

Synchronous condensers for voltage support in AC systems



ABB is a global leader in power and automation technologies that enable utility and industry customers to improve their performance while lowering the environmental impact. Synchronous condensers from ABB ensure efficient and reliable operation of power grids through reactive power compensation and additional short circuit power capacity.

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01 ABB Synchronous condenser at site, operated by Hydro-Quebec.

ABB can tailor synchronous condenser modules to match system performance requirements and site conditions, and deliver optimum cost-efficiency.

Operating principles

A synchronous condenser is a device that supports network voltage by providing reactive power compensation and additional short circuit power capacity.

Fundamentally, a synchronous condenser is a synchronous generator operating without a prime mover. Generation/consumption of reactive power is achieved by regulating the excitation current.

An important benefit of a synchronous condenser is that it contributes to the overall short circuit capacity in the network node where it is installed. This, in turn, improves the chances that equipment connected to the network will be able to “ride through” network fault conditions.

A synchronous condenser is also well suited to operating during overload duty for shorter or longer periods of time. Synchronous condensers can support the power system voltage during prolonged voltage sags by increasing the network inertia. They can therefore be utilized as VAR compensating devices in situations where voltage instability must be prevented at all cost.

Dynamic properties

As with any synchronous motor/generator, the electrical dynamics of a synchronous condenser are largely determined by the reactances of the condenser and by the nature of its excitation system. Low transient reactances and comparably high rotor inertia ensure high transient stability margins and excellent fault ride-through capability.

Synchronous condensers from ABB are equipped with a brushless or static excitation system which allows for considerable over-excitation (field forcing) in case of network contingencies. Excitation control is performed by an AVR which is tuned to match the requirements of the specific application.

ABB modular synchronous condenser solutions

ABB offers module-based synchronous condenser solutions with active components designed according to project-specific needs. This allows for a flexible product as well as a short time to in-service.

ABB synchronous condenser modules are compact and fully functional units, with minimal footprint on site and minimal need for external auxiliary support.

A typical ABB synchronous condenser module includes equipment such as condenser cooling, lube oil supply, auxiliary power distribution, excitation system, starting equipment and computer simulation models. Therefore the synchronous condenser module is a complete, self-sustained package tailored for specific performance requirements, site conditions and optimal costs.

In order to achieve effortless control co-ordination, ABB can provide condenser control panels with all necessary monitoring, protection and regulation functions configured in accordance with customer requirements.

With thousands of large synchronous motors and generators installed worldwide, ABB has the know-how and experience to select and provide the best starting method and dimension the synchronous condenser appropriately.

To ensure enduring and reliable operation, ABB synchronous condensers are designed for high reliability, durability and the capability to operate for a long time between service intervals.

Technical data	
Reactive power / module	up to 75 MVAR*
Short circuit power	Custom designed
Overload capabilities	Custom designed
Voltage	1 – 15 kV
Frequency	50 or 60 Hz
Standards	IEC, NEMA, CSA etc
Ambient temperature	-50°C to +60°C -58°F to +140°F
Cooling methods	Open duct ventilated with WP filter Air-water heat exchanger Air-air heat exchanger
Starting methods	Pony motor Reactor Capacitor Auto-transformer Direct On Line Others on request

* Higher output is achieved by using several modules in parallel

Main benefits

- **Additional short circuit power**
 - Synchronous generators enhance grid strength at connection points.
- **Capability to ride through network disturbances**
 - Synchronous condensers can provide voltage support to the power grid during prolonged voltage sags.
- **Complete modular package**
 - With ABB's customizable modular design, time to in-service for a synchronous condenser can be as low as 12 months.
- **Compact design**
 - The modular solution ensures the smallest possible footprint, fast installation and minimum assembly on site.
- **Cutting-edge technology**
 - Synchronous condensers are carefully designed for minimum losses, noise levels, vibrations and weights.
- **Uniform and compatible control equipment**
 - ABB can provide uniform and fully compatible excitation and protection control equipment to simplify control interaction.
- **Long track-record and reliable operation**
 - The technology and its operating principles are well known and ABB has been developing and manufacturing large synchronous motors and generators for more than a century.
- **Long operating lifetime**
 - Some synchronous motors and generators supplied by ABB are still in operation after more than 40 years.
- **Easy maintenance and worldwide life cycle support**
 - ABB's network of worldwide service centers provides excellent support during the product life cycle. Synchronous condensers can operate for a long time between inspections and services, and are therefore also suitable for installation in remote areas. ABB can provide all the tools necessary for maintenance to be performed at the site, as well as good spare parts availability.

For more information please visit:

<http://new.abb.com/motors-generators/synchronous-condensers>

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