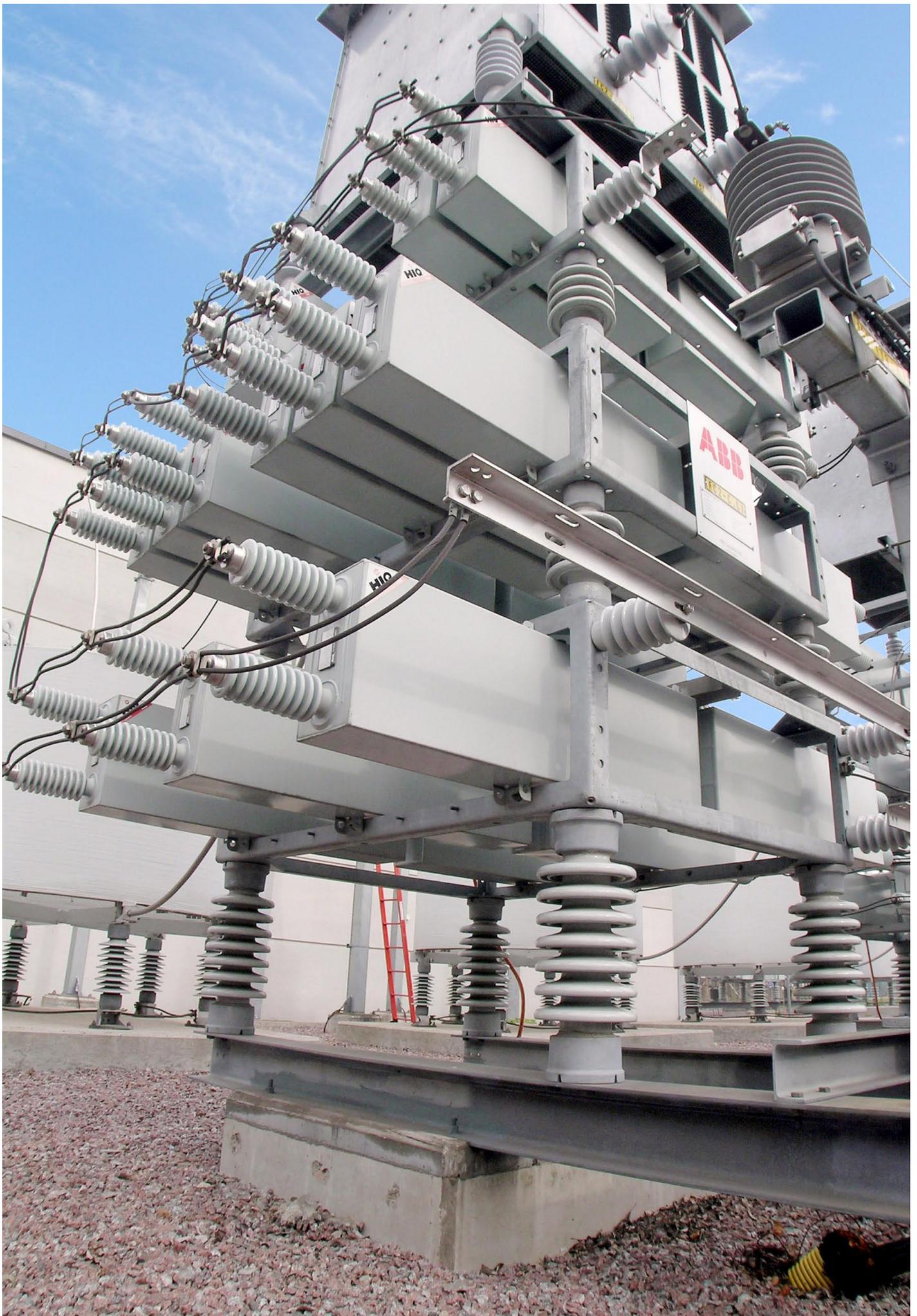


# Power capacitors for high and medium voltage applications



# Give your grid a power injection with power capacitors from ABB in Ludvika

ABB in Ludvika provides complete resources in electrical high voltage technology, and stands for innovative new approaches with the focus on efficient and environmentally friendly power transmission.

This brochure is about capacitors and what they can accomplish in a power grid. ABB has manufactured capacitors for more than 70 years and has been responsible for many important development stages in capacitor technology. The present line includes conventional impregnated capacitors HiQ and dry capacitors DryQ for DC.

## Lower losses and lower harmonics

Capacitors are very beneficial in power grids. By producing reactive power, they compensate for the reactive power consumption of electrical motors, transformers, etc. The results can be seen in the form of more stable power grids with increased transmission capacity, reduced losses thanks to higher power factors.

Capacitors also constitute a key component in the various filter solutions reducing harmonic contents. A non-distorted sinusoidal voltage without harmonics reduces the risk of problems in the form of disturbances in production equipment, metering errors and malfunction in relay protection, and also extends the service life of connected equipment.

An economic calculation most often shows that a capacitor installation quickly pays for itself.

## A complete program with complete support

ABB's capacitors and capacitor banks are used both in transmission and distribution grids. There are filter installations,

shunt and series compensating installations, and HVDC transmission systems all over the world, both at power companies and industries.

As an ABB customer, you gain access to an all-embracing line of capacitors and complete support in the form of analyses, calculations and suggestions on custom solutions for generation of reactive power and harmonic filtering. Solutions that make it possible to increase active power and reduce disturbances through a smoother sinus form.

Our comprehensive product line, which besides capacitors also includes surge arresters, instrument transformers and circuit breakers, makes us a comprehensive supplier of both individual high voltage apparatuses and complete turn-key installations.

## ABB's capacitors are used all over the world

Capacitors from ABB have demonstrated their robustness and reliability at power installations all over the world. Our capacitors are designed for reliable operation in all climates, from arctic cold to tropical heat.



# Quality and the environment go hand in hand

**Market driven research and development are behind ABB's successes in capacitors. The focus has been on developing solutions that provide reliable operation and long service life so as to create the conditions for good operating economy at our customers' installations. Creative engineering and materials development, in combination with modern production technology, constitute the basis for this.**

The HiQ and DryQ capacitors are designed for long technical service life, the same as for all of our other high voltage apparatuses. Extensive operating experiences show that the failure rate is very low. For you as a plant owner, this means safe operation and low maintenance costs.

## **Production is controlled by strict quality routines**

ABB's capacitors are produced in highly automated shops, but it is the engagement of our employees that is the determi-

ning factor in attaining good final results. A finely tuned quality system with constant checks during all phases of production guarantees high and consistent quality.

## **Consideration to the environment is a matter of course**

All development work at ABB is oriented towards creating environmentally friendly technology. Our impregnated capacitors are already very advanced in this respect, and our DryQ capacitors entail further progress.

From the perspective of overall service life, the DryQ capacitors have lower environmental impact than conventional capacitors. All material is inserable in an environmentally friendly manner, and with the dry technology, the risk of leakage is eliminated.

With special dampening devices, noise levels can also be reduced for our HiQ capacitors.





# Power compensation with HiQ capacitors

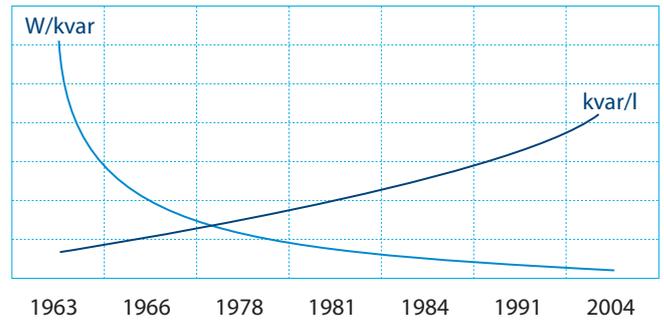
A long-term goal at ABB has been to reduce capacitor losses and to increase the output per volume unit. HiQ capacitors are a result of this development. With HiQ capacitors, we tailor cost-effective and environmentally friendly capacitor banks for reactive power compensation in all types of power grids.

## QBANK open-rack banks for voltages up to 500 kV

QBANK is a flexible concept for open-rack shunt banks and enables very compact solutions that save space at installations. Configuration and power can be varied within wide range.

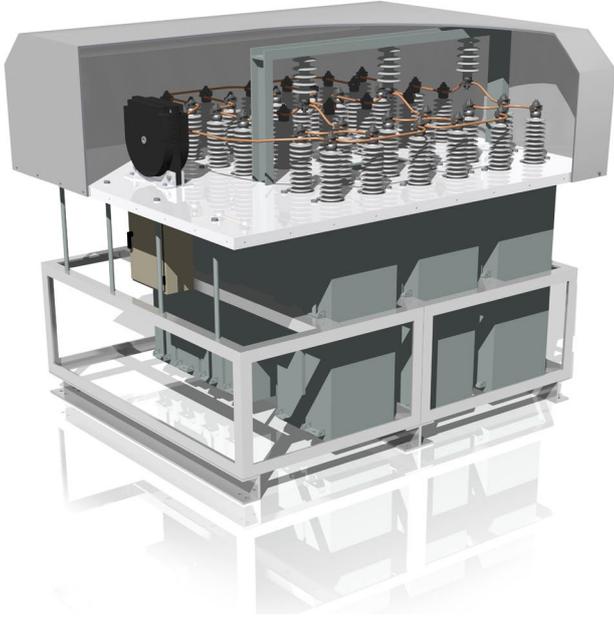
QBANK is supplied with internally fused, externally fused or fuseless configurations depending on the bank's voltage and power level. ABB has the expertise needed to engineer an optimal solution for each unique installation.

QBANK is used by customers all over the world. Several years of operating experience and satisfied users testify to the high quality and reliability of HiQ capacitors.



Development of ABB's power capacitors with respect to losses (W/kvar) and power density (kvar/l)





SIKAP



Pole-mounted bank

ABBACUS shunt bank



# Power compensation for medium voltage applications

**ABB has a range of metal enclosed capacitor banks for a variety of medium voltage applications. The enclosed capacitor bank design enables installation without special fencing. The product range consists of indoor and outdoor solutions, which can be single step fixed or multi-step switched. They are available from low to high power ratings up to 36 kV. Complete factory assembled, ready to be secured to the foundation.**

## **SIKAP**

SIKAP is the trade name of ABB metal enclosed capacitor banks for voltages 4.5 - 24 kV, for fixed compensation. The enclosure covers the live parts and protects the bank from short-circuit due to external causes. It also increases the personal safety.

The system consists of internal fused ABB HiQ capacitors with proven long service life and low losses. All supplied items are enclosed by an aluminum cover.

## **ABBACUS and EMPAC**

The ABBACUS and EMPAC is a packaged reactive compensation system with modular, multi stage switched capacitor steps that will automatically compensate the network to maintain a preset level of power factor. Capacitor stages are

switched in and out automatically based on both the power factor and load conditions to ensure a pre-set target power factor is achieved without the risk of over compensation. ABBACUS and EMPAC shunt banks are available for voltages up to 36 kV.

ABBACUS, EMPAC and SIKAP are based on well-proven technology, and characterized by high reliability and low maintenance costs. The modular design permits the addition of new capacitor units to meet future needs.

## **Pole-mounted banks for voltages up to 36 kV**

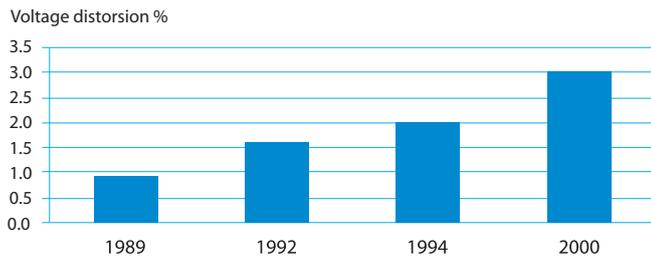
Pole-mounted shunt banks constitute a simple solution for reactive power compensation, close to loads. ABB can supply various configurations with fixed or switched power, and with various control functions.



# Harmonic filtering

As electrical consumption increases, demands on availability and high electrical quality are also increasing. It is important that the harmonic content is limited in the supply voltage. Developments during recent years, however, point to a strong increase in the amount of harmonics in power grids. In industrial grids, harmonics are generated by non-linear loads such as rectifiers, static frequency converters, arc furnaces, etc. Even in distribution networks, harmonics are produced by, for example, computers and low-energy lamps. Harmonics can lead to several problems, such as: increased losses in machines and apparatuses, control system faults or disturbances in electronics and computers.

Fortunately, the problems can be prevented using suitably adapted harmonic filters consisting of capacitors, reactors, and in some cases, even resistors.



Harmonics increase in the power grid of a south-western Swedish city.

## Each installation requires its own solution

Each electrical installation is unique, and to attain optimal filtering, careful analysis and measurement of the harmonic content under various operating conditions are first needed. At ABB, there is substantial experience and expertise in this area, and in the engineering and design of suitable filters.

Besides filtering harmonics in grids, the harmonic filter generates reactive power to the grid. Harmonic filters can also solve problems with parallel resonance between a grid's inductive and capacitive sections.

## Our filters are built with quality products

HiQ capacitors, - as well as our other high voltage products - are produced in some of the world's most modern shops in Ludvika, and constitute the building blocks of our filter solutions. Other important components of the filters are supplied by carefully selected suppliers, and we can consequently guarantee the highest quality and reliability.

The filters system can be constructed with band-pass filters for filtering a specific frequency, or as high-pass filters that even dampen a wide range of frequencies. Band-pass filters for various frequencies are often combined in the same filter solution.

