

**HMS Medium Voltage**

# Metal-clad Switchgear





M E T A L - C L A D S W I T C H G E A R

Safety  
and  
Reliability

Flexible  
Design  
and  
Compact

Easy  
Installation  
and  
Maintenance

# HMS-106

with Vacuum Circuit Breaker HAF

# HMS-108

with Vacuum Circuit Breaker HVF

## HMS Medium Voltage

# Metal-clad Switchgear

Hyundai medium voltage metal-clad switchgears models HMS-106 and HMS-108 with a drawable circuit breaker trucks are single-tier, factory-assembled and suitable for a rated voltage of 7.2kV to 24kV.

The switchgears have been type tested in accordance with applicable IEC standards.



### C O N T E N T S

General .....	03
<b>HMS-106</b>	
Construction .....	06
Dimension .....	08
<b>HMS-108</b>	
Construction .....	11
Dimension .....	13

# Metal-clad Switchgear

## Design Concepts

HMS switchgears have been designed and manufactured in cooperation with our quality assurance program ensuring;

- Maximum safety and reliability
- A minimum of maintenance, with all parts easily accessible
- A simple but flexible design
- Easy installation

## Applicable Standards

HMS switchgears comply with the following international standards.

- IEC 298 and 694
- BS 5227
- JEM 1425

## Description of Protection Degree

Degree	Description of Protection
IP2X	Protection against entry to hazardous parts for a finger or other solid foreign objects of diameter greater than 12mm. No protection against water.
IP4X	Protection against entry to hazardous parts for wires of a diameter or strips of a thickness greater than 1.0mm. No protection against water. Recommended for power plants, offshore plants, substations and industrial plants.
IP41	Same as IP4X, but vertically falling drop protection is added.
IP51	Same as IP41, but dust protection is added. (The ingress of dust is not totally prevented, but dust shall not penetrate in a quantity sufficient to interfere with satisfactory operation) Recommended for coal mine plants.

## Degree of Protection

Degree of protection for standard switchgears are as follows. The other degrees (IP41, IP51, etc.) are also available on request.

- Degree of protection for the switchgear enclosure : IP4X
- Degree of protection for the internal partition : IP2X

## Operating Conditions

Hyundai's switchgears are intended for use under the normal indoor operating conditions and special operating conditions.

### Normal indoor operating conditions

- Ambient temperatures :  
35°C maximum for 24 hour average.  
40°C maximum value.
- The altitude is not to exceed 1000M sea level.
- Relative humidity :  
95% maximum over a 24 hour average.  
90% maximum one month average.

### Special operating conditions

The following conditions are considered special operating conditions.

- Different values from those specified in the normal indoor operating conditions.
- Outdoor operation.
- Heavy vibrations or shocks.
- A hazardous area.
- Seismic requirements for nuclear power plants.

## Finish

The switchgear enclosure is cleaned, rust-proofed and painted through Hyundai's standard electrostatic powder coating procedure.

The average thickness of the painted finish is 50 microns.

Standard finish colours are Munsell no. 5Y7/1 and RAL7032 (Both are a light gray).

## Enclosure

The rigid outer enclosure of the switchgear consists of steel sheets with folded edges bolted together.

The CNC machine and FMS(Flexible Manufacturing System) make extremely accurate dimensions possible, providing the best quality and savings in installation costs.

The standard thicknesses of steel plates are as follows:

Frame	2.3mm
Front door	3.2mm
Rear door(or plate)	2.3mm
Bottom plate	2.3mm ~ 3.2mm
Others	1.6mm and above

## Name Plate

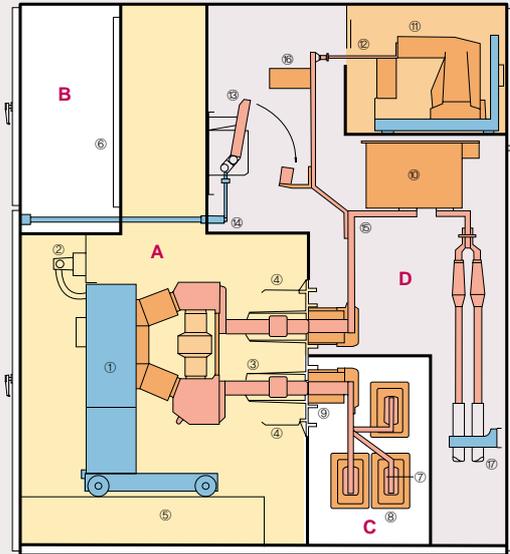
Material : Laminated plastic, 2.0t (White background)  
Fixing Method : PVC locker(Sealer)

## Routine Testing

Routine tests are conducted on each unit at Hyundai's factory to ensure that switchgears meet their specifications.

- A power-frequency voltage test on the main circuit
- A power-frequency voltage test on the auxiliary and control circuits
- Resistance measurement for the main circuit
- A mechanical operations test
- A test of auxiliary electrical devices
- Verification of correct wiring

# HMS-106



## A Circuit-breaker Compartment

1. Withdrawable breaker truck with 3AF circuit-breaker
2. Plug and socket for auxiliary circuit
3. Contact bushing
4. Metal shutter
5. Dummy stand

## B Low Voltage Compartment

6. Mounting plate for auxiliary devices

## C Bus-bar Compartment

7. Main bus-bar
8. Partition bushing
9. Fixed disconnecting contact

## D Cable Connection Compartment

10. Block-type current transformer
11. Withdrawable truck with voltage transformer
12. Shutter
13. Earthing switch
14. Shaft for earthing switch
15. Branch bus-bar
16. Epoxy insulator
17. Cable clamber

## Construction

The HMS-106 switchgear is divided into compartments by means of earthed metal partitions.

- Circuit-breaker compartment
- Low voltage compartment
- Bus-bar compartment
- Cable connection compartment

## Cable-connection Compartment

The cable-connection compartment is accessible from a hinged rear door. (A bolted, removable cover plate is also available on request)

Sufficient space is provided for the termination of power cables; as many as six cables per phase can be connected.

Epoxy resin-insulated 3 voltage transformers(V.T.), mounted on withdrawable trucks, with high rupturing capacity fuses can be located in the upper/rear part of the compartment.

An extension guide rail is provided for the maintenance of V.T. with the truck half-drawn out but still in the panel.

3 block-type current transformers (C.T.) can be mounted per panel, however, bushing-type C.T.s can be added to the line and load sides of the contact bushing.

Zero phase current transformers and surge arresters are also located in the compartment.

The earthing switch operated from the front of the panel has making capacity that can be switched onto live parts. The position indicator is provided at the front of the panel.

## Circuit-breaker Compartment

The HMS-106 switchgear contains a withdrawable breaker truck incorporating a vacuum circuit breaker HAF.

The following locks are provided to ensure proper operation and personnel safety.

- The withdrawal or engagement of a circuit breaker is impossible unless it is in the "open" position.
- The operation of a circuit breaker is impossible unless it is in the 'service' or 'test/disconnected' positions.
- Uncoupling the plug on an auxiliary circuit is impossible when the breaker truck is in the 'service' position.
- The operation of the earthing switch is impossible unless the associated breaker truck is in the 'test/disconnected' position or removed from the panel. (A keyed lock is provided to ensure safe operation).

The track-resistant, flame-retardant polyester insulated contact bushing completely prevents the propagation of faults from the C.B. compartment to the bus-bar compartment and vice versa.

The metal shutters, lockable in the closed position, automatically shield off the fixed disconnecting contacts when the breaker truck is drawn-out.

The earthing bar is provided at the bottom of the compartment for earthing the breaker truck between the 'test/disconnected' and the 'service' positions.

The 24 pin plugs and sockets on an auxiliary circuit remain connected in the 'test/disconnected' position so that the circuit breaker can be tested.

## Low Voltage(LV) Compartment

The LV compartment with a front-hinged door accommodates relays, measuring instruments, switches, terminal blocks, indicating lights, etc.

Standard control wiring in the LV compartment is 2.0mm, 600V graded pvc insulated wire. PVC ducts make the wiring easy and simple.

Interconnections between panels can be made through the openings on the side plates. The opening is shrouded with grommet to protect the wiring from damage.

Each wire is identified by the wire number on the white vinyl tube at its end. A ring-type lug is provided for wiring.

## Bus-bar Compartment

Bus-bars braced with partition bushings (polyester) run through the bottom of the panel.

No moving parts enter in the bus-bar compartment, making the bus-bar invulnerable.

The bus-bar system has high dynamic and dielectric strength and can dissipate heat.

In a 15kV switchgear, a mechanically and electrically outfitted insulating bus-bar system is provided.

The removable insulation cover (boot) is placed over the joints and secured in place. In 7.2 and 12kV switchgears, a bared bus-bar system is standard.



Circuit-breaker  
Removed



Circuit-breaker in the  
'Service' Position



Cable-connection Compartment  
with Rear Door Open

# HMS-106

## Special Tools and Accessories

### Special tools are supplied(standard)

- A hand crank for breaker truck withdrawable
- A manual charging handle for C.B.s
- An operating handle for the earthing switch.
- An extension guide rail for V.T. truck withdrawable
- A trolley for the breaker truck

### Accessories

- Auxiliary contacts for breaker trucks in the 'service' position : 1No +1Nc supplied on request.
- Auxiliary contact for breaker trucks in the 'test/disconnected' position : 1No +1Nc supplied on request.
- A heater(110V or 220V), if requested or for outdoor operation, will be supplied to the C.B. compartment.
- A surge arrester
- Zero phase current transformer

## Electrical Characteristic for HMS-106

Rated voltage (kV)	Rated 1min power-frequency withstand voltage (kV rms)	Impulse withstand voltage (kV peak)	Rated current (A)	Short-time withstand current for 1s <sup>(1)</sup>	
				(kA rms)	(kA peak)
7.2	20	60	1250, 2000	40	104 <sup>(2)</sup>
			2500, 3150		
12	28	75	1250, 2000	40	104 <sup>(2)</sup>
			2500, 3150		
15	36	95	1250, 2000	40	104 <sup>(2)</sup>
			2500, 3150		

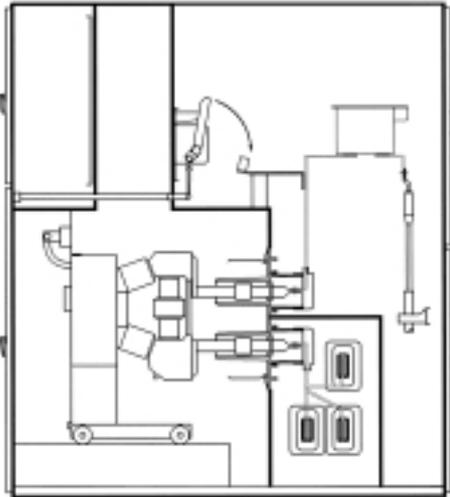
<sup>(1)</sup> for duration > 1s, consult us

<sup>(2)</sup> 100ka for 50Hz

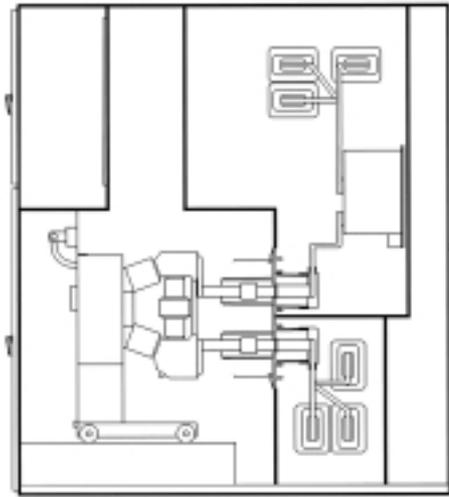
## Cubicle Dimension for HMS-106

Rated voltage (kV)	Rated current (A)	Width (mm)	Depth (mm)	Height (mm)
7.2	1250, 2000	900	2000	2300
	2500, 3150		2200	
12	1250, 2000	900	2000	2300
	2500, 3150		2200	
15	1250, 2000	900	2000	2300
	2500, 3150		2200	

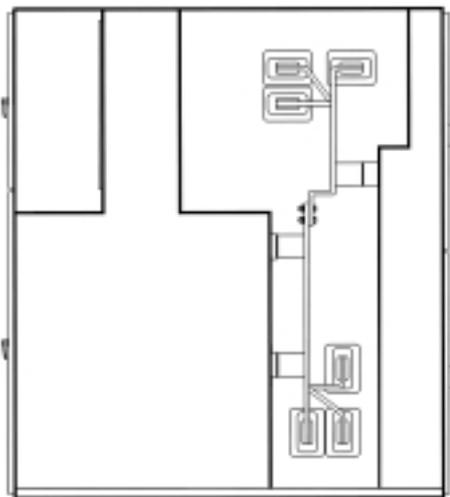
Outgoing Feeder Panel



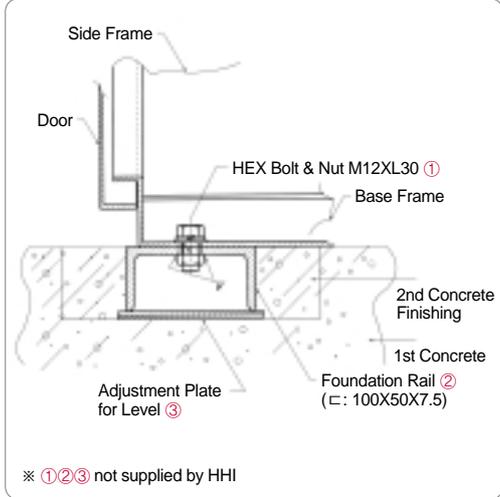
Bus Tie Panel



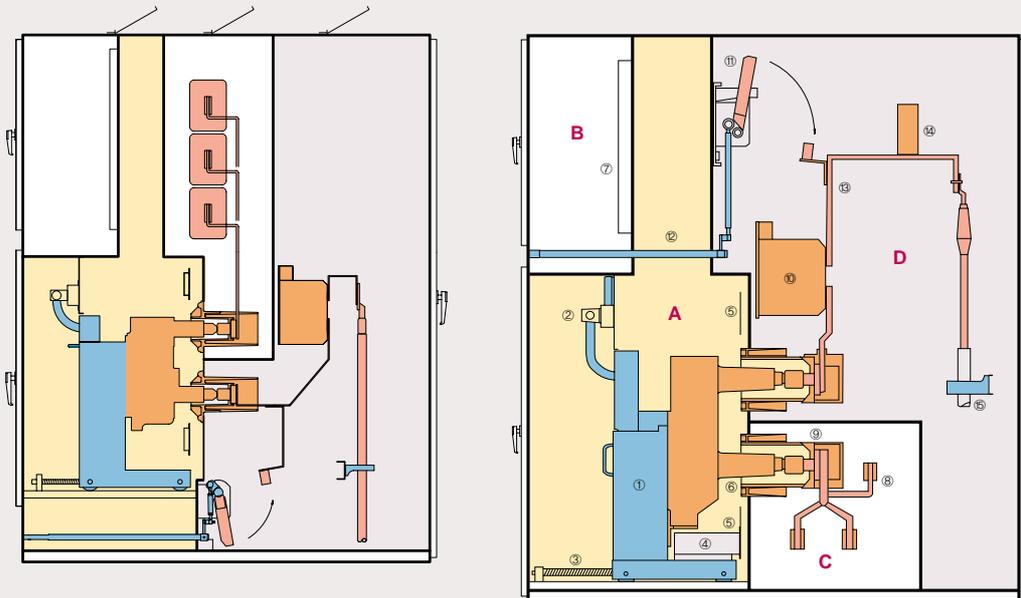
Bus Riser Panel



Recommended Anchoring Detail



# HMS-108



## A Circuit-breaker Compartment

1. Withdrawable breaker truck with HVF circuit-breaker
2. Plug and socket for auxiliary circuit
3. Screw for truck in and out
4. Guide for shutter operating mechanism
5. Metal shutter
6. Contact bushing

## B Low Voltage Compartment

7. Mounting plate for auxiliary devices

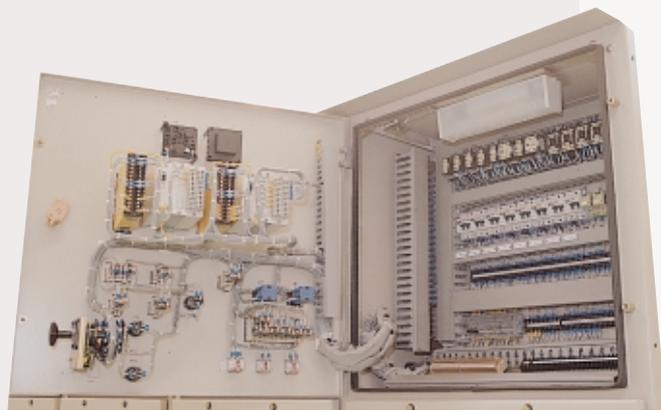
## C Bus-bar Compartment

8. Main bus-bar
9. Fixed disconnecting contact

## D Cable Connection Compartment

10. Block-type current transformer
11. Earthing switch
12. Shaft for earthing switch
13. Branch bus-bar
14. Epoxy insulator
15. Cable clamber

LV Compartment



## Construction

The HMS-108 switchgear is divided into compartments by means of earthed metal partitions.

- Circuit-breaker compartment
- Low voltage compartment
- Bus-bar compartment
- Cable connection compartment

## Cable-connection Compartment

The cable-connection compartment is accessible from a hinged rear door. (A bolted, removable cover plate is also available on request)

Sufficient space is provided for the termination of power cables; as many as six cables per phase can be connected.

For 7.2kV and 12kV switchgears, epoxy resin-insulated voltage transformers (V.T.) with high rupturing capacity fuses can be mounted on the upper/rear part of the compartment.

6 current transformers (2 per phase) can be mounted.

Zero phase current transformers and surge arresters are also located in the compartment.

The earthing switch operated from the front of the panel has making capacity that can be switched onto live parts. The position indicator is provided at the front of the panel.

The ground bus located at the bottom runs the full range of panels.

## Circuit-breaker Compartment

The HMS-108 switchgear contains a withdrawable breaker truck incorporating a vacuum circuit breaker HVF, vacuum contactor (up to 12kV) and a SF<sub>6</sub> gas circuit-breaker can also be mounted on the truck by request.

The following locks are provided to ensure proper operation and personnel safety.

- The withdrawal or engagement of a circuit-breaker is impossible unless it is in the "open" position.
- The operation of a circuit-breaker is impossible unless it is in the 'service' or 'test/disconnected' position.
- Uncoupling the plug on an auxiliary circuit is impossible when the breaker truck is in the 'service' position.
- The operation of the earthing switch is impossible unless the associated breaker truck is in the 'test/disconnected' position or removed from the panel (A keyed lock is provided to ensure safe operation)

The track-resistant, flame-retardant polyester insulated contact bushing completely prevents the propagation of faults from the C.B. compartment to the bus-bar compartment and vice versa.

The metal shutters, lockable in the closed position, automatically shield off the fixed disconnecting contacts when the breaker truck is drawn-out.

The earthing bar is provided at the bottom of the compartment for earthing the breaker truck between the 'test/disconnected' and the 'service' positions.

The 24 pin plugs and sockets on an auxiliary circuit remain connected in the 'test/disconnected' position so that the circuit breaker can be tested.

# HMS-108

## Low Voltage(LV) Compartment

The LV compartment with a hinged door accommodates relays, measuring instruments, switches, terminal blocks indicating lights, etc.

The control wiring in the LV compartment is 2.0mm 600V graded PVC insulated wire. PVC ducts make the wiring easy and simple.

Interconnections between panels can be made through the openings on the side plates. The opening is shrouded with grommet to protect the wiring from damage.

Each wire is identified by the wire number on the white vinyl tube at its end. A ring-type lug is provided for wiring.



Circuit-breaker Removed



Circuit-breaker in the 'Service' Position



Bus-bar Compartment



Cable Connection Compartment

## Bus-bar Compartment

Bus-bars supported by fixed disconnecting contacts run through the bottom of the panel. However, for 7.2kV and 12kV switchgears, partition bushings are also provided between adjacent panels to fortify the bus-bar against high dynamic stresses caused by high fault current.

No moving parts enter in the bus-bar compartment, making the bus-bar invulnerable.

The bus-bars are made of high-conductivity copper or copper-clad aluminium.

In a 24kV switchgear, a mechanically and electrically outfitted insulating bus-bar system is provided.

The removable insulation cover(boot) is placed over the joints and secured in place.

In 7.2 and 12kV switchgears, a bared bus-bar system is standard.

## Electrical Characteristic for HMS-108

Rated voltage (kV)	Rated 1min power-frequency withstand voltage (kV rms)	Impulse withstand voltage (kV peak)	Rated current (A)	Short-time withstand current for 1s <sup>(1)</sup>	
				(kA rms)	(kA peak)
7.2	20	60	1250, 2000	40	104 <sup>(2)</sup>
			2500, 3150		
12	28	75	1250, 2000	50	130 <sup>(3)</sup>
			2500, 3150		
24	50	125	630, 1250	25	65 <sup>(4)</sup>
			2000, 2500		

<sup>(1)</sup> for duration > 1s, consult us

<sup>(2)</sup> 100ka for 50Hz

<sup>(3)</sup> 125kA for 50Hz

<sup>(4)</sup> 63kA for 50Hz

## Cubicle Dimension for HMS-108

Rated voltage (kV)	Rated current (A)	Width (mm)	Depth (mm)	Height (mm)
7.2	630, 1250	750 <sup>(1)</sup>	1600	2350
	2000	750	1600	
	2500, 3150	900 <sup>(2)</sup>	1800	
12	630, 1250	750 <sup>(1)</sup>	1600	2350
	2000	750	1600	
	2500, 3150	900 <sup>(2)</sup>	1800	
24	630, 1250	800	2000	2350
	2000, 2500	1000 <sup>(3)</sup>	2200	

<sup>(1)</sup> 650 for 25kA

<sup>(2)</sup> 750 for Bus Riser Panel

<sup>(3)</sup> 800 for Bus Riser Panel

# HMS-108

## Special Tools and Accessories

### Special tools are supplied(standard)

- A hand crank for breaker truck withdrawable
- A manual charging handle for C.B.s
- An operating handle for the earthing switch.
- Alignments for breaker truck removal

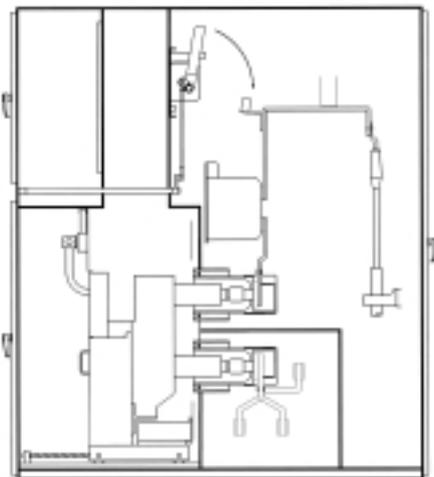
### Accessories

- Auxiliary contacts for breaker trucks in the 'service' position : 1NO+1NC supplied on request.
- Auxiliary contact for breaker trucks in the 'test/disconnected' position : 1NO+1NC supplied on request
- A heater(110V or 220V) by request will be supplied to the C.B. compartment
- A surge arrester
- Zero phase current transformer

## Typical Section Views

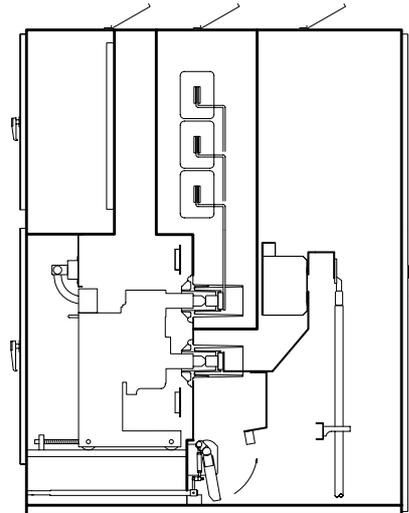
### Main Bus Located Bottom Side

#### Outgoing Feeder Panel



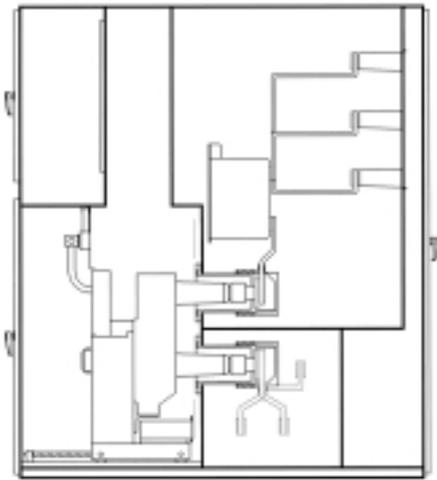
### Main Bus Located Top Side

#### Outgoing Feeder Panel



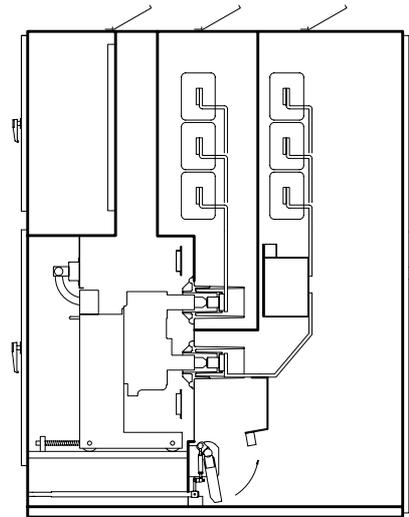
Main Bus Located Bottom Side

Bus Tie Panel

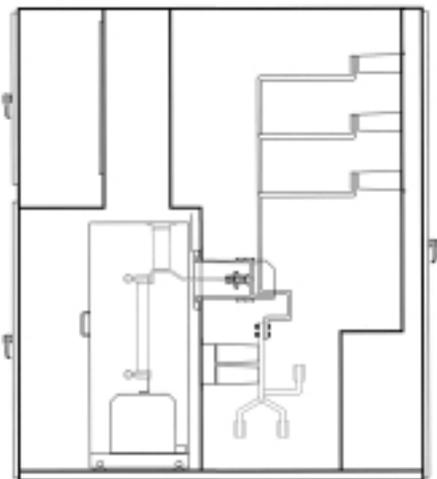


Main Bus Located Top Side

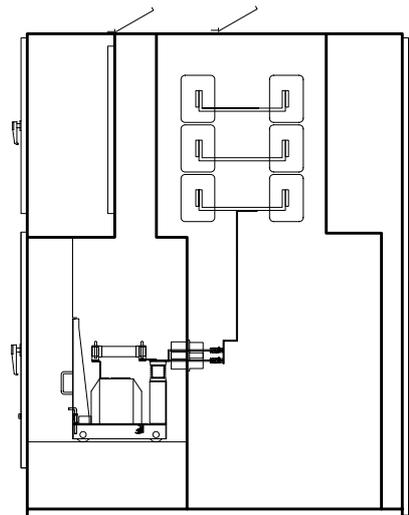
Bus Tie Panel



Bus Riser Panel with Drawable V.T Truck



Bus Riser Panel with Drawable V.T Truck



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