



POWER FOR SHIPS and NAVAL BASES

Frequency converters, "Shore Power" for Ships.

50Hz, 60Hz and 400Hz three phase and single phase

There is a growing world focus on energy conservation with the drive towards reducing the now familiar "carbon footprint", add to this the exhaust noise disturbance, smoke and air pollution from internal combustion engines all contributing to the "global warming" effect on the ozone layer.

The maritime community is also taking this subject seriously with the Government Agencies, shipping companies, cruise lines, car ferry ports, Naval dockyards, Harbours and Marina operators are actively seeking alternative ways of providing shore side power for the vessels when they berth at port.

Some background

There are an increasing number of luxury cruise liners and fast car carrying vessels calling at international ports and there are more visiting Navy vessels berthing at foreign locations.

When a vessel berths in a port the propulsion engines are turned off but normally its diesel engine driven generators would continue to run to provide power for all of the on board "auxiliaries" such as air conditioning, heating, lighting, battery charging, communications centre, computers, navigation system, water pumps and other utility services.

The diesel generators produce noise, vibration, exhaust smoke, air pollution, toxic gases, CO₂ emissions they also require bulk fuel storage and consume vast amounts of (smelly) diesel fuel, and incur costly maintenance and the inevitable need for replacement parts as necessary for all internal combustion engines. Add to these factors the ever escalating fuel bill costs the continued use of the diesel generator for this duty has become a significant liability.

Many of the Marinas, Ports and Harbour operators are now offering visiting vessels the opportunity to "plug into" the local city power supply grid at dockside power distribution points so the on board diesel engine generators can be turned off while the vessel is in port.

Here is the problem. Many countries have their own local power grid distribution voltages, the American continent also has a frequency of 60Hz whereas most other countries of the world have a power distribution frequency of 50Hz. The Power Systems International "SHORE POWER" frequency converters are a cost effective means of providing "point of use" power on the dockside or "on board" for all types of ships, yachts, vehicle ferries or Naval Vessels enabling them to connect to any shore power service in the World!

On board "SHORE POWER" frequency converters.

When the on board "SHORE POWER" converter is connected to the dockside power source service point, the frequency converter will automatically adjust to the local voltage and frequency and deliver to the Vessel a high stability and galvanically isolated power supply. The "SHORE POWER" frequency converters can also be provided with batteries to provide an uninterruptible power supply feature to cover any disturbances and power failures in the dockside service power.

Our "SHORE POWER" frequency converter will allow the shutting down of the vessel's engine driven auxiliary power generators, there would then be barely any audible noise to disturb passengers or neighbouring vessel or on board personnel, no vibration smoke or fumes or smell, no CO₂ emissions, no costly additional diesel fuel or oil bills.

Our on board "SHORE POWER" frequency converters are available in sizes from 25kVA to 150kVA with three phase 50Hz or 60Hz output. The single phase 50Hz or 60Hz output frequency converters are available in sizes up to 50kVA.

The "SHORE POWER" converters are suitable for installation on board vessels of all types providing them with a possibility to connect to any shore based power supply anywhere in the world



Fixed installation "SHORE POWER" frequency converters.



Our fixed "SHORE POWER" frequency converters are designed for use on the dockside public supply grid networks of 50Hz or 60Hz with 3 phase standard input voltages of 208V, 380V, 400V, 460V or 575V. The output voltage and frequency will be according to the needs of the ship.

The shore to ship frequency converters are manufactured in sizes of 50kVA to 400kVA in an indoors type of enclosure IP23 or IP31 for installation in a sub-station or power distribution room. The shore to ship frequency converters are also manufactured in an all-weather IP54 outdoor enclosure for installing on the dockside or mooring berth. The "SHORE POWER" frequency converters provide a galvanic isolation between dockside shore power pick up point and the on board vessel power distribution system.

Military and custom engineered "SHORE POWER" converters.

Custom engineered versions of the "SHORE POWER" converters are designed and manufactured to Military and customer specifications with 50Hz, 60Hz and 400Hz outputs and with integral batteries for provide a secure and isolated uninterruptible power supply for critical duty, submarine, Naval and Defence related applications.

We can also provide the "SHORE POWER" converters with DC output or as a combination converter with AC and DC output. The power converters can be designed for installing on board ships, mobile rough terrain vehicles, trailer or for permanent fixed installations.



Cables, cable stowage and reeling systems for "SHORE POWER" converters.

We can also supply the "SHORE POWER" frequency converters with input and output cable, cable stowage, reeling systems and distribution systems for the fixed shore to ship power converters.



Figure 1

SHORE POWER mobile Cable Reeler



Figure 2

SHORE POWER distribution unit

"SHORE POWER" Technical details:

The "SHORE POWER" frequency converters up to 250kVA are available for installation on board all types of Super-yachts, Cruise Liners, passenger ships, Vehicle ferries, Navy vessels and Coastguard fast patrol and search & rescue boats.

Outdoor all weather versions of SHORE POWER frequency converters are available in sizes of 50kVA to 400kVA for connection to the local power supply Grid or dockside power source. These frequency converters are for installation on the dockside or Marina jetty to provide a galvanically isolated precisely regulated voltage and frequency to suit the service requirement of the user.

The Power Systems International SHORE POWER frequency converters have integral isolation transformers, and can accept three phase input voltages of 200V to 600V, 50Hz or 60Hz, the rectifier converts the AC input to DC and the PWM high performance IGBT inverters convert the DC back to high stability, precise 3 phase and neutral, 50Hz or 60Hz at voltages of 208V, 380V, 400V, 460V or 575V.

The on-board version of the SHORE POWER frequency converter provides for the Yachting community a power converter that will enable them to connect to the shore power in any marina or dockside power source in the world.

Power Systems International "SHORE POWER" frequency converters provide the user with a secure power supply which isolates the vessel from any power line disturbances present on the public power network.

The output of the converter also isolates and protects the on board electrical and electronic equipment from the damaging effects of harmonic distortion spikes, voltage dips, surges often present in dockside power supplies.

Features:

- Three phase power capacities from 50kVA to 400kVA
- Single phase power capacities from 10kVA to 50kVA
- Input voltage range 350V to 500V 50Hz, 60Hz or 200V 3 phase for 400Hz,
- Transient voltage suppression and lightning protection
- Output voltages from 208V to 575V three phase
- Output voltages 115V and 230V single phase and neutral
- Output frequency, 50Hz, 60Hz or 400Hz
- Enclosure ingress protection, IP23 or IP31 indoors, IP54 outdoors
- Analogue and digital metering

- Sine wave output
- Electronic and current limit protection
- Input and output circuit breakers
- Emergency power off (EPO)
- Diagnostics and event logging
- Remote status indication interface

Specification for "SHORE POWER" frequency converters.

Basic 3 phase "SHORE POWER" frequency converter.

The shore power frequency converter comprises three stages, an optional input module with auto voltage and frequency selector and transformer. The standard frequency converter has a rectification stage to convert the AC to DC and an inverter stage for converting the DC back to AC.

Input

Standard 3 phase voltages:	380V, 400V, 415V, 460V, 480V and 575V
Input stage:(Option)	350V to 575V automatic voltage range selection input module
Standard frequency:	50Hz or 60Hz
Frequency range:	40Hz to 70Hz
Power factor:	0.95 lagging
Inrush current:	In. x 0.5 to 1.5 depending on size
Protection:	voltage, current monitoring with electronic protection.
Operational Environment:	Temperature range from -10C to +50C
Humidity:	to 95% non-condensing.

Output

Standard sizes:	50kVA to 400kVA
Rating:	Continuously rated at 0.85 power factor.
Waveform:	Sinusoidal < +/-2% distortion
Overload permitted:	Motor starting peak In.x 6, In.x 2 for 30 seconds, In.x1.5 for 1 minute, In.x 1.1 for 10 minutes all depending on operating temperature and duty cycle.
Voltage:	220V, 380V, 400V, 460V, 480V and 575V standard voltages, 3 phase 3 wire delta or 3 phase 4 wire star connected with neutral and earth.
Voltage regulation:	+/-1%
Frequency:	50Hz, 60Hz or 400Hz
Frequency regulation:	>1%
Harmonic distortion:	<2% with linear load connected.
Load non linearity:	Permitted <3:1 crest factor
Phase imbalance:	Up to 50% within the voltage limits
Efficiency:	>93% at full load, depending on size
Protection:	voltage, current, frequency, short circuit and temperature

Mechanical and General

Ingress protection:	Indoors IP23, IP31 standard, outdoors all weather IP54
Construction:	Press formed, folded and stiffened passive plated steel structure frame and base and painted. Top, base frame, doors and removable exterior panels press formed from rust inhibited sheet steel primed and painted in two part resin light textured finish, colour RAL 9010 as standard.
Ventilation and cooling:	Fans are fitted to the heat sinks of the electronic power assemblies with additional fans to extract the air from the enclosure.
Features;	Supplied as a basic frequency converter for specific voltages and frequencies or with the optional multi voltage and dual frequency input module.
Metering:	Analogue metering of input and output voltage, current and frequency. Digital metering is available as an option with analogue instruments as supplementary metering
Controls:	On/Off output, On/Off input, emergency power off (EPO). Input isolator, output isolator, push buttons
Indicators:	On, alarm, fault,

Optional features:	Data logger event recorder, diagnostics data, remote communications data interface card, generator/converter seamless power transfer module, output load disconnect MCB, input stage MCB, mimic power status and alarm panel. Automatic input voltage selector module to cover for 350V to 575V 3 phase power sources.
Audible noise level:	Depending on size, between 60dBA and 65dBA measured at 1 metre and 1.8 metres from the floor level.

**DIMENSIONS of basic unit in IP23 enclosure:
(excluding the input selector module)**

Power capacity kVA	Width mm	Height mm	Depth mm	Weight mm
50	800	1200	500	480
60	800	1200	600	560
80	1000	1400	600	660
100	1200	1600	600	800
125	1200	1800	600	920
150	1200	1800	800	980
180	1600	1800	800	1020
250	1600	1800	800	1035
300	1800	1900	950	1250
400	1800	1900	950	1350

The base plinth for bolting the converter to the deck is 150mm high.

The dimensions are based on the basic converter design in IP23 enclosure with input and output of 380V, 400V or 415 volts 50Hz or 60Hz.

The actual final dimensions could differ from those shown above and confirmation should be sought at the request for quotation stage when all required options, features and ingress protection should be clearly stated.

The (optional) automatic input voltage selector module dimensions are not included in the above table

IMPORTANT advantages of using our “SHORE POWER” frequency converters

Shore power is often provided by dockside diesel engine driven generators or from public power supply grid network. The diesel generators produce smoke, fumes, noise, toxic smells, vibration and require fuel storage facilities, frequent maintenance and replacement parts. They also need storage batteries for starting and are often subject to neglect and misuse. The rising cost of diesel fuel is a major consideration and can no longer be ignored.

Our “SHORE POWER” frequency converters have distinct advantages

- Little audible noise
- No vibration
- Maintenance inspection once a year
- Simple fault diagnostics
- Repairs can be made quickly by the user
- No mechanical parts to wear out
- 20 years design life
- Isolation from external power disturbances.
- No combustion smells
- No fuel to spill
- No smoke
- No pollution
- No harmful emissions
- No fuel storage

"SHORE POWER" Frequency converter pictures



Figure 3

100kVA on board SHORE POWER frequency converter with digital metering



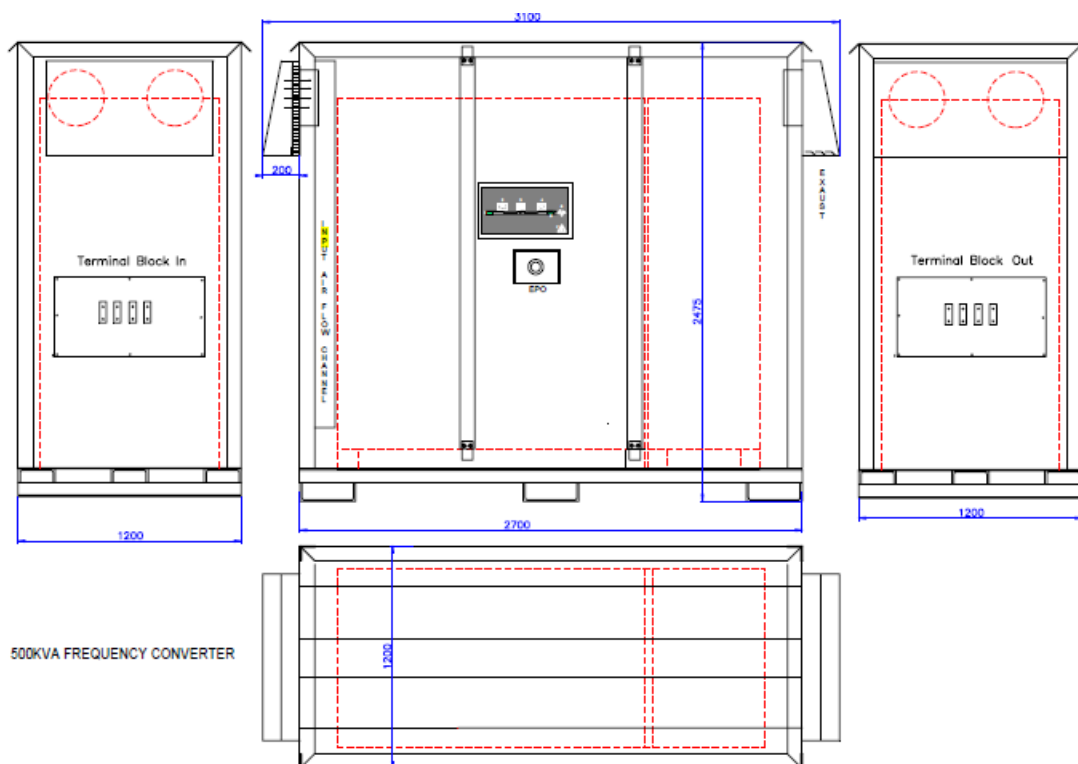
Figure 4

100kVA outdoor fixed installation SHORE POWER frequency converter



Figure 5

150kVA on board SHORE POWER frequency converter with auto input select module and mimic features



Typical construction of IP54 outdoor version 500kVA "Shore Power" frequency converter



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