



**Medium voltage, arc-proof, air-insulated,
metal-clad switchgear and controlgear
up to 12kV**

HS21

For marine and offshore use




Description

Characteristics

- Medium voltage switchgear for marine and offshore use
- Full type approval
- Type tested in accordance with IEC 62271-200
- Metal-clad construction
- Independently arc-fault tested
- Circuit breaker with safety metal shutter
- Option of air insulated bus bars
- Safety mechanical interlocks
- Front service operation
- Circuit breaker insertion and withdrawal with the front panel door closed
- Making current earthing switch
- Intelligent circuit monitoring devices





Type Approval Certificate Extension

This is to certify that Certificate No. 03/10027(E5) for the undernoted products is extended as shown.

This certificate is issued to:
PRODUCER Terasaki Electric Co., Ltd.
6-13-47, Kamihigashi, Hirano-ku, Osaka, 547-0002, Japan

PLACE OF PRODUCTION

Terasaki Electric Co., Ltd. Yao Factory
9-125, Oihara, Yao-city, Osaka, 581-0092, Japan

Terasaki Electric Co., (F.E.) Pte. Ltd.
17, Tuas Street, Singapore 638454

Terasaki Electric Imari Co., Ltd.
3798-4, Kubara, Yamashiro-chou, Imari, Saga, 849-4256, Japan



Terasaki Electric (Shanghai) Co., Ltd.
Building 5 & 7, No. 399, Xuanzhong Rd., Nanhui Industrial Zone, Pudong, Shanghai, 201314, China

Terasaki Electric (China) Ltd.
72, Pacific Industrial Park, Xintang, Zhencheng, Guangzhou, 511340, China

DESCRIPTION High Voltage Switchgear metal enclosed and metal clad

TYPE	Type HS21 Series : HS21-1/ HS21-2 / HS21-3 / HS21-4
	Main bus bar current : 1250A / 2000A / 1250A / 2000A
	Load bus bar current : 600A / 600A, 1000A / 600A / 600A, 1000A
	Rated Voltage : 7.2kV / 12kV
	Rated frequency : 50, 60 HZ
	Rated Power frequency Withstand Voltage : 20kV / 28kV

Certificate No. 03/10027(E6)
Issue Date 17 July 2018
Expiry Date 16 July 2023
Sheet 1 of 3



T. Shigeno
 Yokohama Technical Support Office
 Lloyd's Register Group Limited

Lloyd's Register Group Limited
QTA 10F, 2-3-1, Minatomirai, Nishi-Ku, Yokohama, JAPAN

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Application

All TERASAKI medium voltage switchboards are specifically designed and manufactured to meet the environmental and safety conditions of the marine and offshore industries.

TERASAKI's reputation throughout the marine and offshore industry ensures that reliability and safety are of prime importance in the design and manufacture of the HS21 medium voltage switchboard.

Design standards incorporated

The switchgear and controlgear and the instrument have applied the following standards.

- IEC 62271-200 : switchboard
- IEC 62271-100 : circuit breaker
- IEC 62271-106 : contactor
- IEC 61869-2 : current transformers
- IEC 61869-3 : voltage transformers
- IEC 60255 : Measuring relays and protection equipment
- IEC 60076-1 : power transformer
- JEC 1201 : zero-phase current transformer

Adapted various marine classification

- American Bureau of Shipping (ABS)
- DNV (DNV)
- Bureau Veritas (BV)
- Lloyd's Register (LR)
- Nippon Kaiji Kyokai (NK)

Environmental specification vessel types

- Ambient temperature : 45°C
- Relative humidity : 95%
- Vibration (, in accordance with IEC 60092-504) all control devices
 - 2 ~ 13.2Hz, interval of vibration $\pm 1.0\text{mm}$
 - 13.2 ~ 100Hz, acceleration $\pm 0.7\text{g}$
 - max. acceleration 0.7g

Applications

The HS21 switchboard is designed for use in:

- Offshore Plant
- Oil Rig supply vessels
- Shore connection & On-shore Power Supply System
- Floating Production Storage Offloading vessels (FPSO)
- Floating Storage Offloading vessels(FSO)
- LNG Carriers
- Large Passenger vessels
- Container ships
- Oil tankers
- Cruise ships
- Ferries
- Storage and Work Barges
- Floating Docks, Various Dredgers, others

Type testing

The HS21 switchgear and controlgear is independently tested in accordance with IEC 62271-200 and marine classification society requirements.

- Temperature rise test
This test is carried out at the rated current of the switchgear and controlgear with the classification societies requirements of a 45-degree C ambient temperature being taken into consideration.
- Dielectric test
Including impulse voltage and power frequency withstand voltage test.
- Main circuit resistance measurement
There shall be less than 20% difference in the DC measured resistance values of the main and control circuits.
- Short-time and peak withstand current test
The panel is deemed to have passed the test if there is no deformation or damage to components and conductors following application of a short circuit current to the switchgear and controlgear.
- Arcing due to internal fault test
The switchgear and controlgear is deemed to have passed the test if following the application of an internal arc fault, in accordance with IEC 62271-200 Annex A the original mechanical integrity and inflammability of the panel is maintained.



Arcing due to internal fault test

General specification

- Basic specifications and panel size of 7.2 kV and 12 kV are the same (Refer to the following pages for panel size)
- Abundant prepared optional equipment

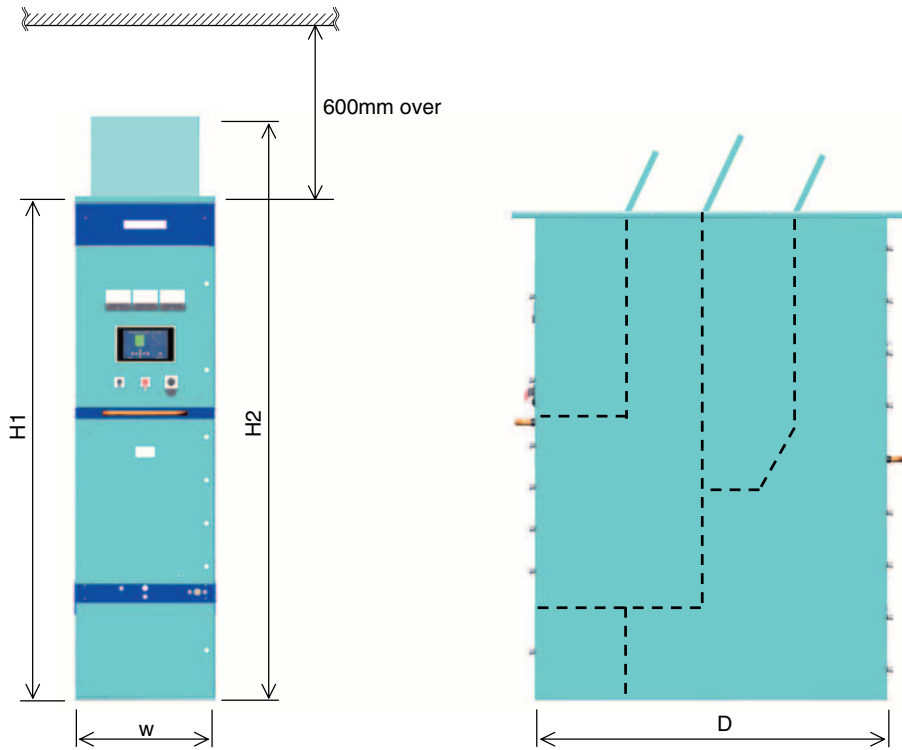
	Type			
	HS21-1	HS21-2	HS21-3	HS21-4
Application				
Standard conformance	IEC 62271-200 (IEC 60092-508) ¹⁾			
Classification	ABS, BV, DNV, LR, NK and others			
Loss of service continuity category (LSC) / Partition Class	LSC2B-PM			
Internal arc classification (IAC)	AFLR			
Rating				
Rated voltage	7.2 kV		12 kV	
Rated frequency	50 / 60 Hz			
Rated power frequency withstand voltage	20 kV/min		28 kV/min	
Rated lightning impulse withstand voltage	60 kV		75 kV	
Rated short time withstand current	25 kA 1sec (3sec) ²⁾			
Rated peak withstand current	65 kA			
Internal arc withstand current	25kA 0.2sec (20kA 1sec) ⁴⁾			
Main bus bar current	1250 A	2000 A	1250 A	2000 A
Load bus bar current	600 A	600/1000 A	600 A	600/1000 A
Construction				
Switchgear construction	Metal-clad			
Degree of protection	Low voltage compartment		IP32	
	High voltage compartment		IP43	
Optional equipment ³⁾				
- Inspection window	- Arc detecting system	- IP33 of low voltage compartment protection		
- Arc gas exhaust duct	- Insulation tube cover on bus bar	- Earthing switch on main bus bar		
- Surge arrester on main bus bar	- Infrared rays window			

Notes

- 1) ANSI C37.20.2 on request
- 2) 3 sec on request
- 3) Refer to the following pages about the details of optional equipment
- 4) With arc gas exhaust duct

Dimensions

Basic panel design (example)



H2 : With open pressure relief flap

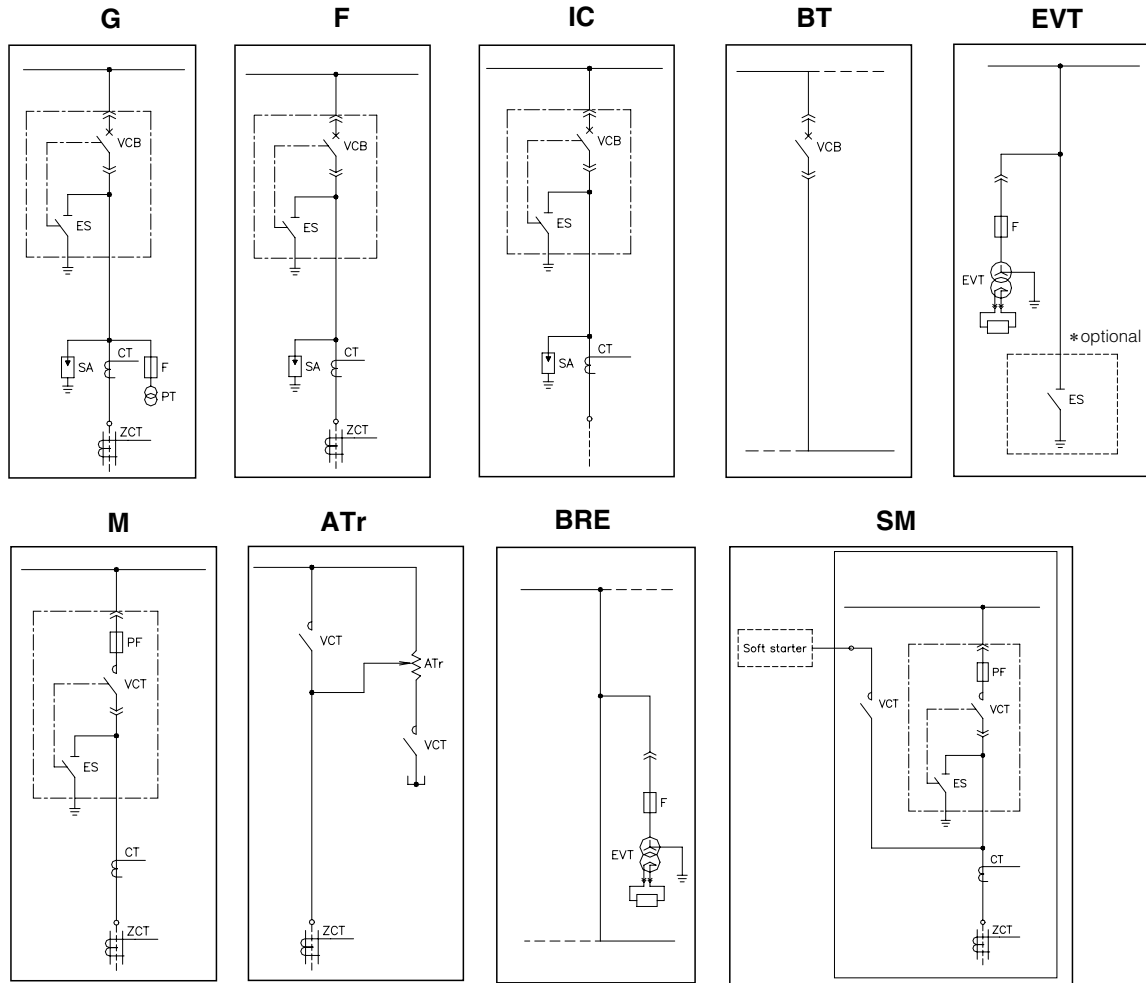
Panel type	W (mm)	H1 (mm)	H2 (mm)	D (mm) ³⁾
Generator panel	650	2300	2800	1680 • 1880 ⁴⁾
Feeder panel				
Incoming panel				
EVT panel				
Motor panel				
Soft start motor panel				
Bus-tie panel 1 ¹⁾				
Bus riser & EVT panel	800			
Bus-tie panel 2 ²⁾	900			
Sync panel	1000			
ATr panel	1000			

Notes

- 1) LNG vessel only
- 2) Container vessel only
- 3) With panel thickness
- 4) Top cable entry only

Technical data

Typical unit



G	Generator panel	M	Motor panel
F	Feeder panel	ATr	Auto transformer panel
IC	Incoming panel	BRE	Bus riser & EVT panel
BT	Bus-tie panel	SM	Soft start motor panel
EVT	Earthed voltage transformer		

* An earthing switch can be provided in the EVT panel if required.

Vacuum circuit breaker and Vacuum contactor application

Panel types	VCB			VCT
	630A	1250A	2000A	200/400A
Generator panel	○	○		
Feeder panel	○	○		○
Motor panel	○	○		○
Incoming panel	○			
Soft start motor panel				○
Bus-tie panel		○	○	

○ : Applicable

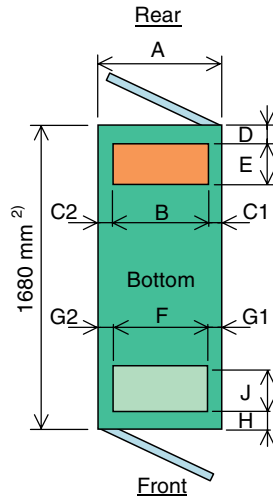
Technical data

Cable entry plan

The HS21 switchboard standard cable entry is from the bottom.

Power cables enter through the rear bottom plate and control cables through the front bottom plate.

Top cable entry can be provided, but consultation with TERASAKI is recommended as panel dimensions will increase.



Bottom entry cable



Power cable entry (example)

Panel type	Width		Power cable entry				Control cable entry				
	A(mm)	B(mm)	C1(mm)	C2(mm)	D(mm)	E(mm)	F(mm)	G1(mm)	G2(mm)	H(mm)	J(mm)
Standard panel ¹⁾	650	450	75	125	134	174	450	75	125	126	236
Bus riser & EVT panel	800	600					600				
Bus-tie panel	900	—					700				
Sync panel	1000	—					800				
ATr panel	1000	800					—				

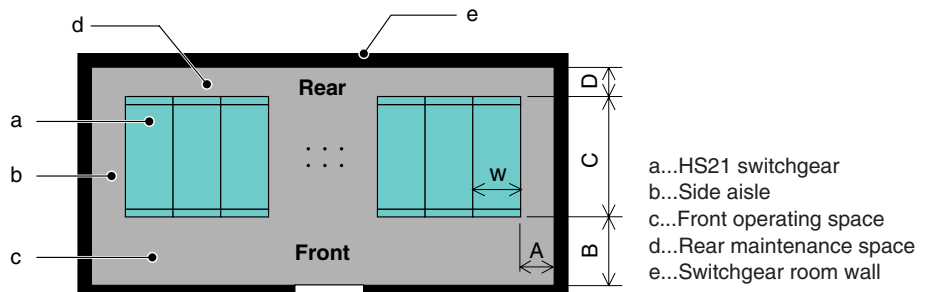
Notes

1) Refer to 650mm panel width on "Dimensions" page

2) 1880mm: Top cable entry

Room planning

The room planning of installing HS21 in the switchgear room is shown below.



Panel width -W	Room height (mm)	A (mm)	B (mm)	C (mm)	D (mm)
only 650 mm	≥2900 ¹⁾	≥1000	≥1600	1680	≥700
with 800 mm				1880 ²⁾	
with 900 mm					
with 1000 mm					

1) Without angle base

2) 1880mm: Top cable entry

Metal-clad

Compartments

Each section of the HS21 metal-clad switchboard is separated into four compartments.

- Circuit breaker
- Main bus bar
- Cable terminations
- Low voltage equipment

To withstand internal arc faults, segregation between compartments is achieved by the use of metal partitions.

See 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 breaker can not be carried out without first satisfying the reliable interlock procedure.

Main bus bar compartment

The main bus compartment is designed for 1250A and 2000A round-edged, tinned-copper bus bars. Insulation between panels is maintained by the use of track-resistant epoxy insulation materials. A fully insulated bus bar system can be provided if required.

Cable compartment

Standard cable entry is from the rear bottom. However, if required cable, entry can be from top side, but the depth of the panel will increase. Access can not be gained to this compartment without first satisfying the reliable interlock procedure of the switchboard.

Also located within this compartment are:

- Earthing switch
- Zero-phase current transformer
- Surge arrester
- Voltage and current transformers

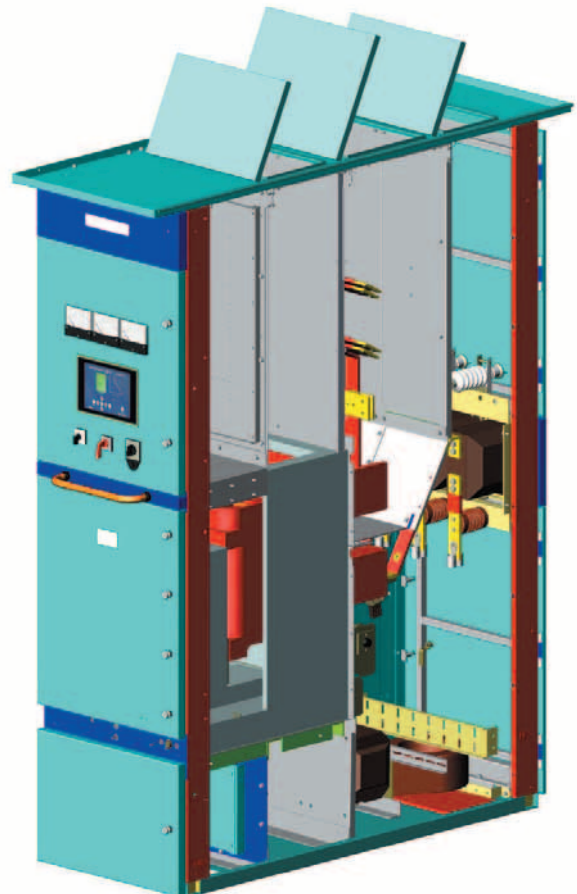
Low voltage compartment

The upper and lower low voltage compartments are located top and bottom of the circuit breaker compartment. Cables routed through the circuit breaker compartment are protected by metal shielding.

Panel partitions

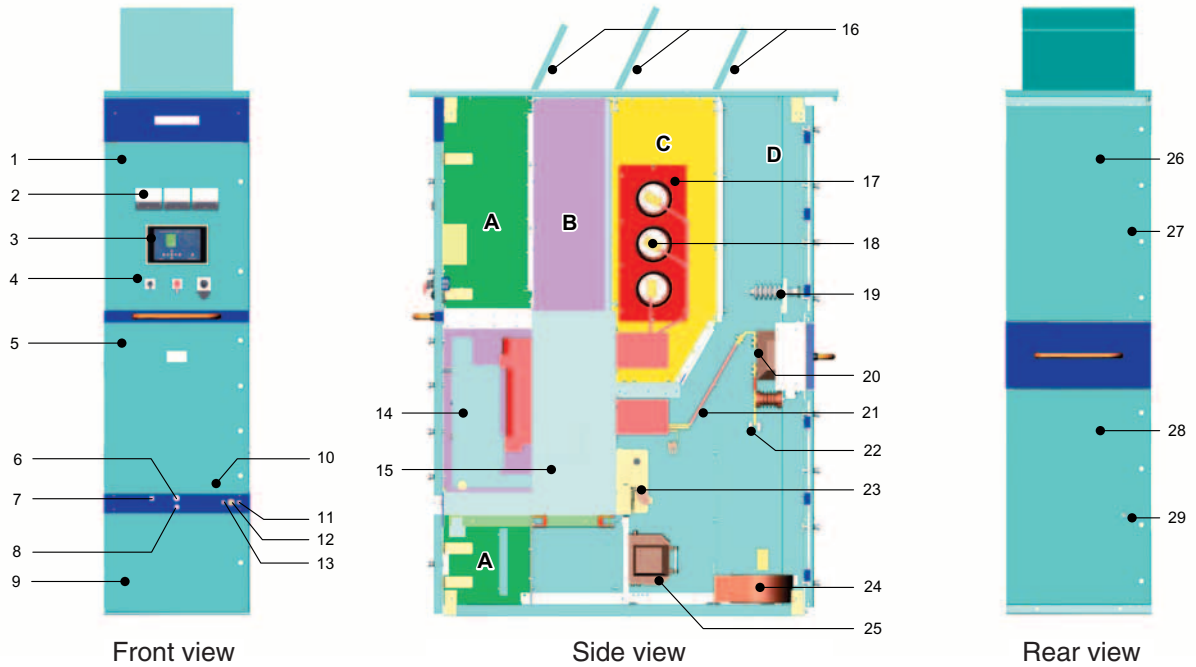
The compartment between each panel is divided by the metallic partition.

Since each compartment have not penetrated between panels, other panels are not affected even when the accident happens by a certain panel. Moreover, when extending in the future, it can install easily.



Construction

Basic panel design (example)



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 : Insulation bushing
- 18 : Main bus bar

B Circuit breaker 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 operating handle port
- 13 : Lower cable compartment door key
- 14 : Vacuum circuit breaker
- 15 : VCB cradle

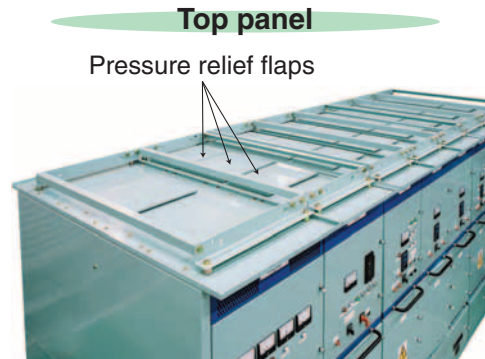
D Cable compartment

- 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

Product description

Pressure relief flaps

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



Insulation bushing

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

Insulation bushing



Specification

Rated voltage	12 kV
Rated power frequency withstand voltage	28 kV / min
Rated lightning impulse withstand voltage	75 kV
Over current strength	25 kA 1sec (3sec) ¹⁾

1) 3sec on request

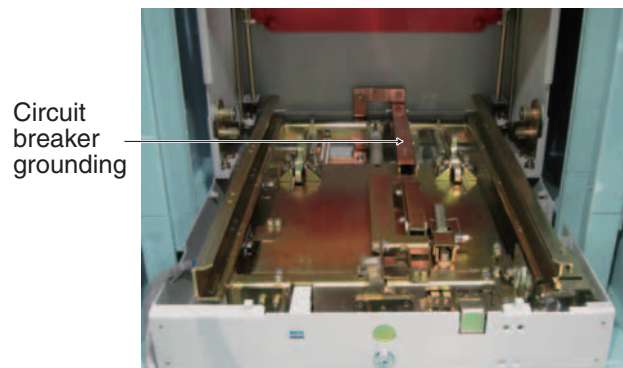
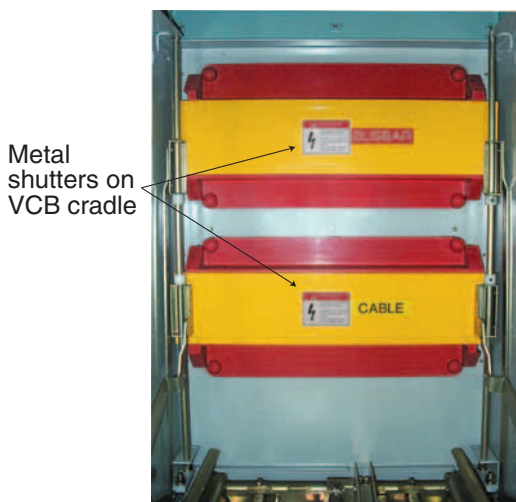
VCB (VCT) cradle

The cradle is equipped with mechanical interlocking facilities on the basis of safety consideration.

Metal shutters operate automatically on withdrawal or insertion of the VCB / VCT and VCCT.

Metal shutters of VCB cradle

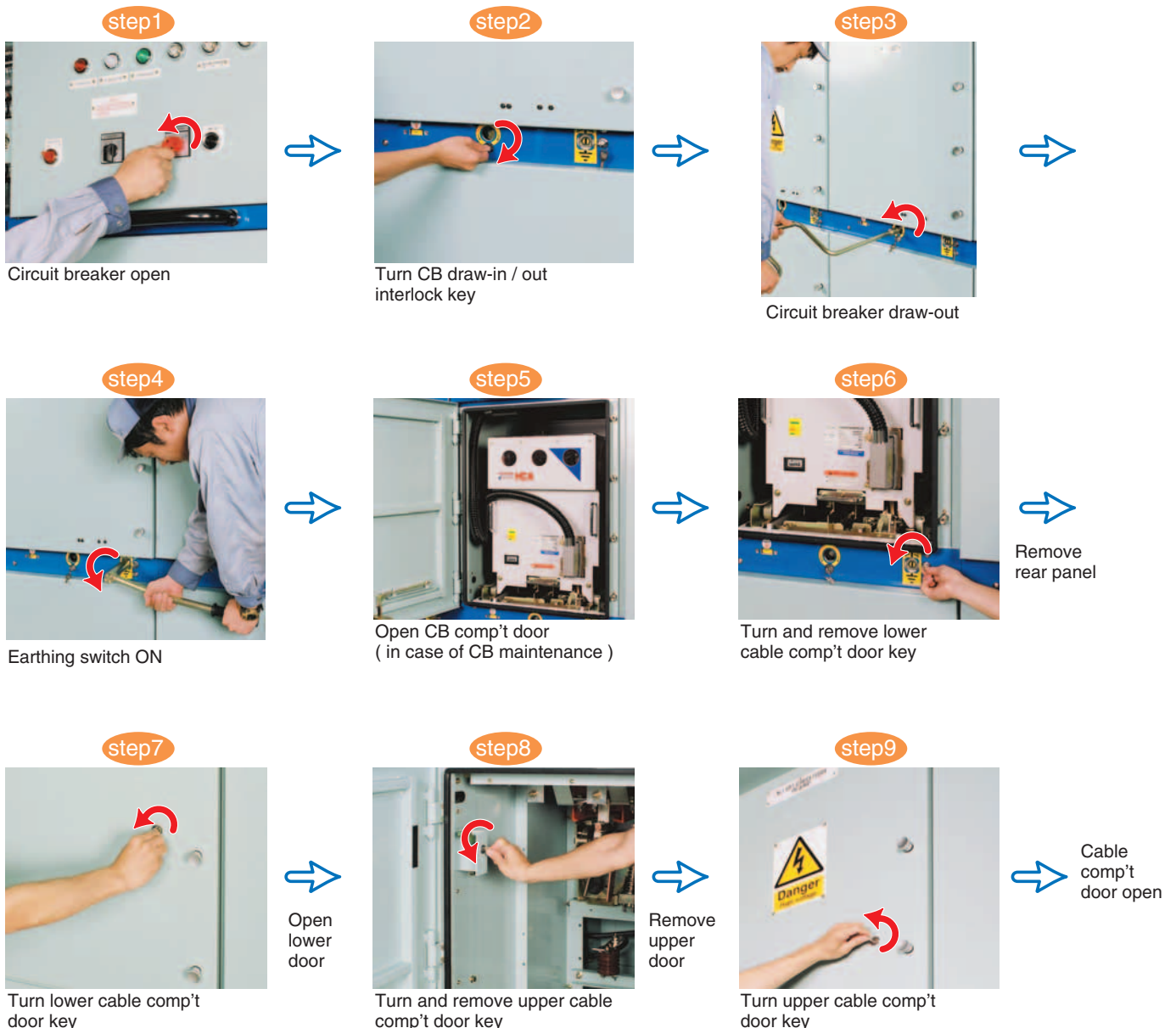
VCB cradle mechanism



Interlocks

- Mechanical interlocking facilities satisfy demand of IEC62271-200.
- Descriptions of the HS21 switchboard interlocks are shown below.
 - With metal-clad compartmented switchgear and controlgear, door should only be opened when the part of the main circuit contained in the compartment being made accessible is dead.
 - They shall be provided with locking facilities, unless the safety of persons is assured by a suitable interlocking device.
 - The withdrawal or engagement of a circuit breaker, switch or contactor shall be impossible unless it is in the open position.
 - It shall be impossible to close the circuit breaker, switch or contactor in the service position unless it is connected to auxiliary circuit.
 - When circuit breaker is a connect position, it isn't possible to do the "ON" position of earthing switch.

Interlock release procedure for maintenance (example)



Components

Vacuum circuit breaker HVF

• Applicable standards

The HVF vacuum circuit breakers meet all the requirements of IEC 62271-100 and the other applicable standards.

• Service life time

HVF vacuum circuit breaker operating mechanism features reduced maintenance requirements, providing a long-life expectancy of 30,000 operations.

Because of the small amount of contact erosion, contact life is increased to 20,000 operations for the rated normal current.

• Maintenance free

The circuit breaker require little maintenance.

In fact, only the parts subject to normal wear and aging must be serviced to ensure fully reliable operation.

This involves simple jobs carried out by the customer's personal with short servicing times and corresponding downtimes and also long operation periods between servicing.

Maintenance is confined to lubricating the operating mechanism.

The vacuum interrupters and their supports need not be serviced.

• Rapid load transfer, synchronizing and operating duty

With its consistent short closing and opening times, the HVF is especially beneficial in load transfer from one circuit to another without interruption of service. This high speed operation synchronizes the systems so that they are parallel at the moment of contact closure.

According to the relevant standards, tests were carried out for the following operation duty.

O - 0.3s - CO - 3min - CO (for auto-reclosing)

• Switching upload transformers

By using special contact materials, the chopping current of the vacuum circuit breakers is only 4 to 5A.

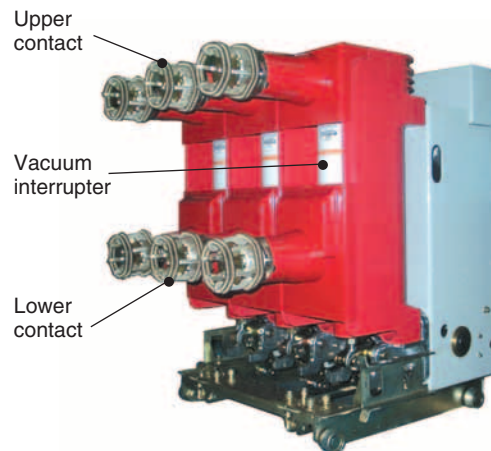
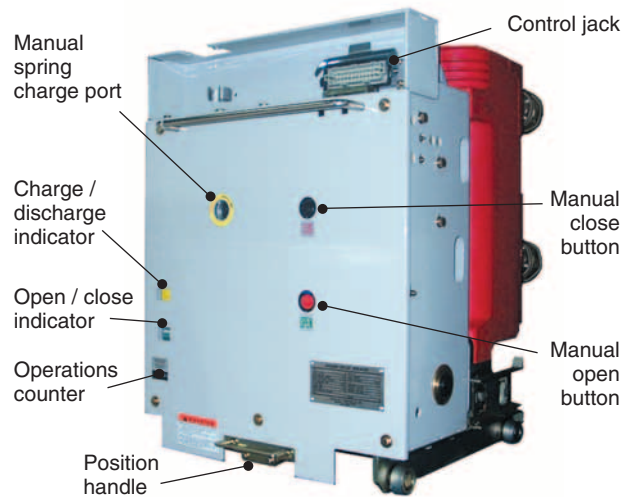
This means that no dangerous over voltages arise when unloaded transformers are disconnected.

Specification

Type	HVF-104□ / HVF-204□ ¹⁾		
Rated voltage	7.2 / 12 kV		
Rated current	630 A	1250 A	2000 A
Rated frequency	50 / 60 Hz		
Rated short circuit breaking current	25 kA		
Rated short circuit making current	65 kA		
Rated short time withstand current	25 kA 3sec		
Rated control circuit voltage	DC 110V		

1) Type number in the square "□" 1) ...630A, 2) ...1250A, 3) ...2000A

Vacuum circuit breaker HVF



HVF breaker on cradle



Components

Vacuum contactor HCA

• Applicable standard

The HCA vacuum contactor is manufactured in accordance with international standard IEC 62271-106.

• Service life time

HCA vacuum contactor operating mechanism features reduced maintenance requirements, providing a long-life expectancy of 1,000,000 operations.

• Contact inspection

Inspection of contacts for wear can be easily carried out by removal of the front plate and examination of the maximum contact wear point (2mm) marked in white on the contact.

If the contacts are eroded below this mark, the vacuum interrupter should be immediately replaced.

Specification

Type	HCA-6□C□ ¹⁾	
Rated voltage	7.2 kV	
Rated frequency	50 / 60 Hz	
Rated current	200 A	400 A
Rated short circuit breaking current (with power fuse)	40 kA	
Rated short time current	3.2 kA 1sec	
Rated control circuit voltage	AC / DC 110V	
Max motor capacity	1500kW	3000kW

1) Type number in the square "□"

HCA-□C□

2...200A, 4...400A

F...fixed type without fuse

J...fixed type with fuse (double)

A...fixed type with fuse (single)

B...draw-out type without fuse

D...draw-out type with fuse (single)

H...draw-out type with fuse (double)

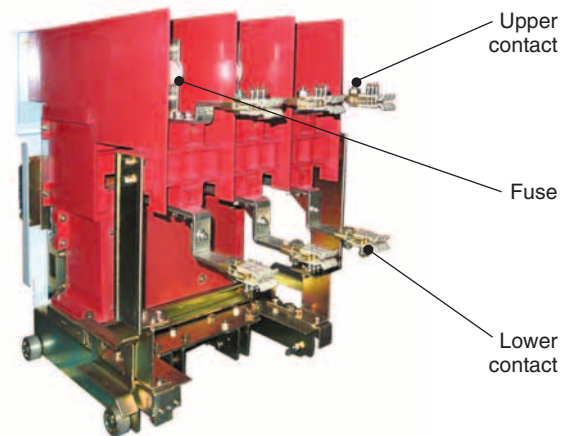
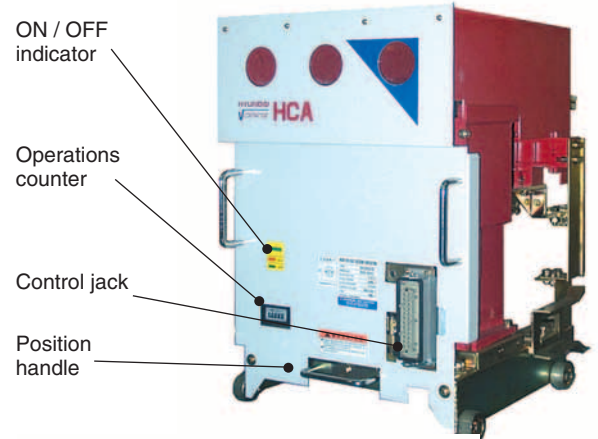
Earthing switch

The earthing switch is located on the VCB/VCT cradle and has a making current capacity rating that ensures maximum possible protection for the operator in case of an error.

Specification

Rated voltage	12 kV
Rated short time withstand current withstand voltage	25 kA 3sec
Rated short circuit making current withstand voltage	63 kA

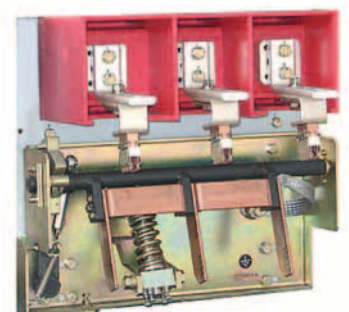
Vacuum contactor HCA (with single fuse)



HCA contactor on cradle



Earthing switch



Components

Multi-Protection Relay PRR-1H

• General characteristic

PRR-1H is a multi-protection relay for medium or low voltage circuit breakers that is capable of indicating via LEDs that the load current is picked up or the breaker trips open and showing various information including the phase current, line voltage and fault current on the LCD.

The relay is available in three types: for generator protection, feeder circuit protection, and transformer protection.

• Functions

- Multi-protection
- Detection via zero-phase voltage
- Directional ground fault current detection
- Ratio differential characteristic
- Reverse power trip
- Readout of trip/alarm cause
- Internal clock
- Self-diagnostic

• Measurement/event indication function

Load current (±1.5%)	Present value for each phase
	Present max value
Line voltage (±1%)	Present value of each line voltage
	Present value
Electrical power (±2.5%)	Demand value
	Max. demand value
	Electrical energy (±2.5%)
Power factor (±5%)	Present value
	Frequency
Trip event log	Fault current
	Indication of cause
	Fault occurrence time
Alarm event log	Alarm cause · Alarm event log
	Indication of alarm fault current value and operating time

• Features

- The zero-phase voltage detection scheme is used for insulation monitoring, which allows the relay to apply to an isolated neutral system. Then, the directional ground fault protection scheme prevents miss-detection due to occur ground fault of other system.
- The ratio differential characteristic permits application of the relay to fault detection in or protection of transformers and generators within a system. The bias function also serves to prevent a malfunction.

Multi-Protection Relay PRR-1H-G



<Specification>

- Control voltage: 110V DC, 24V DC
- Electric power consumption: 5VA
- Dimensions: W230×H140×D202

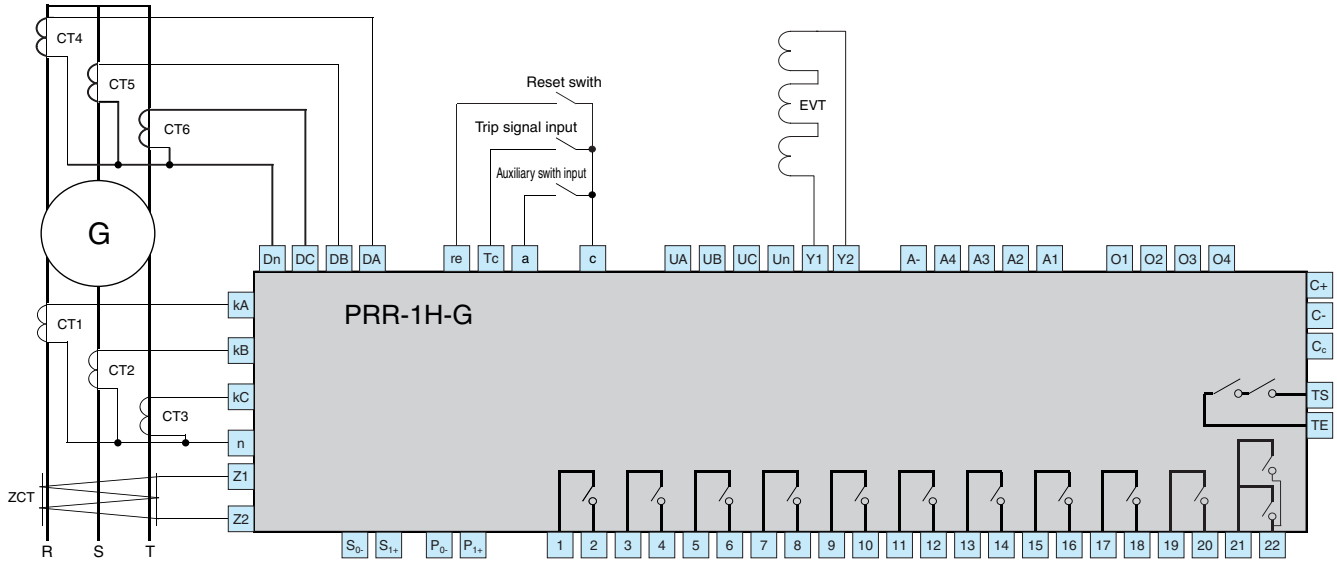
• Protective function

		PRR-1H-G	PRR-1H-F	PRR-1H-T
		Generator protection	Feeder circuit protection	Transformer protection
Adjustable long time-delay trip	LT	○	○	○
Adjustable short time-delay trip	ST	○	○	○
Adjustable instantaneous trip	INST	○	○	○
Adjustable undervoltage trip	UV (27)	○	△	—
Adjustable overvoltage trip	OV (59)	○	△	—
Adjustable reverse power trip	RP (67R)	○	—	—
Adjustable Overvoltage ground ground fault trip	OVGR (64)	○	○	○
	Directional ground (87G)	○	○	○
	Directional ground (87T)	○	—	—
Ratio differential trip DIFF	(87T)	—	—	○
	PTA	○	○	○
Pre-trip alarm	PTA2	○	—	—

○: Standard △: Optional

Components

• Connection diagram



Terminal description

S ₀₋ , S ₁₊	Control power input for Protective function 110V DC, 24V DC	A1 - A	Monitoring function 4 – 20mA signal output
P ₀₋ , P ₁₊	Control power input for Monitoring function 110V DC, 24V DC	A2 - A	
KA - n	Measuring CT LT, ST, INST, PTA, PTA2, DIFF, RP, (NS)	A3 - A	
KB - n		A4 - A	
KC - n		1 - 2	Operation signal output
DA - Dn	3 - 4		
DB - Dn	5 - 6		
DC - Dn	7 - 8		
Z1 - Z2	ZCT	9 - 10	
a - c	Auxiliary switch input	11 - 12	
Tc - c	Trip signal input	13 - 14	
re - c	Reset switch	15 - 16	PTA2 operation signal output
UA, UB, UC, (Un)	Rated voltage input for UV, OV, RP, (UF/OF)	17 - 18	Lock-out
Y1 - Y2	EVT	19 - 20	Circuit self-diagnostic (For Protective function)
O1 - O2	Monitoring function CT for 4 – 20mA signal	21 - 22	Trip signal output
O3 - O4	CT rated current: 1A or 5A	C+	Communication line (+)
		C-	Communication line (-)
		Cc	Communication line (common)

• Other features

- Separation of the control power for the protection circuit and measuring circuit enhances the redundancy and reliability.
- Information displayed on the LCD of the front panel includes the phase currents, voltage, electrical energy, demand electrical power, power factor, pickup current & time settings, fault current and trip pickup time.
- An internal clock allows the fault occurrence time to be displayed on the LCD and up to 100 fault events and 100 alarm events to be viewed in chronological order.
- The self-diagnostic function comes standard with the relay, providing an alarm via a relay contact output if an error occurs in the CPU.

Optional functions are shown below.

- Output signals including current and voltage are analogue and delivered via 4 to 20 mA DC terminals.
- Modbus communication is available.

Components

Motor protection relay PRS-1S

• General characteristic

The PRS-1S is an electronic motor protection relay with high functionality that detects various states when an AC motor starts and while it is operating. Measurement and monitoring functions are installed in addition to the basic 3 elements of the motor protection function (overload protection, open-phase protection, and reverse-phase protection).

• ANSI 51R : Overload protection function

The protection function is adapted to the motor starting characteristics and the load characteristics.

• ANSI 46 : Open-phase protection function

“Open phase” is a state in which the motor operated in a single-phase state because the power wire connected to the motor became disconnected, the connection area was loose, or there was a disconnection inside the motor. Open-phase states can cause motor winding burnout, and detecting open-phase states can prevent this.

• ANSI 47 : Reverse-phase protection function

“Reverse-phase” is a state in which the phase sequence of a motor is connected in reverse and the motor rotates in the reverse direction. This cannot be checked visually in some installation locations, and reverse-phase protection is a function that is essential in order to prevent reverse rotation.

• Other protection functions

- ANSI 51L : LOAD INCREASE
- ANSI 50 : OVER CURRENT SHORT
- ANSI 49S/51 : THERMAL CAPACITY
- ANSI 46 : UNBALANCE
- ANSI 48 : MAX START TIME

• Function that displays and saves the activation information and history

- Trip and alarm activation: If trip or alarm occurs, the time of occurrence, cause of activation, activation value, and activation duration are displayed on the screen. The system can save 100 instances each of trip and alarm activation.
- History of phenomena that occurred: The system can save a total of 200 instances of the history of the following phenomena that occurred. These phenomena will be displayed on the screen in chronological order, so it is easy to track detailed information about the phenomena that occurred.
 - Trip activation (time of occurrence / cause of activation)
 - Alarm activation (time of occurrence / cause of activation)
 - Reset operation (time of occurrence / reset operation details)
 - External input (time of occurrence / external input state)

• Measurement display function

- The display screen displays the following measurement values.
 - Phase current • Unbalanced current • Motor winding temperature • Motor load current
 - Leakage current • Motor starting time • Motor starting current • Motor operating time
 - Motor operating cycles • External command input state • External output operating state

• Monitoring function

- Communication function: In Modbus RTU mode (RS-485), it is possible to read and write protection setting values and output measurement values and histories.
- Analog output: The maximum phase current value can be converted to 4-20 mA current and output externally.

Motor protection relay PRS-1S



Specifications

Control voltage	DC110V
VA consumption	5VA
Outline dimensions	Width 96 × height 144 × depth 116 (includes terminal area on back side)
Temperature range	-10°C ~ +55°C
Storage temperature	-25°C ~ +75°C
Humidity	95% or less, and there must not be any condensation
Based standard	IEC60255 Measuring relays and protection equipment IEC60947-4-1 Part 4 Contactors and Motor-Starters

- ANSI 66 : TOO MANY STARTS
- ANSI 67 : DIRECTIONAL GROUND RELAY
- ANSI 49R : TEMPERATURE
- ANSI 37 : HIGH & LOW CURRENT
- EXTERNAL FAULT

Components

Generating plant management system GAC21

• General characteristic

The GAC21 Generating Plant Management System is designed to be reliable and user friendly. The system design is based on TERASAKI's experience as a dedicated manufacturer of generator control technology and multiplex transmission systems that have successfully been supplied to a large number of marine projects for many years.

The GAC21 System is a function-dispersed type system that is designed to operate using its PLC (programmable logic controller).

It consists of two control units, the GAC21 Automatic Generator Controller and the Type EAS-201 Multi functional synchronizer and can be utilized with up to a maximum of 5 generators.

• PLC (programmable logic controller)

The GAC21 automatically controls generators using its programmable logic controller. It covers the management of the entire generating plant, including the automatic load sharing function, automatic start, automatic switching and power management.

Control parameters and settings can be easily modified using the device provided with every GAC21 system.

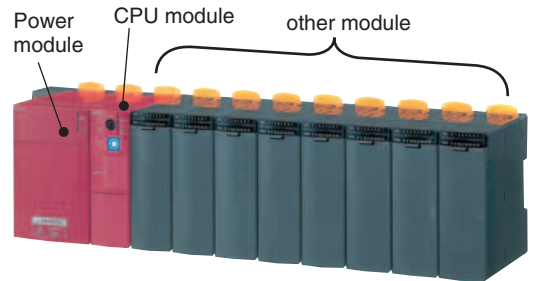
Multi functional synchronizer EAS-201

The EAS-201 Multi functional synchronizer has following features:

• Characteristic

- Check synchronizing function for manual operation support
- Self- diagnostic capability for CPU error, ADC error and power low
- Easy to realize error by LED indication
- Independent LED synchro lamp function from CPU
- Function for confirming normality of synchronous detection (Beat wave form)
- Easy to save event log
- Modbus communication can be transferred analogue data including voltage, frequency and so on.

PLC (programmable logic controller)



Specification

Type	Micrex-SX
Standard conformance	IEC 61131
Control power supply	24V DC (+30% to -25%)
CPU	32 bit processor
Processing speed	20 to 520 ns
Program memory	32 k step
Module function	analog input / output, digital input / out put, communication
No. of controlled generators	Max. 5
Communication	RS232C, RS485, TM, SX-BUS, P-link, Modbus ¹⁾

TM ... TERASAKI multiple transmission system
SX-BUS, P-Link ... Fuji Electric original high speed data link system

1) Constraints conditions

Automatic digital synchronizer EAS-201



Specifications

Type	EAS-201
Busbar input voltage	110 / 220V AC (switching)
Generator input voltage	
Rated frequency	50 / 60 Hz
Closing designation (selective)	SLOW, FAST, SLOW/FAST
Control output	250V AC 3A 24V DC 3A
Serial port	RS-485, Modbus
Controlled source	Busbar side 110V DC
Dimensions (mm)	W96 × H96 × D182

Optional equipment

HS21 prepares the various option equipment to improve safety more.

The list of the option equipment is shown below.

- **Inspection window**

Installed in the circuit breaker compartment door when visual confirmation is required by ships staff of the operating position of the circuit breaker.

- **IR Window**

Using Thermography enables temperature measurement of busbar without opening the closed compartment.

- **Arc detecting system**

Detection of an internal arc fault utilizing a light sensitive device (or current monitor) to detect arc flash. This enables the circuit breaker to open in the shortest possible time thereby minimizing damage to the switchboard.

- **Arc gas exhaust duct**

Should be used to divert arc gases to a safe location in the event of an internal arc fault.

- **Fully insulated bus bars**

This system affords additional insulated protection. Insulated tube on bus bar and boots are fitted to all bus bar connection points.

Insulation boots



- **Earthing switch on main bus bar**

If the customer requires additional safety, an earthing switch can be provided for the main bus bar.

- **Surge arrestor on main bus bar**

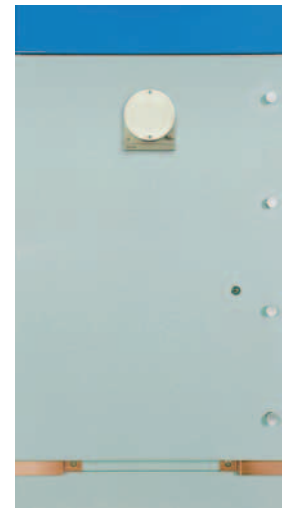
Additional protection can be provided on the main bus bar by the fitting of surge arrestors.

Inspection window



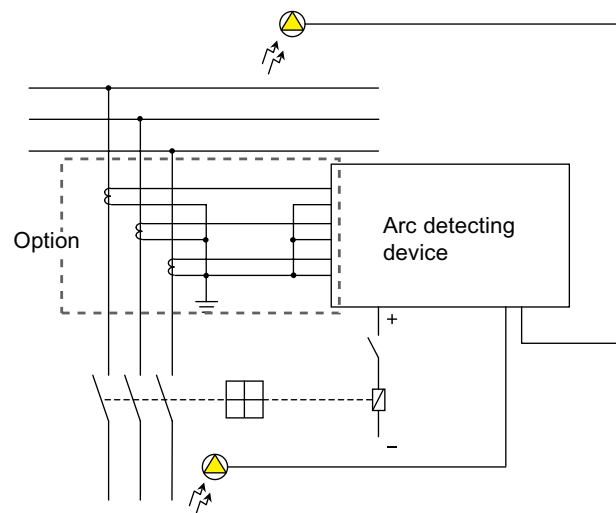
CB compartment door

IR Window



Cable compartment door

Arc detecting system



Arc gas exhaust duct



Fully insulated bus bars



Accessories

The accessories provided as standard are shown below.

- **Circuit breaker lifter**

Used to assist in the removal of the circuit breaker, contactor etc.

Standard type

Height	1800 mm
Width	600 mm
Depth	1250 mm

Compact type

Height	850 mm
Width	600 mm
Depth	1150 mm

- **Circuit breaker draw-in/out handle**

Used to assist in the withdrawal and insertion of the VCB and VCT.

- **Earthing switch operating handle**

Used for earth switching operations.

- **Charging handle**

Used to charge the closing spring of the circuit breaker.

- **Vacuum checker**

Used for check the vacuum degree.

Specification

Input voltage	200 / 220 V AC
Out-put voltage	11 kV / 22 kV AC
Weight	22kg

Lifter



Compact type



Standard type

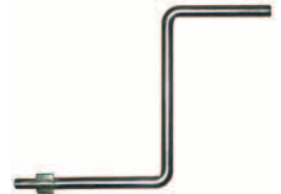
Circuit breaker draw-in/out handle



Earthing switch operating handle



Charging handle



Vacuum checker



Memo

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TERASAKI ELECTRIC CO., LTD.

Head/Osaka Sales Office

6-13-47 Kamihigashi, Hirano-ku,
Osaka 547-0002, Japan

TEL +81-6-6791-2786

FAX +81-6-6791-2773

hakuei-osaka@terasaki.co.jp

Head Office/International Sales Dept.

6-13-47 Kamihigashi, Hirano-ku,
Osaka 547-0002, Japan

TEL +81-6-6791-2790

FAX +81-6-6791-2773

hakuei-osaka@terasaki.co.jp

TERASAKI ELECTRIC CO.,(F.E.) PTE. LTD.

17 Tuas Street Singapore 638454

TEL +65-6561-1165

FAX +65-6561-2166

tefe@terasaki.com.sg

www.terasaki.com.sg

Tokyo Sales Office

Nikko Kayabacho Building 5F, 1-6-10, Kayabacho,
Nihonbashi, Chuo-ku, Tokyo 103-0025, Japan

TEL +81-3-5644-0150

FAX +81-3-5644-0155

Shanghai Representative Office

Room No.1405-6, Tomson Commercial Building,
No.710 Dong Fang Road, Pudong, Shanghai 200122, China

TEL +86-21-5820-1611

FAX +86-21-5820-1621

terasaki@vip.163.com

TERASAKI ELECTRIC (SHANGHAI) CO.,LTD.

Building 5 & 7, No.399 Xuanzhong Rd,
Nanhui Industrial Zone, Shanghai, China 201314

TEL +86-21-5818-6340

FAX +86-21-5818-6350

tsc@terasaki.com.cn

www.terasaki.com.cn

Kyusyu Branch Office

3798-4 Kubara, Yamashiro-Cho, Imari-City,
Saga Pref 849-4256, Japan

TEL +81-955-28-3700

FAX +81-955-28-3799

Hamburg Representative Office

Anderheitsallee 4c, D-22175 Hamburg,
Germany

TEL +49-40-55-611-911

FAX +49-40-55-611-912

dan.graniceanu@terasaki.de

TERASAKI ELECTRIC (CHINA) LTD.

Building A-04, NO.76, Chuangyu Road, Ningxi Street,
Zengcheng District, Guangzhou 511338, China

TEL +86-20-8270-8556

FAX +86-20-8270-8586

tcsales@terasaki.cn

www.terasaki.cn

AUG. 2023

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Printed in JAPAN