

Hyundai Ring Main Unit

for Marine Use (7.2 kV 20 kA / 1 sec)



Hyundai Ring Main System
HRS



HRS – Hyundai Ring Main System

for Marine Use (7.2 kV 20 kA / 1 sec)

The HRS system ensures high-quality, high-reliability power source and Uninterruptible Power Supply device for end-user. Fully SF₆ gas insulated HRS provides protection against hard environmental elements such as flooding, and is maintenance-free with long operating life time.

HRS has one modular and easy extensible type which has HRS-L(Load Breaker Switch), HRS-V(Vacuum Interrupter).



Field of Application

Hyundai HRS system is designed not only for industrial use but also for vessel use.

Also, HRS meets various voltage range as follows.

| | |
|--------------------|---------------|
| Rated voltage [kV] | 7.2 |
| Rated current [A] | 630 |
| Short time Current | 20 kA / 1 sec |

IEC/GB Standards

Hyundai HRS system meets IEC/GB Applications.

International Application

IEC 62271-200
IEC 62271-105
IEC 62271-102
IEC 60265-1
IEC 62271-100
IEC 60694
IEC 60376
IEC 60480

Chinese Application

GB 3906-1991(Alternating current metal clad switchgear)
GB 1984-2003(High-voltage alternating-current circuit-breakers)
GB 3804-1990(High-voltage alternating-current load-breaker switches)
GB 16926-1997(High-voltage switches)

**Electrical
Safety**

**High Speed
Rotary Puffer**

**Safety
Upgrade for
Operator**

**Manual
and Remote
Control**




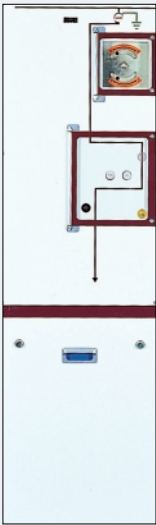
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Ring Main Unit

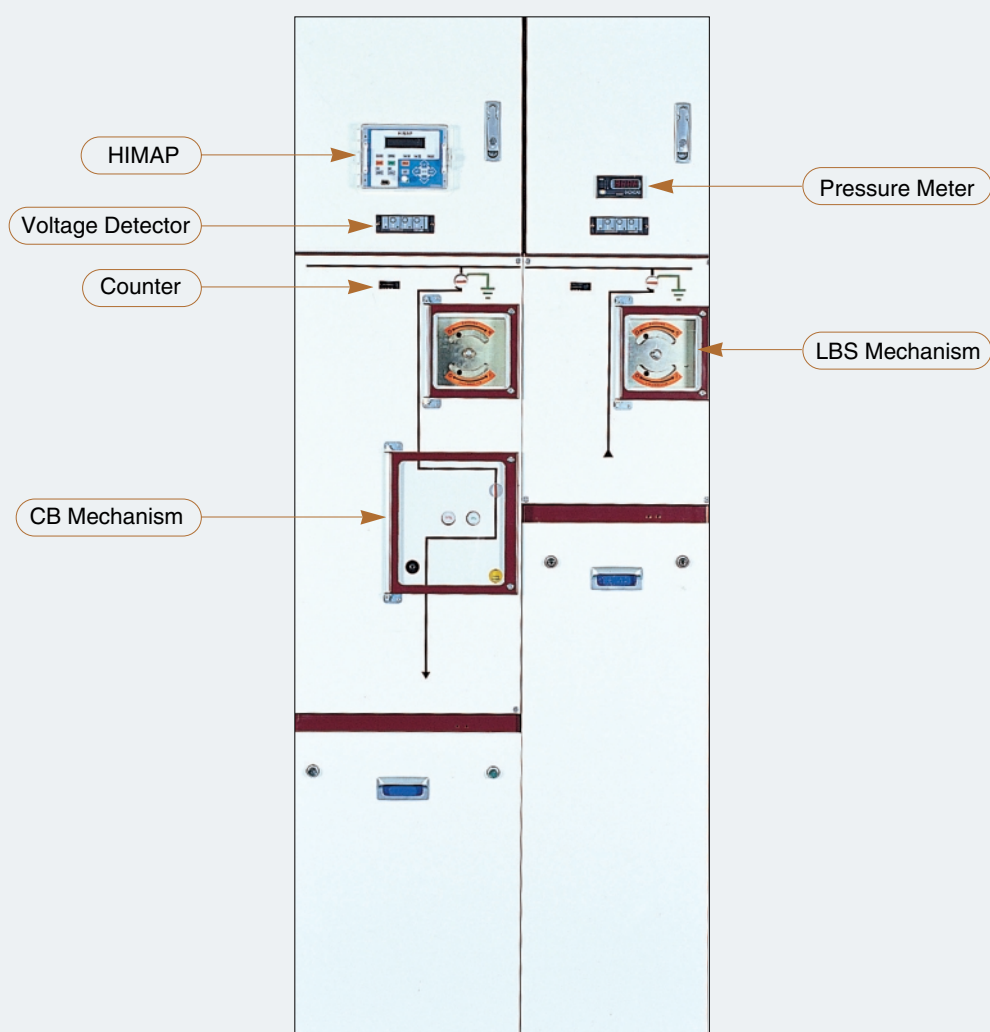
Function

Hyundai HRS system has the following functions.

| Scheme | Denomination | Description |
|---|----------------------------------|--|
|  | HRS-L (Incoming Panel) | <p>3-Position switch-disconnector allows to connect the main busbar or disconnect it from incoming cables.</p> <p>This disconnects the actual current to its rated value, and has three positions "Close-Open-Earth."</p> <p>In the earthing position, short circuit and three phases of the MV cables are earthed simultaneously.</p> |
|  | HRS-V (Feeder Panel) | <p>This panel has 3 vacuum interrupters for each phase and a 3-position switch-disconnector in series.</p> <p>Like HRS-F panel, the optional over-current protective relay HIMAP-Fi can be used for general or transformer protection.</p> |

General Scheme Description

HRS(Extensible Type)



Ring Main Unit

Detailed Scheme Description

Operating Mechanism

Two parts of operating mechanisms are served depending on the switching device.

■ Circuit breaker mechanism:

Ready for operating by spring charged with manual lever or motor.
Close operating is done by push button, then spring is charged simultaneously for open.

■ 3 Position switch:

Ready for operating by spring loading with manual lever or motor.

3-Position switch-disconnector for HRS has characteristics which are rotation and buffer type for safety. And it is equipped with special spring to reduce the operating speed deviation caused by operator.

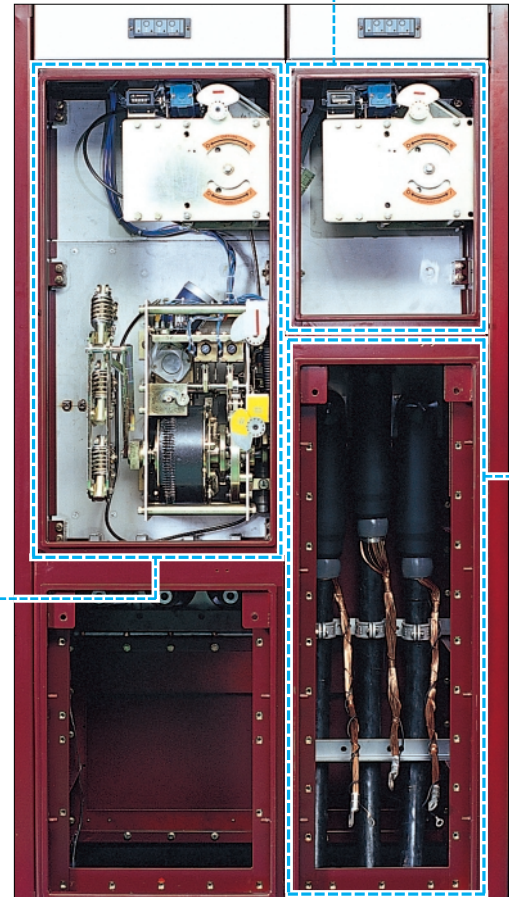
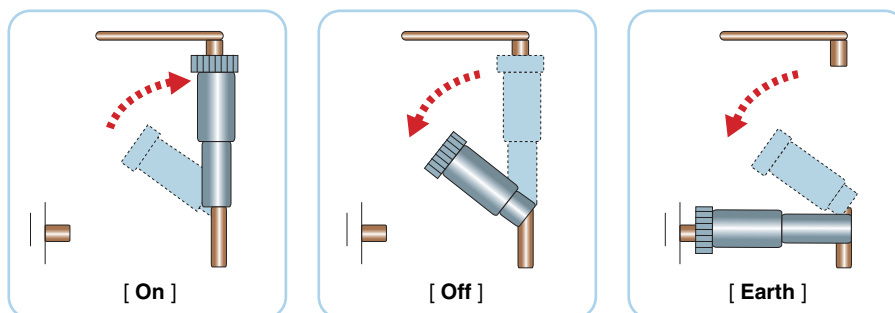
Circuit Breaker

Circuit breaker panel consist of two parts. One is mechanism and the other is Vacuum Interrupter.

There are two(2) contacts at each pole, fixed contact is placed near the back of the panel and the moving one oriented towards the front of the panel.

Operating Sequences : O - 0.3 sec - CO - 3 min - CO

■ Switch Operation



Gas Tank

The gas tank, stainless-steel(SUS 304L) contains 3 position switch disconnecter, busbar and vacuum interrupter, and is filled with SF₆ gas. SF₆ gas pressure is 1.3 bar absolute(except altitude more than 2,000m meters above). The tank is sealed perfectly; there is no need for maintenance and refill of the gas.

So, it serves long and safe operating condition.

This tank has bursting disc which evacuates the gas through the gas duct. In the case of internal arc, it prevents harm to personnel, cables, etc.



Cable Compartment

The steel-plate ensures mechanical deformation and galvanized treatment prevention from corrosion and it gives enough space for cabling works.

The front is painted with powder paints.

In this panel a copper strip busbar runs along the length of the panel for the connection to the earth.

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Ring Main Unit

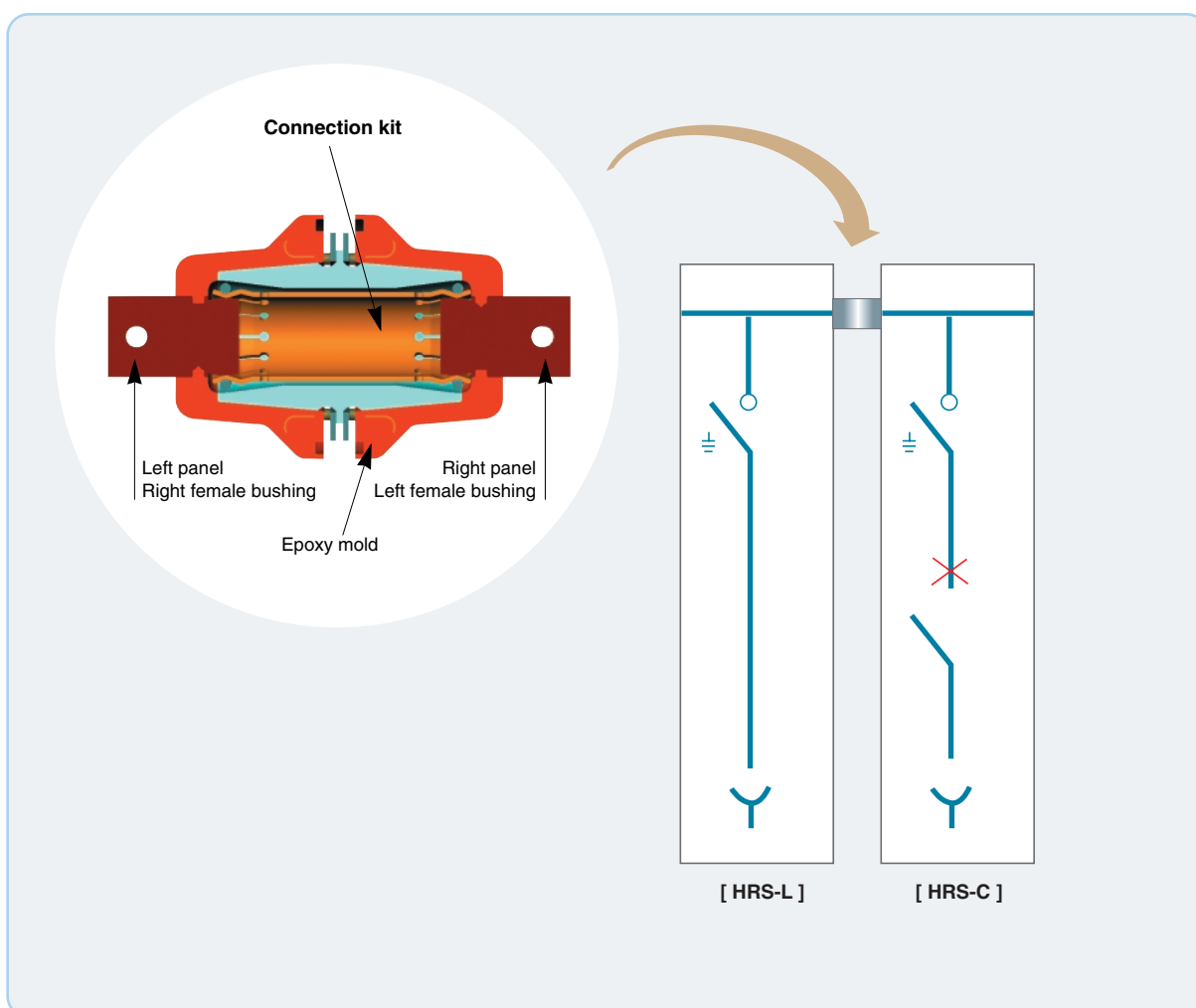
Connection

Connection between panels



Panels are connected electrically by the connecting kit which is made by Hyundai. This kit comprises three phase plug-in adaptor which is placed between the female bushings on the side of the panels.

This connection kit prevents partial discharge and maintains the insulation characteristics, the rated currents and short circuit currents, that the panels have individually. After fitting the three adaptors on the three phases of the busbar, it is only necessary to connect the earth and ensure the mechanical link between the panels with bolts.



Operation

Easy operation mechanism

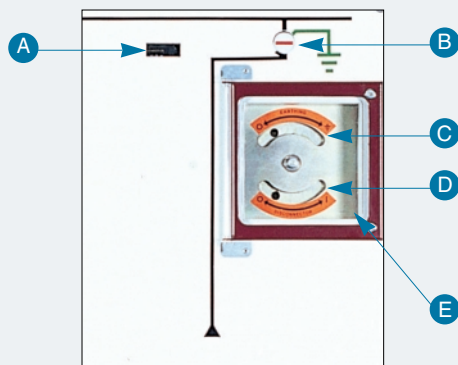
HRS has circuit breaker, 3 position switch disconnecter panel.

Each panel has a cover on which indicator, mimic diagram and operating hole is placed.

Operator can check the on-condition with positioning indicator.

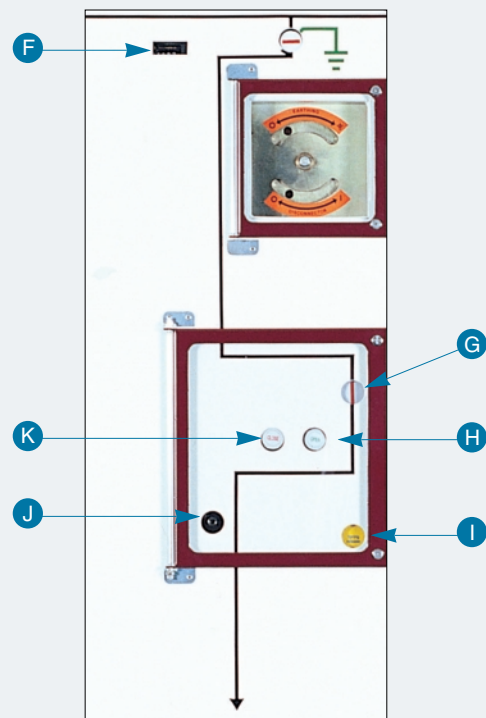
Mechanism is linked directly to the moving part to ensure hi-fidelity operation at any condition.

[HRS-L]



- A : Operation counter
- B : Indicator
- C : LBS close/open handle inlet
- D : Earthing close/open handle inlet
- E : Safety cover with locking

[HRS-V]



- F : Operation counter
- G : Breaker on/off indicator
- H : Breaker off push button
- I : Spring charge indicator
- J : Spring charging handle inlet with cover
- K : Breaker on push button

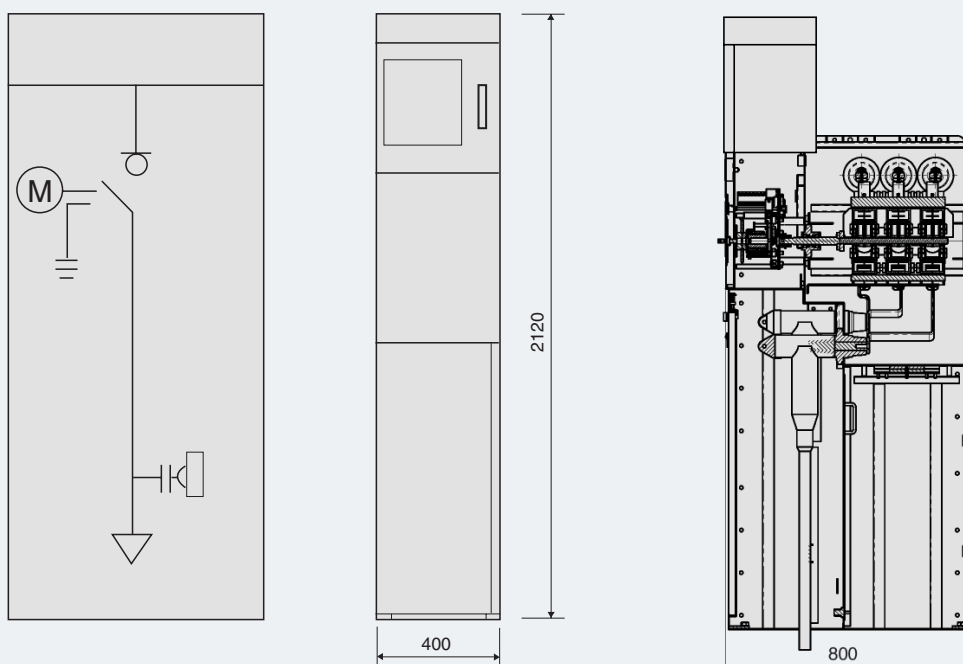
Ring Main Unit

Characteristics

Technical data(nominal values)

| Type | HRS-L(LBS) |
|--|------------------------|
| Rated voltage [kV] | 7.2 |
| Rated frequency [Hz] | 50 / 60 |
| Rated power frequency withstand voltage [kV] | 20 / 23 |
| Rated lightning impulse withstand voltage [kV] | 60 / 70 |
| Rated current for busbars [A] | 630 |
| Rated short-time current [kA] | 20 / 1 sec |
| Rated breaking current [A] | 630 |
| Rated short-circuit making current [kA] | 52 |
| Rated earthing short-circuit making current [kA] | 52 |
| Rated current (Load) [A] | 630 |
| Insulating gas | SF ₆ |
| Rated filling gas pressure, absolute, 20°C [bar] | 1.3 |
| Degree of protection (High voltage part) | IP 65 |
| Degree of protection (Low voltage part) | IP 4X |
| Dimension | W:400 x D:800 x H:2120 |

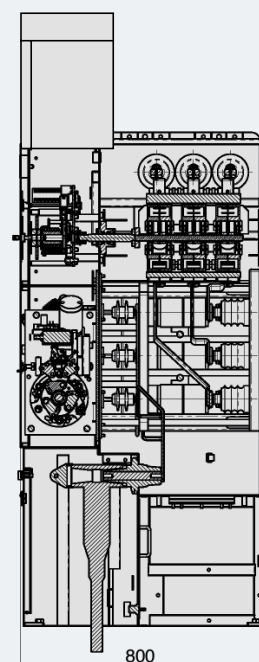
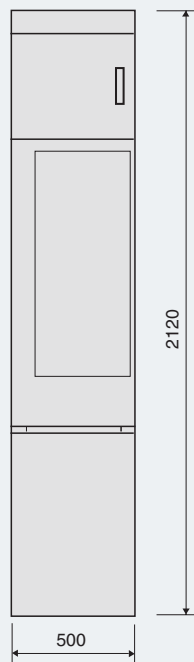
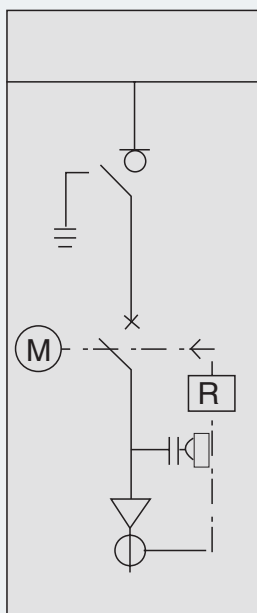
Unit : mm



Technical data(nominal values)

| Type | HRS-V(CB) |
|--|-------------------------------|
| Rated voltage [kV] | 7.2 |
| Rated frequency [Hz] | 50 / 60 |
| Rated power frequency withstand voltage [kV] | 20 / 23 |
| Rated lightning impulse withstand voltage [kV] | 60 / 70 |
| Rated current for busbars [A] | 630 |
| Rated short-time current [kA] | 20 / 1 sec |
| Rated breaking current [kA] | 20 |
| Rated short-circuit making current [kA] | 52 |
| Operating sequences | O - 0.3 sec - CO - 3 min - CO |
| Rated current (Load) [A] | 630 |
| Insulating gas | SF ₆ |
| Rated filling gas pressure, absolute, 20°C [bar] | 1.3 |
| Degree of protection (High voltage part) | IP 65 |
| Degree of protection (Low voltage part) | IP 4X |
| Dimension | W:500 x D:800 x H:2120 |

Unit : mm



Ring Main Unit

Characteristics

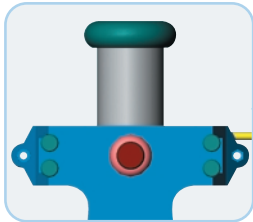
Electrical safety

3 position switch disconnecter mechanism can be earthed to discharge for personnel safety.
All operation to be carried out in the panel which is filled with SF₆ gas, so it need not take an electrical components to pieces.

Safety upgrade for operator

To prevent from mis-operation HRS prepared handle shutter interlock, so HRS ensures operator's safe operation and prevents accident at any time.
And under alive condition, any operator can not open the door to prevent operator's miss.
HRS ensures safety for operator under any condition.

High speed rotary puffer



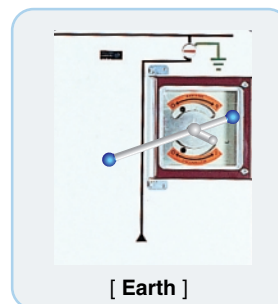
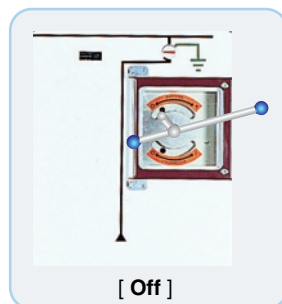
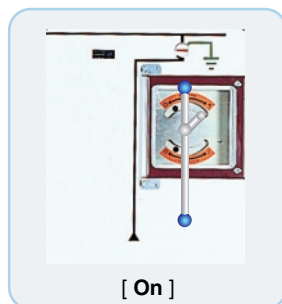
To ensure high insulation and recovery HRS system has high speed and rotary puffer type disconnecter which is operated in the SF₆ gas.

Manual and remote control

"On" and "Off" can be operated by manual or remote.

Handling

3 position switch disconnecter mechanism

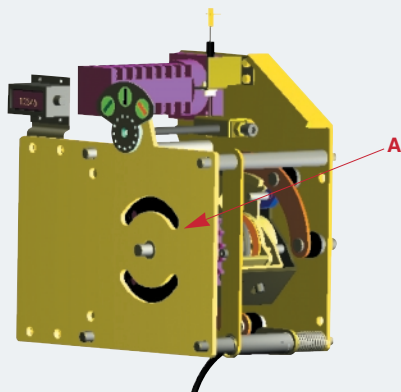


To ensure the operator's safety the mechanism can be "Earth" only after the 3 position switch disconnecter is in the "Off" position.

Operating Principle

Motorized 3 position switch disconnecter mechanism

To ensure the operator's safety the mechanism can be "Earth" only after the 3 position switch disconnecter is in the "Off" position.



Operation

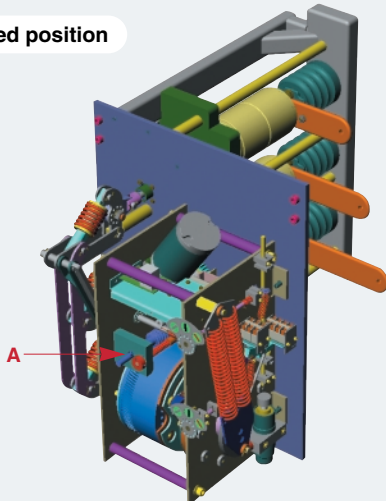
1. When "Close" push button is pressed, "A" rotates to clockwise, then the position of mechanism placed "Close".
2. When "Open" push button is pressed "A" rotates to counterclockwise, then the position of mechanism placed "Open". Only this status can be switched to "Earth".

Motorized circuit breaker mechanism

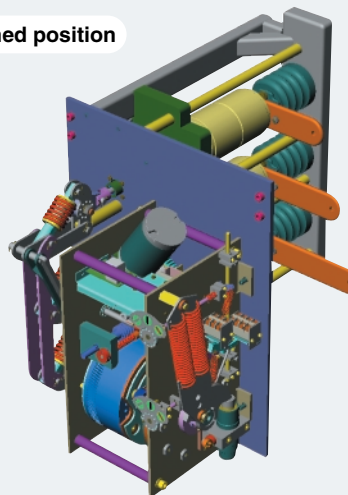
Circuit breaker mechanism is broken(opened) by abnormal condition such as over-current.

So, this function ensures safety of load. If abnormal condition to be recovered to normal condition, re-close is possible.

Closed position



Opened position



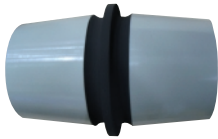
Operation

1. Insert the handle at "A" slot which is the start point of spring charge, then wind up clockwise until it stops.
2. If push button "On" is pressed, the charged spring is discharged, then the circuit breaker is in the "Close" position.
At the same time "Open" spring is charged, and it is ready for "Opening".
3. If push button "Open" is pressed, trip spring for "Open" is discharged, then the "Open" process is finished.

Ring Main Unit

Accessories

Connecting Set



When serial connecting each panel, this one will be equipped with each phase. This ensures perfect water-proof, sealing and safety from electrical shock.

End Plugs



When serial connecting each panel, this one will be equipped at each end side. This ensures perfect water-proof, sealing and safety from electrical shock.

Handle



User friendly manual operating handle uses for 3 position switch disconnecter.

Gas Indicator



Gauge for SF₆ pressure user can check easily gas press in front of the panel.

Cable Plug



Cable connecting material. It ensures high insulation level, rated power frequency / lightning impulse to withstand voltage.

Counter



To count the operating times of mechanism. User can adjust the times manually.

Bursting Disc

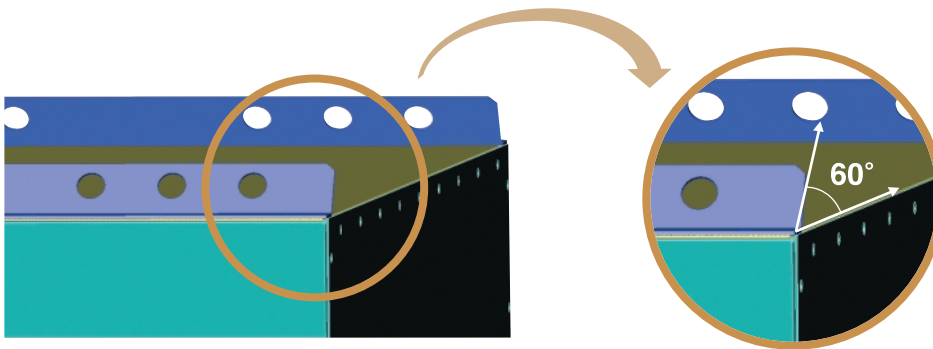


This bursting disc prevents the panel from bursting. It burst when inner SF₆ gas become hot gas such as arc fault.

Transport and Installation

Transport

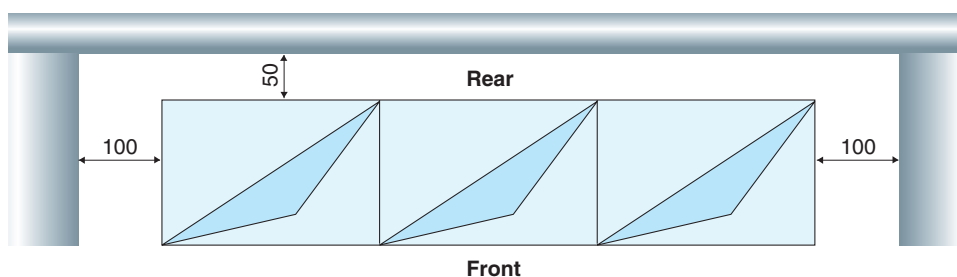
When transporting the panels, hook the transport rope or hook on the lifting angles which are placed upper of the panels. When using transport rope or hook, it must become horizontal direction and 60° . If using bolts, it must meet or be above tensile strength 4.4T and M10. And topside 4 positions or above places must be bolted.



Installation

HRS panel is operated normally below altitude 1,000meter, ambient temperature under $-5 \sim 40^\circ\text{C}$ condition. Panel's durability secures 30 years in normal operation.

For ventilation, minimum distance from rear side must be 50 mm or above, from side it must be 100 mm or above. Also, the variegated floor of when establish on customer need by preliminary consultations supply of base seat of suitable special procurements form possible (Option).



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