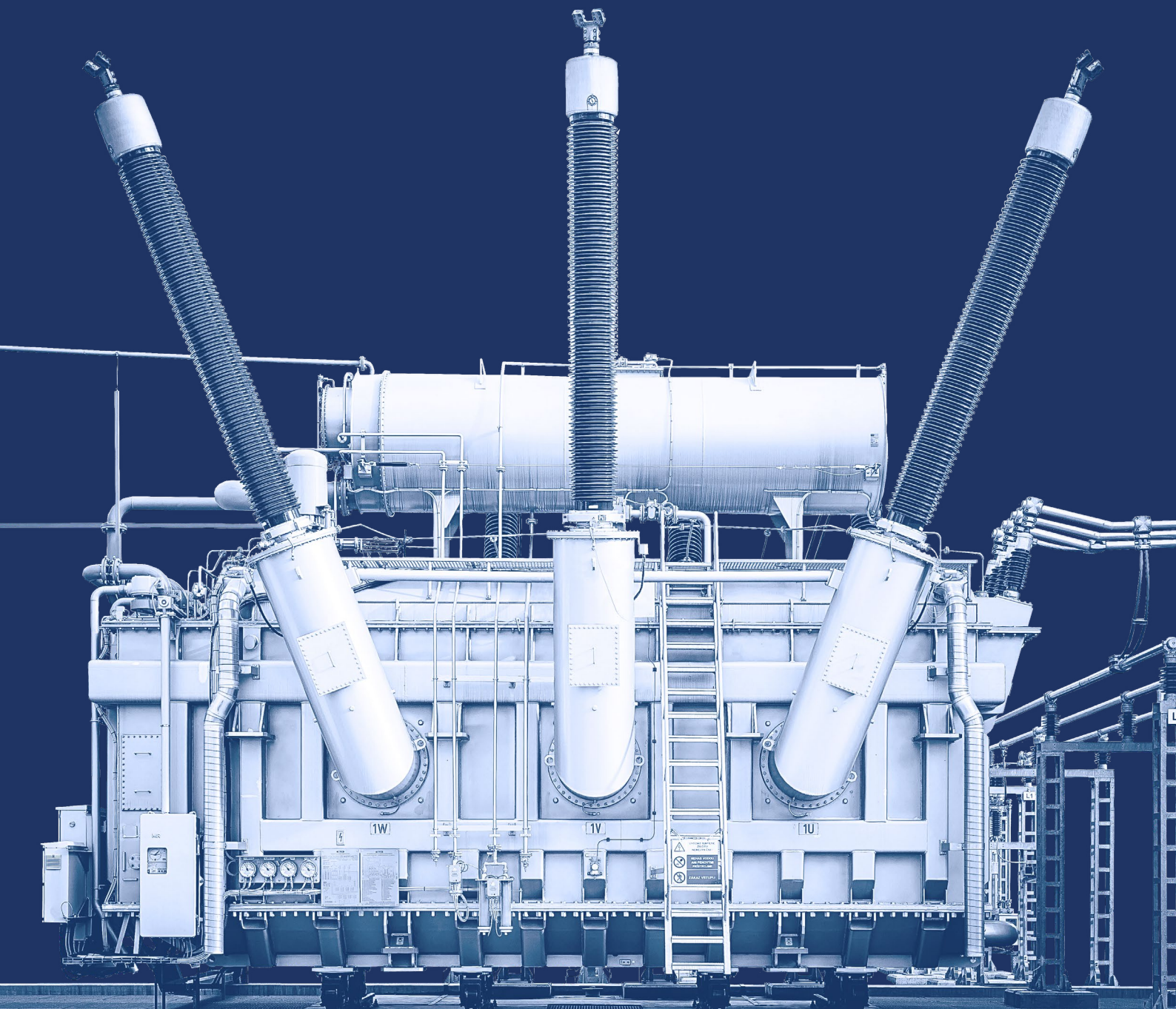
1921 ETD 2021

Manufacturing Trafos
in Plzeň

GENERAL INFORMATION



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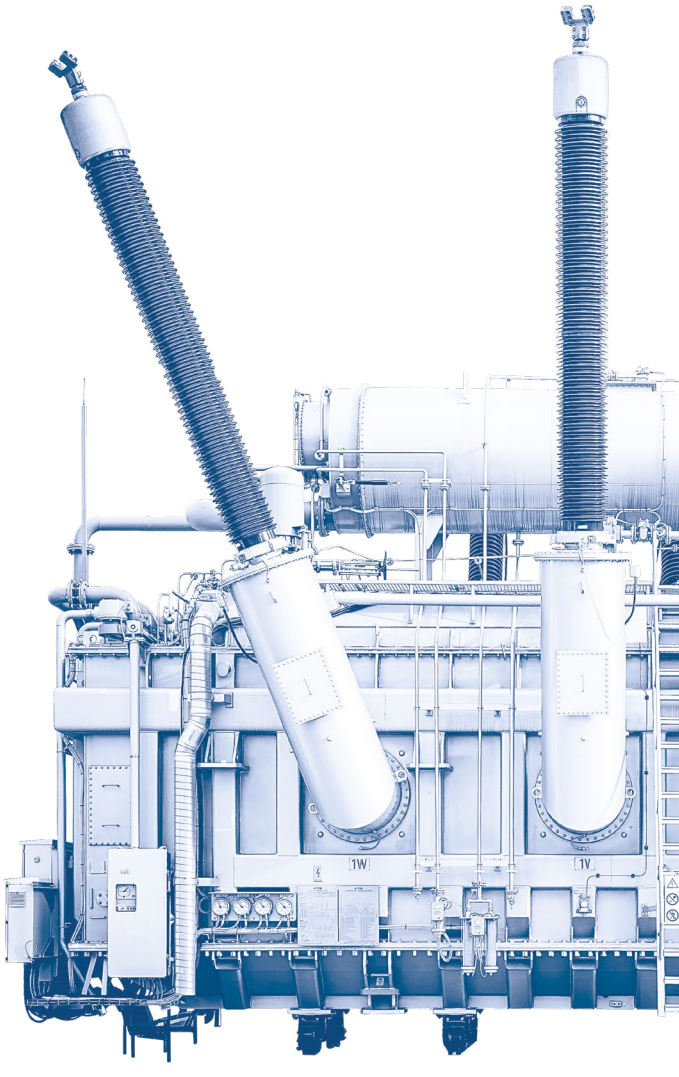


IMPORTANT MILESTONES IN THE HISTORY OF ETD TRANSFORMÁTORY A.S.

1918–20
Construction of the Electrotechnical factory in Doudlevce (ETD) in developing Škoda Works in Pilsen.

1921
Start of production: electrotechnical assembly of engineering supplies, production of components for heavy-current electrotechnical engineering, power industry and electric traction units.

1923
Dispatch of the first power transformers of 1 150 kVA to Elektrické podniky of the city of Prague, production of rotating and nonrotating machines according to French license, electrical equipment and automation systems.

1930
Production according to own design engineer know-how under the direction of Prof. Sumec and Dr.-Ing. Lammeraner.

1965
Start of production of traction transformers.

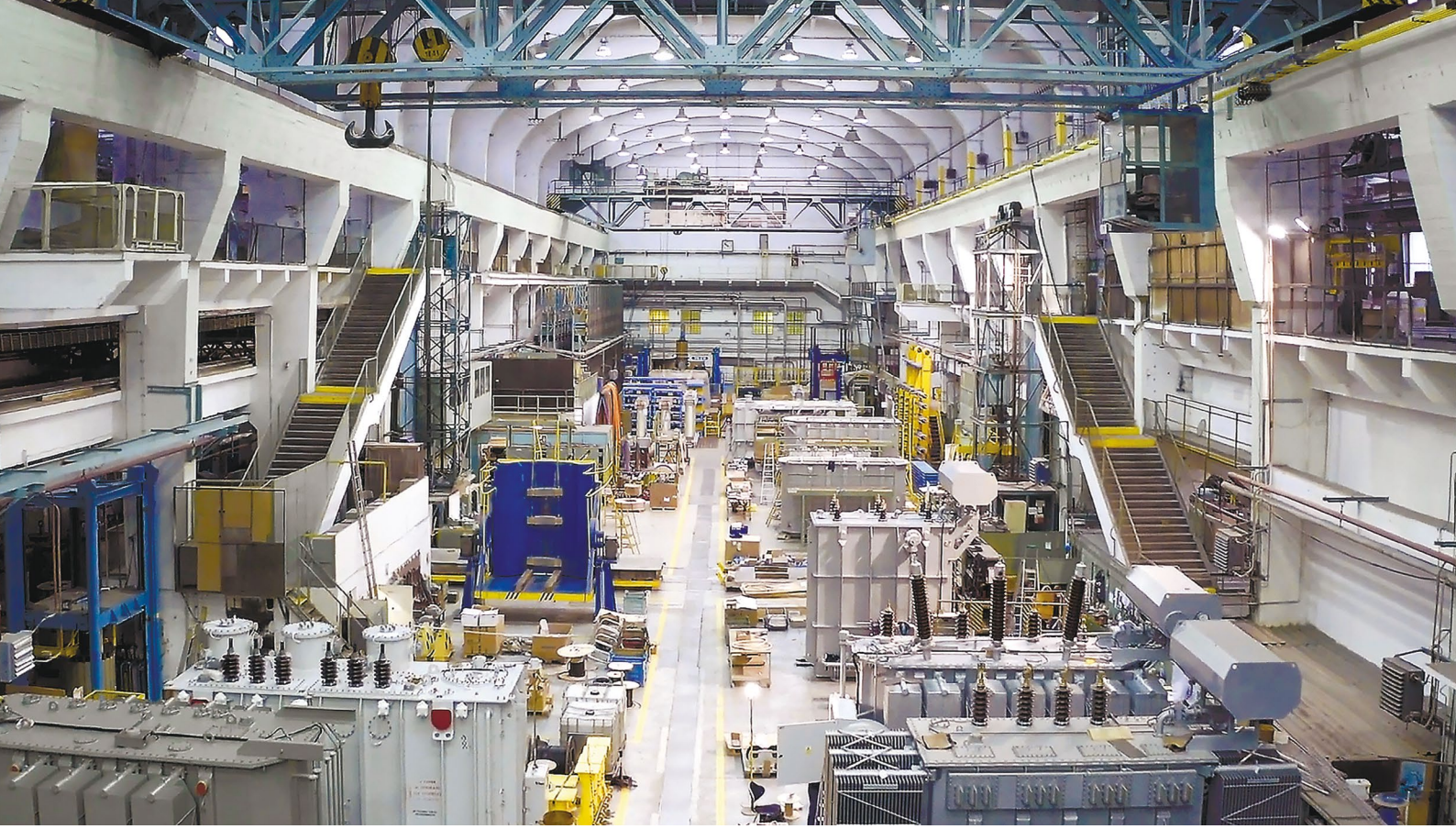
1979
Manufacture of the first transformer of 570 MVA with single-phase groups, manufactured for the Mělník III Powe Station.

1980–90
Development of electrotechnical production under the ŠKODA brand and attracting new markets in the world (application of products - thermal, hydro, nuclear power stations, substations of transmission and distribution systems, substations and special sources in industry, transportation and others).

1992
Start of specialization in the production of transformers and electrical equipment and additional production of welds and pressed pieces.

1999
Transformation of ETD into a single-fi eld factory oriented to the production of transformers, choke coils, reactors and equipment.

2003
Certification of established quality management system under ISO 9001.



2004

Purchase of ETD by Slovak company BEZ TRANSFORMÁTORY a.s., a member of IBG Group, foundation of the company ETD TRANSFORMÁTORY s.r.o., later a change of the legal form into a joint-stock company.

2008

Purchase of Electrical Testing Laboratory, expansion of the scope of activities in the testing and measuring of electrical engineering materials and electrical equipment according to ČSN EN ISO/IEC 17025:2005.

2011

Production of a series of large power transformers of 250 to 300 MVA, start of the manufacture of new special transformers for the connection of semiconductor transducers.

Production of a new electronically controlled compensation reactor.

2012

Certification of established environmental management system under ISO 14001.

2013–14

Development, production and dispatch of autotransformers with output power 350 MVA.

2014

Obtaining of certificate of management system for health and safety at work according to BS OHSAS 18001.

2015

Development and manufacturing transformers with the output of 128 MVA for seismically active regions in Chile.

2016–17

Successful supplies of transformers 350 MVA for ČEPS, a.s., realization of a pilot project in the field of transformers replacement together with a reconstruction of substation 110/22 kV.

2019

Delivery of autotransformer 250 MVA for Slovak TSO.

2020

We become a supplier for Nuclear Power Plants: 2 transformers 300 MVA.

First delivery to Israel market.

First online FAT and online SAT tests as well are performed.

PRODUCTION PROGRAM OF ETD TRANSFORMÁTORY A.S.

PRODUCTS AND SERVICES

Power transformers

- Three-phase regulating oil transformers with a power range of 10 to 320 MVA and nominal voltage up to 420 kV,
- Three-phase non-regulating oil transformers with an output up to 410 MVA and voltage up to 420 kV,
- Single-phase non-regulating oil transformers with a total output of the three phase set up to 1200 MVA and voltage up to 420 kV,
- Special type regulating and non-regulating transformers as required by the customer (e.g. number of turns, nominal impedance voltage, outlet configuration, cooling, etc.).

Autotransformers

- Three-phase oil transformers with an output up to 400 MVA and voltage up to 420 kV.

Locomotive transformers

Furnace transformers

Traction chokes for rail vehicle loads.

- Railway, underground or tram cars, trolley-buses and other special use inductors.

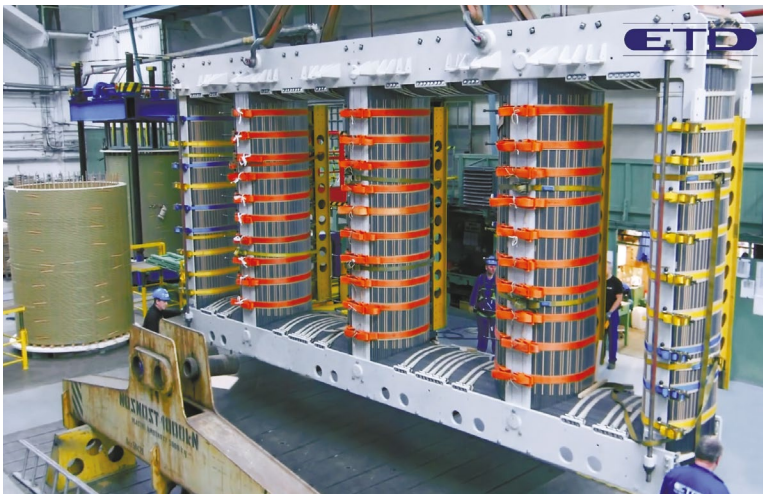
Start-up and special reactors.

- Thyristor regulated (step-less).
- Voltage regulated (step-regulation)
- Non-regulated Shunt reactors.

Assembly, maintenance and 24-hour service, provide by our highly skilled experts.

Reconstruction and repairs

- Own produced transformers
- Other producers transformers.



Tests in laboratory accredited accordance ČSN EN ISO / IEC 17025:2005.

- Measurement of physical properties of electrical engineering materials
- Electrical and ventilation test and measuremet
- Traction chokes for rail vehicle loads.
- Railway, underground or tram cars, trolley-buses and other special use inductors.
- NT at industrial facilities
- A wide range of accredited tests (list with the tests is provided upon request).

THE MAIN BUSINESS ACTIVITY

Development, production and supply of Power transformers, induction coils, reactors and other electrical equipment including tests, installation and service.

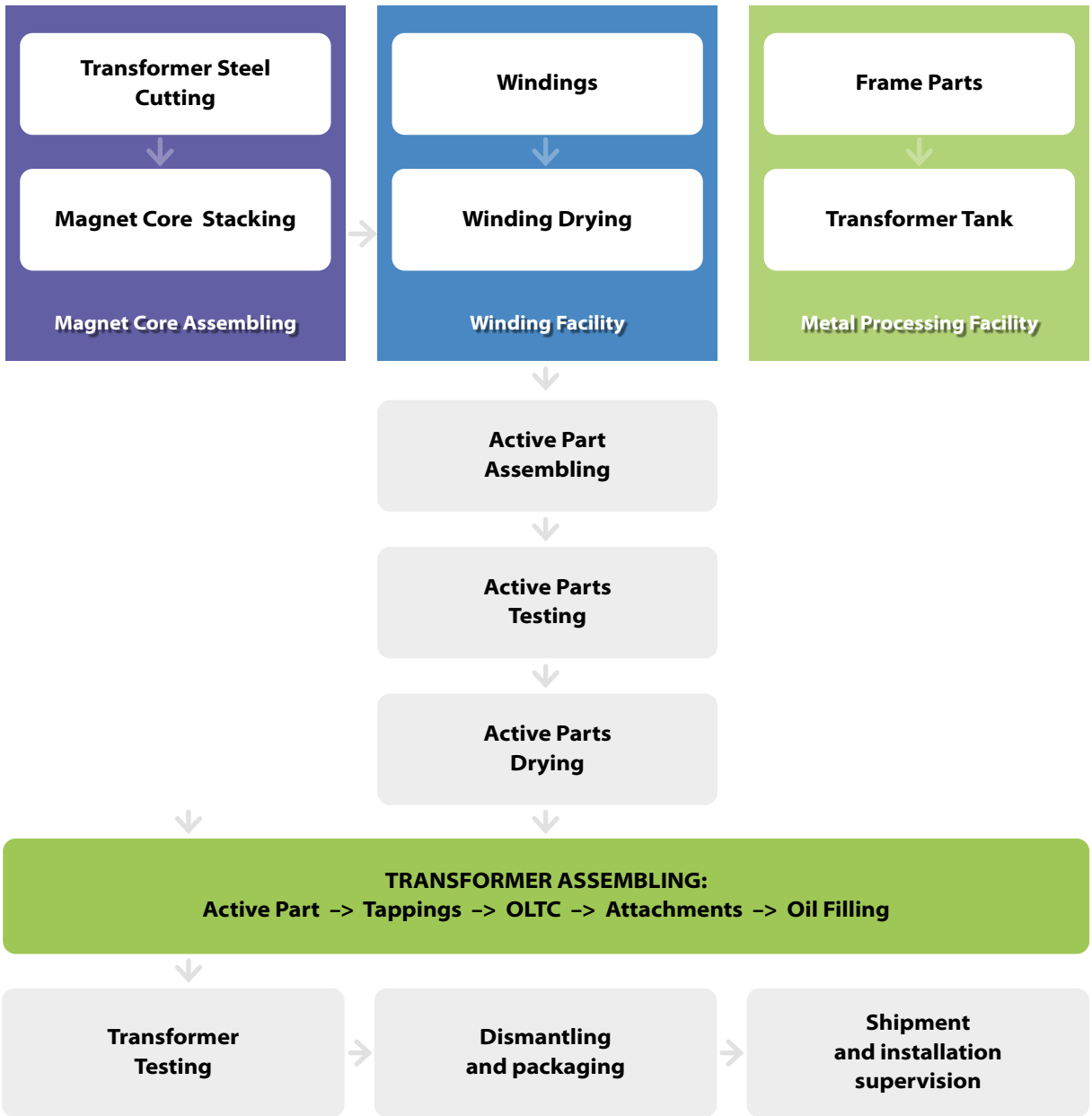
Reconstruction and modernization of substations 400, 110, 22 kV

- Encapsulated technologies 110 a 22 kV (GIS)
- Control systems and protections
- Overhead and cable lines in substation
- Design of power equipment
- Engineering activities in construction
- Realization of buildings
- Supply of equipment and material
- Protection setting, testing, inspection
- Maintenance and service

POWER TRANSFORMER PRODUCTION FLOW CHART

In the production halls of ETD TRANSFORMÁTORY are situated modern and sophisticated machines, delivered from the top machine producers in Europe, related for transformer industry.

We have total production area of 20800 m^2 from which covered area is approximate 19000 m^2.



HOW WE PERFORM

Design of our transformers.

All our products are result of our own design, intertwined with 100 years of experience!

In our database we have numerous different designs. Combining our long tradition and experience with modern and approved computer software we are able to implement new materials and technological processes.

This gives us opportunity to found solution for every specific requirements never mind how tough they are!

Our transformers meet all new standards and regulations like ECO Design norms, which helps to reduce Carbon Footprint globally!

Core assembly.

For magnetic cores ETD use steel sheets of high grade magnetic orientation HI-B and laser treated magnetic steel. Magnetic core is stacked by overlapping of individual steel sheets according to the step-lap system. With accurate cutting and careful stacking of the magnetic steel low no-load loss, low no-load current, low amplitudes of the in-rush current and low noise level is obtained. Automatic machine for magnetic core bandaging ensure extra strength on core limbs foe extra decreasing of the noise.

Windings production.

The windings are made from electrolytic copper of high purity or electrotechnical aluminum, upon client request. They are manufactured in different variants, depending of transformer type, power, voltage.

Some of used types of windings are: Single-layer or multilayer windings; Interleaved windings; Helical windings; Continuous disc windings.

During the drying process, the windings are continually pressed with a force higher than that encountered during operation of the transformer, which ensures that the windings are dynamically stable and that there is no shrinkage of the insulation during operation. This eliminates the need to press the windings and ensures reliable operation of the transformer over its entire service life.

Active part assembly.

Before assembly all windings are pre-dried and checked physically are they matching to requested dimensions. Special clamp design and insulation system ensure that in case of short-circuit in the network, transformer will withstand it without any consequences for his stable and continues work. Used technology of Active Part assembly is proven by our 100 years of production and operation of our transformers in all kind of working conditions.

Tank.

Tanks are designed with reinforced plane walls to withstand full vacuum and 70 kPa overpressure. We can manufacture two types of tanks: the classic tank and the tank in the shape of a bell.

Corrosion protection of the tank and equipment is standardized and is defined in dependence on climatic conditions in which the transformer shall be in operation or according to the customer's requirements.

Testing Laboratory and Quality assurance.

All produced transformers in ETD TRANSFORMÁTORY pass 100% control in our testing laboratory. Together with this and our intermediate control points during processes of the production we ensure high quality and reliability of our product.

ECO-DESIGN REGULATION AND IMPACT OF IT ON ETD TRANSFORMÁTORY A.S.

Legislation and implementation objectives.

On June 11th 2014 EU Commission Regulation No. 548/2014 on implementing Directive 2009/125/EC concerning Ecodesign with regard to small, medium and large power transformers, came into force in all 28 countries of the European Union.

New legislation imposes, within EU, maximum level of losses (or minimum efficiency) for transformers placed on the market or put into service from July 1st 2015, and purchased after June 11th 2014.

After June 11th 2014, manufacturers and customers should not engage in new framework contracts for transformers not meeting minimum requirements outlined in the Regulation.

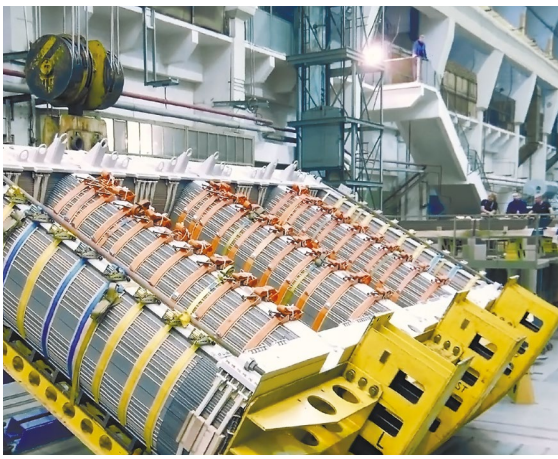
Framework contracts signed before 11th June 2014 can run till the end date, even with deliveries after July 1st 2015. Ecodesign objectives include improved energy efficiency and general environmental compatibility, thus reducing CO_2 emissions. Ecodesign Regulation is focused on reducing transformers' electrical losses (1st step in 2015 / 2nd step in 2021), and to clarify and make more visible indication of performance.

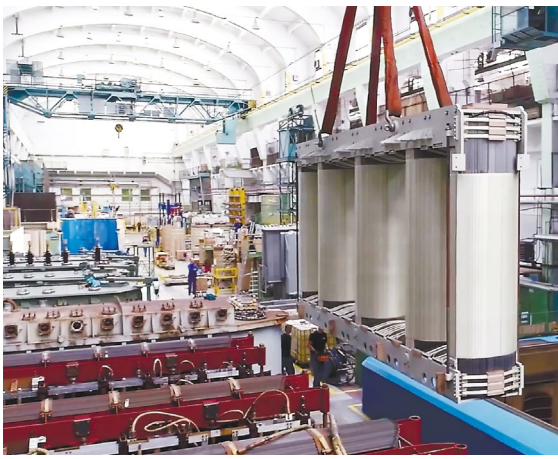
Impact on transformer design.

With the new Regulation, maximum level of losses for distribution transformers is set throughout EU, and for the first time minimum efficiency requirement is given for power transformers over 3.15 MVA.

Tolerances on guaranteed losses, as prescribed in IEC 60076-1, are no longer considered.

Regulation establishes Ecodesign requirements for power transformers with a minimum power rating of 1 kVA used in 50 Hz electricity transmission and distribution networks or for industrial applications. Some new definitions are introduced for the purpose of Regulation.





Tranformer definition in the regulation	Highest voltage for equipment (Um)	Rated power (Sr)
Small power transformer	Um ≤ 1.1 kV	Any
Medium power transformer	1.1 kV < Um ≤ 36 kV	5 kVA ≤ Um ≤ 40 MVA
Large power transformer	Um ≤ 36 kV	Sr ≥ 5 kVA
	Any	Sr ≥ 40 MVA

Power transformers (medium power transformers > 3150kVA and large power transformers)

For medium power transformers with rated power > 3150 kVA and ≤ 40 MVA, as well as large power transformers, the Regulation does not directly define maximum no-load and load losses. It defines minimum Peak Efficiency Index (PEI), in (%):

$$PEI = 1 - \frac{2(P_O + P_{CO})}{Sr\sqrt{\frac{P_O + P_{CO}}{P_k}}}$$

where:

P_o – the no-load losses measured at rated voltage and rated frequency, on the rated tap;

P_{co} – the electrical power of the cooling system for no-load operation;

P_k – the measured load losses at rated current and rated frequency on the rated tap corrected to the reference temperature acc. EN 60076-1;

Sr – the rated power of the transformer on which P_k is based.

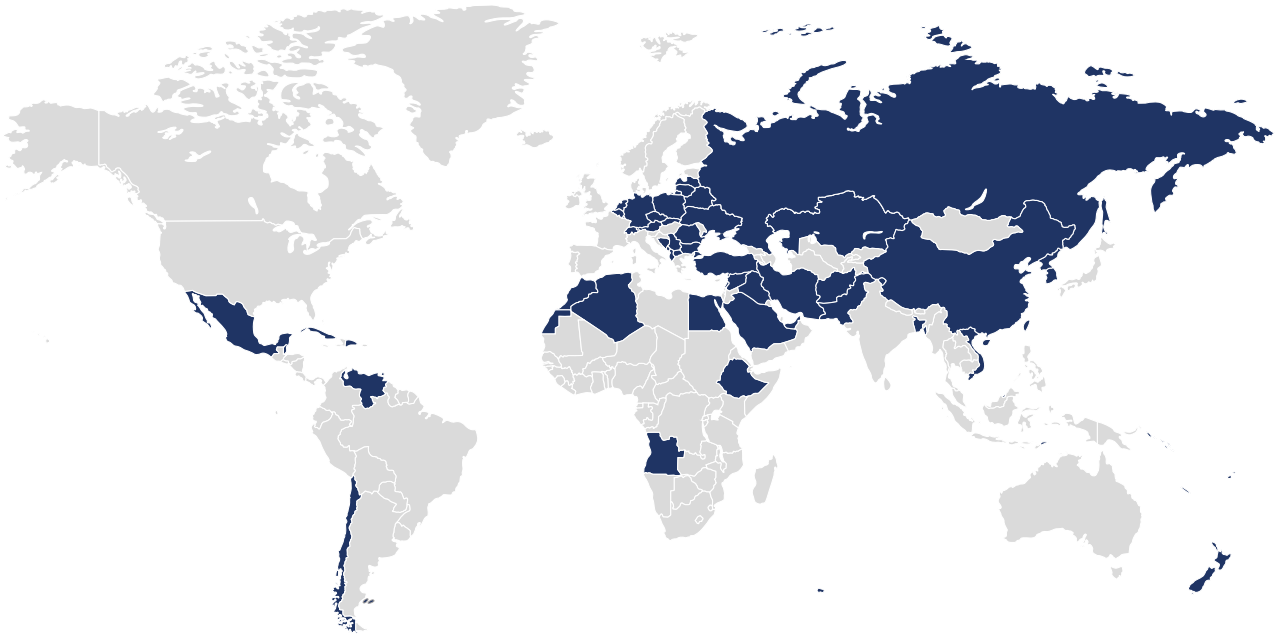
Following market trends and customer requirements in previous years, ETD TRANSFORMÁTORY a.s.

put a lot of effort into design of transformers with increased efficiency. We are already producing and delivering transformers according to first and second stage of EcoDesign regulations.

Also, in the past years we supplied transformers for various EU customers with the same or lower losses than required by EcoDesign directive. At the moment we are able to design and deliver transformers according Tier 2, even also with better PEI upon customer request.

Rated power (MVA)	Tier 1 (1.7.2015.)	Tier 2 (1.7.2021.)
≤ 4	99.465	99.532
5	99.483	99.548
6.3	99.510	99.571
8	99.535	99.593
10	99.560	99.615
12.5	99.588	99.640
16	99.615	99.663
20	99.639	99.684
25	99.657	99.700
31.5	99.671	99.712
40	99.684	99.724
50	99.696	99.734
63	99.709	99.745
80	99.723	99.758
≥ 100	99.737	99.770

GEOGRAPHY OF DELIVERIES



Czech republic	Lithuania	Egypt	Dominican republic	Bangladesh
Slovak republic	Macedonia	United Arab Emirates	Denmark	Maroco
Poland	Bulgaria	Bahrain	Countries of former	Ethiopia
Germany	Romania	Angola	Yugoslavia	Lebanon
Austria	Ukraine	Venezuela	Afghanistan	China
Switzerland	Belarus	Mexico	Irak	Korea
Holland	Russia	Chile	Iran	Vietnam
Latvia	Kazakhstan	Cuba	Pakistan	Algeria.

PRODUCT RANGE

Three-phase transformers	6,3 - 450 MVA, up to 420kV
Autotransformers	up to 450 MVA, up to 420 kV
Single-phase transformers	up to 1,200 MVA, up to 420 kV
Shunt reactors	up to 200 MVAr, up to 500 kV
Other products	Start-up reactors | Saturation reactors | Special reactors | Traction transformers | Chokes | Furnace transformers

Dr. Michael Amon

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Manufacturing Trafos
in Plzeň

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This catalog is subject to further changes in terms of technical details due to our continuous improvement, without priornotification. Therefore, please refer to our specialists to obtain the latest information.

Dr. Michael Amon

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