformers ranging from 5 MVA to 250 MVA & up to 220 kV class.

The policy of Elsewedy Transformers is to provide products that conform to our customers' requirements according to international standards and deliver them on time with competitive quality; this requires all departments to have quality objectives which are reviewed periodically to ensure continuous improvements of quality management system. Core and Winding design & types which offer the least loss were selected using magnetic field analysis, and also used in Elsewedy Power Transformer to ensure high levels of efficiency. Moreover, by selecting the optimal insulating structure through the electric field analysis of insulation between turns, sections, windings and phases, the Power Transformer's electrical stability is achieved.

Fluent analysis technology has enabled us to achieve the optimal cooling system, and 3D strength analysis has enabled us to make a structural design that can withstand internal mechanical power short-circuits caused by system faults, seismic conditions according to external impacts, and the impact of transportation.
We have started the manufacture of power transformers since 2009; and we have supplied more than 100 power TRs (of which, around 100 TRs in EETC network only).
Elsewedy Power Transformer factory is equipped with the updated processes machines; the new core cutting machines, the new winding machines, high-capacity vacuum heat drying equipment, and has a testing lab with an outstanding performance.

We at Elsewedy Transformers are committed to providing our customers with distinguished products and services. We extend to enhance our partnership with our customers by covering all specific requirements and by being available everywhere.

Why Elsewedy Power Transformers

+ Not only Latest, but also the Newest Technology

As the leading company in Egypt's power solutions industry, Elsewedy Electric is playing a central role in the national power supply network, based on its reliability and Newest technology.
Elsewedy Electric's experience in manufacturing and production of the Electricity technologies for many years has enabled us to proudly present the Power Transformers.

+ Over 70 years of experience for electrical solutions; 30 years –of which- as a Manufacturer

Elsewedy has been walking a single path in the field of industrial electricity for the past 30 years, and has achieved technological innovations and improved competitiveness through continuous R&D and investments.
On top of all the merits that are part of existing systems, Elsewedy Power Transformers provide a Total Solution with a Network Control System.

+ Trust Elsewedy Power Transformers performance

Testing is the only way to ensure perfectly operational products. So, if you are concerned with reduced competitiveness caused by maintenance problems and defects, hesitate no more and choose Elsewedy Power Transformers.
Safety and reliability are of the utmost importance in the power transformers. That is why you need to choose a reliable company. Elsewedy Power Transformer will ensure optimum reliability through stable performance in any given condition.

+ Qualified people manufacture quality products

Professional and fully trained engineers will lead you to perfect success on your business with highly trained skills and careful management.
In addition, our plant continually strives to achieve the optimal balance between outsourcing and local professional trained manpower. Every effort is made to ensure the product quality.

+ Streamlined manufacturing with state-of-the-art machinery

Elsewedy Power Transformers manufacturing plant is equipped with modern machinery for fast, efficient production. Our clean facilities enable the production of less-defect products, within which even a single speck of dust is not allowed.

+ Sales and customer service

Elsewedy Power Transformers Company is very much a market-driven organization. The company is structured to ensure the shortest possible lines of communication between customers and Group companies.
Elsewedy sales department is supported by a network of small, efficient sales offices and specialist representatives with an expert knowledge of local conditions and of the customer's requirements.
Elsewedy strategy is based on creating solutions for its customer, combining state-of-the-art technology and manufacturing with international contracting and after-sales services, ensuring that any project need is met on time.

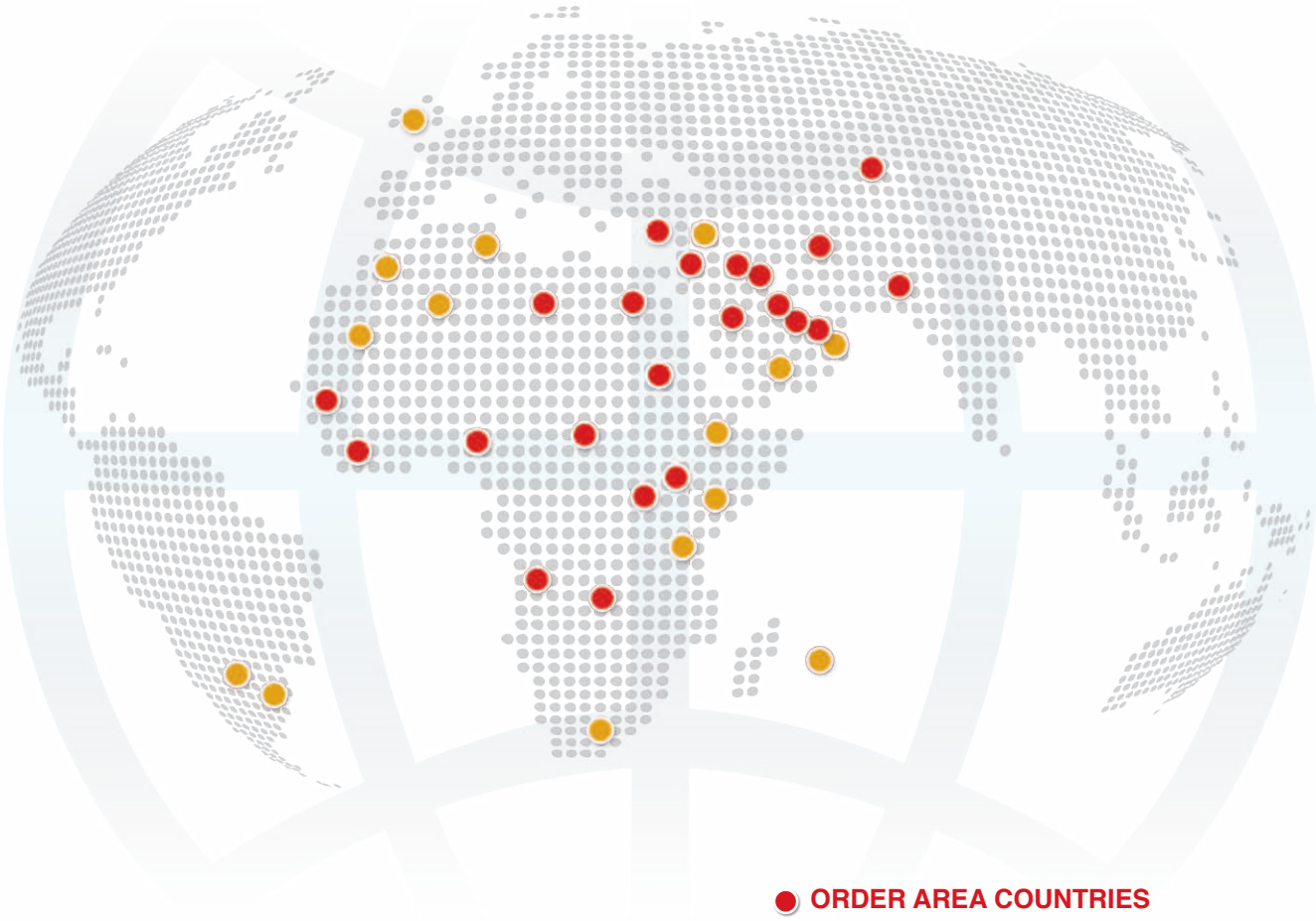
+ Efficiency & environment

We in Elsewedy always think about efficiency & environment. We aim to not only provide economic advantages for our customers through increased energy efficiency, but also to fulfill our social responsibilities through the development of environment-friendly products.

Health, Safety & Environment Management System of Elsewedy Power Transformers has been developed to define and communicate the company's HSE policy and objective for the purpose of effective implementation of the HSE Management System that primarily designed to help in achieving total safety of personnel & company assets.
Definitions and terminology used within Elsewedy Power Transformers HSE system are based on the International standard ISO 14001:20014 & OHSAS 18001:2007.

We delivered power transformers to many countries in middle east & Africa for example: Egypt, KSA, UAE, Kuwait, Sudan, Algeria, Ghana, Zambia…

Our Globally Reach



ORDER AREA COUNTRIES

Egypt, KSA, UAE, Kuwait, Iraq, Libya, Sudan, Zambia, Ghana, Nigeria, Angola, Central Africa.

OFFERING AREA COUNTRIES

Algeria, Tunisia, Morocco, Nigeria, Kenya, Ethiopia, Tanzania, South Africa, Burkina Faso, Cote devoir, Mauritania, MoreshiousYemen, Oman, Syria, United kingdom, Uruguay, Argentina.

Elsewedy Power Transformers

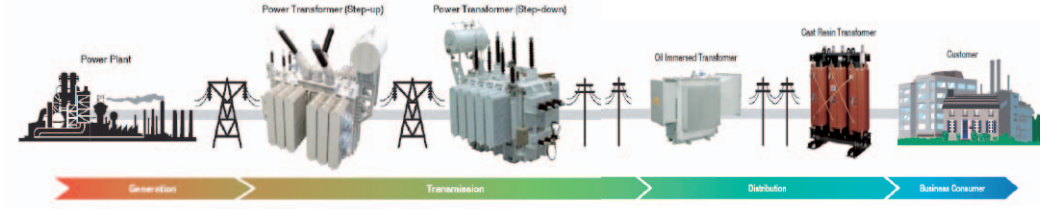
Elsewedy Transformers comply with all customer specifications as well as national and international standards as

IEC, IEEE/ANSI, NEMA, BS & AS.

As the leading company in Egypt's power solutions industry, Elsewedy Electric is playing a central role in the national power supply network, based on its reliability and technology. Elsewedy Electric's experience of manufacturing and production technologies of over many years has enabled us to proudly present the Power Transformers.

Reliability as a Result of Accumulative Knowledge & Experience

Classification		Description
Type		Core type
Phase		Single or Three phase
Frequency		50 Hz or 60 Hz
Rated Voltage		3.3 kV up to 220 kV
MVA capacity		Up to 250 MVA
Construction	Tank	Conventional type, Bell type
	Oil preservation system	Conservator type, N2 seal type, Air seal type, … etc
	Cooling method	ONAN, ONAF, OFAF, OFWF, ODAF
Applicable standards		IEC, IEEE/ANSI, NEMA and BS.
Applications		Generation Step-up Units (GSU) • Transmission & Distribution Substations. • Industrial Plants: - Oil & Gas Refinery. - Chemicals & Petrochemicals. - Cevment Industry - Rolling mills. - Mining Industry. - Desalination Plants. • Pumping stations. • Railways / Metro. • Malls / Hotels / Resorts. • Different infrastructures fields.




ELSEWEDY
TRANSFORMERS

Manufacturing Process

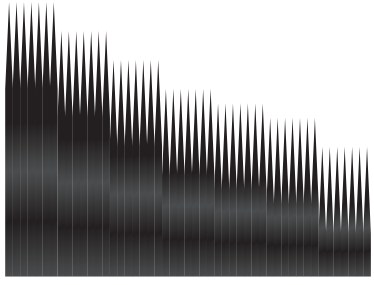
Core

that's all working to improve sound level C/Cs. & reduce iron loss to min value & reduce existing current & we supplies core cutting & core slitting facilities with bolt less & rigid construction making our transformers more reliable

The iron core influences the subsequent efficiency of a transformer; That's why we design our transformers as core types in which the wound and non-wound limbs of the core are located at the same level and connected by yokes.
The choice of sheet metal also greatly effects the quality of the core. We use high-quality, cold-rolled grain oriented silicon steels sheet. Depending on project requirements, we may also laser-treated sheets.

The suitable construction of the frame structure, the preset surface pressure of the lamination, the proper flux density and the gluing of laminations edges after clamping ensure a moderate level of magnetic noise and prevent increase of no-load losses after impulse voltage tests.

The step lapped joints of the core laminations reduce the additional losses arising in the corner portions



Windings & Insulation

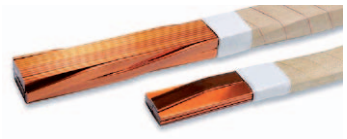
In manufacturing power transformers, the most suitable winding method is employed according to MVA capacity, system voltage and the required tapping range for each TR.
Only Electrolytic grade copper is used in making transformer windings. Copper formed in various types viz. Paper Covered Rectangular Conductor, Paper Covered Combined Conductor, Enameled, resin bonded & Paper Covered Combined Conductors, and finally Netting tape or Paper Covered Continuously Transposed Conductors also called as CTC's.
"Especially, the transposed conductor is composed of several wires individually covered with enamel and this entire wire unit is covered with several layers of insulation paper.

The advantage of using transposed conductor:

- Reduce significant amount of eddy current loss in the windings. Bonded CTC's provide very High Mechanical strength against short circuit forces.
- Improve winding utilization factor and productivity in manufacturing of windings."

The winding process is conducted in a dust free environment.

The vertical type machines are used for high-voltage, low-current conditions with a small number of conductors and implements a complex winding method.



The horizontal type machines are used for winding methods of a low-voltage, high-current type with a large number of conductors

Multiple series loop helical windings are used for making regulating coils. This type of regulating coils helps to balance ampere turns throughout complete height of the coil, thus reducing asymmetry during short circuit.

Disc type of windings is suitable for windings with higher no. of turns and with law current. i.e. especially high voltage windings.

Single multiple layer helical windings are preferably used for low / medium voltage with moderate no. of turns and higher current.

Interleaved disc windings or contra shield disc windings are used for high voltage (132 kv. And above) coils. These types of windings provide better performance during all impulse conditions by making uniform voltage distribution throughout the complete height of the winding.

Core-coil assembly

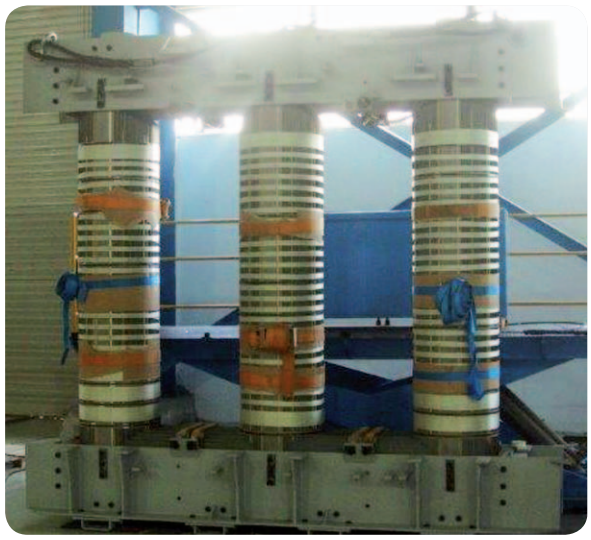
For insulation, all Elsewedy transformers have a concentric winding structure. All the insulation materials Used to provide di-electric strength and cooling ducts within and between windings is made of high quality electrical precompressed boards (PCB) intended for use in transformers. The insulation between the windings and between the winding to the core is of the oil-pressboard barrier system.

The required dielectric strength within and between windings and between windings and core is achieved by using composition of oil & PCB forming a complete barrier system.

For assembly, wooden structures for the lead winding are employed in order to build the most compact transformers possible.

This structure provides optimal support for the core-coil, ensures maximum short circuit strength and maintains the integrity of the core and coil during transportation and earthquakes.

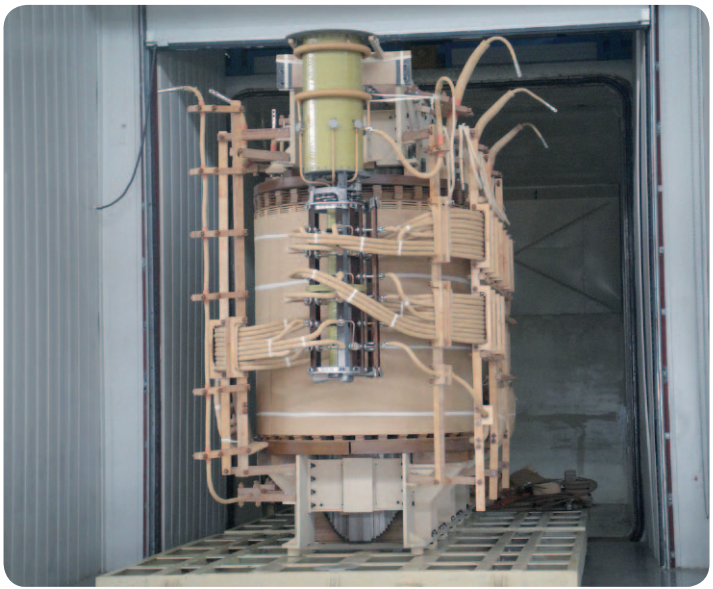
Top and lower yoke plates structure minimizes stray losses and prevents deformation due to mechanical forces.



The tapped winding helps to adjust the transformation ratio to network conditions safely, simply, and gradually – whether off load, via tapping switches, or under load, by means of on-load tap-changers.

As a rule for off-load devices, the tapping switches are adjusted manually. For on-load tap-changers, however, separate motor drives can be controlled either onsite or remotely.

Adapting to network conditions (Voltage adjustment)



Vapour phase drying (VPD)

For Large Power Transformers, VPD is used for proper preparation (dehydration, degassing, impregnation) to optimize the dielectric properties of transformer insulations.

High mechanical rigidity is achieved via hydraulic pressing, through a calculated force and tightness all pressure screws.

Tank

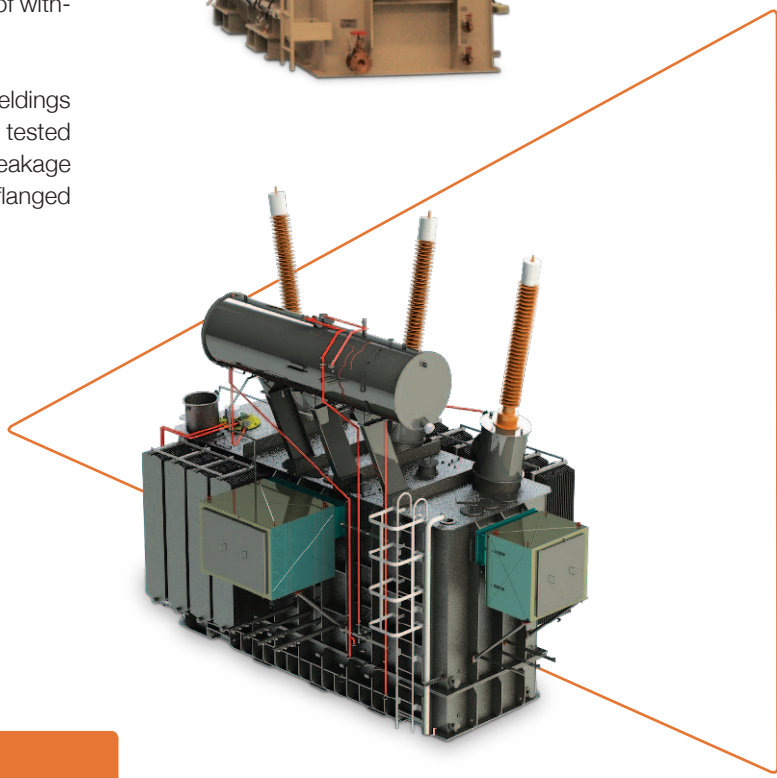
Another main component of each transformer, the tank, accommodates the Core-and-coil assembly, Tap changer with connections, Oil filling, Bushings & accessories fittings.

The tank, cover and conservator are manufactured of steel plate; the tank is usually from a rigid type; with removable radiators thru shut-off valves. The complete tank together with all flanged connection is capable of with-standing hydrostatic over pressure and full vacuum.

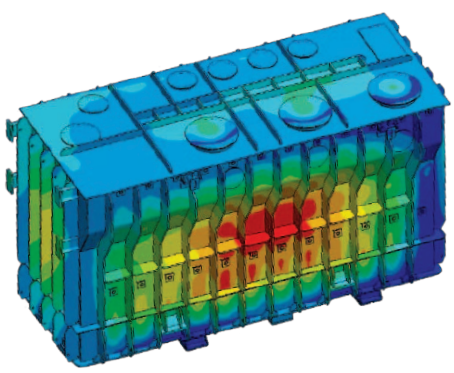
Double welding is used where the oil tightness is required; the weldings are made by qualified welders and all the weldings are checked / tested with a penetrant liquid to guarantee that there is no chances for leakage and rubber / cork rubber compound is used for the gasket on flanged connections.

Standard construction consists of a deep tank and a cover; but for larger transformers, or upon request, we also manufacture bell type tanks.

If desired and necessary, large power transformers are designed for convenient transportation.



Non-magnetic steel is used around the high current carrying bushings to reduce the eddy-current losses.
The surface of the tank, cover and con-servator are cleaned from rust and other impurities. The inside of the tank is cov-ered with oil resistant paint and the outer surfaces are painted with high-quality cor-rosion protection to help ensure a long ser-vice life.



Final assembly

The Oil is used to for Transformer Cooling, it also provides part of the electrical insulation between internal live parts; and should remain stable at high temperatures for an extended period. So, Elsewedy makes sure to use the most approved oil with high quality from well-known suppliers around the world.

The Oil conservator is mounted above the transformer tank thru a connecting pipe. It causes flow freely as it expands or contracts due to oil temperature changes.

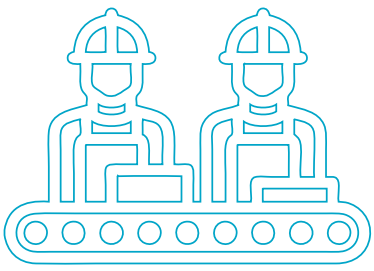
High quality instruments with superior performance are always used for transformer condition monitoring & controlling.

The main conservator may be fitted with a nitrile membrane to avoid all contact of ambient air with the transformer oil.
Buchholz relays are placed in this connecting pipe between tank and conservator to collect the gases.

Air dryer is connected to airspace above the oil for humidity.

The radiators groups are fitted to the transformer tank through butterfly valves or placed in separated cooling banks; with high mechanical strength ensured by reinforcing ribs.
Based on customer requirements or operational conditions, we build Transformers with ONAN or ONAF cooling system.

Varieties of using different types of Bushings with or without cable boxes are also available in our design. Porcelain type bushings, Condenser type, GIS, Resin paper or plug-in type terminals may be used based on projects' specifications or customer requirements.



Accessories & special Accessories

– Bushings.

– Automatic Voltage Regulator “AVR”

– Oil level indicator

– Off-circuit tap changer OCTC

– Pressure relief device

– Cable boxes

– Remote tap changer control panel “RTCC”

– Bi-directional rollers

– Buchholz relay

– Temperature level indicator.

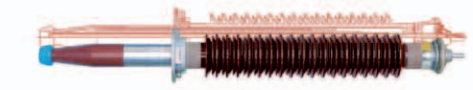
– Oil temperature indicator

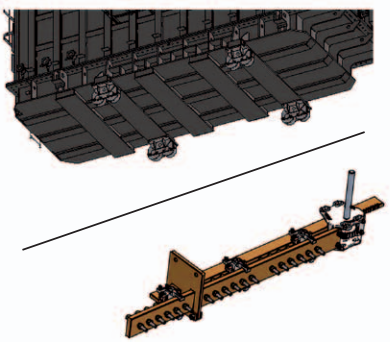
– On-load tap changer (Oil type or vacuum type) “OLTC“

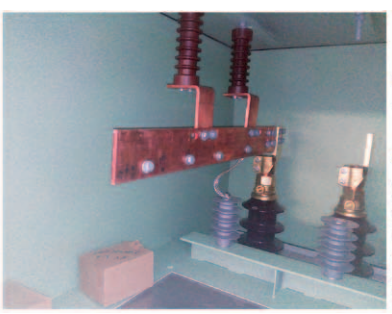
– Winding temperature indicator

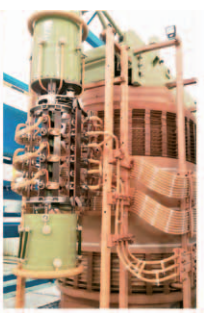
– Dissolved gas analysis

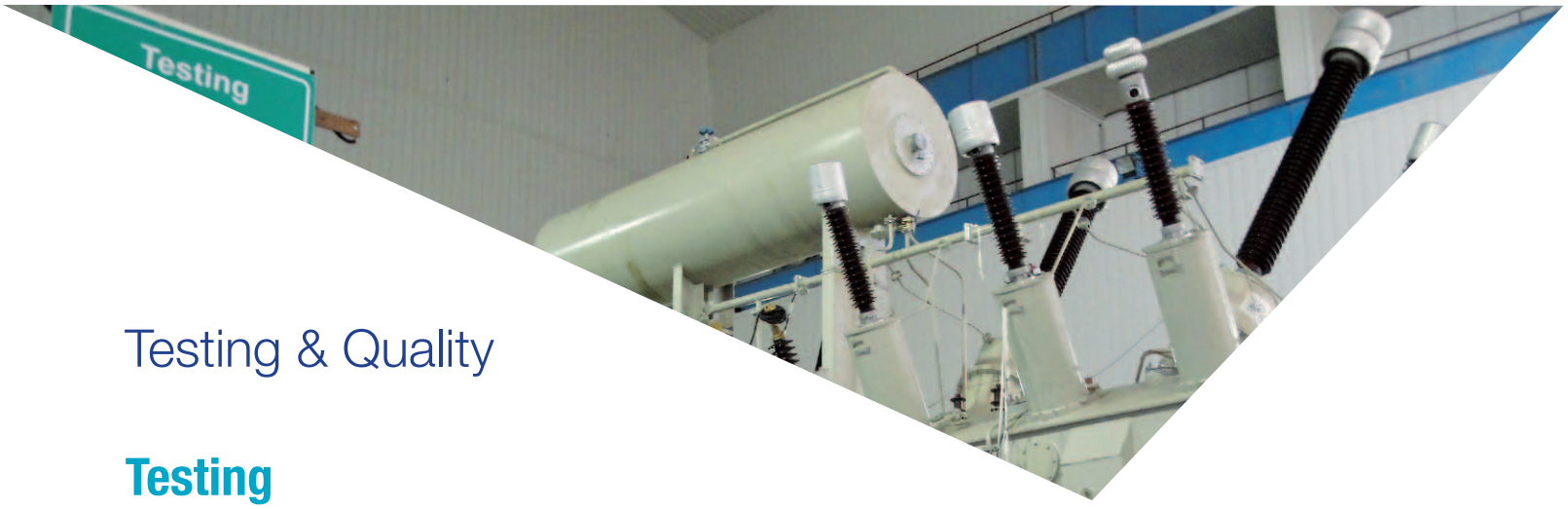
– Fiber Optics temperature sensor











Testing & Quality

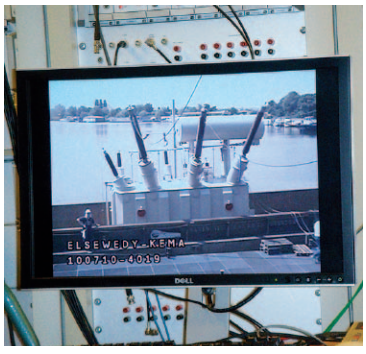
Testing

Our policy is to produce products which meet all customer specified requirements, whether specified or implied, as well as all applicable industrial codes and national standards. In accordance with this policy, we produce and deliver all of our transformers on schedule.

For this reason, Elsewedy Transformers has the largest and latest Testing Equipment Laboratory in the Middle East and Africa, carrying out various Routine, Type Tests. In addition to this, a part of the Special Tests performed internally and then certified by external testing procedures at DEKRA (KEMA previously) and other International Labs.

The test facility has instruments manufactured from all over the world and huge investment has been done in setting up the entire facility. All instruments are calibrated as per International standard requirements and the material is tested confirming to relevant IEC/ASTM standards.

In order to realize our quality policy, we are adopting an Integral Quality System starting from receiving the raw materials until dispatching the final product.



Testing Types

1. Routine test :

1.1. Measurement of winding resistance

1.2. Measurement of voltage ratio and testing of voltage vector relationship

1.3. Measurement of impedance voltage, short-circuit impedance and load.

1.4. Measurement of no-load loss and current

1.5. Dielectric tests:

1.5.1. Separate source voltage withstand test

1.5.2. Induced overvoltage withstand test

2. Type test:

2.1. Temperature rise test.

2.2. Dielectric tests: lighting impulse test.

3. Special test:

3.1. Short circuit test.

3.2. Tests on load tap-changer.

3.3. Measurement of harmonics in the no load current

3.4. Dielectric test: PD test & chopped wave test.

3.5. Measurement of zero-sequence impedance on three phase transformers.

3.6. Tests of auxiliary equipment and wiring

3.7. Measurement of sound level.

3.8. Leakage test for transformer tank.

We are implementing a system of well identified test and control points and stages:

1 **Quality Reception (Raw materials)**

3 **Manufacturing Process Control**

2 **Oil & Insulation Material Test**

4 **Electrical Final Test**

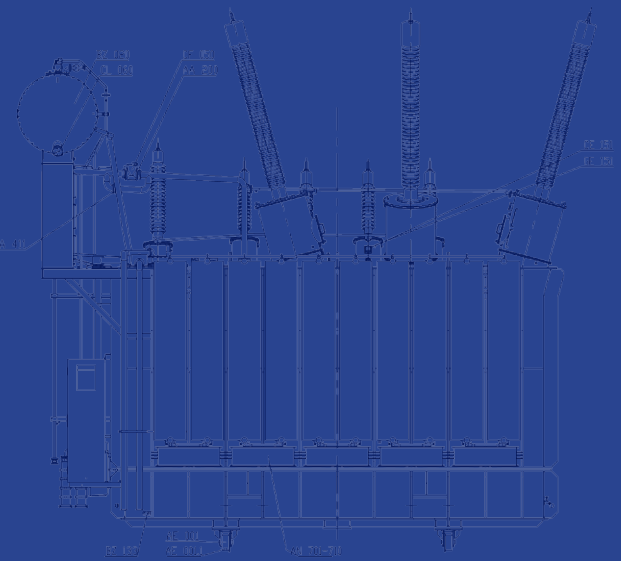
5 **Dispatch Final Inspection**

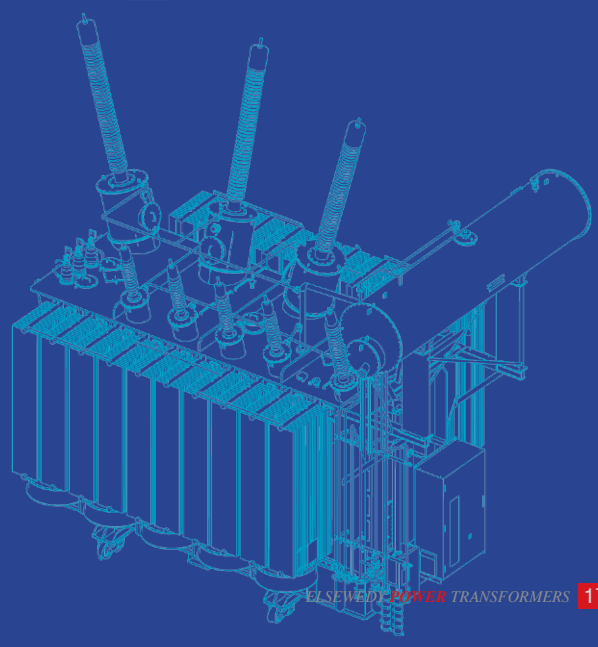
Design & Technical Support

By utilizing the most modern and up-to-date design technologies, Elsewedy provides designs which can meet:

- the customer's various needs of power, voltage, mode of operation, low noise level, connection techniques, type of cooling, transport, installation, operation … etc
- The projects' various specifications and international standards.

Program	Function	Manufacturer
ANSYS	Structure Analysis	Ansys
SAPRTON	Magnetic Field, Losses, Heat and Electromagnetic Stress	VIT (Ukraine)
Maxwell 2D/3D	Magneto-static, Electrostatic, Eddy Current, Transient EM, Loss, Force	Ansoft
ELEX-2D	Electrostatic Field Calculation	VIT (Ukraine)
EMFIS	Electromagnetic Field Analysis	SNU
PTAN	Calculation of Impulse Overvoltage and safety Margin in Winding	VIT (Ukraine)
VLN	Impulse Analysis	VIT (Ukraine)
ELDMAG-3D	Stray Loss Calculation	VIT (Ukraine)
TOK	Current Distribution in Winding During Short Circuit	VIT (Ukraine)
OST	Optimization of Place for Transposition in Helical Winding	VIT (Ukraine)
TURNIN	Calculation of Turn Insulation Safety Factor	VIT (Ukraine)
ELDINST	Analysis of Mechanical Strength of Winding under Short Circuit	VIT (Ukraine)





The largest and latest Testing Equipment Laboratory in the Middle East and Africa.

Quality Reception

Raw materials

We have an excellent raw material test laboratory set up with a state of art instruments. All major raw materials such as Copper, Lamination, Oil, Tank, Insulation, Temperature-measuring instruments can be tested. The material acceptance is done as per International Standard/Customer specifications.

We have an Atomic absorption spectrophotometer using which we can check the material composition of any material .All major material as mentioned in periodic table can be tested using Atomic absorption spectrophotometer.

All material received is tested as per IEC/ASTM standards and assisted by respective Quality Assurance plan.

High quality instruments with superior performance are always used for transformer condition monitoring & controlling.

Oil

Benefits:

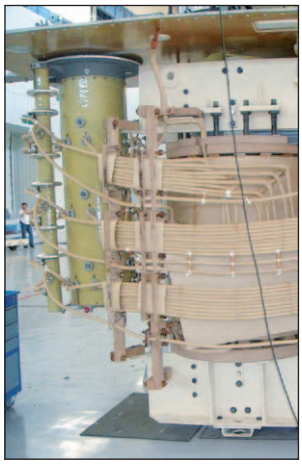
In house test facility for checking all major properties of transformer, oil is available. In addition, we also have a facility to check corrosive sulphur in oil. This play a major role in oil quality since absence of sulphur/sulphide compounds helps in less deterioration of insulation and further leading extended transformer life.

1) Assured Raw Material Quality.
2) Less In process and Final process stage failures/ rejections.
3) Consistent Transformer Performance.
4) Qualify suppliers.
5) Monitor raw material quality.
6) Have raw material properties traceability for each transformer manufactured.

Quality Control

Process

Quality Control is carried out at each stage of production on a self-assessment basis. Each employee regards the next workstation as his customer, and performs a series of quality checks before passing on a product down the line.
The Quality management department monitors all quality control documents and carries out its own additional inspections at strategic points in the production process.
This system of checks and counterchecks allows immediate action to be taken and modifications to be made as required. It also feeds Elsewedy's process of continuous improvement.

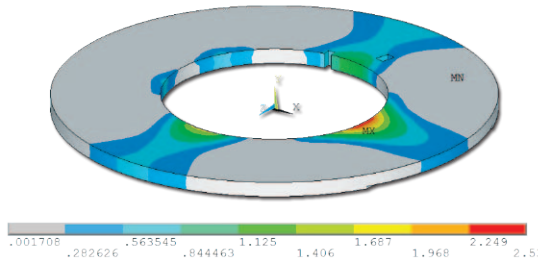


Testing

To guarantee our customers' optimum satisfaction, all transformers are tested and calibrated to IEC Standards internally.
These Tests results are considered the main indication of the extent to which a transformer is able to comply with a customer's specified requirements such as the loading capacity, dielectric withstand ability and further operating characteristics.

Research & Development

Research and Development plays a critical role in the innovation process. It's essentially an investment in technology and future capabilities which is transformed into the products; or to improve the processes and services. As Elsewedy Power Transformers is a specialist supplier, we always try creating added value through the development of advanced products.



Elsewedy Power Transformers maintains an extensive Research and Development department with a staff of expert Engineers and comprehensively equipped electrical and chemical research laboratories.

The R&D department also monitors and evaluates designs and manufacturing innovations suggested by the different operational units.

R&D engineers play an active role in various standardization committees and provide valuable technical advice to the company's sales staff.

In brief Concentrated points in research and development activities are advanced insulation systems, loss reduction, more compact transformer design and increased efficiency. To reach these goals, we benefit mainly from Power Transformers Research and Development Centers worldwide. Theoretical aspects of a transformer development project are carried out by experienced engineers who have expertise in their respective fields. Results are verified by running full scale testing in order to avoid extrapolation mistakes

The development of manufacturing techniques is also a part of research and development activities. The manufacturing technique which affects the quality and reliability of a transformer is carried out in close cooperation with design, production and development engineers.

1. Research:

Elsewedy has a continuing program of applied technological research into the thermal, mechanical, electrical and electromagnetic performance of transformers.

2. Product development:

Based on the Results obtained from theoretical research, we always update and develop the practical stages of product development.
The primary objectives of this development work are product and component optimization, capitalization of transformer losses and standardization, all of which enable Elsewedy to ensure continuous improvement in Quality, Performance and Delivery.

3. Major achievements and current projects include:

> Producing and marketing low-noise and low-loss Transformers.
> Using alternative dielectric material to reduce fire risk and environmental impact.
> New compact S/S for utility and industrial applications.
> Monitoring and Control Protection system for Power Transformers.
> Study the impact of relational energy applications and network operations on the integrity of the insulation in Transformers.

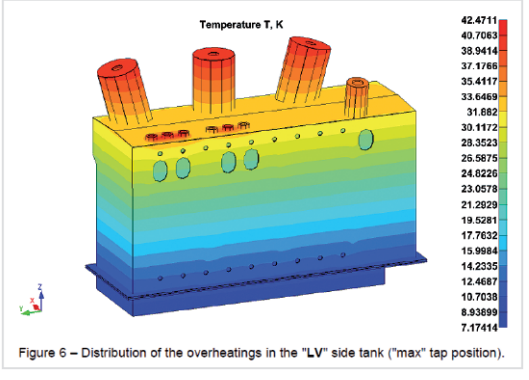
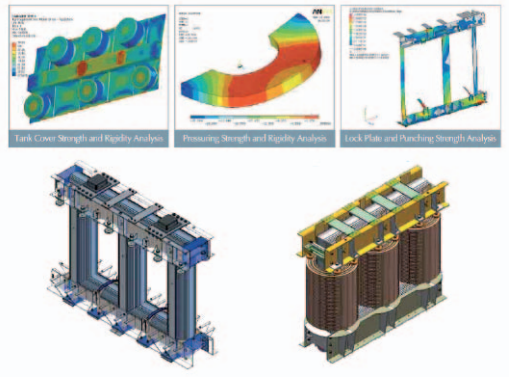


Figure 6 – Distribution of the overheatings in the "LV" side tank ("max" tap position).



Other Services

Site Service and Training

Elsewedy Transformers offer a full range of after-sales services. These are provided by a Specialist Department within the company.
The Department offers all site services, but not limited to Installation, Testing, Commissioning, Maintenance and Repairing transformers worldwide; in additional to site team trainings.
As a total solution provider, Elsewedy Service can deliver accessories and spare parts also.

Elsewedy Transformers is dedicated to ensuring that customers receive optimum service, reliable maintenance and fast repair of various transformer types.

The company works with group services organization in multi countries in Africa & Arabian gulf Areas. This service and maintenance Capability enables the Elsewedy Transformers to guarantee the operation of transformers in anywhere supplied.
In addition to the Elsewedy Transformers factory is well equipped to handle the whole range of refurbishment activities and repairs in-house when on site work is not an option. This includes repairing the active part, rewinding and replacing the tap changers.
The company can repair both core – and shell – type transformers, whether manufactured by the Elsewedy Transformers or any other manufacturer.

Elsewedy Transformers Site-services engineers are ISO quality – certified.

Logistics

Total Area

Total area: 160,000 m2.
Total Building area under roof: 37,700 m2.

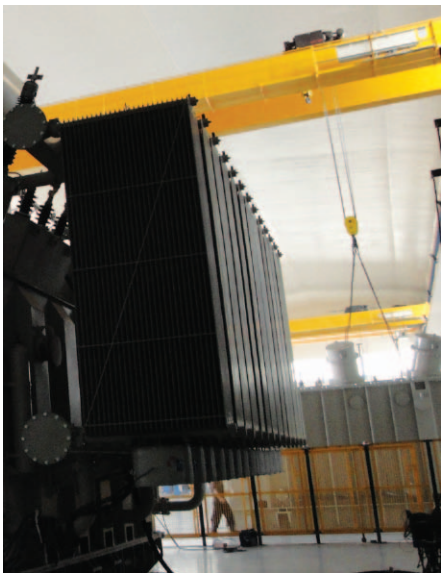
Packing

There is a carpentry workshop equipped with all necessary machinery and tools to manufacturer all types of wooden packages like (pallets, boxes) suitable for export packing of transformers.

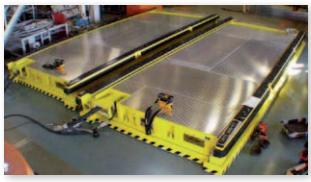
Handling

Forklifts:
4 Forklifts of different lifting capacities available in house for electrical equipment handling up to 25 ton.

Overhead Cranes:
14 Overhead Cranes of different lifting capacities up to 300 ton are available in the factory.



Air Cushion:
the air cushion transport system LPT-250 is suitable for the indoor transportation for transformers & transformers components with total weight up to 250 tons.



Transportation:
Airports: Cairo international airport, which all types and capacities of aircraft can land, is 40 km away from our factory.
Sea ports: Mediterranean Sea and Red sea Ports, which can hold all kinds and size of ships, the farthest one is 360 km away from our factory.
Highways: main highways lead to Elsewedy Transformers factory, only 2 km away from the factory.

Satisfaction Letters

EGYPTIAN ELECTRICITY TRANSMISSION COMPANY (EETC)
Chairman
Tel.: 22618579 Fax: 22616486

الشركة المصرية لنقل الكهرباء
رئيس مجلس الإدارة

Certificate

The Egyptian Electricity Transmission Co."EETC " certifies that the "ELsewedy Electric" Plot No.27 , 1 st District, 5 th Settlement, New Cairo - Egypt has executed on turnkey base 220 K.V 66 K.V Transformers with This Specs .

- 36 Transformer 125 MVA 220/66/11 - 220/66/22 K.V
- 160 Transformer 40 MVA 66/11 - 66/22 K.V
- 20 Transformer 25 MVA 66/11 - 66/22 K.V

The projects Execution level is in accordance to the required standards and achieved on time, EETC thanks ELsewedy Electric for the sincere co-operation.

This Certificate is issued upon the company's request without any liability on Egyptian Electricity Transmission CO.

Chairman for
Egyptian Electricity Transmission CO.
Eng: Gamal Abdel Rahim

Date: 4 /7/2017

Signature is approved
First undersecretary
For Ministry of Electricity & Energy
Dr. Eng. Hassan Mahmoud

ELSEWEDY TRANSFORMERS

REPUBLIC OF GHANA
MINISTRY OF FOREIGN AFFAIRS AND REGIONAL INTEGRATION

TR/SF.1 VOL. 7

I, HANAAN NKYI ASAKU, Assistant Director, Legal and Consular Bureau, Ministry of Foreign Affairs and Regional Integration of the Republic of Ghana, DO HEREBY CERTIFY that the signature of RICHARD APIETU, Second Deputy Judicial Secretary, covering the signature of SUSSIE NKUMSAH, COMMISSIONER FOR OATHS, ACCRA, GHANA appearing on the "ORIDCO, TESTIMONIAL BY **ING. REV. S. F. KWOFIE,** DIRECTOR, ENGINEERING" dated 14th September, 2015 is the true and certified signature of the said RICHARD APIETU, Second Deputy Judicial Secretary of the Judicial Service of Ghana.

Given under my hand and seal of the Ministry of Foreign Affairs and Regional Integration of Republic of Ghana this 2nd Day of May, in the Year of Our Lord Two Thousand and Seventeen (2017)

ASSISTANT DIRECTOR
LEGAL & CONSULAR BUREAU
MINISTRY OF FOREIGN AFFAIRS & REGIONAL INTEGRATION

ELSEWEDY TRANSFORMERS

ZESCO

Ref: D&CS/DERP/90/ 2016

28th June 2016

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

We hereby confirm that ZESCO Limited purchased power transformers manufactured by Elsewedy transformer Company Limited of Egypt under Contract No.: ZESCO/DERP/01/2010. The details of the power transformers purchased are as follows:

Item	Voltage level	Capacity	Quantity	Year Of Delivery
1	132/88/33kV	40/52MVA	2	2011
2	66/33kV	20/26MVA	2	2011
3	66/11.5kV	30/40MVA	2	2011
4	66/11.5kV	20/26MVA	2	2011
5	66/11.5kV	20/26MVA	2	2014
6	33/11.5kV	30/40MVA	2	2011
7	33/11.5kV	20/26MVA	14	2011

All these transformers have been installed in our Distribution and transmission networks and they are all in service. The performance of these transformers has been excellent and without any failure since their commissioning. Furthermore the noise level of these transformers is very low making them suitable for installation near residential areas.

Should you require any further clarification do not hesitate to contact the under signed.

Yours faithfully,
ZESCO LIMITED

NSHIMWENAMO MULENGA
PROJECT MANAGER - DERP

ZESCO LTD
DIRECTOR - D&S

ELSEWEDY TRANSFORMERS

All correspondence to be addressed to the Managing Director
ZESCO Limited, Stand No. 6949 Great East Road, P.O. Box 33304, Lusaka-Zambia

الشركة القابضة لكهرباء مصر
الشركة المصرية لنقل الكهرباء
قطاع الشمالية – منطقة القاهرة
مكتب رئيس قطاع شبكات الجهد الفائق

العنوان: ٢٢ شارع شمس بالشيخ – القاهرة
Email: eetctc@yahoo.com

السادة / شركة السويدي للكابلات

(عناية السيد المهندس / عاصم الفخراني)

تحية طيبة وبعد...

إشارة إلى خطاب سيادتكم المرفق صورته بشأن الإفادة عن كفاءة المحولات التي جرى توريدها لمنطقة كهرباء القاهرة من قبل شركتكم الموقرة قدرة (٤٠ ف.أ) جهد ١١/٦٦ ك.ف بمحطات المحولات التالية (الإسناد – الوراق – الجبل الأصفر – بقرة المعادي – أبو رتمل).

رجاء التكرم بالإحاطة بأن المحولات المشار إليها تعمل بحالة جيدة حتى الآن ومطابقة للمواصفات الفنية وهي الآن معتمدة للتركيب بالشبكة الكهربية الموحدة في المشروعات المستقبلية.

وتقبلوا فائق الإحترام...

رئيس قطاع شبكات الجهد الفائق
مهندس
" عبد المقصود أحمد محمود "

ELSEWEDY TRANSFORMERS

ELSEWEDY CABLES

Transformers Segment
Office : Plot 35, 1st District, 5th Settlement, New Cairo
Direct : (+4202) 27599727
Fax : (+4202) 27599799
Tel. : (+4202) 27599700 – 709 (10 Lines)
E-mail : transformers@elsewedy.com
http : www.elsewedycables.com

التاريخ : 2010/12/14
مكتب رقم : 137/10NOH

السيد المهندس / عبد المقصود أحمد محمود
/ رئيس قطاع شبكات الجهد الفائق – منطقة كهرباء القاهرة
/ الشركة المصرية لنقل الكهرباء

تحية طيبة وبعد...

بالإشارة إلى المحولات قدرة 40 م.ف.أ ، جهد 66 ك.ف التي تم توريدها وتحويل الخدمة بمنطقة كهرباء القاهرة إلى محطات محولات كل من (الإسناد – الوراق – الجبل الأصفر – بقرة المعادي – أبو رتمل).

يسرنا الفكر بالقائنا عن مدى كفاءتها و مطابقتها للمواصفات التي تطرحها الشركة المصرية لنقل الكهرباء وكذلك من اعتمادكم لتوريد هذه النوعية من المحولات لتركيب بالشبكة في المشروعات القائمة لشركاتم الموقرة.

وتفضلوا بقبول فائق الاحترام...

المهندس / عاصم الفخراني
مدير الإدارة الفنية لشبكات المحولات
محمول رقم: 01017990004
Email:asim.fakhrany@elsewedy.com

ELSEWEDY TRANSFORMERS

Reference List

ENERGY

- More than 40 units of Transformers with nominal system voltage class 220 kV; and rating up to 125 MVA & 175 MVA in EETC multiple substations.
- More than 200 units of Transformers with nominal voltage class 66 kV; and ratings up to 40 MVA in EETC multiple substations.
- More than 20 units of Transformers with nominal system voltage class 132 kV; and ratings up to 30 MVA in Arabian Gulf Region (KSA, Kuwait, UAE, Iraq, … etc).
- More than 50 units of Transformers with nominal system voltage class 161 kV; and ratings up to 66 MVA in Black Africa Region (GRIDCo, ZESCO, Central of Africa Republic, … etc).
- More than 50 units of Transformers with nominal system voltage class 66 kV; and ratings up to 20 MVA in North Africa Region (Libya, Sudan… etc).

INDUSTRIAL

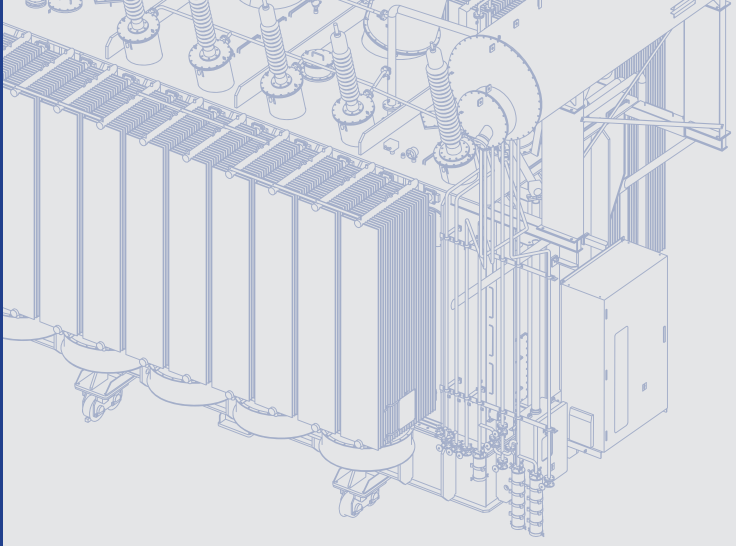
- Power Transformers with different systems voltage class up to 220 kV; and different ratings up to 125 MVA in Egypt:
  - > Phosphate factory - Abu Tartour,
  - > Enppi / Ethydco Ethylene Petrochemical Plant – Alexandria,
  - > Nahda Cement Factory - Qena,
  - > Steel factory - Suez,
  - > Polyster Plant - Ain Sokhna,
  - > Tajamouat City – 10th of Ramadan, … etc
- Power Transformers with nominal system voltage class up to 33 kV; and ratings up to 50 MVA in Black Africa & Arabian Gulf:
  - > Sokoto Cement factory - Nigeria.
  - > Arabian Cement Factory - Saudi Arabia.

INFRASTRUCTURE

- Power Transformers with different systems voltage class up to 220 kV; and different ratings up to 125 MVA in Egypt:
  - > Cairo Airport - Cairo,
  - > Cairo Metro - Cairo,
  - > Water Pumping Stations - New Cairo,
  - > Cairo Stadium - Cairo,
  - > Watania Electrical S/S – New Cairo.
- Power Transformers ratings up to 34.5 kV and 20 MVA in Arabian Gulf:
  - > Shoaibah SWCC Plant – Saudi Arabia,
  - > King Abdulaziz Military City (KAMC) – Saudi Arabia,
  - > King Fahd Industrial Port (KFIP) – Saudi Arabia,
  - > King Faisal Military City (KFMC) – Saudi Arabia.
- Power Transformers ratings up to 63 kV and 70 MVA in Black Africa:
  - > Ministry of Energy & Water – Angola.
  - > Tema Seaport – Ghana.

BUILDING

- Power Transformers with different systems voltage class up to 220 kV; and different ratings up to 75 MVA in Egypt:
  - > Cairo Contact Centers Park S/S - Cairo,
  - > Cairo Festival City S/S – New Cairo,
  - > Haram City Low Cost Housing S/S - Giza,
  - > Barwa / Damac S/S – New Cairo.
  - > Uptown Cairo (Zahraa El-Mokattam) S/S - Cairo.
  - > Marassi (Sidi Abd Al-Rahman) S/S – North Coast Alameen.
  - > Almaza City Center S/S - Cairo,



Egypt
175 MVA 220 KV

Angola
70 MVA 63 -11.5 KV

Ghana
33-33-20 MVA (161-34.5-11.5) KV

Emirates
(SEWA) 20 MVA 33 KV

kuwait
30 MVA 132- 11.5 KV

Iraq
31.5 MVA 33 KV

Libya
20 MVA 66 - 11 KV

Sudan
20 MVA 66 / 33 KV

KSA
20 MVA 33 KV

Certificates

Quality Assurance

As we have dedicated to guarantee supplying the Transformers with highest quality; our quality assurance program complies with ISO standards to ensure that every Elsewedy's product is designed, manufactured, inspected, tested and delivered in the most efficient manner possible.

The continuous monitoring of systems performance is essential and performed with the use of the most powerful diagnostic tools which contributed to the reliability of Elsewedy Quality system that is based on the following worldwide approved Management Standards:

- Quality Management System (ISO 9001:2008)
- ISO 17025 (Competence of Testing & Calibration Laboratories)
- Environmental Management System (ISO 14001:2004)
- Occupational Health and Safety Assessment Series (OHSAS 18001:2007)

High quality instruments with superior performance are always used for transformer condition monitoring & controlling.


KEMA

Type test Certificate of short-circuit performance

Elsewedy Transformers,

10th of Ramadan, Egypt

has successfully passed the type test sequence on a three-phase

oil immersed power transformer

Rating: 30 MVA – 132 kV (+7x1,5% -13x1,5%) kV / 11,5 kV – Dzn10 – 50 Hz

The test object passed the required clauses of

IEC 60076-5

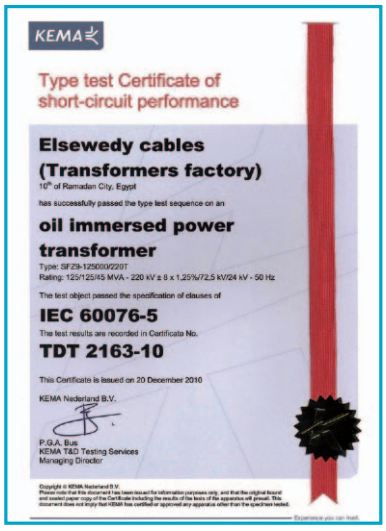
The test results are recorded in Certificate No.

TIC 2102-12

This Certificate is issued on 17 December 2012

KEMA Nederland B.V.

S.A.M. Verhoeven
Director Testing, Inspections & Certification The Netherlands


KEMA

Type test Certificate of short-circuit performance

Elsewedy cables (Transformers factory)

10th of Ramadan City, Egypt

has successfully passed the type test sequence on an

oil immersed power transformer

Type: SFZ9-125000/220T

Rating: 125/125/45 MVA - 220 kV ± 8 x 1,25%/72,5 kV/24 kV - 50 Hz

The test object passed the specification of clauses of

IEC 60076-5

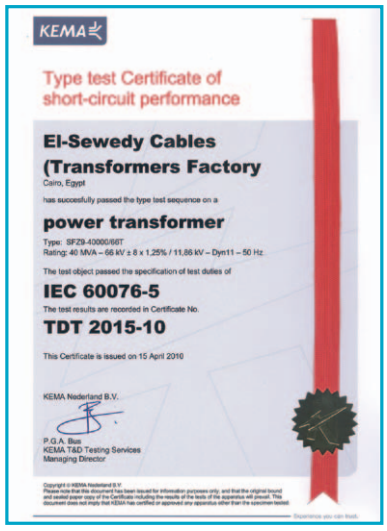
The test results are recorded in Certificate No.

TDT 2163-10

This Certificate is issued on 20 December 2010

KEMA Nederland B.V.

P.G.A. Bus
KEMA T&D Testing Services
Managing Director


KEMA

Type test Certificate of short-circuit performance

El-Sewedy Cables (Transformers Factory

Cairo, Egypt

has successfully passed the type test sequence on a

power transformer

Type: SFZ9-40000/66T

Rating: 40 MVA – 66 kV ± 8 x 1,25% / 11,86 kV – Dyn11 – 50 Hz

The test object passed the specification of test duties of

IEC 60076-5

The test results are recorded in Certificate No.

TDT 2015-10

This Certificate is issued on 15 April 2010

KEMA Nederland B.V.

P.G.A. Bus
KEMA T&D Testing Services
Managing Director


ELSEWEDY TRANSFORMERS

TRANSFORMER TESTING DEPARTMENT
TEST CERTIFICATE

Form : QC-FR-04-09
Issue : 1

Technical Data

Product Name	Power transformer	Type	PT-033000-161000-0001
Accept Date	7-3-2012	Serial NO.	014021102
Finish Date	10-3-2012	Rate power	33/33/23 MVA (ONAF) 25/25/17 MVA (ONAN)
Client	GHANA GRID COMPANY LIMITED	Voltage	(161±8×1.25%)/34.5/11.5 kV
		Rated current	118.3/552.5/1004A (ONAF) 89.6/418/753.08A (ONAN)
Manufacturer	ELSEWEDY TRANSFORMERS	Connection symbol	YNd11yn0 Prim/Sec/Ter. Dyn1 Sec/Ter.
		Rated frequency	50Hz
		cooling	ONAN/ ONAF (80/100%)
Address	10th of Ramadan Zone 3 Cairo Egypt	Phase	3
Test standards	IEC60076-1-2000 IEC60076-3-2000	Test items	Routine tests
Conclusion	• The PT-066000-161000-0001 power transformer passed all the routine tests After Short Circuit according to IEC60076-1-2000-04, IEC60076-3-2000. • The out-of-tank inspection does not reveal any defects such as displacements, shift of lamination, deformation of windings, connections or supporting structures, so significant that they might endanger the safe operation of the transformer		
	Date : 11/3/2012		
Note			

Notice: 1. The report is invalid without an inspecting authority seal or an official seal.
2. The report is invalid without writing, checking and inspecting signature.
3. The photocopy of this original test is invalid without an inspecting authority seal or an official seal.

Testing	Approved:	CERTIFICATE
Ahmed Elsaeed Mohamed Ibrahim	Doaa Hegazy	

ELSEWEDY TRANSFORMERS
Quality Director
Test Department

Short Circuit Test

Specification of Transformer	Test Date	Type of Tap changer	Customer
Power transformer 32 / 40 MVA 66 / 11.86 KV Dyn11	15-Apr-2010	O.L.T.C	EETC from EGYPT
Power transformer 45 / 125 / 125 MVA 220 / 72.5 /24 KV YNyn0d11	20-Dec-2010	O.L.T.C	EETC from EGYPT
Power transformer 50 / 66 MVA 161 / 34.5 KV YNd11	07-Mar-2012	O.L.T.C	GRIDCO from GHANA
Power transformer 33 / 33 / 25 MVA 161 / 34.5 / 11.5 KV YNd11yn01	10-Mar-2012	O.L.T.C	GRIDCO from GHANA
Power transformer 30 MVA 132 / 11.5 KV Dzn10	17-Dec-2012	O.L.T.C	MEW & KOC from KUAWIT
Power transformer 13 / 20 MVA 33 / 13.8 KV Dyn11 60 Hz.	21-Jun-2016	O.L.T.C	SEC from KSA

Our Suppliers & Partners

Core

- ThyssenKrupp
- AK Steel
- posco SS — posco specialty steel co.,Ltd.
- NIPPON STEEL & SUMITOMO METAL
- LTC — ENERGY AT WORK

Winding

- SUPERIOR ESSEX
- DE ANGELI PRODOTTI
- PRECISION
- RATIONAL
- ELSEWEDY CABLES

insulation material

- WEIDMANN — ELECTRICAL TECHNOLOGY
- TEMPO — INSULATION, INC.
- PUCARO
- ENPAY — Transformer Components

Final Assembly

- NYNAS
- Shell DIALA
- ERGON — Naphthenic oils. That's our business.
- PASSONI & VILLA — AN ALSTOM COMPANY
- CEDASPE
- TRENCH
- ABB
- GE Energy
- XD
- MESSKO INSTRUMENTS
- MR
- MS MORGAN SCHAFFER — Accuracy is Everything.
- c.a.p.t. — de-energized tap changers
- a-eberle — A.Eberle GmbH & Co. KG

Plot No. 27, 1st District, 5th Settlement,
P.O.Box 311, New Cairo 11853, Egypt
Tel.: (+202) 275 99 727
Fax: (+202) 275 99 759
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