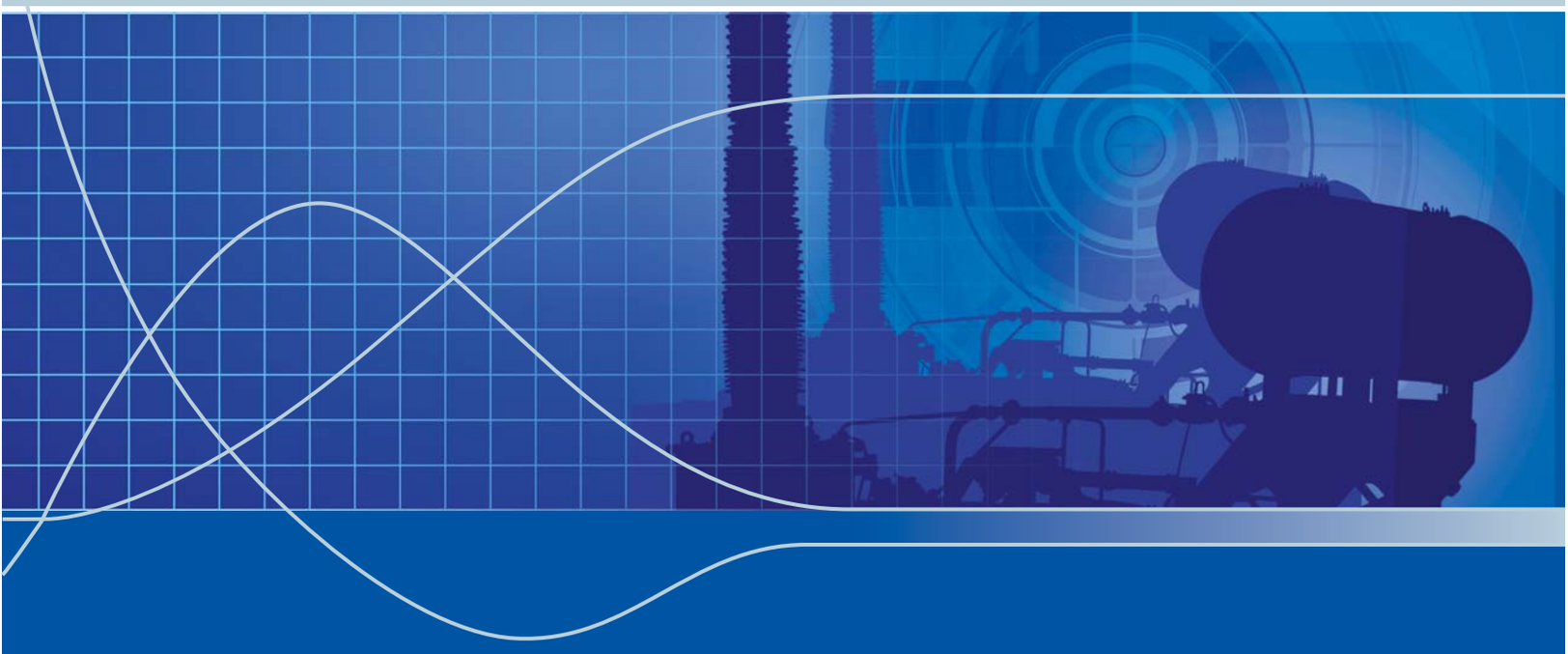


ZAPOROZHTRANSFORMATOR

# RELIABLE PARTNER
# RELIABLE EQUIPMENT

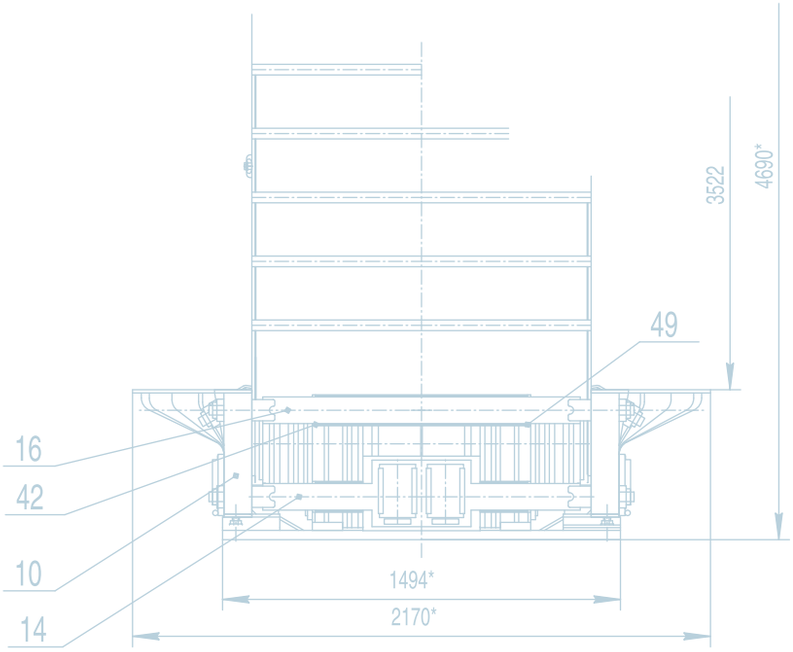
- Together we create reliable products, thus ensuring development of power industry of continents.
- By continuous improvement we transform our knowledge, energy and experience of the generations into common success.
- We enjoy what we do and are proud of it.

# RELIABLE PARTNER – RELIABLE EQUIPMENT

Igor Kleyner
CEO

Public Joint Stock Company Zaporozhtransformator (ZTR) is one of the world leaders in transformer manufacturing due to state-of the-art technical equipment, knowledge, experience and professional skills.

ZTR strengthens its top level position in the CIS (former USSR) market by meeting the customers' increasing and more complicated requirements. Continuous innovations and investments insure high competitiveness of the company and meeting the high market standards.




Reliability, dignity, professional attitude and innovative methods – these are the values we use to guide our efforts. As a result of such an approach ZTR is among the most technically advanced and developed companies in the transformer industry.

We add to the experience accumulated more than 65 years of productive work and hand these valued achievements down to the generations to come. It is essential to note that our main asset is our staff. It is difficult to find equals to our workers in mastery, striving for growth and pride of the company.

I am absolutely convinced that ZTR will continue to make our customers feel pleased and confident with our first rate products, and there is a list of preconditions for that: a strong team of managers, workers and technicians, wide range of orders, excellent reputation and prospects for future work.


ZTR

# 6 COMPANY


Zaporozhye transformer plant was founded in 1947 in order to meet the Soviet Union electricity industry growing demand for large power transformers.

In 1994, after the Soviet Union conversion into the Commonwealth of Independent States (CIS), the company from the State-owned enterprise Zaporozhye Transformer Plant was reorganized to the Open Join Stock Company Zaporozhtransformator with a brand name – ZTR, and since 2011 it has become a Public Join Stock Company Zaporozhtransformator.

Since 1947 PJSC Zaporozhtransformator (ZTR) has been supplying high quality transformer equipment to the customersin different industries. More than 160 thousand ZTR transformers and shunt reactors are reliably operating in 86 countries worldwide.

ZTR transformer equipment is successfully operating in various climatic and seismic conditions from the coldest Polar Regions to the hot deserts of Central Asia and Africa.

With an annual production capacity up to 60 000 MVA ZTR is a leader in the CIS* transformer market.

ZTR manufactures power transformer equipment with a voltage range up to 1150 kV and a range of power ratings up to 1250 MVA.

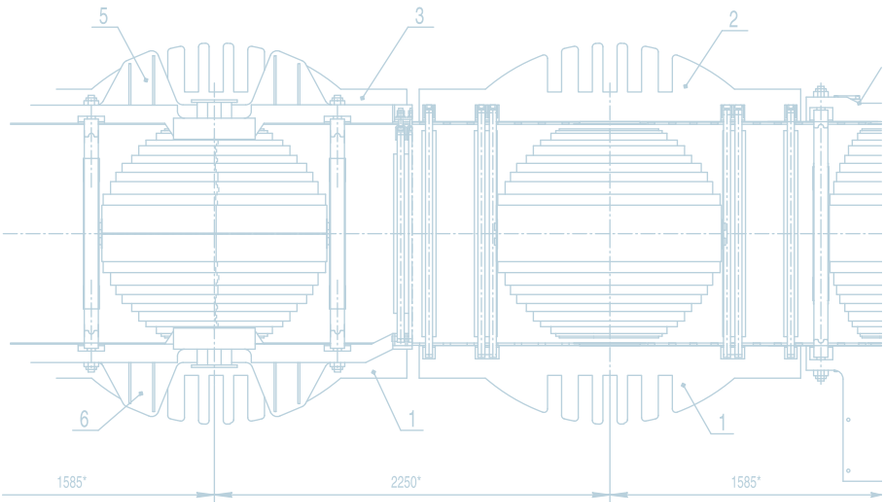
* CIS – Commonwealth of Independent States – former USSR

Nearly 80% of all power transformers currently in operation in the CIS countrieswere produced by ZTR.

Thirteen nuclear power plants and 75% of thermal and hydro power plants of the CIS countries are also equipped by ZTR transformers.

Skilled and experienced ZTR designerscan successfully grasp any complex customers' technical requirements and provide sophisticated solutions.

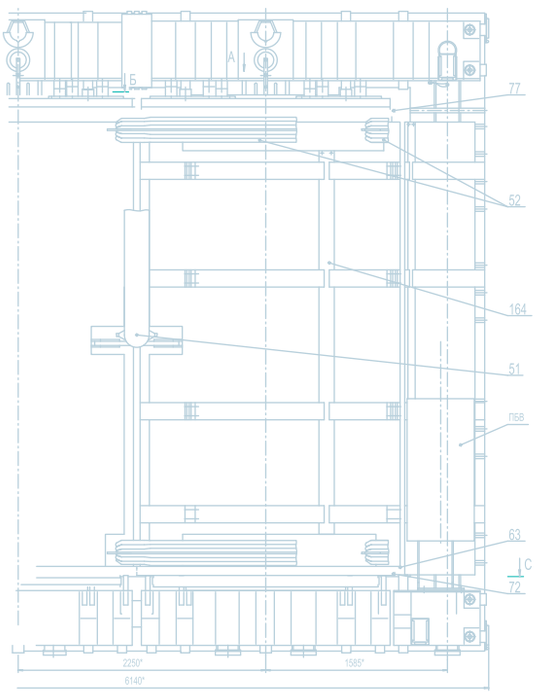
ZTR values its reputation of reliable partner – manufacturer of reliable equipment. The main asset of the company is close-knit long-term relationship with the clients, based on sustained collaboration experience and mutual trust.



# 8 PRODUCT RANGE

ZTR manufactures oil-immersed power-transformers, electrical reactors and controlled shunt reactors rated for capacity from 1 MVA up to 1250 MVA for voltage classes from 10 kV up to 1150 kV inclusive.





## TRANSFORMERS

- Generator transformers;
- Autotransformers;
- Power plant auxiliary and standby transformers;
- Transformers for substations of backbone and distribution networks and industrial enterprises;
- Transformers for DC transmission lines and high-capacity converter substations of tie-lines;
- Special transformers:
  — Transformers for metallurgical companies;
  — Transformers for railway substations;
  — Phase-shifting (phase-inverting) transformers;
  — Line regulating transformers;
  — Furnace transformers;
  — Transformers rated for two nominal voltages.

## ELECTRICAL REACTORS

- Shunt reactors;
- Neutral reactors;
- Smoothing reactors;
- Special-purpose reactors.

## CONTROLLED SHUNT RECTORS (CSR)

- Controlled shunt reactor is a new type of FACTS devices (controlled equipment for AC transmission networks).

## PARTS & COMPONENTS

- Tap changers – OLTC, OCTC;
- Cutoff and safety valves;
- Shutter valves;
- Low voltage bushings up to 35 kV;
- Other original parts and components.

## MAIN CUSTOMERS

- Power sector companies:
  — Generating companies;
  — Transmission network companies;
  — Distribution companies;
- Ferrous and non-ferrous metallurgical companies;
- Oil and gas companies;
- Railways companies;
- Mining companies;
- Other industrial and municipal utility companies having their own substations.

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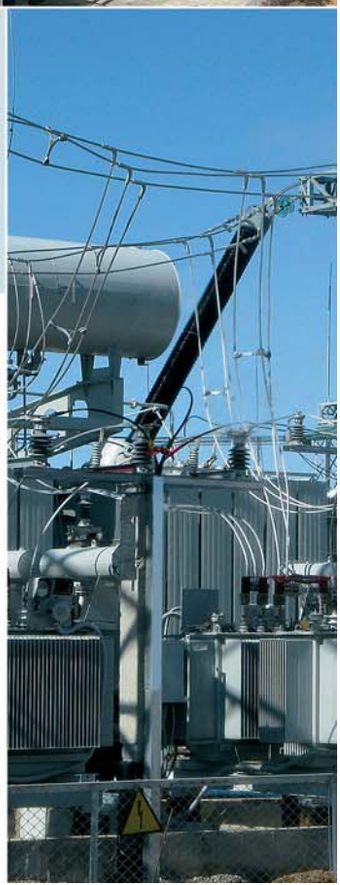
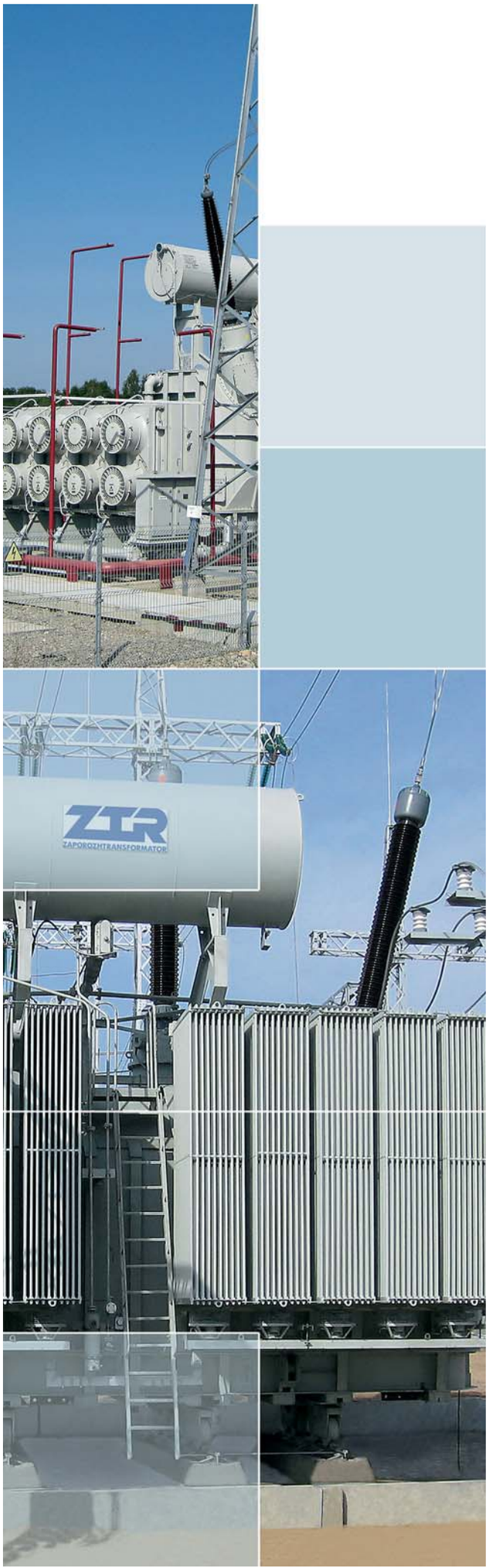
# MAGNETICALLY CONTROLLED SHUNT REACTORS – NEW TYPE OF FACTS DEVICES



Magnetically controlled shunt reactor (MCSR) is a new type of FACTS (Flexible AC Transmission System) devices which starting from 90th is widely used for automatic voltage stabilization and reactive power control in transmission and distribution networks and at the level of industrial consumers. Numerous advantages typical for magnetically controlled transformer equipment allow MCSR to keep leading position among other FACTS devices.

MCSR allows to:

- Avoid daily and seasonal voltage oscil-lations in electric network due to rapid varying of consumed value of reactive power;
- Improve quality of electrical energy;
- Optimize and automatize conditions of power system operation; rapidly and effi-ciently respond on changes of electrical parameters by remote control of MCSRset-point from SCADA/EMS terminal ofrelevant Dispatch Center;






• Significantly decrease losses of electric energy during power transmission and distribution;

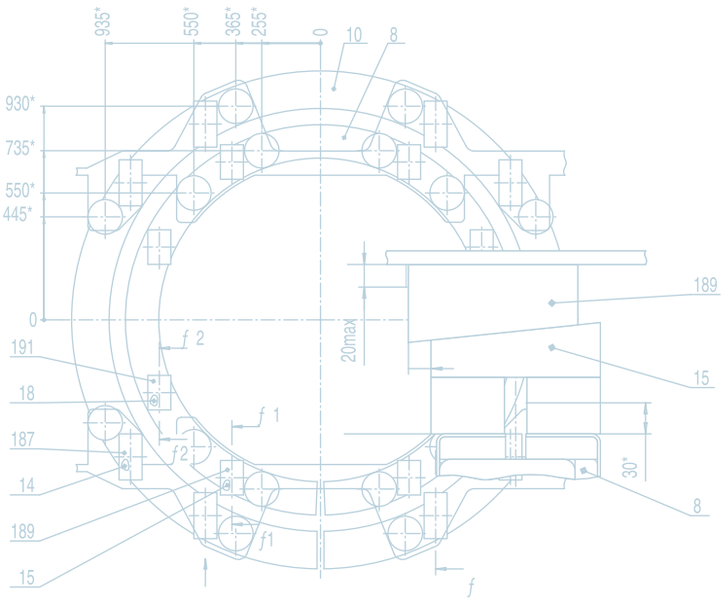
• Significantly improve network stability;

• Improve maintenance conditions ofelectrical equipment by decreasing number of switchings of non-regulatedreactive power compensation devices and considerable decreasing number oftaps changeover of unstable transformer'sLTC devices;

• Increase transfer capability of HV linesand provide secure automatic voltagecontrol in case active power flows areclose to the thermal or stability limits;

• Avoid voltage collapses after networkincidents (e.g., load rejections, generatorand line outages, etc.);

• Provide favorable voltage conditions for operation of power generators.



# 12 QUALITY SYSTEM

Quality management system plays the key role in all spheres of company's activity and ensures high products quality, customer satisfaction and strengthens ZTR reputation of quality product manu-facturer.

Quality Management System pursuant to international standard ISO 9001 is valid at ZTR PJSC. System has been implemented and functioning at the company since 1995.

Products' Quality Assurance at the level of world standards is one of high-priority strategic tasks of the company.

ZTR Integrated Management System is aimed to assurance of high level of the products quality and the customers' satisfaction. System covers both the processes directly related to the products' quality, and all essential processes of the company, including ecological management, labor safety and health protection.

Correspondence of ZTR PJSC Management System to ISO standards is confirmed by international and national certification bodies:

- SGS – in international certification system.
- Russian Register – in GOST R system.
- UkrNIIMetCert – in UkrCEPRO system.


SGS

Certificate HU06/2125

The management system of

**Zaporozhtransformator PJSC**

3, Dnepropetrovskoe shosse, Zaporozhye, 69600, Ukraine

has been assessed and certified as meeting the requirements of

**ISO 9001:2008**

For the following activities

- power and special transformers of unit capacity up to 1250 MVA, voltage up to 1150 kV A.C. and +/- 750 kV D.C
- distribution transformers
- electrical reactors of various designation, capacity up to 250 MVAr, voltage 800 kV
- tapchanging devices and other components of transformers and reactors
- rendering of services on diagnostics, installation and repair of power transformers

Further clarifications regarding the scope of this certificate and the applicability of ISO 9001:2008 requirements may be obtained by consulting the organisation

This certificate is valid from 7 September 2012 until 6 September 2015 and remains valid subject to satisfactory surveillance audits.
Re certification audit due before 1 August 2015
Issue 7. Certified since April 1996

Authorised by

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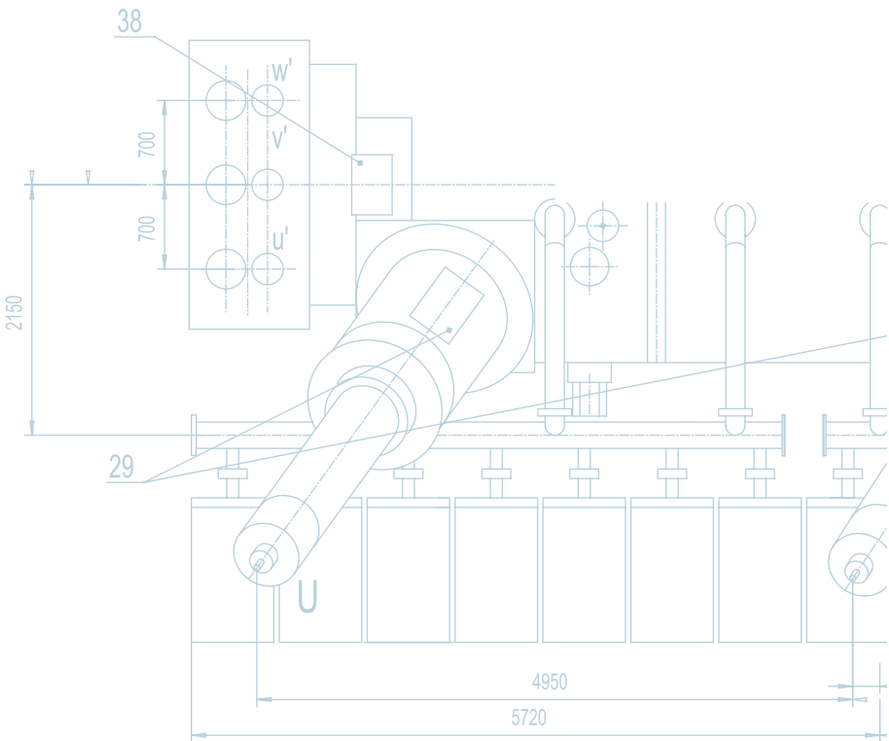
UKAS MANAGEMENT SYSTEMS 005


Correspondence of ZTR PJSC Management System to ISO 9001-2008 standard was confirmed by ZTR through certification audit in 2009.

In the year 2011, ZTR certified Management System for correspondence to standards ISO 14001:2004 and OHSAS 18001:2007, and in 2012 welding production was certified for compliance with standard ISO 3834-2:2005.

Systematic elaborating, analysis and continuous improvement of quality objectives and programs of each divisionincrease efficiency of ZTR quality management system.

ZTR transformers and shunt reactors satisfy the requirements of international standards GOST, DSTU, IEC, ANSI, BS, IRAM, UNE, IEEE and all other technical conditions and requirements of customers.



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# TECHNOLOGICAL EQUIPMENT AND PRODUCTION PROCCESS

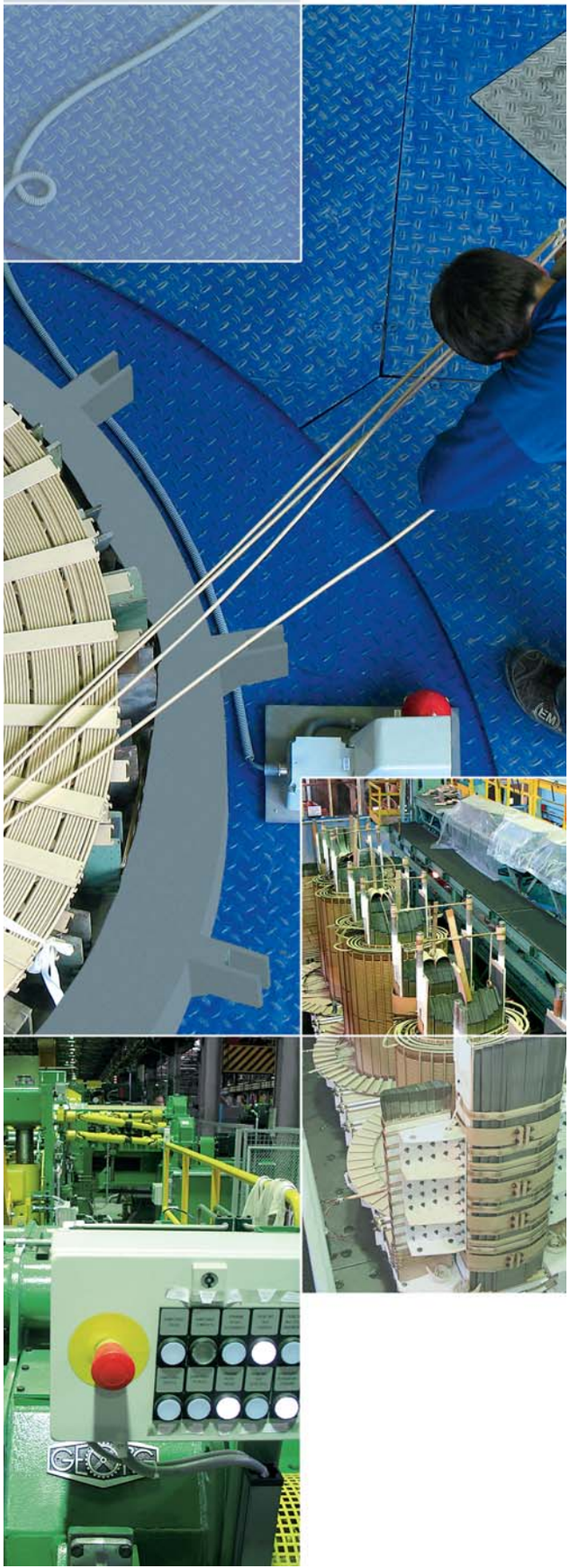
## CORE PRODUCTION

Transformer magnetic cores are produced of high quality silicon grain oriented electric steel with low and extra low specific loss including steel with laser treatment. Electric steel length cutting is carried out on COMEC automatic slitting lines.

Core plates are cut on GEORG (Germany) high-precision automatic CNC cross- cutting lines equipped with hardalloy tools and V-dies. The sector of automatic line of cross-cut electro steel cutting Georg with pressing and packing of finished E-core is responsible for automated cutting and assembling of transformers' core.

Technical features of slitting and cutting equipment allows producing of core plates with all required shapes, including those for step-lap interleaving.

Magnetic core assembling is carried out on mechanized stands — sheet pack turnovers, with lifting capacity of 350 tons. The assembled magnetic cores are carefully tested and data are registered.



## WINDING PRODUCTION

Windings are made of different types anddesigns, — screw-type, continuous-type, interlacing-type, including windings of continuously transposed conductors (CTC). The windings are made on horizontal and vertical winding machines Stollberg и Gunter Seibold (Germany) providing possibility tomake windings with mass up to 20 000 kg.

Specified geometrical parameters of windings are ensured by using special expanding mandrels. For Axial Winding stabilization we undertake special measures, which include drying under constant pressure. Like throughout all our production processes, this process is continuously controlled as well, and the data are registered.

## INSULATION PRODUCTION

The insulation production covers all insulat-ing parts and assembly units used during transformer/reactor manufacturing process. We have the machinery for layingout, cutting, stamping, pressing, gluing and drying of insulation parts made of press-board. Automatic lines are used to manufacture distance bars for windings to ensure their dynamical stability.

Practically all insulation parts needed are produced in-house: i.e. core and leveling insulation, bars, rings, rods, gaskets, insulating plates, cylinders, segments, spacers, strips and so on.

## THERMAL AND VACUUM TREATMENT

Thermal and vacuum treatment of transformer active parts and insulating components is carried out by means of about 150 units of equipment, including vacuum drying compartments, oil degassing plants, oil drying boilers, filter-presses, plants for oil filling under vacuum, etc.

Drying process employed at the factory ensures moisture removal up to residual water content less than 0,2%, providing the large margin of insulation dielectric strength.

Drying is carried out in petroleum product vapors according to advanced technology, in the installations of Micafil company, (Switzerland). Such process is fully automated and stipulates recording of temperature and vacuum modes. Instrumentation ensures on-line estimation of residual moisture content in insulation.

## ASSEMBLING

Assembling of the transformers, considering their individual type of production, isperformed on the stands equipped withmechanized lifting racks, soldering and welding apparatus, hydraulic means for winding pressing, set of special and handling fittings.

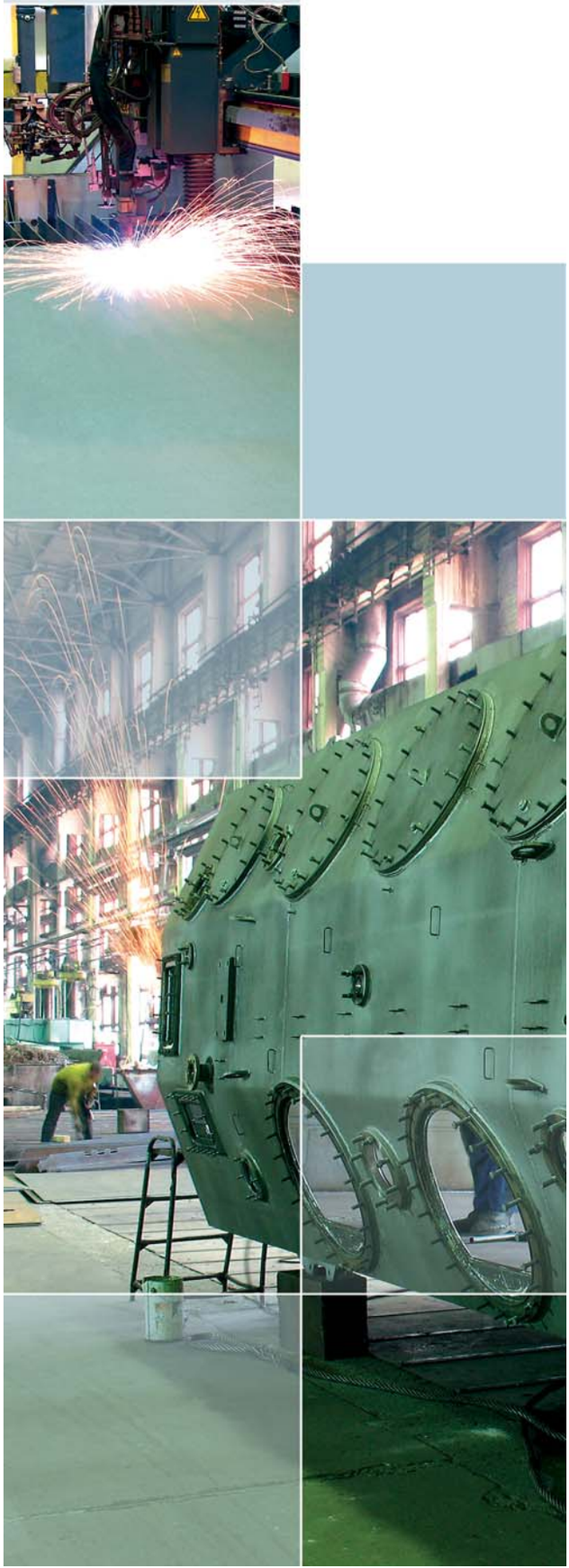
Handling (lifting) operations are performedusing electric bridge and cantilever craneswith lifting capacity up to 500 tons.

The technology of the transformer shiftingon the air cushion via specially coatedfloors ensures maneuverability and efficiency of execution of assembling procedures.

Special load lifting tool set makes possible complete verification of transformer assembling with installation of all components (radiators, coolers, pumps, filters, fans, instrumentation, monitoring devices, etc.).

## WELDING

Blanking operations as for cutting of sheetand profile metal-roll are performed bygas- and flame-cutting, automaticmachines with computerized control, man-ufactured by ESAB (Sweden).



Welding is done mainly by semi-automatic arc welding in protective gas environment. Along with the main welding technique we use a mechanized welding method under flux layer.

Test methods applied on metallic structures:

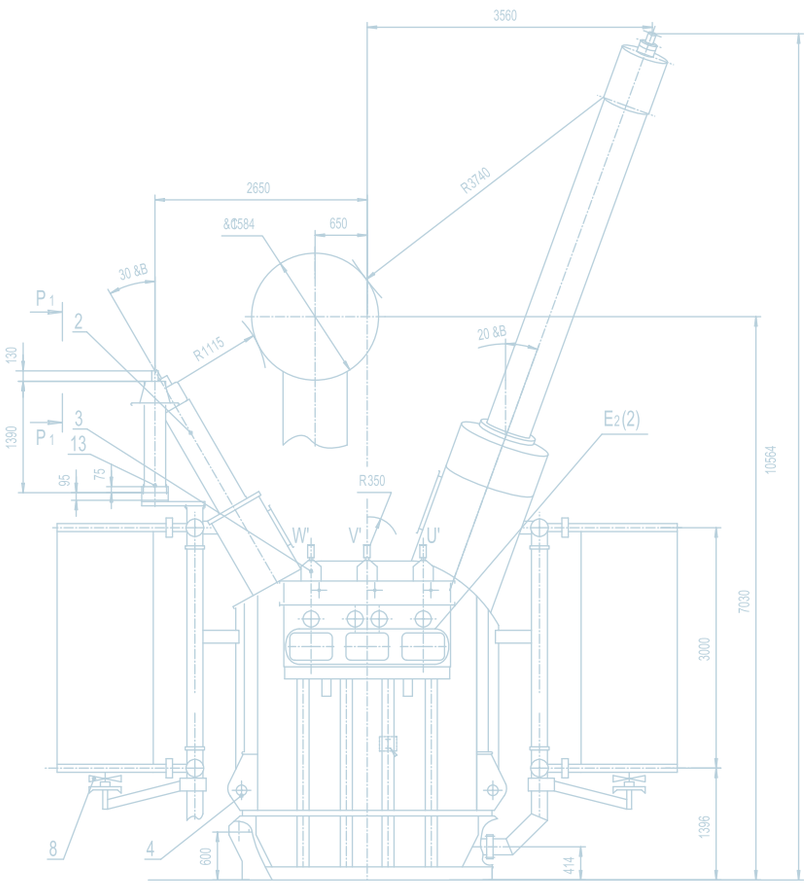
- «Bubble» inspection method, where airis supplied under pressure into product cavities, and outer welds are checked by immersion of the article in water or by application of surface-active substances;
- Luminescent method of inspection: based on the application of ultra-violetlight and a special luminophor compound on welds;
- Ultrasonic method of inspection: tocheck especially important butt joints.

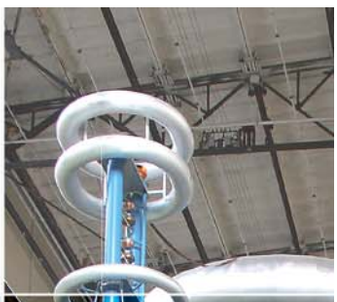
All inspection results are accurately noted, to allow full traceability.

Before painting the surfaces are treated by shot-blasting method, that ensure metalcleaning up to SA2,5 degree. Painting isdone by high-technology painting and drying equipment and airless spraying equipment made by Graco (USA) and Wagner, (Germany).

## TESTS OF POWER TRANSFORMERS AND REACTORS

Testing facilities permit carrying out tests in full scope, in compliance with the international standards (IEC, IEEE Std., etc.) and special requests of the customers (except short-circuit withstand tests). Materials, components, parts and assembly units are thoroughly checked during the whole manufacturing process.



Factory Acceptance Tests of all transformers are carried out according to the standard IEC 60076. First preproduction model of the new transformer design is also subject to acceptance (type and special) tests in accordance with IEC 60076 or other standards required by the customer. Additional tests can also be carried out, depending on the customer request.

High-voltage tests are performed using impulse voltage generator HIGHVOLT, Germany, which is used for lightening and switching impulses testing of power transformers, shunt reactors and other electrical equipment with maximum voltage up to 1150 kV.

State-of-the-art testing equipment and staff qualification ensures up-to-date performance of tests in full compliance with the requirements of international standards ISO, IEC, IEEE Std, ASTM.

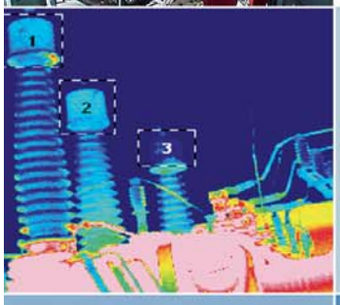
# AFTER-SALE SERVICE

ZTR provides full range of services during warranty and after-warranty period of transformer equipment operation such as commissioning, maintenance, diagnostics and modernization.

Our field-service engineers are available to guide erection team during installation, field-testing and commissioning.

Practice proved the importance of having our field service engineers at site once the installation starts as they are well aware about our products, and can elaborate in advance an installation manual with logical erection stages, which (if followed) will help the customer to minimize the installation costs.

All service engineers working in our Service Department are well-qualified specialists having experience in transformer design and manufacturing.




Now we are ready to offer:

- Supervision of installation, start up and adjusting tests, putting transformers into operation;
- Delivery of original spare parts, materials and special technological equipment for repair works, organization and execution of repair works;
- Training of your personnel subject to service & maintenance at our premises;
- Training of your personnel subject to service & maintenance at site;
- Providing consulting services during all standard service life of transformers;
- Periodic inspection, monitoring and, if necessary, providing transformer's current conditions diagnostics;
- Elaboration and performance set of works for prolongation of standard service life of transformers.

Purchasing transformer equipment of ZTR, you will also purchase adequate care of your equipment, which helps to preserve the value, appearance and operational capabilities as long as possible.

# ZTR HISTORY

**2012** – ZTR reference list expanded to Guatemala. ZTR reached reached a peak of 48 000 MVA.

**2011** – supply of equipment for Solar Power Plants in USA and Spain.

**2010** – ZTR reference list expanded to Spain.

**2009** – Recertification of quality management system, ISO 9001:2008 certificate received.

**2006** – Single-phase transformer for cross voltage regulation in autotransformer 333 MVA, 750 kV. ZTR reference list expanded to Venezuela.

**2005** – Representative office was opened in Almaty (Kazakhstan).

**2003** – Representative office was opened in Moscow (Russian Federation).

**2002** – Controlled shunt reactor 180 MVAr, 330 kV was manufactured and successfully commissioned. Up to the present moment this product remains unique worldwide.

**2001** – Principally new three-phase controlled reactor 100 MVAr, 220 kV was designed and manufactured.

**2000** – Control and monitoring systems were designed and manufactured.

**1997** – First three-phase controlled shunt reactor 25 MVAr, 110 kV was designed.

**1996** – First controlled shunt reactor First shunt reactor was manufactured.

**1988** – The point of 70000 MVA was got over, with this record ZTR became one of the largest transformer manufacturer in the world.

**1985** – Single-phase unit transformer rated 417 MVA, 1150 kV was manufactured.

**1982-1985** – Equipment set for DC power transmission line 1500 kV: converter transformers 320 MVA, ± 400 and ± 750 kV, with power winding 500 kV was designed.

**1980** – The most powerful three-phase transformer rated 1250 MVA, 330 kV, for power generating units 1000 MW was manufactured.

**1977** – Three-phase transformer 1000 MVA, 330 kV was manufactured. There was one hundred thousandth unit manufactured since the company foundation.

**1972** – Three-phase autotransformer 560 MVA, 330/110 kV was manufactured.
– Single-phase autotransformers for industrial transmission lines, rated for new voltage class 750 kV – autotransformer 333 MVA, 750/330 kV and 417 MVA, 750/500 kV were manufactured.
– Transformer 1000 MVA, 330 kV for unit operation with generator 800 MW was manufactured.

**1971** – Transformers and autotransformers 206 MVA and 167 MVA, 500 kV were manufactured.

**1967** – Transformer 630 MVA, 220 kV was manufactured. It was the most powerful transformer at that time.

**1962** – First unit three-phase autotransformer 250 MVA, 500 kV with in-built OLTC device was manufactured.

**1949** – First transformer TM-1000 kVA, 10 kV was manufactured.

**1947** – Construction of the transformer plant was started in Zaporozhye.

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