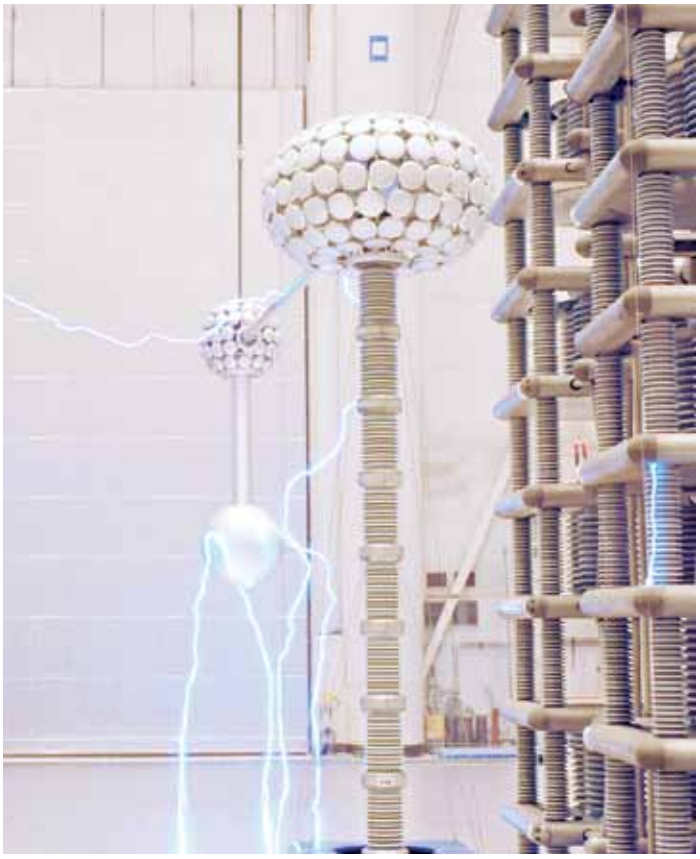
Power transformers

Shunt reactors
Proven history for future success

Power and productivity
for a better world™

Shunt reactors
– an investment for today and for the future



Improving power quality and reducing transmission costs

Shunt reactors increase the energy efficiency of power transmission systems by improving power quality and reducing transmission costs. By combining low life cycle cost and high efficiency, ABB shunt reactors will boost your bottom line.

Why shunt reactors?

Shunt reactors are the most compact and cost-efficient way to compensate for reactive power generation in long high-voltage power transmission lines and in cable systems. They can be permanently used in service to stabilize power transmission, or switched in under light-load conditions for voltage control only.

Increasing energy efficiency in overhead lines

Over long transmission lines, reactive power is generated as an effect of the capacitance between the lines and earth. The reactive power cannot be used for any application and should be balanced to reduce energy losses. Shunt reactors absorb the reactive power, thus increasing the energy efficiency of the system.

Improving voltage stability at low load

At low loads, the voltage increases along the transmission line. A shunt reactor reduces the voltage increase, keeps the voltage within the desired limits, and contributes to the voltage stability of the system.

Time-varying load conditions

Transmission systems are subject to daily or seasonal load variations. Variable shunt reactors allow customers to continuously adjust the compensation, as loads vary over time. They make switching in and out of fixed-rating reactors unnecessary, which eliminates harmful voltage steps. The variable reactor can always be adopted to the need, both in today's operation and in the future grid. In addition, variable shunt reactors can interact with other systems such as SVC and HVDC links in order to optimize the system operation. Variable shunt reactors are therefore economical means to improve voltage stability and power quality under time-varying load conditions.

Shunt reactors – an investment for today and for the future

Increased revenue

– Increase your revenues of active power in cable applications and long overhead lines.

Reduced costs

– High reliability, low maintenance costs and low internal losses reduce operating costs.

Reliable partner

– ABB has been supporting its global customers for more than 100 years.

Environmental benefits

– ABB takes environmental considerations into account throughout the shunt reactor life cycle – design, manufacturing, operation, and phase out.

A vital part of modern energy systems

Cables and renewable energy sources are becoming increasingly common in energy systems. However, in both cases, reactive power or unpredictable active power generation are negative side effects. Shunt reactors are playing an increasingly important role to compensate for these variations.

Long transmission lines

Shunt reactors are the most compact and cost-efficient means of compensating for reactive power generation in long transmission lines. Placed permanently in service to stabilize power transmission, or switched in under light-load conditions for voltage control only, shunt reactors combine high efficiency and low life cycle costs to cut transmission costs. Shunt reactors increase energy efficiency and power quality in both new and existing transmission lines.

Cable systems

The increased use of cables is driven by environmental concerns such as the development of offshore wind parks and the difficulty in obtaining the right of way for new overhead lines. Energy trading and the need for efficient use of generation and reserves between countries drive the demand for interconnections, sometimes using AC sea cables. However, cables generate more reactive power than overhead lines, which makes shunt reactors even more important for transmitting active power in the grid.

Renewable energy sources

Wind power and solar energy are a growing part of the energy mix in many countries. Compared to conventional large power generation, renewable energy sources generate unpredictable and fluctuating active power. Variable shunt reactors provide an attractive solution to compensate for these variations.

Auxiliary power in remote areas

By adding a secondary winding, shunt reactors can be used to supply several MVA of power in remotely located substations. These specially designed shunt reactors can also be used to supply power to remote villages located close to the substation, without the need for a high voltage step down transformer.

Flexible spare in larger networks

A variable shunt reactor (VSR) can be used as a flexible spare, positioned on different locations along larger transmission networks.

Exceptional and proven field reliability

ABB is the world's largest supplier of high-voltage shunt reactors. Since 1960, we have delivered more than 2,500 shunt reactors to 70 countries worldwide. Robust design and production excellence ensure exceptional and proven field reliability.

Customized to operating environments

Differing environmental and operating conditions require special design and manufacturing considerations. Reactors must withstand severe heat, cold, humid and salty environments, lightning and earthquake forces as well as voltage fluctuations. ABB reactors are customized in cooperation with our customers according to specifications and international standards.

Long and trouble-free lifetime

ABB reactors offer trouble-free operation and easy maintenance. ABB's design concept with high mechanical stability and low vibration ensures a long service life of the reactor and its external components. Many ABB reactors have been in service for 30–40 years without the need for service or repairs.

Low sound and vibration levels

Reactors are subjected to extreme mechanical forces. 100 times per second, the gapped limb in a large shunt reactor experiences forces of up to 40 tons. Low sound and vibration levels throughout their lifetime are proof of the solid mechanical design of ABB shunt reactors.

Drawing on extensive research and development resources

ABB reactors are designed and manufactured according to the same production methods and quality systems throughout the world – ensuring consistently high product quality. Drawing on ABB's extensive research and development resources, we use advanced design tools to ensure optimum design parameters.

All shunt reactors are laboratory tested

Reactors are laboratory tested using modern test equipment for correct and reliable measurement. Reactor integrity and performance under full-load and over-voltage conditions are verified, ensuring that each reactor will withstand extreme conditions during a network disturbance. Noise and vibration testing, magnetic characteristics measurements and dynamic earthquake proofing analyses are conducted on request.

Design excellence

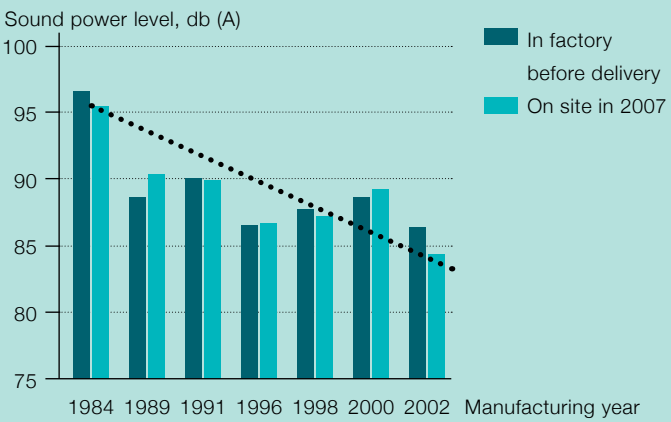
The mechanically stable concept of ABB shunt reactors is the result of optimum design and manufacturing quality and leading engineering know-how in every detail.

The core is at the heart of every shunt reactor. The magnetic field creates pulsating forces across all air gaps amounting to tens of tons. To meet this force the core is constructed to be extremely rigid which minimizes vibration and maintains performance over the lifetime.

Winding quality and precision are crucial to reactor performance. Our winding coils are handmade – a skill acquired after a long apprenticeship.

The frame must be designed so that its natural and fundamental frequency is above or below the excitation frequency, keeping noise and vibration levels low.

Long-term noise stability



ABB's test of seven three-phase shunt reactors shows that the noise level remains constant after at least 25 years of service.

A complete product range for high voltage transmission system

ABB offers a complete range of traditional and variable shunt reactors (VSR). Products include the 800 kV range, from 10–330 Mvar three-phase units to single-phase units designed for more than 110 Mvar. Variable reactors are available up to more than 250 Mvar, with large regulation ranges.

Single-phase shunt reactors	
Reactive power	up to 110 Mvar
Voltage	up to 800 kV

Three-phase shunt reactors	
Reactive power	up to 330 Mvar
Voltage	up to 800 kV

Three-phase variable shunt reactors	
Reactive power	up to 250 Mvar
Voltage	up to 500 kV
Regulation rate	40–100 %

Full support from transport to training

Our shunt reactor services range from basic maintenance to advanced diagnostic assessments. Contact your local ABB representative for further information.

Transport

Reliable transportation is key to successful shunt reactor installation. Moving an object the size and weight of a shunt reactor requires planning, know-how, and a global network of contacts. ABB has long experience in delivering reactors by rail, road, sea, and even air – worldwide. Our skilled staff will ensure a fast and efficient transport process.

Installation

ABB engineers will be on site to supervise installation and startup. They will prepare the reactor by reassembling all parts dismantled for transit, refill it with oil and run the necessary tests to ensure trouble-free operation. Customers can choose between a supervisory or full-installation agreement. As far as possible, the engineers assigned will have local language skills.

Training

The customer's local operation and service personnel will be trained during installation and commissioning on site. Comprehensive training programs are available – contact your local ABB representative for more information.

Service

Each shunt reactor comes with a technical guarantee and full backup. This includes field support and global after-sales services delivered by local branch offices, agencies, and representatives throughout the world. Diagnostic assessment, onsite repairs, upgrades, and spare parts deliveries are available to customers worldwide.

Contact us

ABB Ltd.
Affolternstrasse, 44
P.O. Box 8131
8050 Zurich, Switzerland

www.abb.com/transformers

Note
We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

Power and productivity
for a better world™