

Completely Integrated Solutions
for Vessels

SISHIP^{CIS} Fuel Cell Air

Low temperature fuel cells:
zero-emission energy production
for passenger and cargo ships

Your Success is Our Goal

SIEMENS

Industrial Solutions and Services

SISHIP^{CIS} Fuel Cell Air installations are capable of producing electricity from hydrogen and air at zero-emission. In the process, they achieve an even higher degree of efficiency than comparable conventional internal combustion engines. The containerized installations are transportable and can be variably operated both on land as well as on ships. During energy production, only water and heat are generated.

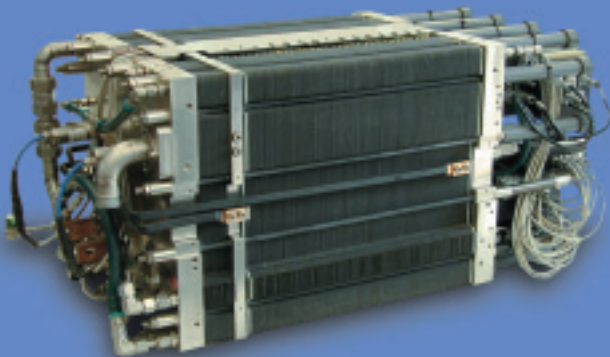
SISHIP^{CIS} Fuel Cell Air – Powerful and environmentally friendly

In light of the high contamination level of many seas, the environmental aspect plays an increasingly important role in the shipping industry. This issue is not limited to only polluted harbor areas or the transport of hazardous wastes, but also a question of the “cleanest” energy production method possible.

Low temperature fuel cells that utilize hydrogen as an energy production fuel produce no pollutants as an end product, but rather only water and heat. They are quickly activated and have excellent dynamic properties.

The advantages of SISHIP^{CIS} Fuel Cell Air at a glance

- Zero-emission energy production using hydrogen and air
- Low noise signature and zero vibrations
- Good degree of efficiency compared to a conventional combination of internal combustion engine and generator
- Containerized, Plug & Play solutions, tailored to individual customer needs
- Containerized, transportable installations enable utilization at various locations/ships
- GL licensed for operation on ships and TÜV certified for operation on land

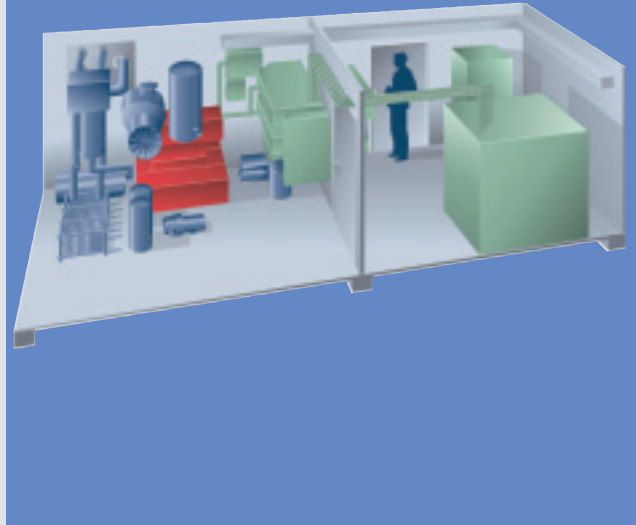


SISHIP^{CIS} Fuel Cell Air – Our solution in detail

SISHIP^{CIS} Fuel Cell Air modules enable the set-up of a local zero-emission fuel cell installation that generates electrical energy and emits only pure water and heat. The installation comprises all procedural components, including gas treatment (e.g. air filtering and humidification), water management (cooling water supply and disposal, the connection between the internal and external installation cooling circuit via a water/water heat interchanger and the fully automatic control system.

The control system assumes all procedural control processes that are necessary during activation/deactivation and operation of the installation with respective load steps. In addition, it assumes the internal installation security monitoring, particularly at the fuel cell level, whereby operational anomalies are immediately identified, and the installation can be shut down safely in the event of a system failure. Upon request, redundantly designed control hardware with a watchdog function identifies hardware problems of the control system and also shuts the installation down safely. If needed, a display screen provides information on the process flow. Hydrogen sensors in the installation ensure that no unusually high hydrogen concentrations can occur. In the event of a failure, the installation is switched to a safe mode. A DC/AC inverter converts the direct current into a network compliant alternating current.

A hydrogen and electrical connection for the energy production at start-up, and for the network feed form the interfaces to the outside. Depending on the inverter utilized, varying networks can be fed. The fuel cell installation is customarily provided with a water-cooled system, or, as an alternative, with air-cooling.



Depending on the system design, the installation can be redundantly configured for energy so that should an individual fuel cell module fail, the installation can continue to be operated at full performance.

The installation is customarily delivered preinstalled in a container. The fuel cell installation is thereby immediately transportable, and can be utilized at various locations, or retrofitted on existing ships. It is, however, also possible to integrate the components individually in a ship.

Depending on the availability of hydrogen, the installation can also be operated continuously.

More efficient and comfortable than internal combustion engines

The fuel cells, running on pure hydrogen, convert the chemical energy at a higher level of electrical efficiency than with a comparable internal combustion engine and connected generator. The quiet, vibration-free operation is yet another advantage in terms of utilization.

Long-term test series indicate a life span expectancy of fuel cells of several years if the prescribed operating conditions are adhered to. The first customer order with an output of 160 kW is currently being realized.

www.siemens.com/marine

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CIS = Completely Integrated Solutions*

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SISHIP^{CIS} – Completely Integrated Solutions for Vessels

As a comprehensive industry-specific solution for seagoing vessels, our SISHIP^{CIS} product family integrates all the products and services you need for sustained maximization of your ship's performance.

For each particular task, a solution has been defined that

- horizontally improves all of your ship's operations
- vertically integrates the ship's information and security management end-to-end, helping to make better-founded decisions
- and, at the same time, is designed for optimal vessel specific maintenance and comes with assured further development over the whole life cycle

Due to this unique combination of horizontal, vertical and life cycle dimensions, our solutions all carry the genes of an exhaustive and sustained plant productivity in their very core.

For More Efficiency. More Performance. More Power.
Completely Integrated Solutions from Siemens.