

Power transformers

Liquid-filled small power transformers
From 5 to 63 MVA up to 170 kV



One global partner

ABB is a global leader in power and automation technologies that enable utility and industrial customers to improve performance while lowering environmental impact. We offer a complete range of power and distribution transformers, components and services. We are committed to being a flexible expert partner worldwide. Working alongside the customer, we identify individual needs to ensure we provide optimal solutions, whether the customer's main focus is on advanced solutions, guaranteed delivery, service, reduction of total cost of ownership or global supply.

Key factors, including return on investments, reduced operating and maintenance cost, and management of aging assets, are addressed and resolved.

That is ABB's idea of true partnership.

Our global manufacturing capabilities and our factory back-up strategy mean that we can offer the most suitable solutions in terms of production capability, on time delivery and product quality. Our focused factory concept allows us to source our product from highly specialized factories, thereby increasing operating efficiency and achieving worldwide excellence.

We are an experienced partner across the globe, offering a local customer interface talking the customer's language and providing local service.



ABB - a global leader

With over 1.3 million MVA in power transformers delivered over the past 10 years from its worldwide production facilities, ABB is the outstanding market leader both for technology and quality.

Our global network can rely on substantial, on-going capital investments and ensures a level of specialization unique in the industry. The ABB transformer team has direct access to the group's combined technical experience and expertise while research and development (R&D) supports customers in meeting their present and future challenges.

As a leader in power and automation technologies, we deliver continuous innovation as well as product and process improvement to meet the challenges set by changing cost constraints thus enabling public utilities and industry customers to improve their performance, cut costs and reduce environmental impact over the long term. ABB means unbeatable total quality, worldwide.



Small power transformers

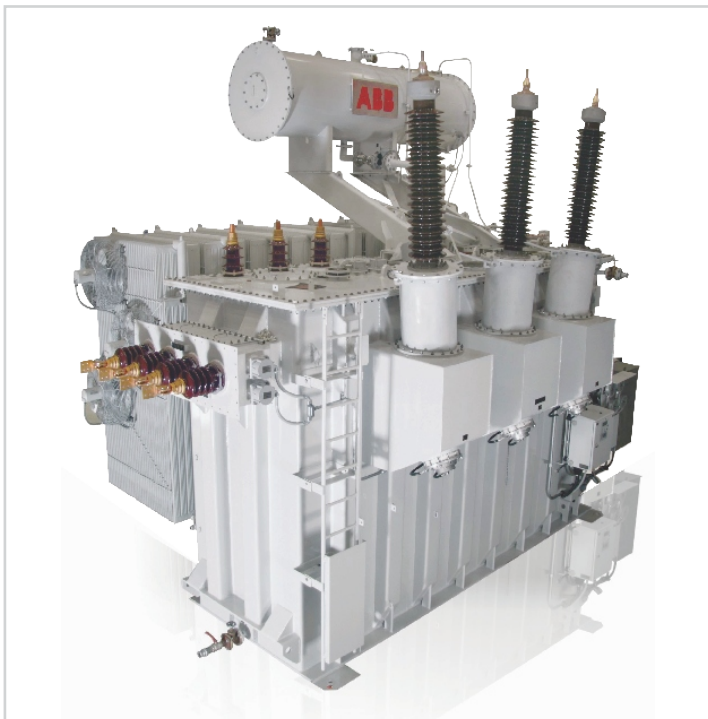
Scope and applications

In response to changing market needs, ABB has redefined its transformer product families and implemented a new business model around small power transformers, from 5 to 63 MVA and up to 170 KV.

The sole player in the industry to change its organization in line with market demands, ABB has set up an organization completely

focused on small power transformers, with its own management team, a dedicated technical staff and production experts sharing their know-how on a global scale.

Our small power transformer factories are strategically located and have fully dedicated production lines, which from a virtual global plant view, have twice the capacity of our nearest competitor.



The range

ABB's range of small power transformers, from 5 to 63 MVA and up to 170 KV, offers ideal solutions for all applications - standard or complex - from the typical substations to railways, furnaces, marine and offshore, including rectifiers, variable speed drive transformers, and reactors. The group has the skills and resources to deal with customer needs, however complex these may be in terms of engineering or assembly requirements, special accessories and special materials or components.

Standard small power transformers

- 5 MVA to 63 MVA
- Up to 170 KV
- 3 phase with/without OLTC
- 2 windings with/without OLTC and with/without (not loaded) stabilizing winding.
- ONAN/ONAF cooling.

Complex small power transformers

- Multi-windings
- Single phase transformers
- Autotransformers
- Special layouts (truck or railway mobiles)
- Special cooling
- Abnormal Impedance
- Low sound pressure level
- Ex-certified transformers



A new generation of transformers

ABB small power transformers are based on two key concepts: product excellence and process excellence.

Usually, down-scaling power transformer technology to distribution generates heavier designs and more complex concepts whereas upgrading distribution transformer technology to power can put reliability and testing at risk. That is why ABB decided to invest in developing a technology specifically for this product family.

Fully exploiting the best ABB practices, we started by modularizing proven transformer designs. This crucial first step led to standardization and simplification of the production process. This combined with the production capacity we have around the world, has permitted substantial investments in automation.

Application range of the global product platform

Rating	5-63/75 MVA
Maximum HV system voltage	170 kV
Maximum LV system voltage	36 kV
Vector groups	Y/d, Y/y, D/y, D/d
Impedance value	Between 6 and 22%
Maximum insulation level	BIL 650
Tap-changer	On HV and/or LV side
Standards	EC, ANSI

The global product platform is the result of these developments and we are now manufacturing higher quality products in a much shorter time.

The ABB small power transformer has all the classical attributes of a power transformer:

- Reliability
- Designs are based on well-proven technology
- Short-circuit strength has been demonstrated several times

That is what we call product excellence.

The ABB small power transformers production is based on:

- Modularization and scalability of design
- Standardization of design tools
- Manufacturing high-throughput lines
- Using the most advanced technology

That is what we call process excellence.



Product excellence

Reliability

No manufacturer in the industry can boast more experience than ABB in design and production of transformers of all types and sizes. We have the experience to balance your life cycle cost needs. Reliability is intrinsic in the small power transformers – right from the design stage. Key transformer components, such as bushings, tap changers and insulation material, are “made in ABB.” We have the world’s best laboratory facilities for testing transformers and all our products are individually tested according to International Standards. No other manufacturer has performed as many independent short-circuit tests as ABB.

Modularization customization

The concepts of modularization and customization are distinctive elements of the global product platform which translate into pre-defined configurations for tank and accessories covering the entire small power transformer range.

All the plane dimensions (length and width) are preset, whereas the third dimension (height) is left open-ended for optimization.

The design process starts with the pre-defined modules which are then customized to meet any customer specification and requests. As a result, the global product platform offers maximum design flexibility:

- LV windings: foil, disk, helical and layer
- HV windings: multilayer, disk and shielded disk
- Conductors: Al, Cu and CTC
- Tap changer: OLTC on HV an LV side, an DETC
- Conservator: with or without rubber bag and double flange



Product excellence

Reusability

Each modular design consists of a limited number of parts: design, bills of materials and drawings are reused as a whole or in part – they are not generated each time from scratch. Since these elements have been through the complete production process at least once up to testing, reusability reinforces the reliability of our products. Only an organization of ABB's size and vision can create a global product platform which ensures full worldwide reusability of proven design and main parts.

Common IT design tool

The global product platform is supported by a common IT design tool including:

- Test proven electrical design rules
- Mechanical rules
- Built-in design optimization application
- Built-in verification tool allowing test values to be checked against calculated parameters (with feedback to further optimize the calculation rules).

This tool reduces the design cycle time, allowing early detection of errors, and produces complete engineering documentation (standard drawings and automatic bills of materials). The costs to replace a transformer can be up to six times the original costs. You want it designed right the first time and built to last. Engineering excellence is one of the pillars on which ABB's world leadership in power and automation technologies is founded.



Quality

Quality can never be achieved by checks and controls alone. Built-in quality procedures are implemented in transformer production even before design work begins, ensuring correct interpretation of customer requirements. A globally accepted quality system- ISO 9000 and supplier qualification program - is integrated with specific factory quality programs including operational excellence, cost of poor quality and on-time delivery, all supported by the ABB customer complaint resolution process.

Product development

Requirements are continuously changing all over the world and the global product platform – the core of ABB technology for transformers for today and of tomorrow – is conceived to integrate each present or future development, such as:

- Midel – BIOTEMP®
- Aluminum winding
- Nomex
- Low noise / low loss solution
- TEC on-line monitoring system
- Dry-type bushings
- Hermetically sealed tank



Process excellence

Automation

Poor manufacturing processes are the leading cause of transformer failure. At ABB we know that standardization of the manufacturing process, based on the most advanced technologies and equipment, increases productivity and improves quality. Modularization of designs ensures simpler procurement and shortens production times without sacrificing optimization. Process excellence as a whole allows reduction of the total cycle time thanks to high throughput production lines.

Standardization, modular design and high production volumes of a well-defined range of transformers allow us to introduce progressively in our factories a level of automation uncommon in transformer manufacturing, particularly in three key phases of the process: core cutting, winding and drying.

Automatic core cutting and stacking

Laminations are automatically cut and stacked to form the complete core. Thanks to this technology, the process is faster and quality is

constant and not dependent on human factors. Automatically produced cores have lower losses, lower noise level and lower magnetizing current.

Semi automatic winding

Disk and helical windings are manufactured on vertical winding machines with automatic bending and braking of the conductors. The machines have computer-assisted controls which receive the manufacturing characteristics electronically from the design department and required limited manual operations. Thanks to this new technology, the process is faster and the winding dimensions are more precise – one of the most important factors in providing short-circuits strength.

Vapor phase drying

This process technology is mainly used for manufacturing power transformers and has now been introduced on a large scale in production of small power transformers to give the same quality as that required for larger units.

1 Focused factories | 2 India | 3 Italy | 4 USA | 5 Finland | 6 China | 7 Vietnam | 8 Colombia



Focused factories

ABB's global manufacturing network is based on the focused factories concept: highly specialized manufacturing units dedicated to specific ranges of products, in competition for speed and efficiency, which develop and share the most advanced technologies. This approach has allowed us to slim down our organization and make better use our resources and competencies.

The following are common to all ABB focused factories:

- Technical standards
- Standard drawings
- Material specifications
- Design rules
- Design tools /software
- Design process
- Method of procurement
- Manufacturing processes
- Quality processes
- Test standards
- Global support from ABB experts



Standard features on our transformers

ABB transformers are generally of the conventional, free breathing tank type, fitted with oil conservator. Sealed units with air-cushion are also available.

They are manufactured and tested in accordance with the major international standards. Cooling methods are ONAN, ONAF, OFAF, OFWF and ODAF.

The transformers can be provided with off-load or on-load tap changers.

Core

Core design is a three-limb type of circular cross-section without bolts through the core. The joints are mitted or step-lap mitted, providing low losses, low on-load current and minimum noise.

Windings

The conductor material is copper and/or aluminum. Conductor shapes can be foil, strip or CTC (continuously transposed conductor). Winding technologies are foil, layers, continuous disk and interleaved disk.

Insulating oil

The mineral oil used in ABB transformers complies with the most important international standards. When requested, transformers can be filled with silicon oil or other fluid.

Tanks

The tank, cover and conservator are made of steel plates. Double welding is used where oil leaks are a concern. Rubber or cork rubber compound is used for the gasket on flanged connections. Non-magnetic steel is used around the high current carrying bushings. The transformer tank is usually of the rigid type with removable radiators connected by shut-off valves. All tanks are leakage tested.



Painting and surface treatment

ABB has a range of proven surface treatments depending on the transformer application environment and manufacturing location. Typically, tank external surfaces are painted with a two-component epoxy primer followed by a two-component acrylic or polyurethane finishing coat. Many other coating systems are available to suit customer's specifications and individual requirements. Separate radiators are generally hot-dip galvanized.

Accessories

- Bushings
- Oil conservator with level indicator
- Rubber-bag in the conservator to prevent oil coming into direct contact with air (optional)
- Filling and drain valves
- Oil sampling device
- Earthing terminals
- Lifting lugs
- Jacking pads (radiator tanks)
- Radiator plate
- Silica-gel breather
- Buchholz relay
- Top oil thermometer

Additional accessories can be fitted according to customer's specifications.

Vacuum treatment

Drying and vacuum treatment is performed using proven technology such as vapor phase drying and LFH (low frequency heating). Before filling, the oil is always degassed and purified.

Bushings

Bushings of the solid porcelain type comply with international standards and are generally located on the cover. For voltages above 52 KV, condenser type bushings are used. Enclosure can be provided in the primary and/or on the secondary side and can be constructed for cable or bus duct connection. Transformers can also be provided with plug-in bushings.

Testing

All ABB transformers are individually tested according to the major international standards.



Perfect transformer care

Our service - always at your side

Just offering the best product is not enough: To bring true value to the customers, they must be supported day by day throughout the world. In addition to the small power trouble free concept, ABB can offer engineered solutions, monitoring and diagnostic contracts, fleet assessment, factory and on-site repair. ABB transformers can be fitted with TEC, a state-of-the-art on-line monitoring system. TEC receives all the control information from just a few multi-purposed sensors. Parameters measured during service are compared with simulated values. The model detects discrepancies and indicates potential malfunctions and/or normal wear. Other features include gas measurement for early indication of potential problems in a winding, and temperature control with consumed lifetime calculation.

Looking forward – components and materials

ABB small power transformers are the perfect products for introducing the latest developments in components. Dry-type bushings are safer, maintenance-free, easy to install and offer higher reliability. The combination of an up-to-date transformer and component technology provides the end user with unique advantages.

Furthermore, new materials like nomex insulation and alternative insulation fluids, like Midel – BIOTEMP, which is safer (less flammable) and environmentally friendly (biodegradable) are now available to the transformer industry. Insulation materials resistant to higher temperatures have reduced the footprint and led to higher overload capability. New materials open the door to new applications, such as transformers with increased safety for urban substations or for installation on off-shore platforms.



Your reliable partner

We deliver much more than a transformer to our customers - we deliver to you requirements a fully tested product, optimized for the lowest life cycle costs by the most advanced design tools and manufactured using the most efficient processes in the shortest time.

With our transformer you also have access to:

- Proven design and cumulative experience
- State-of-the-art transformer technology, open to future developments.
- Products and processes designed for quality
- Global knowledge and production, local sales and services.
- Rapid and precise documentation
- Low CO₂ emission during the transport due to focused factory market allocation.

Small power transformers global manufacturing with local service



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