

An aerial photograph of a large cruise ship docked at a port. The ship is white with blue and yellow accents and has "www.aida.de" written on its side. The port area includes a large glass-fronted building and various other structures. In the background, a city skyline with several tall buildings is visible under a clear blue sky. A smaller boat is moving through the water in the lower right corner, leaving a white wake.

**SIEMENS**

*Ingenuity for life*

# Sustainable power supply for eco-friendly ports

Shore connection power supply  
system for ships: SIHARBOR

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# Totally Integrated Power (TIP)

A reliable, highly available, and flexible power supply for industries as well as buildings and facilities provides the basis for both industrial processes and infrastructure solutions.

Everything from a single source: The perfectly matched medium-voltage systems provide an efficient solution for ports and ships.

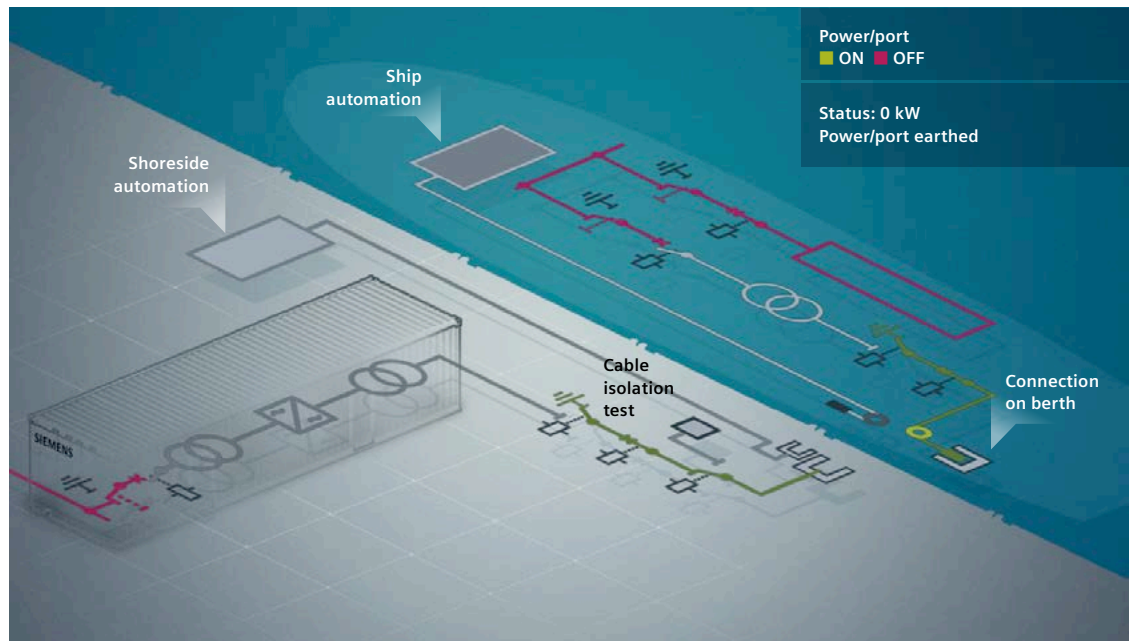
Siemens' solution is Totally Integrated Power (TIP), our comprehensive power supply portfolio of software and hardware products, holistic systems for all voltage levels, as well as energy management solutions. TIP is closely linked to industrial and building automation systems and is integrated into enterprise IT systems.

This allows to fully exploit all the optimization potential of an integrated solution. TIP meets even the toughest requirements of supply-critical assets. An extensive support throughout the entire lifecycle starting with planning up to services completes our offering.

## New challenge in ports

Shipping is booming continuously, and more and more cruise liners are docking at ports. Of course, this implies problems for the port operators, because the ship also has to generate power for onboard equipment, shops and air conditioning when berthed. This means that the diesel generators commonly used on board also have to run permanently in the port. This process generates large amounts of CO<sub>2</sub>, NO<sub>x</sub> and dangerous fine particulate matter. The emissions of a berthed cruise liner can be compared to the environmental pollution of a medium-sized city.

With regard to their own employees and the local residents of the port area, the port operators are determined to cut back the air and noise pollution. With SIHARBOR, Siemens offers a power supply solution with numerous advantages for the respective operators at the ports.



SIPLINK converter system for network applications in a SIHARBOR solution

## Perfectly matched components for maximum efficiency

### Why must the frequency be converted?

In international maritime traffic, around 75% of all ships are equipped with 60 Hz networks.

However, only 25% of the countries operate their power grids with this frequency.

Therefore, the onshore frequency must be adjusted to the onboard frequency in 75% of the countries. With the SIPLINK converter system and the SINAMICS SM120 CM converters, ships operating at 50 Hz and at 60 Hz can be supplied.

### For all voltages and frequencies

With its modular concept, the system is perfectly adapted to all required power ratings, voltages and frequencies. SIHARBOR uses an isolating transformer to galvanically isolate the ship's network from the onshore power grid and other ship networks.

### SIPLINK: Siemens Power Link

SIPLINK is a converter system adapted for network applications. It can connect two or more medium-voltage AC networks with different voltages, phase angles and frequencies. With SIPLINK, the voltage is adjusted by transformer tap changing and by modification of the converter output voltage. Thus, any required transfer voltage to the ship can be implemented.

### Compact converter solution with high efficiency

The system comprises a variable frequency converter, the control system and the HMI (Human-Machine Interface). The perfectly matched components provide an efficient solution for ports and ships.

# SINAMICS SM120 CM – The reliable medium-voltage converter for frequency conversion

## SINAMICS SM120 CM (cabinet modules)

The SIPLINK system is based on the universally applicable SINAMICS converter family. By means of the M2C topology, the medium-voltage converter SINAMICS SM120 CM generates a sinusoidal voltage in many small steps. In this way, the output current attains a perfectly sinusoidal wave form, and in many situations no further filtering is required.

The SINAMICS SM120 CM medium-voltage converter is the modular system for applications with special requirements. A wide range of matching components and functions enables the implementation of project-specific solutions.

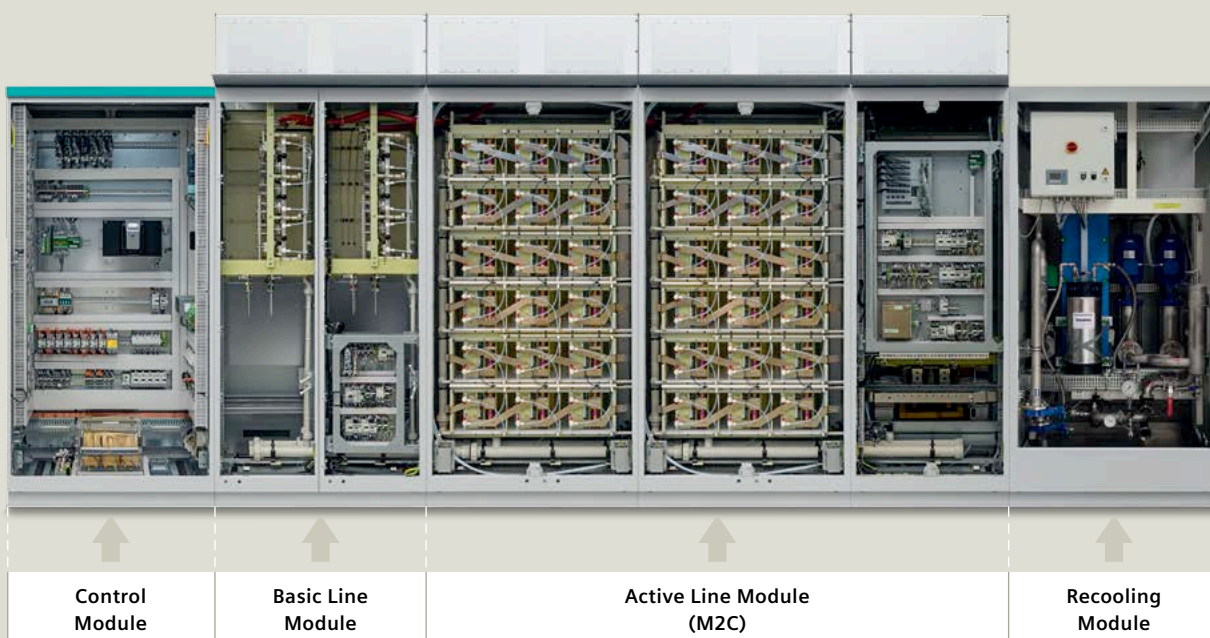
SINAMICS SM120 CM (cabinet modules) with a multi-level active line module ensures an excellent performance while feeding power into the grid. The converter is commonly used, apart from shore connections, in testing facilities and in applications of the marine, energy, mining, and steel industry.

The modular SINAMICS SM120 CM system combines topologies that have been proven time and again, and have successfully been in operation for several years.

## Your benefit

- Higher overall efficiency and reduced space requirements compared to conventional two-point low-voltage solutions
- Cable lengths with up to 1000 m possible – due to the sinusoidal output voltage of the M2C technology
- Low network feedback – due to the selectable diode infeed (12-, 18-, 24-, 36-pulse)
- Support of selective clearance of short-circuits by overcurrent supply of the M2C-ALM

Medium-voltage converter SINAMICS SM120 CM (cabinet modules)





# Comprehensive solution with SIHARBOR



Quick and easy connection to the ship via the cable management system

## Power supply from the public grid – Reliable and clean

SIHARBOR enables the ships to get power from the onshore power grid when berthed, so that it will not be necessary to operate the diesel generators commonly used on board. Thus, SIHARBOR provides numerous benefits not only for port operators, but also for ship owners, local residents, and the port staff.

## Safe and easy operation

In order to eliminate the residual risk of arcing in the plug-in connection, the cable connection to the ship is tested at rated voltage with low power before being connected. On a higher level, the SIMATIC S7 control unit with operator panel monitors the state of the whole SIHARBOR system centrally. Thereby, all relevant messages and data can be indicated, and all operating and safety functions can be selected. The control unit ensures that

only permissible switching operations according to IEC/ISO/IEEE 80005 are executed. The personnel who operates the plug-in connection on shore and on board is protected by generally double electrical interlocks. Protection is ensured both by the software and by the hardware, independently of each other. The whole shore connection system can be remotely controlled from the ship without additional qualified personnel.

## Everything from a single source

On request, SIHARBOR can be designed as a turnkey solution, from planning through system integration (with all LV and MV products and switchgear for connection to the grid) up to commissioning and service. The system can optionally be installed in a container or in already existing buildings.

## Your benefit

- **For ships:** Reduction of maintenance costs and fuel consumption of the diesel generators in the port. Discounts for ships using the shore connection power supply system
- **For ports:** New business opportunities for the port operator by providing power supply for ships
- **For local residents and the port staff:** Improved quality of life by reduction of emissions, noise and vibrations

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Energy Management  
Mozartstrasse 31 c  
91052 Erlangen, Germany

[www.siemens.com/siharbor](http://www.siemens.com/siharbor)

For more information, please contact  
our Customer Support Center.

Phone: +49 180 524 70 00

Fax: +49 180 524 24 71

(Charges depending on provider)

E-mail: [support.energy@siemens.com](mailto:support.energy@siemens.com)

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