ELECTRONIC BUS LINK TAKES REDUNDANCY TO THE NEXT LEVEL
REACH THE HIGHEST REDUNDANCY

The Switch Electronic Bus Link (EBL) has been designed to increase redundancy when several The Switch DC-Hubs have been joined to create a vessel’s network. The guaranteed selectivity between hubs increases personnel safety. The closed bus link reduces fuel consumption, while increasing available power to the grid. Distance between the forward and aft hubs can also be lengthened, increasing safety and redundancy.

Why an EBL?

Maintaining selectivity – always
The Switch EBL connects DC-Hubs together. The main function of the EBL is to maintain and ensure selectivity between the DC-Hubs if a major fault occurs. A major fault in one DC-Hub will not significantly decrease the voltage level of another healthy DC-Hub.

Response in microseconds
The Electronic Bus Link (EBL) allows each DC-Hub to work independently. In only 10 microseconds, this key piece ultra-rapidly cuts and isolates any possible error in the system, creating safe redundancy for the vessel. This means the DC-Hub and EBL are well suited for the Dynamic Positioning Class 3 (DP3) market.

Creating the DC ring network
A full EBL interconnection has an EBL in each DC-Hub to connect two DC-Hubs together with a DC cable. The two EBLs protect both DC-Hubs from a cable short. Two or more The Switch DC-Hubs may also be connected together in a closed ring DC network to further increase reliability, even for DP3 operations.

Rigorous testing
Extensive testing, supervised by DNV-GL, has verified the performance of The Switch EBL. In one test, a drop of less than 20 V from about 1000 V DC in the healthy DC link occurred with a full short circuit in the shorted DC-Hub and in the cables interconnecting them. The drives connected to the healthy DC-Hub continued operation completely undisturbed.

The Switch DC-Hub
The DC-Hub is the smartest solution available to create a multi-megawatt DC power system for the marine industry.

The DC-Hub is made up of several independent The Switch Power Drive units. These are frequency converters, which can be installed on board as either a retrofit or as an original design.

The frequency converters are part of the DC-Hub, with each being assigned a separate load or source function. Batteries can also serve in source or load mode, depending on whether the system is draining the batteries or charging them. The DC-Hub ensures that the change between different modes is seamless and without requiring any action from the crew.

The main parts in the EBL are:
- A 2-pole DC breaker disconnects both plus and minus in the case of a detected earth fault
- IGBTs with gate drivers allow the desired DC current and are capable of switching off a short circuit current, before any damage occurs
- An LR-damping filter stops oscillations between the two connected DC-Hubs with low impedance
- Internal control boards control the IGBTs and communicate over Ethernet with an external power management system
- To fulfill the demands for DP3 ships, two IGBTs are effectively connected in a series – one in the positive and one in the negative line – with completely independent drive and control
- In case of a hidden failure, the EBL guarantees that a short circuit current is interrupted

Each DC-Hub is customized for the vessel in question to provide reliable DC systems in separated sections.
REFERENCES

Battery hybrid references with Wärtsilä

Vessel type: Fish factory vessel
Owner: Wärtsilä ship design

Vessel type: Passenger ferry
Owner: Wightlink Ltd

Vessel type: Viking Lady OSV-DP2
Owner: Eidesvik Shipping

DC-Hub references with Wärtsilä

Vessel type: Dalian deepwater development drillship

Vessel type: Sapura heavy lift vessel / pipelayer
Owner: Larsen & Toubro

Vessel type: Aker H-6e semi-submersible drill rig
Owner: Transocean

Shaft generators references with Wärtsilä

Vessel type: Deep Sea 1
Owner: Otto Marine Limited

Vessel type: Go Phoenix
Owner: Otto Marine Limited

PERMANENT MAGNET MACHINE RANGE

When using The Switch permanent magnet machine as part of DC-Hub, you get an advanced electrical drive train that offers world-class performance. The PM machine can function either as a generator (PMG) or a motor (PMM).

YASKAWA

We are electrifying the world with ultimate efficiency. Our innovative electrical drive train products, capabilities and solutions enable more profitable power generation, energy storage and use, while lowering the cost of electricity and operations.

ENVIRONMENTAL ENERGY