

Marine Switchboard

# Power System



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## Envisioning Tomorrow's Technology Today

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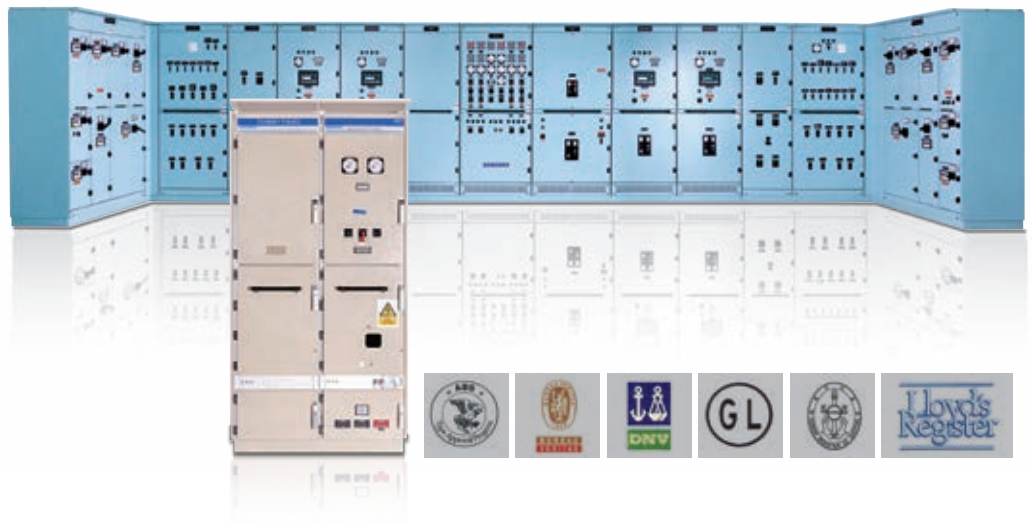


# For Shipowners Concerned with Quality and Safety...

Power Systems, High Voltage Switchboard (SSMV-7, SSMV-7S, SSMV-12) and Low Voltage Switchboard (SSLV), are perfectly safe and efficient system.

The switchboards prevent accidents in the process of power transmission and distribution. Unlike the industrial system, the vessel contains power generation and loads within the same place together, so electrical accidents can lead to the large accidents.

Our system has been developed from the accumulated knowledge and experience in the field of shipbuilding industry, such as commissioning and trials for more than 1,300 vessels.



## III HIGH VOLTAGE SWITCHBOARD\_Power System



High Voltage Switchboard is specially designed and manufactured to meet the environmental and safety conditions of the marine and offshore industries.



## Features

- > Achieved full type approval
- > Tested in accordance with IEC Pub.62271-200
- > Metal-clad construction
- > Independently arc-fault tested
- > World wide quality marine service
- > Safety mechanical interlocks
- > Front service operation
- > Making current earthing switch
- > Intelligent circuit monitoring devices
- > Circuit breaker insertion and withdrawal with the front panel door closed
- > Environmental tested in accordance with IEC60092-504 Sec.5 and GL 2003 VI-part.7

## This Switchboard is developed for use in :

- Offshore Plant
- Oil Rig Supply Vessels
- Floating Production Storage Offloading Vessels (FPSO)
- Floating Storage Offloading Vessels (FSO)
- LNG Carriers
- Large Passenger Vessels
- Container Ships
- Storage and Work Barges
- Floating Docks, Various Dredgers and etc

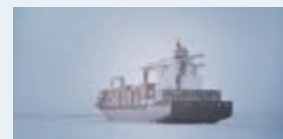
## Environmental Specifications

Ambient Temperature : 45°C

Relative Humidity : 95%

Vibration

Frequency	Displacement	Acceleration
3 - 13.2	±1.0 mm	±0.7 g (Max. 0.7 g)
13.2 - 100		



## Specifications

Items		SSMV-7		SSMV-7S		SSMV-12	
Application	Standard Conformance	IEC Pub 62271-200					
	Classifications	ABS, BV, DNV_GL, LR, KR and others					
Rating	Rated Voltage	AC 7.2kV				AC 12kV	
	Rated Frequency	50/60Hz					
	Rated Power Frequency Withstand Voltage	20kV/min				28kV/min	
	Rated Lightning Impulse Withstand Voltage	60kV				75kV	
	Rated Shot Time Withstand Current	25kA					
	Rated Peak Withstand Current	65kA					
	Internal Arc Withstand Current	25kA					
	Main Bus Bar Current	1250A	2000A	1200A	1600A	1250A	2000A
	Load Bus Bar Current	600A	600/1000A	1000A	1000A	600A	600/1000A
	Construction	Switchboard Construction	Totally-Enclosed, Dead-Front, Floor Standing Multi-Cubicle				
Degree of Protection		IP 22(Please Contact to our SWBD team)					
Vessel type	· LNG Carriers   · Container Ships   · Suttle Tankers   · Oil Rig Supply Vessels   · Offshore Plant   ... etc						
Option	· Insulation tube on bus bar   · 7S is installed by default.   · Infra-red Ray Window						

# INTRODUCTION\_High Voltage Switchboard (SSMV-7, 12)

## Compartment

The metal-clad switchboard consists of four compartment.

- Circuit Breaker
- Main Bus Bar
- Cable terminations
- Low voltage Equipment

To withstand internal arc faults, the segregation between compartment is achieved by the use of metal partitions. See the picture below.

### Circuit Breaker Compartment

This compartment is equipped with a vacuum circuit breaker and contactor. The cradle is equipped with metal shutters. Draw-out and insertion of the circuit out without satisfying the safety interlock procedure in advance.



### Main Bus Bar Compartment

The main bus compartment is designed for 1,250A and 2,000A by round-edged copper bus bars. Insulation between panels is maintained by the use of track-resistant epoxy insulated materials. A fully insulated bus bar system can be provided if required

### Cable Termination Compartment

Standard cable entry is from the rear bottom of Switchboard. if required, entry can be from above, in this case, the depth of the panel will be increased. the access to this compartment can not be gained without satisfying the safety interlock procedure of the switchboard in advance.

Following are located within this cable compartment.

- Earthing Switch
- Zero-phase Current Transformer
- Surge Arrestor
- Voltage and current Transformer

### Low Voltage Equipment Compartment

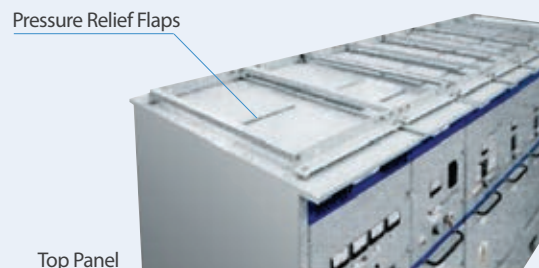
The upper and lower, low voltage compartments are located above and below the circuit breaker compartment. The cables routed through the circuit breaker compartment are protected by metal shielding.

## Panel Partitions

The compartment between each panel is divided by metallic partition. Since each compartment has not penetrated between panel even when an accident happens. Besides, when extending in the future, it can install easily.

## Pressure Relief Flaps

To relieve the pressure during an internal arc fault, pressure relief flaps are provided on the circuit breaker, bus bar and cable compartments, which position is shown below.



## Insulated Bushing

To maintain electrical characteristics and mechanical strength, the three-phase single molding insulated bushings are manufactured using high-grade epoxy resin material.



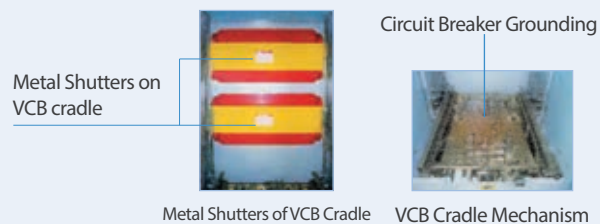
Insulated Bushing

Rated Voltage	12kV
Rated Power Frequency Withstand Voltage	28kV / min
Rated lightning Impulse Withstand Voltage	75kV
Over Current Strength	25kA 1sec (3sec)*

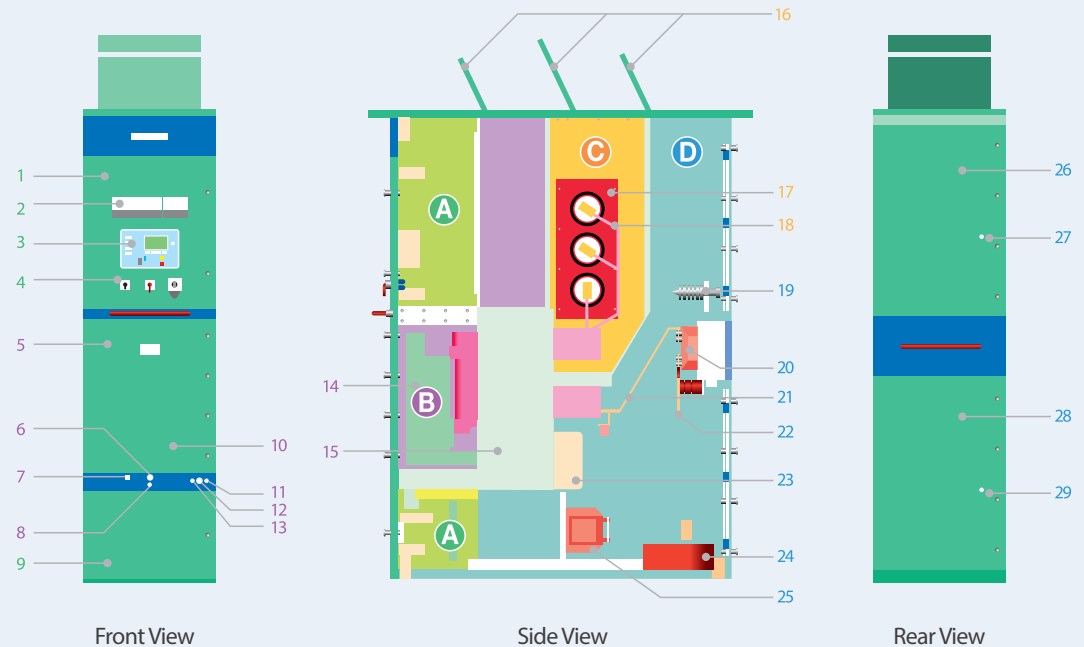
\* 3sec on request

## VCB (VCT) Cradle

The cradle is equipped with interlocking facilities in accordance with IEC 62271-200. Metal shutters operate automatically on withdrawal or insertion of the VCB/VCT.



# III BASIC PANEL DESIGN\_High Voltage Switchboard (SSMV-7, 12)



## A\_Low voltage Compartment

- 1 : Upper door
- 2 : Instrument
- 3 : Protection and control unit
- 4 : Switch
- 9 : Lower door

## C\_Main Bus Bar Compartment

- 16 : Pressure relief flap
- 17 : Insulated bushing
- 18 : Main bus bar

## B\_Circuit Breaker Compartment D\_Cable Compartment

- 5 : Door of circuit breaker compartment
- 6 : VCB draw-in / out handle port
- 7 : Indicator of circuit breaker position
- 8 : VCB draw-in / out interlock key hole
- 10 : Emergency open mechanism
- 11 : interlock key for de-excitation
- 12 : Earthing switch operation handle port
- 13 : Lower cable compartment door key
- 14 : Vacuum circuit breaker
- 15 : VCB cradle

- 19 : Surge arrester
- 20 : Current transformer
- 21 : Load bus bar
- 22 : Power cable terminal
- 23 : Earthing switch
- 24 : Zero-phase current transformer
- 25 : Voltage transformer
- 26 : Upper door
- 27 : Upper cable compartment door key hole
- 28 : Lower door
- 29 : Lower cable compartment door key hole

# HIGH VOLTAGE SWITCHBOARD\_SSMV-7S



## SSMV-7S's Features

- : Customer needs meet with a lot of experiences
- : Enhanced quality, safety and easy operation
- : Minimize front maintenance space
- : Enhanced space efficiency with compact size
- : Minimize environmental pollution for manufacture



## Minimize installation space

- Reflect customer requirements based on high-voltage switchboard of ship and offshore.
- Strengthening the quality, safety and operational convenience of the switchboard.
- Compact to improve of internal space efficiency in a ship, improved space efficiency is about 23% compared to SSMV-7.
- Minimize maintenance space in the front of the switchboard.
- Improves assembly work efficiency and minimizes modification latency time.
- Production method by minimizing environmental pollution.



## Plug jack interlock



- The door cannot be closed unless the control plug is fully engaged in the draw out position of the circuit breaker and improve safety by configuring mechanical interlocks to prevent the circuit breaker from being moved to a service position.
- In previous model, the circuit breaker could be moved to a service position even when the control plug is not engaged.



## Arc limit switch



- Arc limit switch is installed at arc flap, and if an arc occurs, the arc limit switch is activated to generate the circuit breaker signal.
- Arc limit switch device is installed on the upper flap, which has not been applied previous model.

## LOW VOLTAGE SWITCHBOARD\_Power System

Low Voltage Switchboard has been supplying a full range of Low Voltage Switchboards for the marine electrical system with the advanced technology and experience. This Low Voltage Switchboard is specially developed for marine applications. Besides providing enough working space, the compact design of this switchboard saves the installation space.



### Features

- > Totally-enclosed, dead-front, floor standing multi-cubicle type
- > Tested in accordance with IEC Pub. 61439-1, 2
- > World wide quality marine service
- > Compact low-voltage board for power distribution
- > Specially developed for marine applications
- > Meets the requirements of classification societies

### Environmental Specifications

**Ambient Temperature : 45°C**

**Relative Humidity : 95%**

**Vibration**

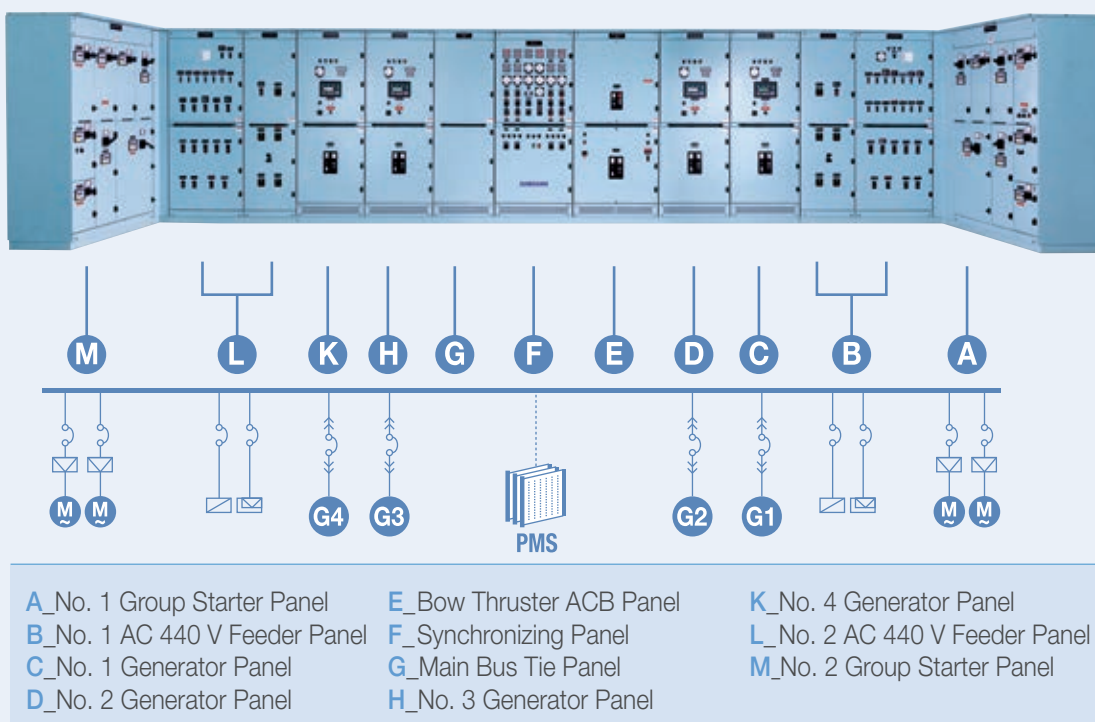
Frequency	Displacement	Acceleration
3 - 13.2	±1.0 mm	±0.7 g
13.2 - 100		

### Specifications

	Items	Low Voltage Switchboard
<b>Application</b>	Classifications	ABS, BV, DNV_GL, LR, NK, LRS, KR, RINA
<b>Rating</b>	Rated Voltage	500 V AC
	Rated Frequency	50/60 Hz
	Rated Current	Up to 8000 A
	Rated Peak Withstand Current	330 kA, Asym, Peak
<b>Construction</b>	Type	Totally-Enclosed, Dead-Front, Floor Standing Multi-Cubicle
	Degree of Protection	IP 22(Please Contact to our SWBD team)
	Frame Work	Formed Sheet Steel or Substantial Box-Frame
	Access	Front and Rear
	Power Line Inlet	Bottom Part of the Rear (Upper Part)
<b>Option</b>	690V AC, IP44	

# INTRODUCTION\_Low Voltage Switchboard

Low Voltage Switchboard consists of following panels.



## Dimension

Generator	Capacity	100 - 650 kW		651 - 900 kW		901 - 1100kW		1101 - 1500 kW	
	ACB	1200AF		1600AF		2000AF		3200AF	
Panels		Width	depth	Width	depth	Width	depth	Width	depth
Generator Panel		600	1000	700	1100	700	1300	900	1500
Sync panel		900	1100	900	1100	1000	1300	1000	1500
Bus Tie panel (ACB Type)		900	1000	1100	1100	1200	1300	1700	1500
Feeder Panel	AC 440V	*A	1000	*A	1100	*A	1300	*A	1500
	AC 220V	*A	800	*A	800	*A	800	*A	1000

\*A : The width of feeder panel depends on MCCB arrangement.

(Note) The height of all panels depends on A.

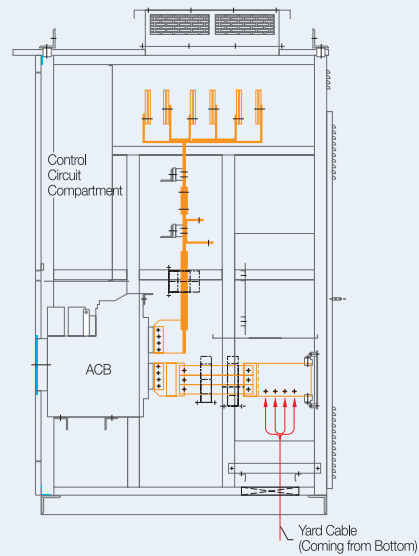
Below 2000 AF : 2220mm

Over 2000 AF : 2340mm

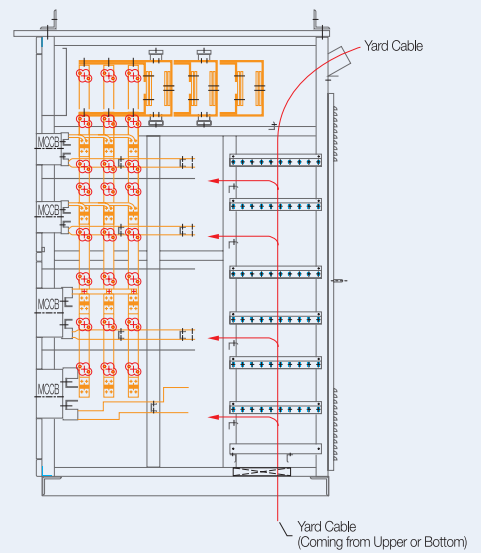
# CONSTRUCTION\_Low Voltage Switchboard



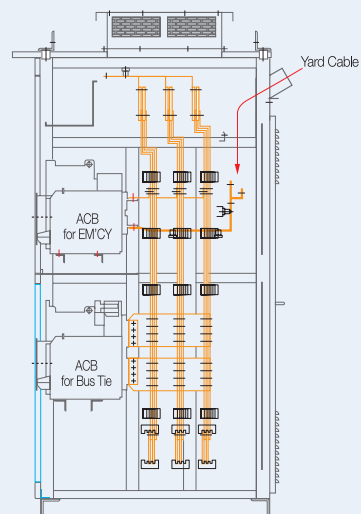
## Generator Panel



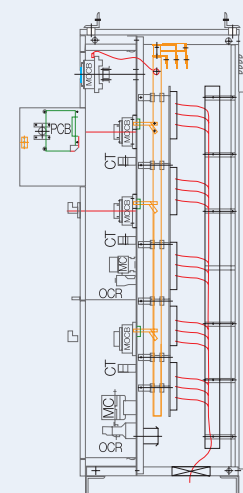
## Feeder Panel



## Bus Tie Panel (ACB)



## Group Starter Panel



# Power System

## Marine Switchboard



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