POWER TRANSFORMERS

HVDC transformers
Building trust through a solid engineering tradition
HVDC
Green and cost effective power transmission

ABB pioneered HVDC transmission technology in the 1950s and continuously develops the HVDC technology to meet the demands of economic and sustainable transmission and integration of different electricity generation types. UHVDC is an advancement of HVDC and represent the biggest capacity and efficiency leap in over two decades.

HVDC at a glance
In 1954 the world’s first high-voltage direct current (HVDC) transmission link was delivered by ABB. A new technology was born and the inventor, Uno Lamm, became known as the father of HVDC. The HVDC technology is used to transmit electricity over long distances by overhead transmission lines or submarine cables. It is also used to interconnect separate power systems, where traditional AC connections cannot be used. HVDC transmission offers, for instance, controllability and low total investment cost compared to AC solutions for long-range transmission.

Cost efficient and environmentally sound long-distance transmission
Over long distances, HVDC offers a cost effective alternative to AC transmission. By means of interconnecting links, existing generating plants in the networks are used more effectively so that construction of new power stations can be deferred. This makes economic sense while minimizing the environmental impact.

Making sustainable energy sources economically feasible
ABB’s HVDC Light™ power system is designed to transmit power under ground and under water, even over long distances. It offers an alternative to conventional AC transmission systems and local generation including connecting wind farms to power grids. Other applications include shore power supply to islands and offshore oil and gas platforms.

The role of HVDC transformers
HVDC transformers are at the heart of HVDC transmission systems. Their main application is to transfer power between an AC system and the DC transmission network. HVDC transformers are also used to ensure an appropriate tapping range for part of the DC voltage and for reactive power control, serving as an integrated part of DC transmission.

World’s most powerful UHVDC transformers
UHVDC is the number one choice when it comes to bringing huge amounts of energy from renewable resources, often far away, to large load centers. China, India, Africa and the Americas are markets with these requirements. ABB was the first to successfully design, develop and test the 1,100kV converter transformer prototype, breaking the record for the highest DC voltage, in 2012.
Operating in some of the world’s most prestigious HVDC projects

ABB’s customer reference projects include HVDC transformers in operation in the world’s largest hydropower projects, interconnection of power grids over sea or land, and flexible connection of wind power generation.

In-house sourcing
ABB has complete in-house control of the design and manufacturing of key components for HVDC transformers, including bushings, tap changers and insulation material. Customers benefit from this by being supplied reliable transformers from a well-proven supplier. Furthermore, in-house supply of key components improves our control of sourcing during the execution of the project.

Rapid development and commissioning
Drawing on a wealth of experience and unmatched research and development (R&D) investments, ABB has a proven record of delivering excellent performance in record-short time. A perfect example is the world-record-breaking speed with which the 800 kV Xiangjiaba–Shanghai project in China was developed. The transformers were installed and commissioned one year ahead of the original customer schedule.

Executing successful projects
Each project is assigned a certified and experienced Project Manager, who is responsible for all aspects of the project. Having supplied to a large number of projects, ABB’s experience covers all stages of a project – which is reflected in our high customer appreciation rankings. Serving many customers from all over the world has given us a deep understanding of the varying customer requirements and operating conditions that characterize HVDC transformer projects.
Customer value based on extensive experience

ABB has delivered more than half of the world’s HVDC projects. Furthermore, ABB has designed and manufactured more than 350 HVDC converter transformer units in the 80–1,100 kV DC voltage range. Our extensive experience helps us deliver outstanding value to customers worldwide.

Specific requirements for HVDC transformers

HVDC transformers are, in contrast to AC transformers, subject to both AC and DC insulation stresses as well as harmonics in the load current. ABB has a deep understanding of the different net system operating conditions, magnetic dynamics and insulation performance, which is crucial to the design of high-quality transformers.

Insulation requirements for both HVAC and HVDC

HVDC transformers are particularly dependent on efficient insulation, both for AC and DC voltage. ABB is at the forefront of basic research as well as dielectric design, building on our exceptional competence and technology capabilities, such as direct measurement of electric fields using electro-optical methods.

Verified short circuit strength

ABB has long been a driving force in the development of transformers with very high short circuit strength, including HVDC transformers. ABB conducts a large number of short circuit tests, and according to KEMA statistics, ABB’s short circuit strength is more than twice as high as the market average.

Full support from transportation to training

The quality of every delivery is assured throughout the entire business process – from sales to commissioning of the equipment. ABB’s worldwide presence with more than 50 transformer facilities and 25 service centers worldwide ensures that aftermarket support will never be an issue.

Transportation

ABB normally arranges transportation from factory to the place of installation. ABB dispatches with bushings, conservator and accessories removed. Due to their large size, the transformers are shipped without oil. The oil is transported separately in barrels or tanks.

Installation

On arrival at the installation site, our trained engineers prepare the transformer for its working life by carefully reassembling parts that have been dismantled for safe transit, refilling it with oil and performing the necessary onsite tests to ensure long and trouble-free life. Customers can choose between a supervisory or full-installation agreement.

Service

Each transformer comes with a technical guarantee and full backup, including field support and global after-sales service. In addition to ABB factories, local branch offices, agencies and representatives are present throughout the world. Diagnostic assessment, onsite repairs, upgrades and spare parts deliveries are available worldwide.

Training

Training of customer personnel on the maintenance and service of transformers, including accessories, can be carried out at our training centers or at other sites according to customer request.