Enabling the shore-to-ship power connection
Static frequency converters

ABB static frequency converters are an economic and efficient solution to convert the grid electricity to the appropriate load frequency.

Enabling the connection
ABB medium voltage and low voltage static frequency converters utilize ABB’s modular converter design providing highly reliable, clean and efficient power conversion. ABB static frequency converters are internally configured as an arrangement of modular rectifiers and inverters controlled by a power electronic controller. The converters produce sine wave voltage to supply the output load.

Shore-to-ship power
Shore-to-ship power helps to reduce polluting emissions, noise and vibration in ports by connecting vessels to the port electricity grid and allowing them to shut down the onboard power generation units while at berth. Since most ships operate with 60 Hz electricity whereas local grid in most parts of the world is 50 Hz, ABB static frequency converters help to adjust the grid electricity to the appropriate ship frequency and are a viable solution in replacing vintage rotating frequency converters (motor/generator set).

Features
- Industrial design
- Two or four quadrants operation
- Selectable frequency setting (50 Hz to 60 Hz or vice versa)
- Scalable solutions ranging from 0.1 up to 27 MVA (*)
- High efficiency also under partial-load conditions
- Optimized footprint (high power density permits compact design)
- High availability (high reliability, low maintenance, proven service concept with 24/365 support, remote diagnosis)

User benefits
- Full range of solution spanning from Low Voltage to Medium Voltage frequency converter to cover all application segments and customer needs
- Flexibility of choice between one-to-one connection or centralized frequency conversion serving multiple vessels
- Optimized CAPEX (lower cost/MVA)
- Optimized cost of ownership and maintenance
- Full integration in ABB’s pre-engineered solutions minimizes overall project risks and costs.

(*) higher power available when paralleling multiple converters
ACS6000 SFC [5-27 MVA]

ACS6000 converters utilize the proven high performance IGCT (Integrated Gate Commutated Thyristor) power switching devices. ACS6000 SFC converters are highly efficient even at partial load. Highest safety levels for personnel as well as high reliability through well proven design ensure best operations and easy maintenance.

Input
- Typical input voltage: 6..132 kV
- Frequency: 50 / 60 Hz
- Input section: 12/24 pulse diode bridge /active rectifier
- Total harmonics distortion: According to IEC61000-2-4

Output
- Typical ship voltage: 6.6 kV / 11 kV
- Frequency: 60 / 50 Hz
- Output section: IGCT voltage source converter
- Converter voltage: 2.7-3 kVac
- Total harmonics distortion: According to IEC/ISO/IEEE 80005-1
- Conversion efficiency: >98%
- Short circuit limit: depending on nominal power and model

Environmental
- Operation temperature: + 5°C ... 32°C standard/no derating (c)
- Humidity: < 95% non-condensing
- EMC emissions: IEC 61000-2-2, IEC 61000-2-4, IEC 61000-6-2

Mechanical
- Enclosure: IP 32/42/54 indoor cabinet or outdoor container
- Cooling: Closed loop liquid cooling
- Standard color: RAL 7035

Interface
- Control interface: Hardwired, Modbus-TCP, Anybus S, Human Machine Interface

Service
- 24/365 service support expert, remote access and diagnosis optional
- Worldwide service and spare parts network

Model ratings and dimensions

<table>
<thead>
<tr>
<th>ID Type</th>
<th>Configuration Name</th>
<th>Max continuous output power (MVA)</th>
<th>Overload capability [10 sec]</th>
<th>Short circuit limit [1 sec]</th>
<th>Interface</th>
<th>Maximum Heat Loss [kW]</th>
<th>Dimension WxDxH [mm]</th>
<th>Weight [kg]</th>
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Parallel load sharing allows operation of multiple ACS6000 SFC.

* Input transformer is required for grid voltage adaptation
* Depending on the model
* Standard environmental conditions and maximum preload equal to 70% apply. Use of chiller can reduce derating at higher temperatures.
PCS100 SFC [0.1 – 2 MVA]

PCS100 converters utilize the latest high performance Insulated Gate Bipolar Transistor (IGBT) power switching devices controlled by a micro controller.

PCS100 SFC comes with an advanced redundancy feature, which allows the operation at reduced power in case of single module fault.

### Input

- **Typical grid voltage**: 0.4 - 30 kV
- **Frequency**: 50 / 60 Hz
- **Input section**: IGBT voltage source converter
- **Converter voltage**: 200 - 480 VAC
- **Total harmonics distortion**: < 3% THDi (at rated load)

### Output

- **Typical ship voltage**: LV (up to 690), MV (6.6 kV)
- **Frequency**: 60 / 50 Hz
- **Output section**: IGCT voltage source converter
- **Converter voltage**: 400 - 480 VAC
- **Total harmonics distortion**: 2.5 THDi (linear load)
- **Efficiency**: 95% typical
- **Max overload capability**: 30 seconds 150%
- **Short circuit limit**: 2 seconds 200%

### Mechanical

- **Enclosure**: IP 20 or IP 42
- **Cooling**: Forced ventilation
- **Standard color**: RAL 7035

### Interface

- **User interface**: Graphic display module touch panel, notebook connection
- **Control protocol**: Ethernet, Modbus-TCP, dry contacts

### Environmental

- **Operation temperature**: 5°C - 40°C standard/no derating (c)
- **Humidity**: < 95% non-condensing
- **EMC emissions**: IEC 61000-2-2, IEC 61000-2-4, IEC 61000-6-2

### Standards and norms compliance

- Designed to CE mark requirements

### Service

- 24/365 service support expert, remote access and diagnosis optional
- Worldwide service and spare parts network

### Model ratings and dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Nominal rating (c)</th>
<th>Converter output continuous power kVA</th>
<th>Current rating</th>
<th>Dimensions WxDxH [m]</th>
<th>Weight [kg]</th>
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Parallel load sharing allows operation of multiple PCS100 SFC.

- **a** Specific voltage levels can be achieved by means of a step-down transformer
- **b** Dimensions are for side-by-side configuration. Back to back configuration dimensions will vary; i.e. 2 x 2MVA converters deliver up to 4MVA power. For IP 23 add 0.1 m depth
- **c** Standard environmental conditions apply. Current rating refers to 480 Vac