



## ELECTRICAL POWER SYSTEMS

### Low Voltage Switchgear

KONGSBERG design and build switchgear and controlgear specifically for the harsh conditions of the marine market. Our well proven, innovative and reliable range of switchgear is the backbone of the next generation electrical power system.

Based on our standardized, modular and highly flexible enclosure system we provide our customers with space-saving, robust and efficient assemblies that will ensure a high level of operational safety and availability. Each switchgear includes a scalable digital layer that enable the customer to select a suitable level of remote functionality, connectivity, remote support, data acquisition and digital services.

#### Reliability

Our switchgear uses internationally recognized world class brands for electrical components, which ensures stable quality and availability during the lifetime of the installation. Our marine switchgear is carefully assembled, inspected and tested to ensure customer satisfaction.

#### Operational efficiency through the Digital layer

In a traditional switchgear you will often find the protection functions divided into more than a single component, which means more cabling, assembly time and additional compartment space needed.

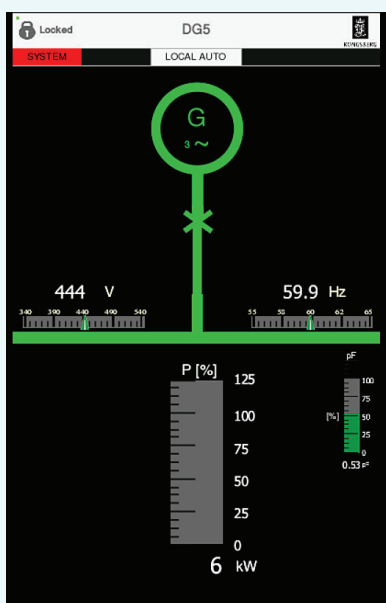
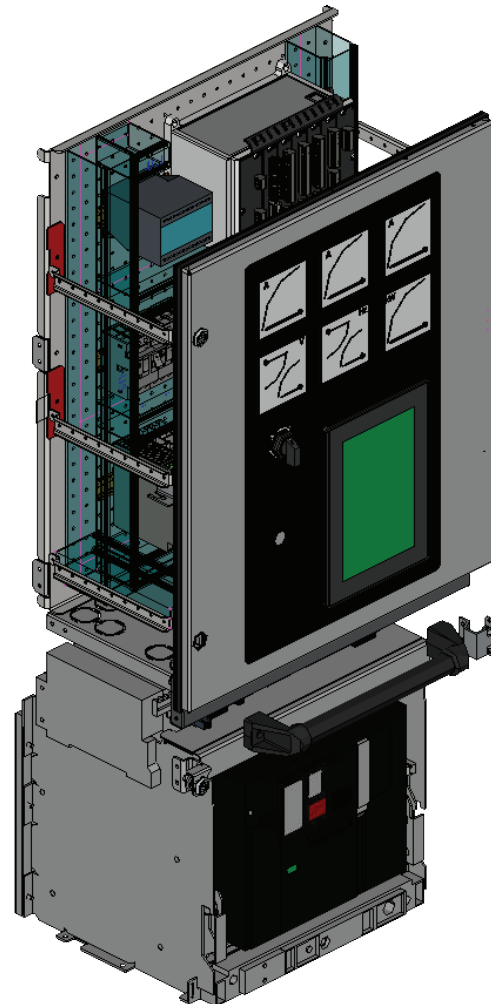
Presenting KONGSBERG combined Local Synchronization and Protection unit (LSP) and the Local Breaker Display (LBD) as the HMI and control of the switchgear. The LSP takes care of the synchronization check for safe operation of the circuit breaker, and necessary protection functions.

With plug-and-play INTEGRATION to KONGSBERG K-Chief IAS, it functions as a gateway to our advanced Power and Energy Management(PMS/EMS) functions as well as KONGSBERG Kognifai digital ecosystem.

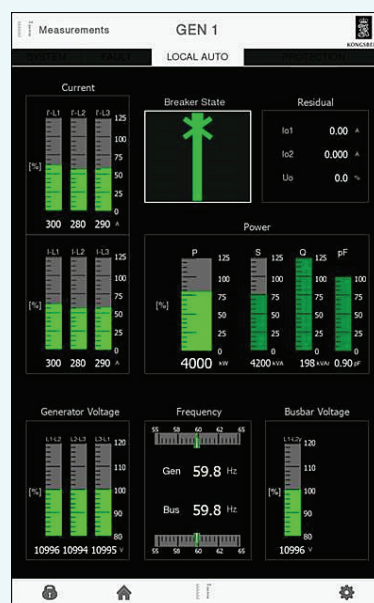
The unit is fitted with:

- Dedicated AC measurement card covering all the required protections and AC measurements.
- I/O cards for signal cable termination.
- Processor and communication module with interconnection to local and remote control managed by IAS/EMS/PMS, as well as being connected to all the other LSP units in the assembly for the purpose of time synchronization and supervision.

The LBD is a 10-inch user-friendly touch screen computer that serves as the breaker's control panel for local indication and operation. It is directly connected to the breaker's LSP unit and provide the operator with a several extended views to support day to day operations.



LBD Breaker display



LBD Measurement display

| Protection Function            | Scaled  | Alarm  | Inh       |
|--------------------------------|---------|--------|-----------|
| [59] Overvoltage 1             | 100.0 % | 442 V  | 0.00 sec  |
| [59] Overvoltage 2             | 110.0 % | 500 V  | 1.00 sec  |
| [27] Undervoltage 1            | 80.0 %  | 470 V  | 0.00 sec  |
| [27] Undervoltage 2            | 80.0 %  | 450 V  | 0.00 sec  |
| [50] Fast Overcurrent 1        | 200.0 % | 1734 A | 30.00 sec |
| [50] Fast Overcurrent 2        | 300.0 % | 3501 A | 0.00 sec  |
| [67] Directional Overcurrent 1 | 110.0 % | 944 A  | 0.10 sec  |
| [67] Directional Overcurrent 2 | 130.0 % | 1107 A | 0.10 sec  |
| [81O] Overfrequency 1          | 100.0 % | 55 Hz  | 0.00 sec  |
| [81O] Overfrequency 2          | 100.0 % | 54 Hz  | 0.00 sec  |
| [81U] Underfrequency 1         | 80.0 %  | 57 Hz  | 0.00 sec  |
| [81U] Underfrequency 2         | 80.0 %  | 56 Hz  | 0.00 sec  |
| [49] Overload 1                | 80.0 %  | 400 kW | 30.00 sec |
| [49] Overload 2                | 110.0 % | 520 kW | 30.00 sec |
| [32] Reverse Power 1           | 0.0 %   | 50 kW  | 0.00 sec  |
| [32] Reverse Power 2           | 10.0 %  | 75 kW  | 0.00 sec  |
| [87G] Diff Current             |         |        |           |
| [50BF] Breaker Fail            |         |        |           |
| [46] Neg Seq current           | 0.0 %   | 173 A  | 0.00 sec  |
| [51] Inv Trip Overcurrent      | 110.0 % | 975 A  | 0.00 sec  |
| External Trip From PMS         |         |        |           |
| External HW Trip               |         |        |           |

LBD Protection display

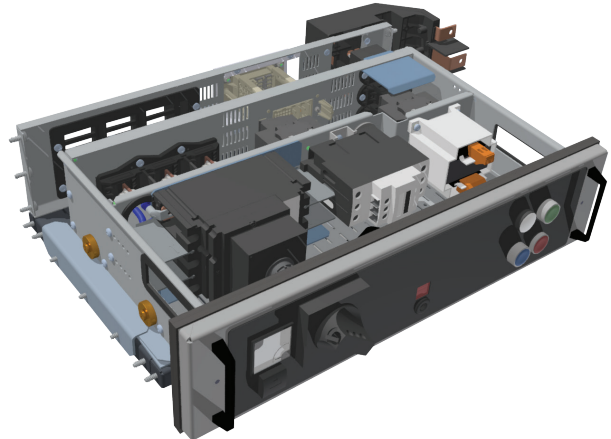
### Safety and serviceability

Breakers are remotely and locally controlled with the enclosure doors closed to ensure the highest level of personnel and material safety during operation. All incoming and outgoing units are available as withdrawable version to further increase safety and serviceability.

Arc resistance represents an essential feature of modern low-voltage power distribution boards, the capability of controlling thermal and mechanical effects of arcing faults substantially contributes to personnel and system protection.

An arcing fault probably represents one of the most serious operating faults as it generates enormous energy in the form of pressure and temperature within milliseconds. This may pose danger to personnel, e.g. due to lose enclosure parts and/or hot gases. Furthermore, adjacent system parts may be subjected to risks, which lead to long downtimes and substantial economic damage.

KONGSBERG Low Voltage Switchgear are constructed and tested for the prevention of such arcing effects.

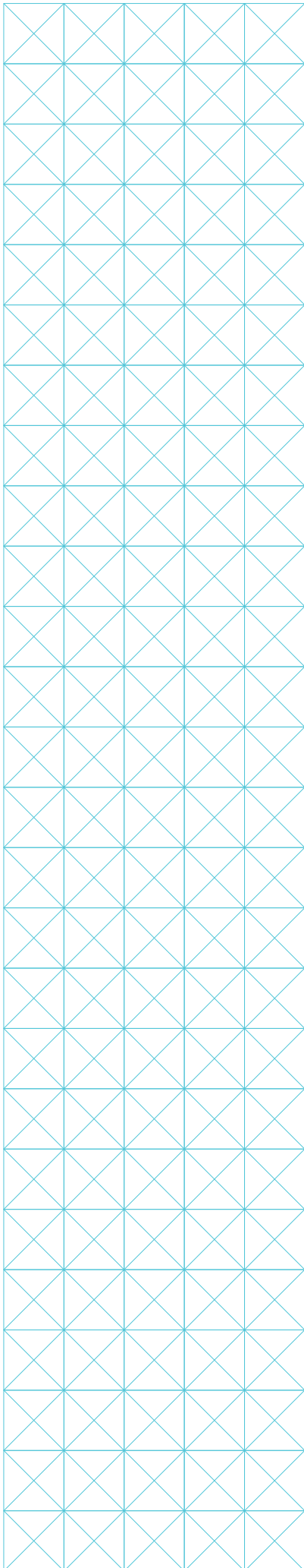


### Support

Switchgear integrated with KONGSBERG K-Chef IAS have increased options for remote assistance.

KONGSBERG Remote Services is a tool for Kongsberg certified engineers worldwide to connect to an installation upon customer request to provide direct remote diagnostics and support via secure and encrypted channels. Our Global Customer Support organization is available 24/7 to provide prompt responses, technical expertise and assistance worldwide.





## Key features

Compact and space saving design with cable entry from bottom, front-access only or access from front and rear. Maintenance-free busbar is standard.

- Generators and breakers are protected by fully integrated KONGSBERG LSP protection and synchronization. The unit are seamlessly integrated to PMS and EMS embedded in K-Chief IAS, thus reducing time used for engineering, installation and commissioning.
- The main electrical components are of the latest type and configuration from internationally recognized name brands verified according to IEC 60533 Electrical and electronic installations in vessel – Electromagnetic Compatibility (EMC), which ensures stable quality and simple maintenance during the lifetime of the vessel.
- Fully compliant with Classification Society Rules.
- Suitable for newbuild and retrofitting.

## Technical data

- Tested according to IEC 61439, IEC 60529 and IACS E10 rev7
- Rated nominal current  $I_n$  7500A
- Rated nominal voltage  $U_n$  690VAC
- Short-circuit withstanding strength  $I_{cw}$  100 kA, peak  $I_{cp}$  220 kA
- Arc tested to 100kA

## Available configurations

- Main Switchboards
- Main switchgear (in case of generator incomer)
- Distribution switchgear (no generator incomer)
- Shore connection
- Emergency switchgear
- Motor control center
- Stand-alone distribution/switch/start/control configurations
  - Power & lighting distribution boards
  - Individual & group starters
  - Electrical testing panel
  - Shore connection box

## Energy efficiency and Sustainability

As a complete systems manufacturer and integrator, KONGSBERG electrical power systems feature a number of advanced functionalities to help optimise propulsion and power utilisation at sea. By utilizing the collective information available in the automation-, power-, propulsion- and dynamic positioning systems we are able to offer a fully integrated dynamic energy management system with powerful functionality such as Advanced Generator Supervisor (AGS), Dynamic Load Prediction (DLP), Dynamic Load Compensation (DLC), Dynamic Hybrid Control (DHC), Dynamic Inertia Control (DIC) and PowerAllocator™.

Our mission is to help our customers lower the lifetime cost and emissions while maximising return of investment. Through our technology and expertise, we can make a difference in meeting tomorrows needs for sustainability and – providing the customer with the FULL PICTURE.

Kongsberg Maritime  
P.O.Box 483, NO-3601  
Kongsberg, Norway

Switchboard: +47 815 73 700  
Global support 24/7: +47 33 03 24 07  
E-mail sales: [km.sales@km.kongsberg.com](mailto:km.sales@km.kongsberg.com)  
E-mail support: [km.support@kongsberg.com](mailto:km.support@kongsberg.com)