

UNMATCHED TESTING CAPABILITIES



Our Large Drive Test Center (LDTC) provides full-load testing capabilities for electric machines and drives up to 18 MW. String testing with the customer's frequency converters is also possible on request.



Lappeenranta Large Drive Test Center – Finland

Full-load testing capability for electric machines and drives up to 18 MW

Vaasa test center – Finland

Electric machine full-power testing over 10 MW. DC-Hub testing, including applications such as active front end (AFE), motor inverter and DC/DC. Full-power testing of drives over 3 MW

Heiane test center – Norway

Member of the Energy House. System integration testing for DC-Hubs with batteries, fuel cells and more

All tests fulfill international standards and class requirements.



www.theswitch.com

The Switch is part of the BEMAC Group
whose products are unified under the BEMAC brand.

DRIVE-SPECIFIC TESTING AVAILABLE

The Switch offers full-power testing and drive-specific test setups at its various locations in Finland, Norway and China.

All tests fulfill international standards and class requirements.



Heiane test center – Norway

Member of the Energy House. System integration testing for DC-Hubs with batteries, fuel cells and more



Vaasa test center – Finland

DC-Hub testing, including all applications – AFE MI, DC/DC. Full-power testing over 3 MW



Lappeenranta Large Drive Test Center – Finland

Full-load testing capability for electrical machines and drives up to 18 MW

THE SWITCH LOCATIONS

Finland

Helsinki, office
Lappeenranta, factory
Vaasa, factory

Norway

Stord, factory
Trondheim, office

China

Beijing, branch office
Lu'an, workshop
Nanjing, branch office and partner factory

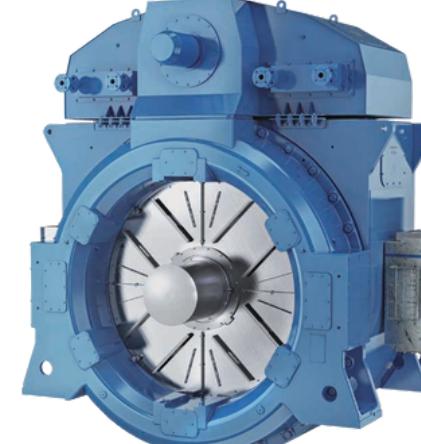
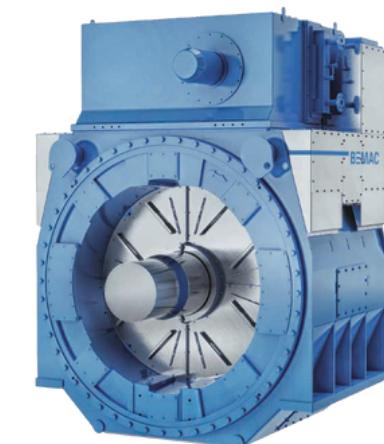
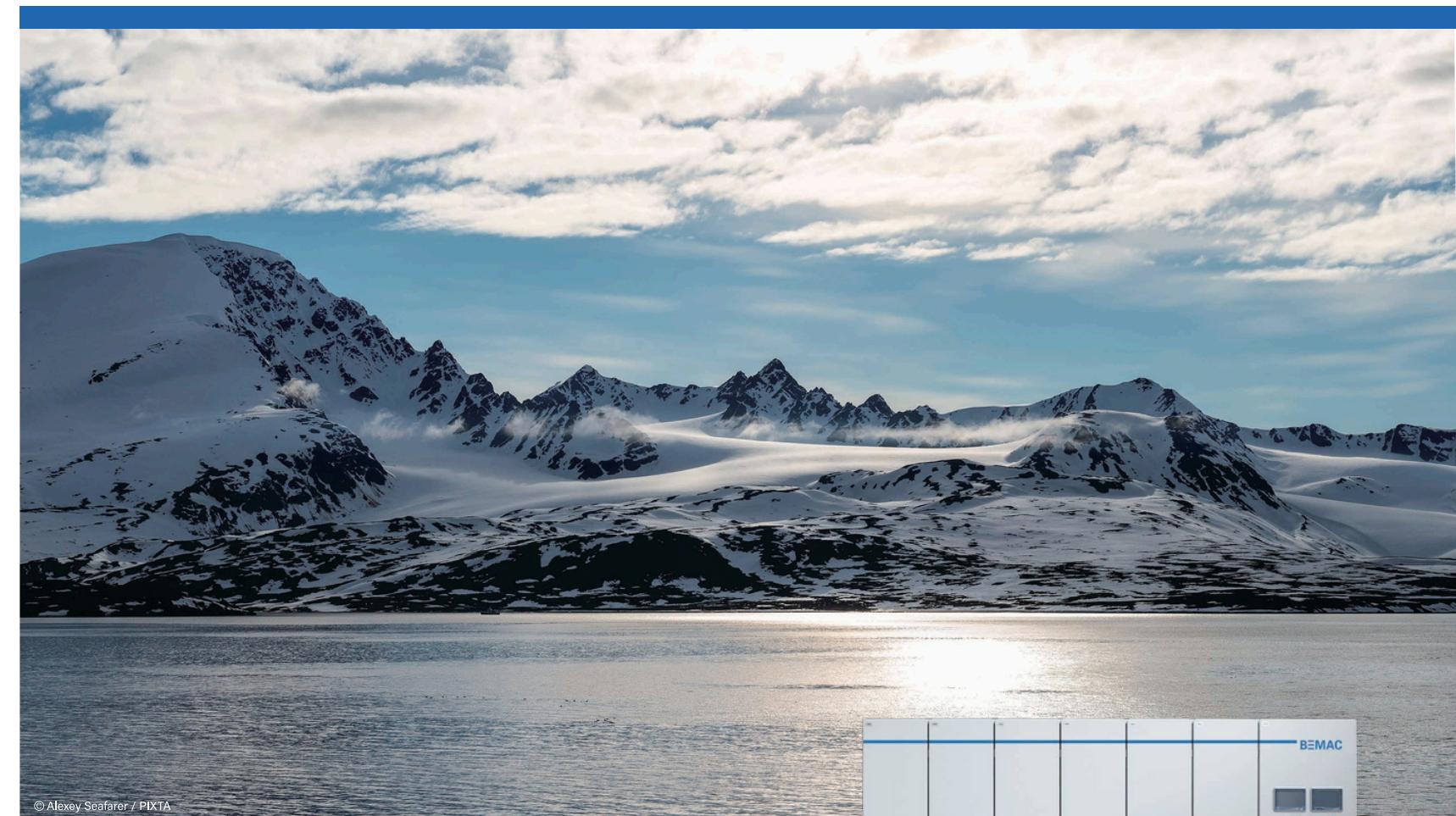
Japan

Imabari, BEMAC head office

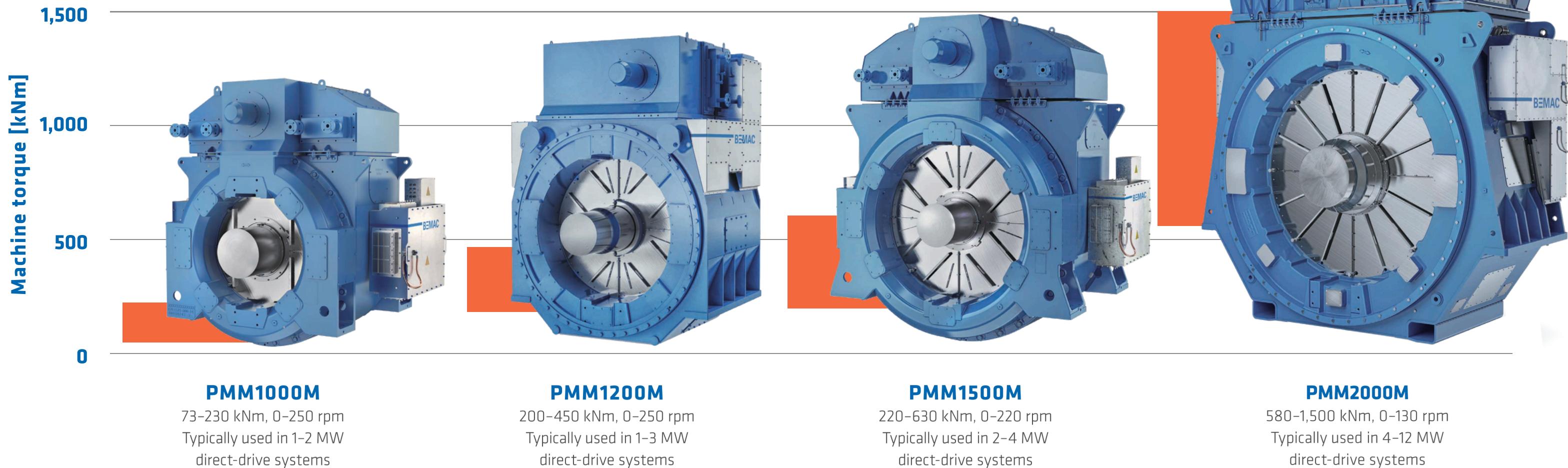
THE SWITCH MARINE PRODUCTS



- Permanent magnet machines
- Single drives
- DC-Hubs for multi-megawatt DC switchboards



WIDEST RANGE OF PERMANENT MAGNET (PM) MARINE MACHINES AVAILABLE



Our wide range of PM machines improves overall efficiency for propulsion and on-board electricity generation, reducing CO₂ emissions and operating expenses.



Permanent magnet technology

- Magnetic field created by strong Neodymium magnets
- Lossless excitation, ensuring maximum efficiency. This results in reduced fuel costs and lower emissions
- Extremely simple mechanical construction, resulting in high reliability and minimal maintenance need
- Form-wound stator with vacuum pressure impregnation (VPI)
- High power density, resulting in a compact design
- Based on over 2 decades of The Switch experience from MW-class PM machines for wind and marine applications
- Tailored to the customer's application
- Several million cumulative operating hours from marine
- Unlike electrically excited synchronous generators (EESGs), PM machines are type-tested at full power before delivery
- Testing with third-party drives is also possible
- No need to replace magnets during the entire lifetime

INLINE SHAFT GENERATORS

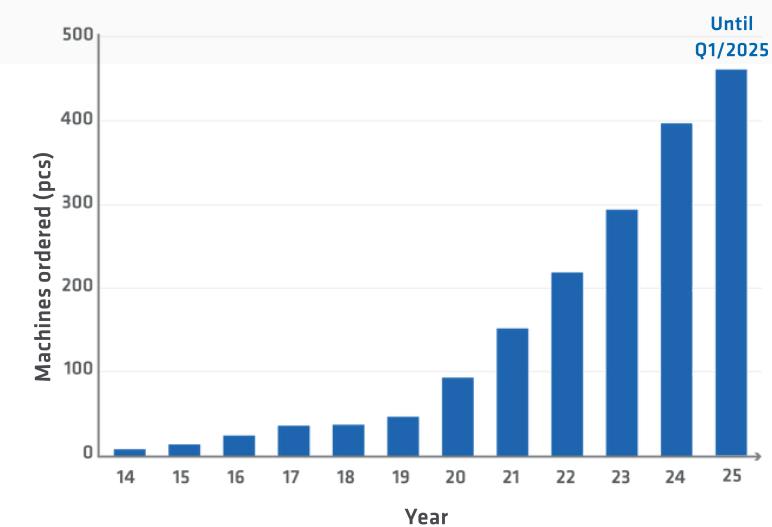
We were the first to deliver a megawatt-class PM shaft generator in 2015. Since then, over 450 of these machines have been sold, with cumulative operating hours exceeding several million. Today, PM shaft generators have become a standard solution in large ocean-going vessels, simplifying their compliance with IMO regulations.



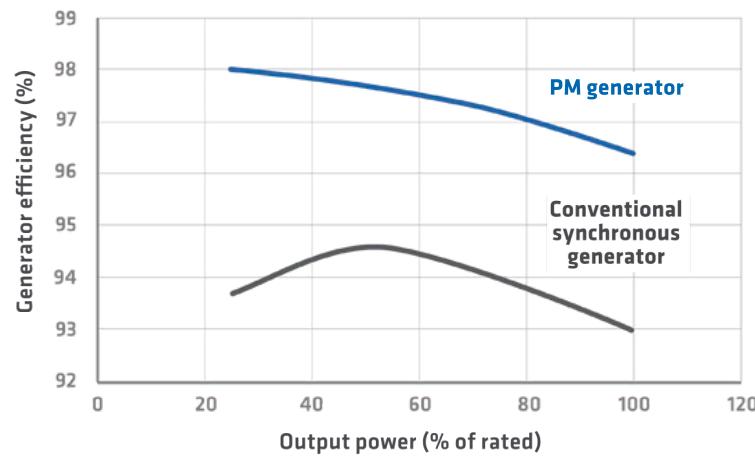
Why choose The Switch PM shaft generator

- Significant fuel savings when electric power is produced by utilizing the vessel's 2-stroke main engine
- Permanent magnet technology further reduces emissions and fuel costs
- Minimal need for maintenance as gensets can stay shut down most of the time
- Possibility for PTI and PTH functions, allowing boost mode or emission-free maneuvering in port areas using batteries
- More space for cargo due to a more compact machine
- Reduced EU carbon tax due to lower emissions
- Minimized project risk with full-power testing of the machine at our factory
- Proven technology with several million cumulative operating hours
- Our machine is always tailored to the customer's system, with flexibility for design changes

Cumulative marine machine orders



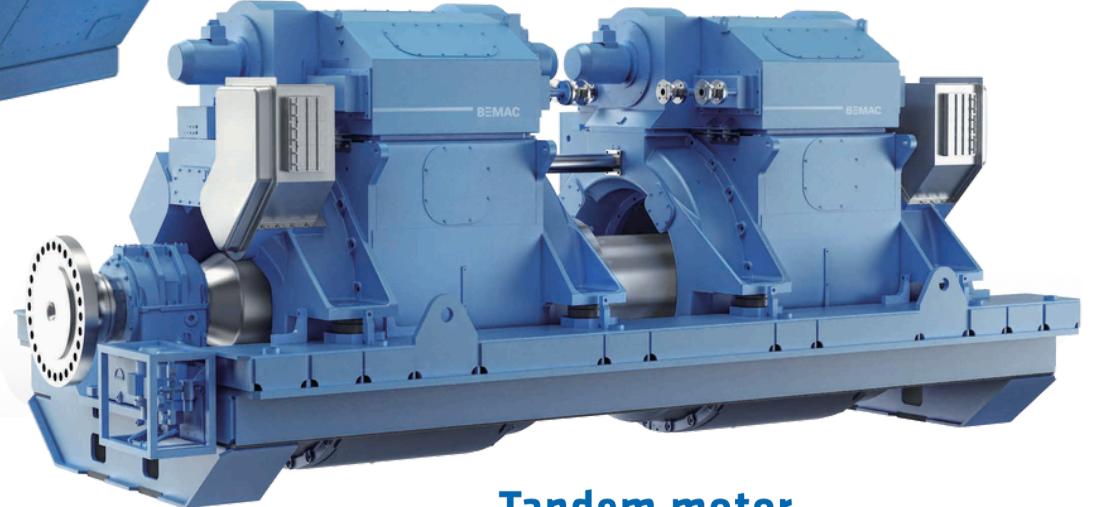
Efficiency comparison



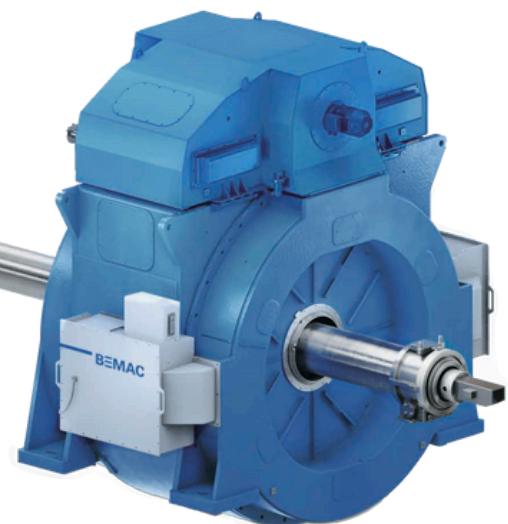
DIRECT-DRIVE PROPULSION



Single motor with bearings



Tandem motor with bearings



Single motor with the shaft and bearings provided by the yard or system integrator

Compact tandem motor

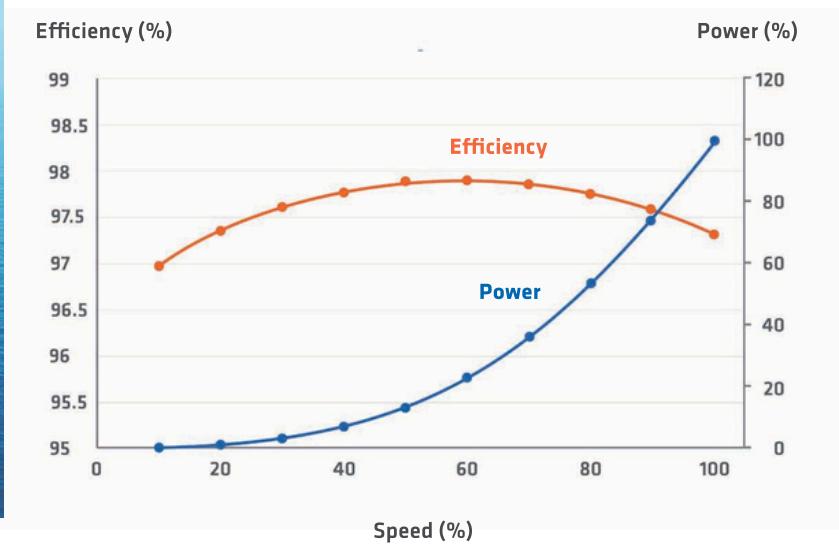
Why choose The Switch PM propulsion motor

- Three different concepts depending on the customer's propulsion line design and redundancy requirements
- The tandem concept for single-screw vessels allows operation with over 50% power in case of motor failure, significantly increasing the system's redundancy
- The motors can also be used in silent applications, such as DNV Silent classes
- Bearings and the shaft are designed together with the ship designer to ensure compatibility, avoid resonances and more
- Extensive product portfolio ranging from below 1 MW to over 12 MW

M/S Nukumi with two The Switch PMM1500M propulsion motors

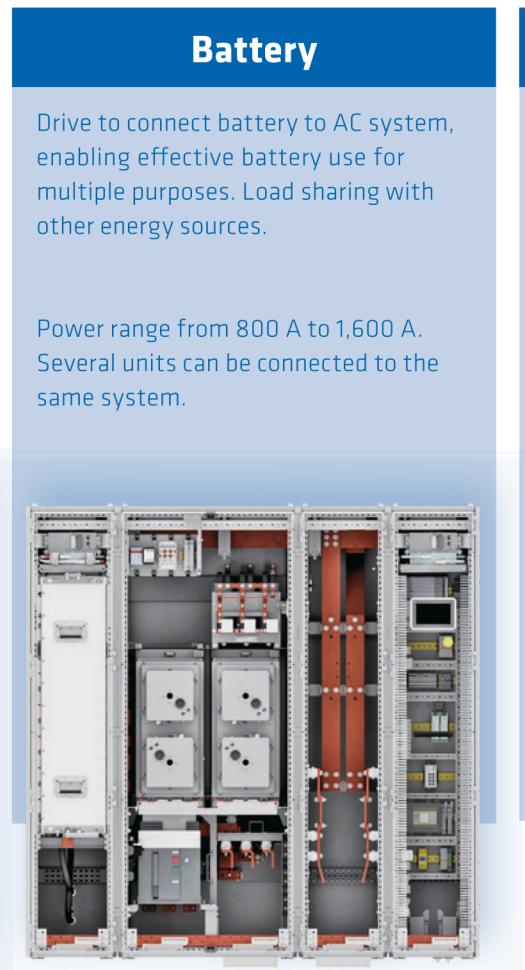


Typical efficiency of a 5 MW direct-drive PM propulsion motor



STANDARD DRIVE FOR SPECIFIC MARINE APPLICATIONS UP TO 6 MW

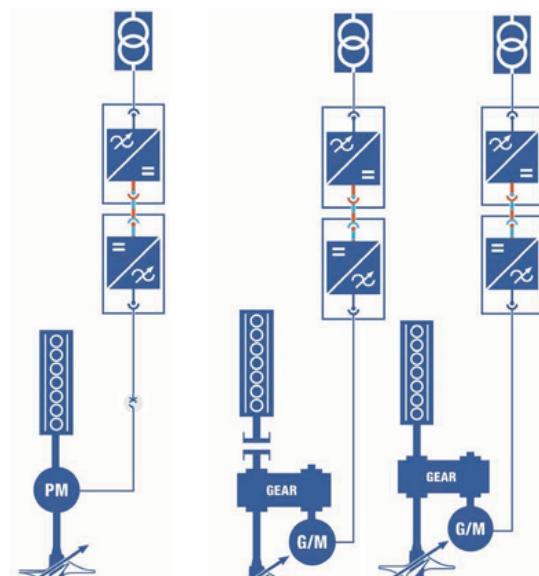
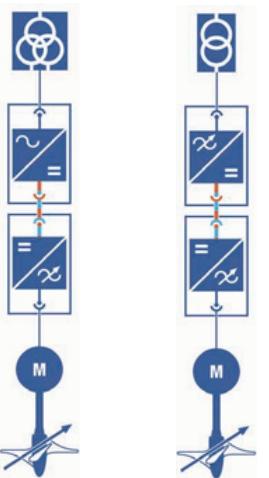
Over 1,500 rugged marine-specific drives now in operation.



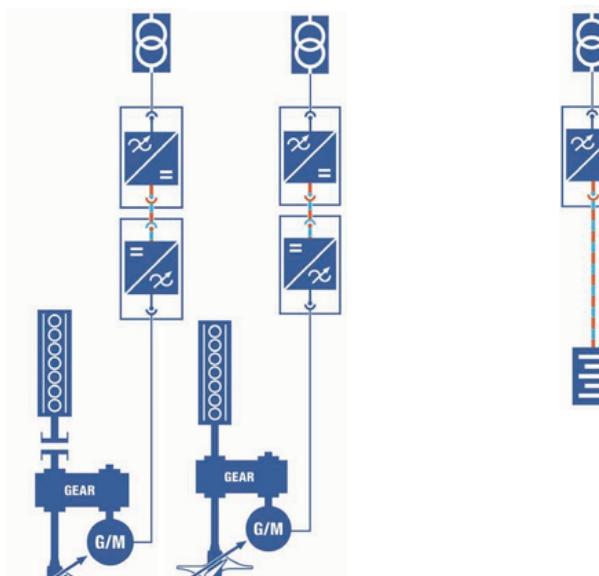
MARINE-SPECIFIC DESIGN

No compromises in features, materials or solutions

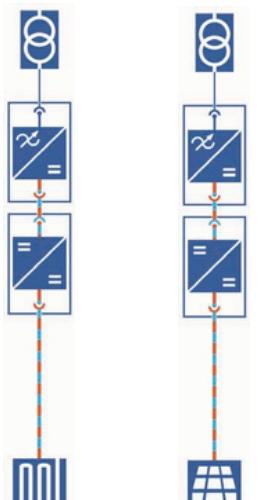
- **Very simple and robust cabinet structure**
- **Fast connectors in the power module** – enables fast and easy maintenance
- **Allows system-level optimization**
- **Vessel's freshwater cooling system connection**
- **Rigid foundation with vibration dampers** – for smooth operation
- **IP44 enclosure for both power module and cabinet** – robust for the environment and fast maintenance



Inline
PTI-PTO



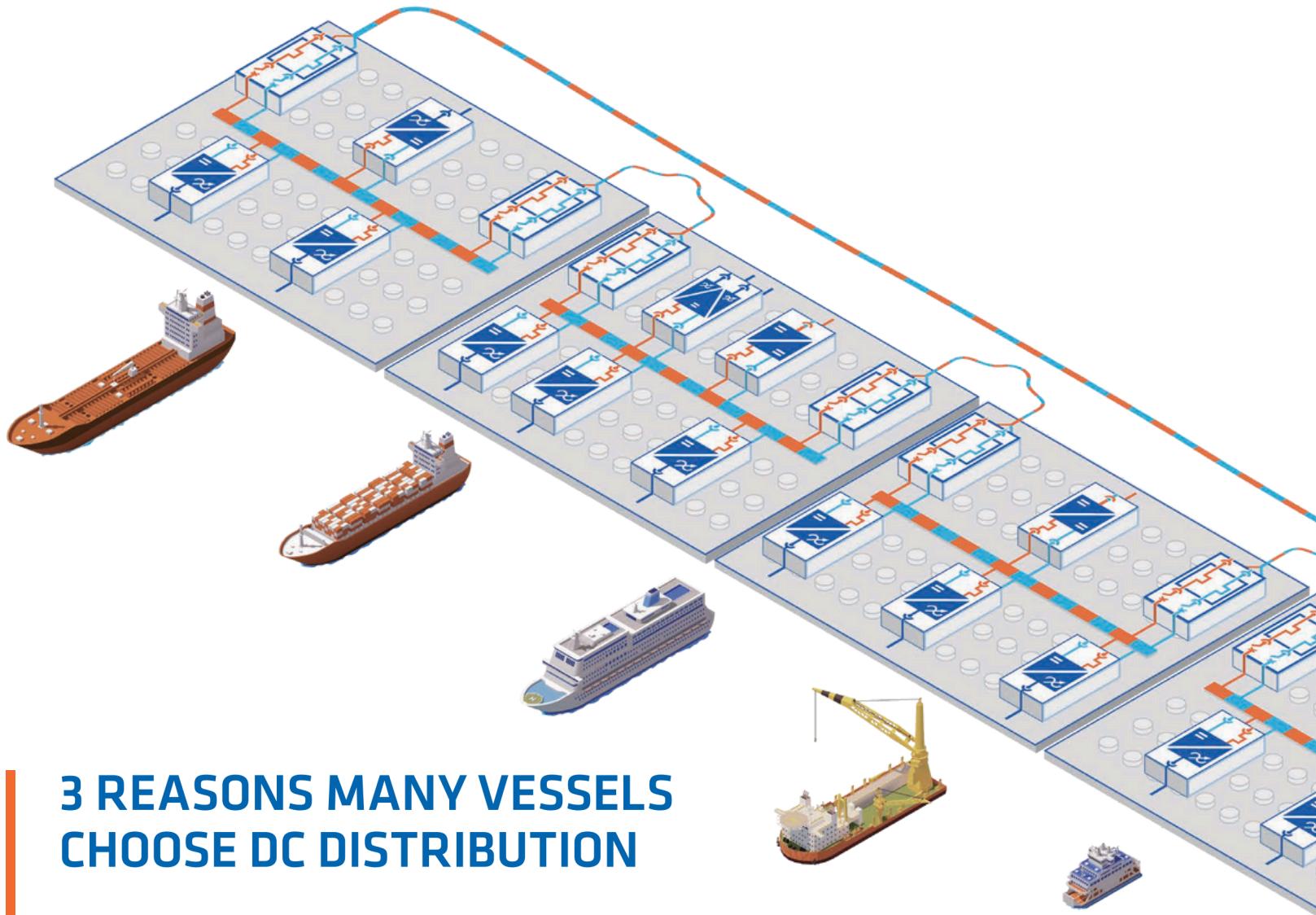
Geared
PTI-PTO-PTH



THE SWITCH DC-HUB: ENGINEERED FOR COMPLEX MEGAWATT-CLASS POWER

WHY DC DISTRIBUTION?

- Fewer components mean higher efficiency
- Efficient use of regenerated energy
- Smaller footprint
- Lower fuel use thanks to variable-speed generators
- Easy integration with batteries and other energy sources
- Future-flexible for changing regulations
- High fault tolerance and system redundancy with semiconductor-based protection



3 REASONS MANY VESSELS CHOOSE DC DISTRIBUTION

#1 – Lowers fuel use, higher efficiency

Variable-speed gensets and batteries optimize energy use for longer operation.

#2 – Increased system redundancy and fault tolerance

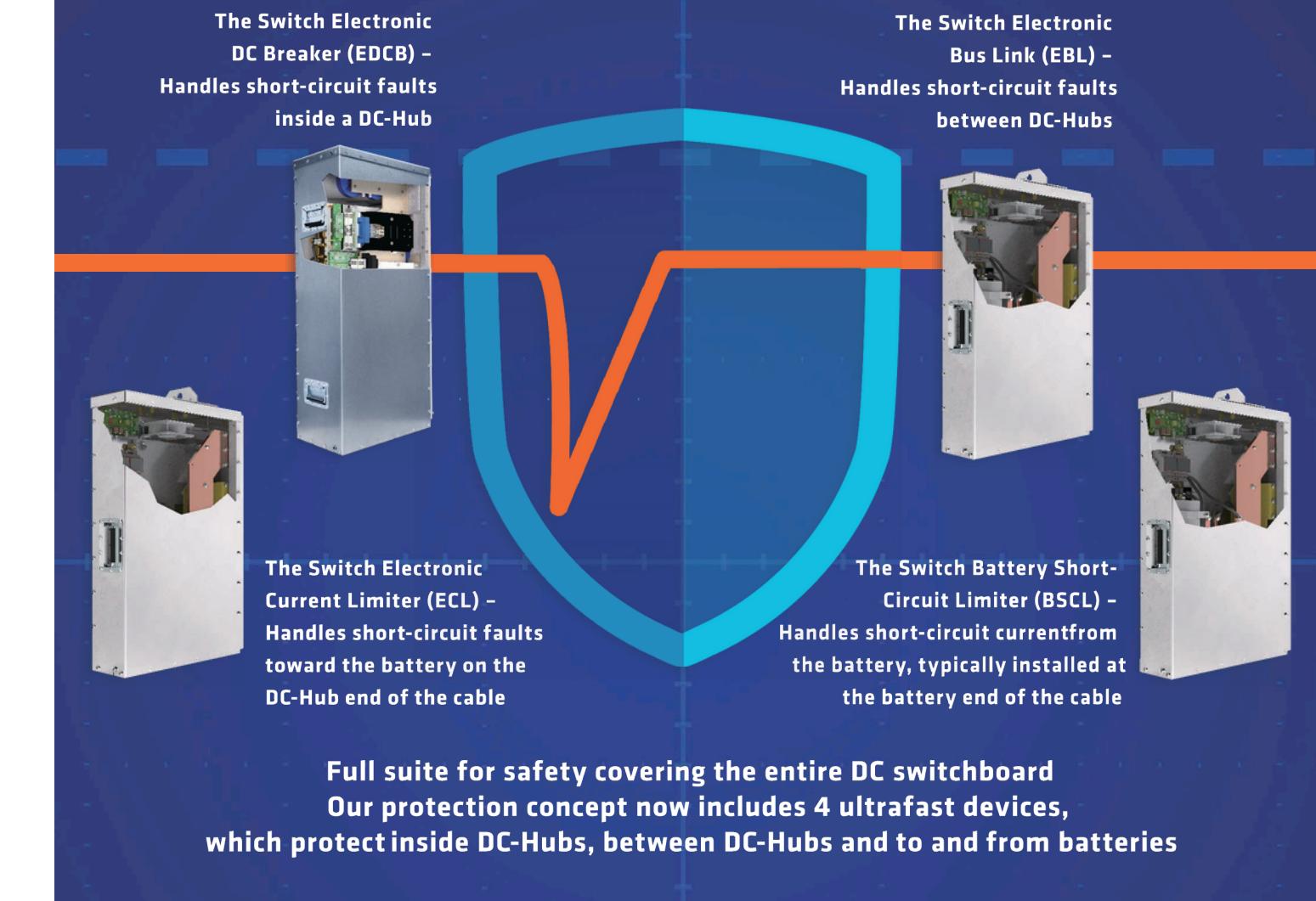
Ultrafast protection devices enable safe closed bus tie operations, even for DP3 operations.

#3 – Easy to operate and maintain

Reliable, user-friendly products maximize uptime and simplify operations.

DC distribution is the future.

SMOOTH RIDE THROUGH THE WAVES



MARINE-SPECIFIC DESIGN

NO COMPROMISES IN FEATURES, MATERIALS OR SOLUTIONS

Ready for harsh marine operation

- Allows system-level optimization and easy at-sea servicing
- Rigid foundation with vibration dampers
- Can be connected to the vessel's freshwater cooling system

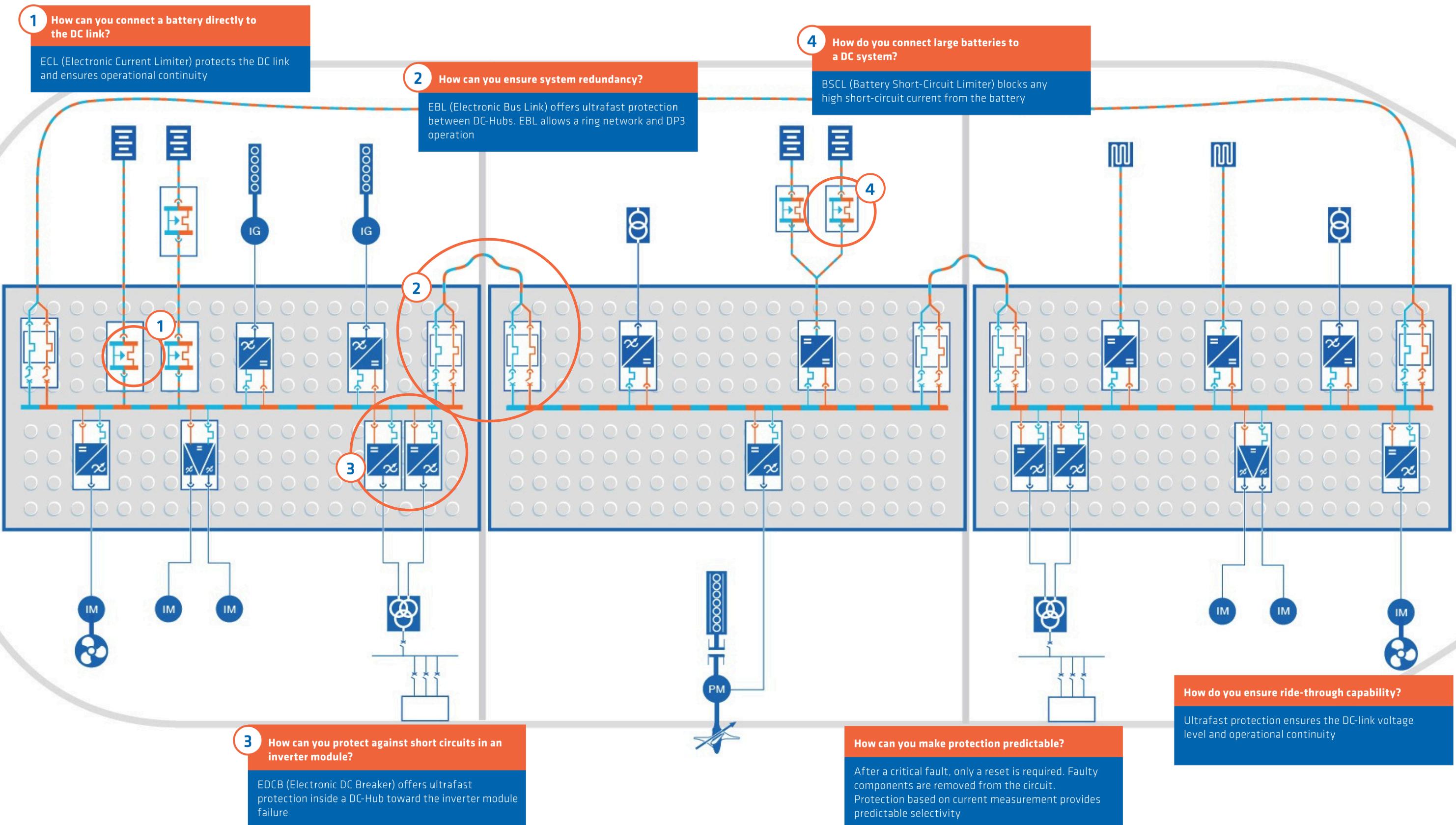
Unique ultrafast semiconductor-based protection concept

- Suite of 4 fit-for-purpose, game-changing products
- Electronic DC Breaker (EDCB) is unique in the market
- Ride-through capability

Fast and reliable maintenance

- Crew can change the module
- Power module with precharge included
- Fast AC and DC connectors in power module
- Closed IP44 power module and cabinet structure
- No bolt connections in the main electrical path

SWITCH TRACKS TO DC DISTRIBUTION



BUILDING BLOCKS

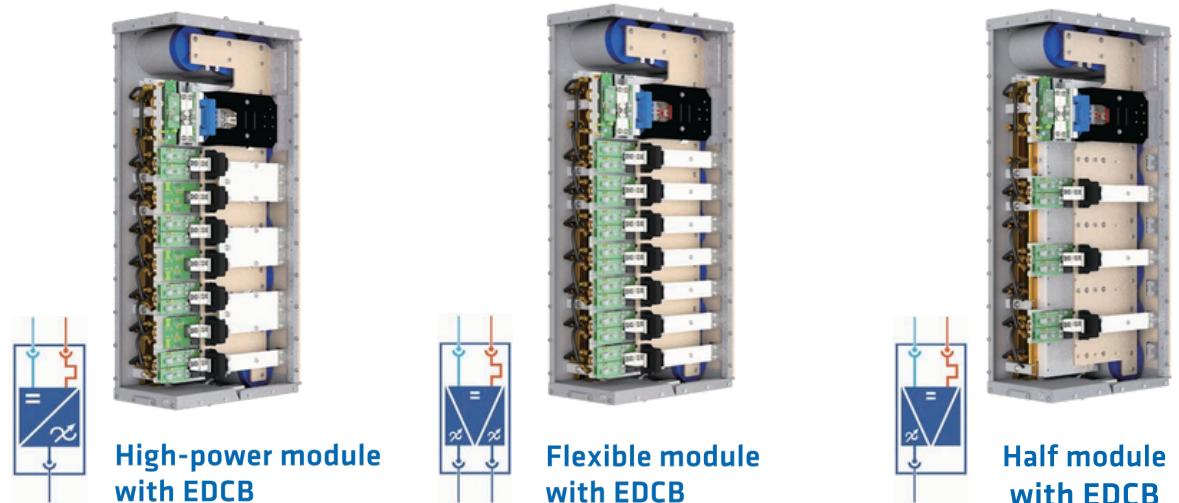


Motor/generator inverter (MI/GI)

- Motor and variable-speed generator applications
- Shaft generator support (PTO, PTI, PTH)
- IM, PM, IPM and EESM supported
- Torque, speed, power, DC voltage and scalar control modes



POWER MODULES



Normal duty current continuous (A)

High-power module 1,600

Flex module 2 x 800

Half module 800

Short-circuit capacity 500 ms (A) *

High-power module 2,500

Flex module 2 x 1,250

Half module 1,250

*for AFE function. Longer duration with derating

Dimensions

W 305

D 580

H 1,140

W

633

D

305

H 1,140