COELMO

EQUIPPED WITH Nidec Power

SYNCMASTER®

Synchronous Condenser

The Power Quality, Reinvented.

WHAT IS A SYNCHRONOUS CONDENSER?

The transition to **Renewable Energy** and the global drive for **Decarbonization** has introduced new challenges to the electrical grids.

With the increasing share of wind and solar power both relying on power electronics rather than rotating generators, many electric **grids** are experiencing **reduced inertia, voltage fluctuations** and **lower short-circuit power availability,** leading to widespread blackouts and operational failures.

In **microgrids** and **isolated networks**, these instabilities can cause **equipment damage, system shutdowns and inefficient energy distribution**.

The **SYNCMASTER®** is a **modular synchronous condenser** solution embedding a rotating electrical machine. It is specifically designed to address these challenges by **providing dynamic voltage support, grid inertia** and **fault current capacity**.

By continuously adjusting its reactive power output, the **SYNCMASTER® stabilizes voltage fluctuations**, ensuring **grid resilience** even in **electric ecosystems** with a large amount of **Renewable Energy**.

COELMO and **NIDEC POWER** have joint force to developp and manufacture the most compact system, fullfiling the market demand.

WHY USE A SYNCHRONOUS CONDENSER?

The transformation of electric ecosystems, driven by the increasing adoption of **Renewable Energy** and the phase-out of traditional thermal power plants or generating sets, has introduced new technical challenges:

REDUCED SYSTEM INERTIA

Inverter-based electric generation lacks the rotating mass of conventional generators, making frequency stability harder to maintain.

VOLTAGE INSTABILITY

Long-distance transmission, fluctuating loads, and the variability of Renewable Energy sources contribute to frequent voltage fluctuations.

LIMITED SHORT-CIRCUIT POWER

Power-electronic-based generation does not contribute significantly to fault current availability, reducing grid protection efficiency.

GRID DECENTRALIZATION & MICROGRID EXPANSION

As industries and critical infrastructures move toward self-sustaining energy systems, ensuring power quality and reliability in microgrids becomes essential to prevent equipment damage and operational failures.

ADVANTAGES

FREQUENCY STABILIZATION

By leveraging its large rotating kinetic energy, **SYNCMASTER®** helps dampen frequency fluctuations.

VOLTAGE CONTROL

SYNCMASTER® continuously **adjusts reactive power, ensuring steady voltage levels.**

GRID INTEGRITY & PROTECTION

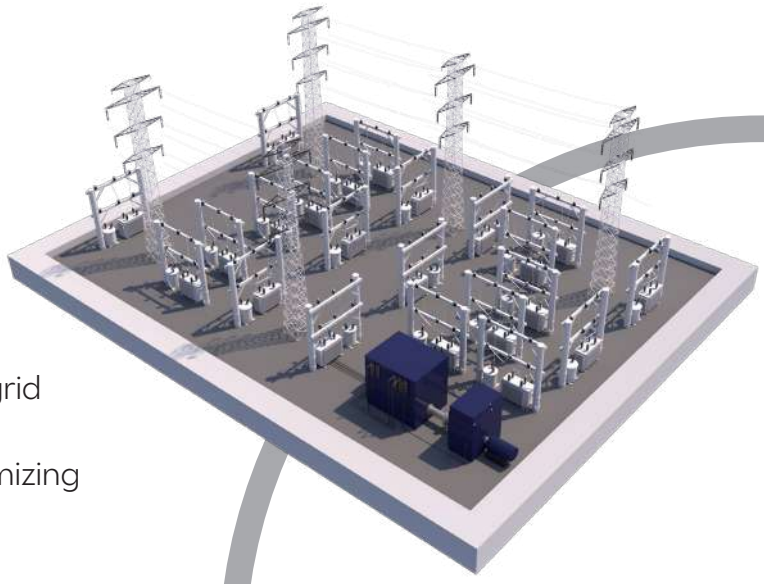
Increasing short-circuit power, enhancing system protection, and preventing failures.

OPTIMISED GRID LOSSES

The possibility to continuously adjust the reactive power will enable the reduction of unnecessary reactive current in the grid lines. This will drive energy saving and optimize the load on grids where every kW counts.

APPLICATIONS

TRANSMISSION NETWORKS



SYNCMASTER®

improves transmission networks by:

- Providing static and dynamic reactive power compensation.
- Offering rotational inertia to mitigate frequency fluctuations.
- Increasing short-circuit power for improved grid protection and reduce voltage harmonics.
- Reducing to minimum the line losses by optimizing the reactive current in the transport line.

MICROGRIDS, HYBRID GRIDS AND ISOLATED NETWORKS

SYNCMASTER®

enhances microgrids by:

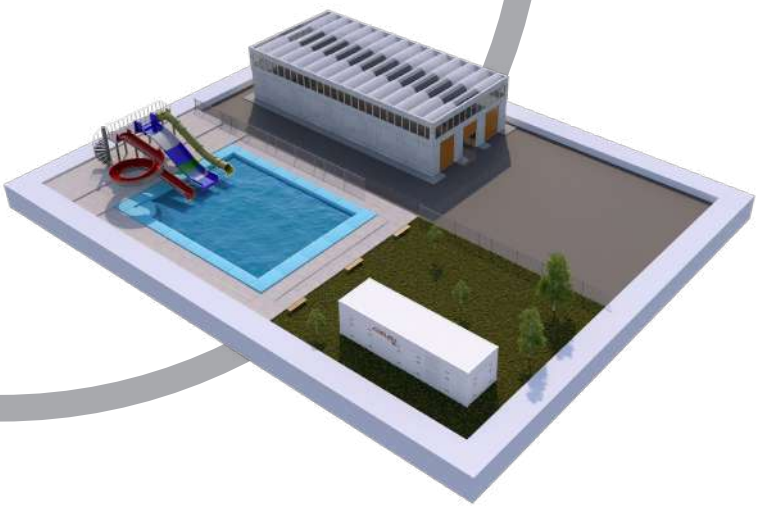
- Maintaining voltage stability with reactive power support.
- Providing necessary inertia for stable frequency control.
- Increasing fault current levels for better protection schemes.
- Optimising grid load by managing unnecessary reactive currents.

RENEWABLE ENERGY INTEGRATION

SYNCMASTER®

helps grids integrate Renewable Energy by:

- Managing power fluctuations from wind and solar generation.
- Providing necessary inertia for stable frequency control.
- Enhancing grid resilience to accommodate higher renewable penetration.
- Reduction of the THD (distortion factor) introduced by inverters both those serving electric motors and those for conversion from renewable sources.



INDUSTRIAL APPLICATIONS

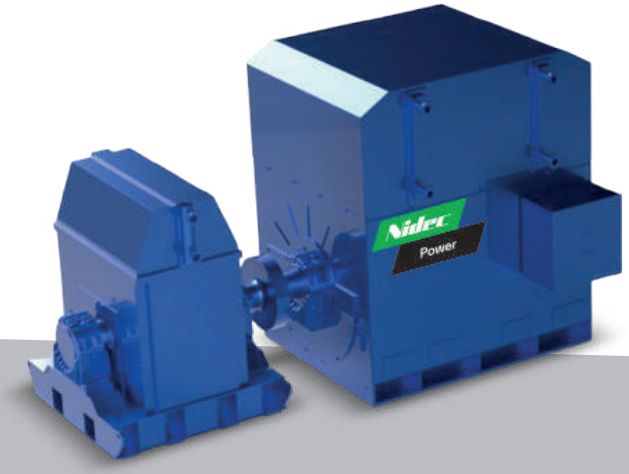
SYNCMASTER®

ensures operational safety for industries with high inductive loads or sensitive electrical equipment require for:

- Voltage stability in steel mills, amusement parks, and manufacturing plants.
- Supporting hospitals and critical infrastructure with reliable power.
- Increasing in the load power factor (Power factor correction of highly inductive loads such as big industries with many electric motors).
- Reduction of the THD (distortion factor) introduced by inverters both those serving electric motors and those for conversion from renewable sources.

TURNKEY STANDALONE UNIT

Optimized for **high-voltage transmission networks** to be installed in dedicated substation.



KEY SPECIFICATIONS

Parameter	Typical Value / Range	Notes
Rated Reactive Power (MVAR)	2 – 80	Capacitive: up to +80 MVAR, Inductive: up to -40 MVAR
Operating Voltage (kV)	3 – 13.8	Other voltages available on request
Nominal Frequency (Hz)	50 / 60	Selectable at design stage
Cooling Type	IC01, IC81W, IC611	Air/air or air/water heat exchangers
Ingress Protection (IP)	IP23 to IP55	According to IEC 60034-5
Inertia Constant (H)	1.7 – 10 s	Project dependent
Subtransient Reactance (X"d)	0.1 – 0.3 p.u.	Based on machine size
Rated Current (A)	150 – 4000 A	Dependent on MVAR and voltage
Short-Circuit Current	Up to 10x rated current	Withstand capacity
Efficiency	≥ 97%	Typical at rated operation
Operating Temperature (°C)	-40 to +60	Ambient temperature range
Excitation Type	Static / Brushless	Fast response systems
Starting System	Pony motor + VFD / SFC	Soft-starting options
Cooling Method	Air cooled (IC01) or water cooled (IC8) or Air to Air (IC6)	Application specific
Lubrication System	Forced oil with jacking oil	Sleeve bearings
Mounting Arrangement	IM1001, IM1005, IM7311, IM7315	IEC compliant
Stator Room Dimensions	6x4x10 m (typical)	For air-cooled or TEWAC installations
Control Room Dimensions	3x3x6 m to 6x6x12 m	For VFDs, exciters, LV panels
Standards	IEC, IEEE, NEMA, ABNT	ISO 9001 / ISO 14001 certified
Applications	Stabilization, inertia, VAr support	HV substations, renewables

CONTAINERIZED SOLUTION

Plug-and-play system for **microgrids** and **industrial applications** and for simple and fast implementation on site. Can be parallelized to increase its power.

KEY SPECIFICATIONS

Parameter	Typical Value / Range	Notes
Rated Reactive Power (MVAR)	1 – 6	Capacitive: up to + 6 MVAR, Inductive: up to -3 MVAR
Operating Voltage (kV)	3 – 13.8	Other voltages available on request
Nominal Frequency (Hz)	50 / 60	Selectable at design stage
Ingress Protection (IP)	IP23 to IP55	According to IEC 60034-5
Inertia Constant (H)	Up to 2.5 s	Project dependent
Subtransient Reactance (X"d)	< 15 %	Based on machine size
Rated Current (A)	Up to 4000 A	Dependent on MVAR and voltage
Short-Circuit Current	Up to 10x rated current	Withstand capacity
Efficiency	≥ 97%	Typical at rated operation
Operating Temperature (°C)	-20°C to +50°C	Other on request
Excitation Type	Brushless	Static on request
Starting System	Pony motor + VFD	Soft-starting options
Cooling Method	Air cooled (IC01) or water cooled (IC8) or Air to Air (IC6)	Application specific
Lubrication System	Forced	Sleeve bearings
Mounting Arrangement	Horizontal	IEC compliant
Soundproof Level	≤ 75 dB (A) @ 1 m	In compliance with ISO 3744
Container Dimensions (Compensator Box)	20 ft (1 MVAR) up to 40 ft (6 MVAR)	Typical layout range
Standards	IEC, IEEE, NEMA, ABNT	ISO 9001 / ISO 14001 certified
Applications	Containerized solutions for grid support. Stabilization, inertia, VAr support.	Flexible and modular. Very fast implementation (turnkey solution). Can be parallelised to increase the total power.

This document is not contractual. According to our continuous product improvement, we reserve the right to change specifications without notice.

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