HMGS Medium Voltage
Gas-Insulated Switchgear
Cubicle Type, Internal Arc-Resistant
HMGS Switchgear
up to 36/38 (40.5) kV,
Medium Voltage
Gas-Insulated Switchgear
Cubicle Type,
Internal Arc-Resistant
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HMGS series

HYUNDAI Medium Voltage Gas-Insulated Switchgear, provide various benefits with compact, safe, and climate independent design.
HMGS series

HYUNDAI Medium Voltage Gas-Insulated Switchgear, manufactured and tested based on accumulating experience acquired throughout the world.
Description

Characteristics

The integrated assembly of vacuum circuit breaker, 3-position disconnector, bus connector and control devices are coordinated electrically and mechanically for medium voltage power system. This metal-enclosed design provides high reliability, user-friendly operation and safety with various electrical advantages to meet various electrical requirements of the medium voltage distribution system up to 36/38 (40.5) kV.

The gas tank is made of stainless-steel or made with the combination of stainless-steel and carbon-steel, containing 3-position disconnector, busbars and vacuum interrupters provide climate independent operation and safe to touch for its life.

This HMGS switchgear is divided into five completely separate compartments:

- Busbar compartment
- Circuit breaker compartment
- Cable connection compartment (Exclude HMGS-G82)
- Low voltage compartment
- Plenum duct

Compactness

The Switchgear of SF₆ gas insulation gives space-saving compactness. The standard frame saves and simplifies layout to reduce switchgear room and construction cost effectively. It also permits complete allocation of space for future extension.

Benefits

- Compact and systematic design
- Optimum engineering
- Modular design saves and simplifies the layout.
- Intelligent digital control and protection system
- Panels coupled by plug-in connecting system
- Extension capability to existing systems on both sides
- Factory-assembled panels with insulating gas at operating pressure requires no SF₆ work on site.
- Operating mechanism is accessed from out side of gas compartment
- Low maintenance allows system to run continuously without down-time.

Production Scope

<table>
<thead>
<tr>
<th>Model</th>
<th>Voltage (kV)</th>
<th>Current (A)</th>
<th>Short-Circuit (kA)</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMGS-G11</td>
<td>≤ 24 (25.8)</td>
<td>2,000</td>
<td>25</td>
<td>IEC, Single Bus</td>
</tr>
<tr>
<td>HMGS-G81</td>
<td>≤ 36 (40.5)</td>
<td>4,000</td>
<td>40</td>
<td>IEC, Single/Double Bus</td>
</tr>
<tr>
<td>HMGS-G30</td>
<td>≤ 36</td>
<td>2,000</td>
<td>31.5</td>
<td>IEC, Single Bus</td>
</tr>
<tr>
<td>HMGS-G38</td>
<td>≤ 38</td>
<td>2,500</td>
<td>40</td>
<td>IEC, Single Bus</td>
</tr>
<tr>
<td>HMGS-G82</td>
<td>≤ 38</td>
<td>2,500</td>
<td>40</td>
<td>IEC (ANSI), Single/Double/Transfer Bus</td>
</tr>
<tr>
<td>HMGS-G83</td>
<td>≤ 40.5</td>
<td>2,500</td>
<td>40</td>
<td>GOST, Single/Double</td>
</tr>
</tbody>
</table>
Safety and Reliability

- Climate independent & Safe to touch
- All live parts are hermetically sealed in the gas-tight enclosure
- Inner SF$_6$ gas is non-flammable, non-toxic and non-ozone depleting insulating medium and prevents contact to oxidation against environmental condition
- Safe and reliable operation of energy storage vacuum circuit breaker with spring charge mechanism
- Partition class PM
- Loss of service category: LSC2
- Internal arc classification of IAC B FLR or IAC A FLR
- Equipped with logical internal interlock system to prevent operating errors and to minimize interruption of operation
- Type tests have been carried out for each switchgear model
- The design, manufacturing, and testing was carried out according to ISO 9001 quality standard.

Certified Quality System: ISO 9001 & ISO 14001

The quality system for the design and manufacture of HMGS switchgear is certified to be in conformity with the requirements of ISO 9001 quality assurance standard from DNV Certification B.V.

The environmental management system is assessed and recognized as conforming to the requirements of the ISO 14001 standard.

Type Test

The HMGS switchgear have performed all the tests required by the IEC, IEEE (ANSI) or GOST standards.

As described in the IEC, the tests were made on representative functional units considered most sensitive to the effect of the tests.

Routine Test

The HMGS was designed for unsurpassed structural strength, to be arc proof, and to offer trouble-free installation and operation providing complete customer satisfaction.

To ensure the quality and conformity of the each functional unit, systematic routine testing is performed during manufacturing according to IEC 62271-200 or related standards.

Applications

Utility and Power Plants
- Transforming stations
- Switching stations
- Power generation stations
- Main and auxiliary switchgear

Industry
- Chemical industry
- Petroleum industry
- Iron and steel works
- Automobile industry
- Oil and gas pipelines
- Textile and rolling mills

Services and Transport
- Shopping malls
- Hospitals
- Large infrastructure
- Civil works
- Airports, ports

Marine
- Drilling rigs
- Off-shore platforms
- FPSOs
- Container ships
- Passenger ships
- Tanker, bulk ships
Description

Automation & Relays

Monitoring and Diagnostic System: HiPDS-D
HiPDS-D, HYUNDAI Intelligent Preventive Diagnostic System, is the advanced monitoring and diagnostic system for air and gas insulated switchgear having the following functions can be applicable.

- Real-time PRPD monitoring for TEV & UHF sensors
- Real-time moisture & temperature monitoring
- AV signal inputs for the internal camera monitoring
- Supporting remote monitoring through ethernet communication

![3D PRPD. analyzing](image1)

Camera monitoring

Power Management System (SCADA): HiPAS
HiPAS, HYUNDAI Intelligent Power Automation System, is a power management system which consists of an independent function modules in a network. It can be divided into 3 system security levels; “Master”, “PCM”, and “Device”.

![Diagram](image2)
LSC2 (Metal clad), Partition Class PM
The gas enclosures are grounded and contain 3-position disconnector or disconnector, busbars and vacuum interrupters. They are designed for their entire life, and inner SF$_6$ insulating gas prevents fire in the system and contact from oxidation. The connection compartment is accessible with the busbar live, and the switchgear meets the requirements for the loss of service continuity, LSC2 and partition class, PM of IEC 62271-200.

Arc Classification, IAC A/B FLR
The Switchgear is designed to withstand and protect personnel in the case of failure due to internal arcing, and classified as IAC AFLR or IAC BFLR, up to 40 kA.

- A FLR: For authorized personnel, front, lateral and rear side
- B FLR: For all front, lateral and rear side
- Specified criteria according to IEC 62271-200
  - Correctly secured doors and covers do not open.
  - No ejection of fragments or of other parts, mass of 60 g or more.
  - No holes up to a height of 2,000 mm.
  - Indicators arranged on front, lateral, and rear side do not ignite.
  - The enclosure remains connected to its earthing point.
- Bursting disc is positioned in each gas compartment and metal pressure relief is positioned in the cable connection compartment which in the case of internal fault, limits overpressure in the compartments.
- Non-flammable materials used for the cubicle.
- The hot and toxic gas can only be released through the arc way or arc duct.
- When installing the switchgear, some fundamental points must be taken into consideration.
- Escape routes for the hot and toxic gases exhausting from switchgear.
- Dimensions of the room with special attention to the height of ceiling.
Description

Switchgear Design

Protection Degree
Protection against entry of hazardous parts and water according to the IEC 62271-200 and IEC 60529 following degree of protection.

<table>
<thead>
<tr>
<th>Protection Degree</th>
<th>IP65</th>
<th>IP4X</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage live parts</td>
<td>Dust-tight and protected against water jet</td>
<td>Protect for a diameter or strips of a thickness greater than 1.0 mm.</td>
</tr>
<tr>
<td>Low voltage compartment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Applied Standard
HMGS is manufactured and tested according to the following IEC or IEEE (ANSI) standards.

<table>
<thead>
<tr>
<th>Switchgear</th>
<th>HMGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>Circuit breaker</td>
</tr>
<tr>
<td></td>
<td>3 Position disconnector</td>
</tr>
<tr>
<td></td>
<td>Load breaker switch</td>
</tr>
<tr>
<td></td>
<td>Fuse combination switch</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IEC 60529</td>
</tr>
<tr>
<td>SF6 gas</td>
<td>Specification Diagnosis guide</td>
</tr>
<tr>
<td>Insulation transformer</td>
<td>Current transformer</td>
</tr>
<tr>
<td></td>
<td>Voltage transformer</td>
</tr>
<tr>
<td>Guide</td>
<td>For application of gas insulated substation</td>
</tr>
</tbody>
</table>

Environmental Condition
All live parts in the circuit breaker and busbar compartment are hermetically sealed by gas-tight enclosure of IP65, and are safe to touch and suitable for application under aggressive ambient condition such as salt, humidity, dust, condensation, altitude and small animals.
Inner SF6 gas is a non-flammable, non-toxic and non-ozone depleting insulating medium and prevents contact to oxidation against environmental condition.

Normal Operating Condition
The rated current of the switchgear is based on the normal operating conditions for indoor switchgear according to the related IEC or IEEE standards as listed below:

- Maximum ambient temperature: + 40°C
- Maximum of 24 hour mean: + 35°C
- Minimum ambient temperature
  - According to the IEC 62271-1, 200: -5°C
  - According to IEEE C37.100.1: -30°C

If the ambient temperature is higher than + 40°C, the permissible current is different from the rated current (please contact us for details). However, the maximum ambient temperature should not be higher than + 55°C.
Modularization
The switchgear unit can be easily assembled and maintained with minimized gas work due to its modular construction. And, in the case of outgoing feeder of HMGS-G82, the circuit breaker of plug-in design can be easily replaced without interrupting power of the main busbar.

Fig.1 Switchgear assembling (HMGS-G81)

Interlocks
- 3-position disconnector can only be operated (electrically and manually) when circuit breaker is in the open position.
- The circuit breaker can be operated when the 3-position disconnector is in the connected, disconnected, or earthed position.

The switchgear can be connected effectively to neighboring panels without SF6 gas injection when installing or expanding the panels.

- HMGS-G11, G81 and G82: Busbar connectors are used for connecting neighboring panels as shown Fig.3
- HMGS-G30: Main busbars can be assembled as shown Fig.4

Fig.3 Busbar connectors for HMGS-G11, G81, G82

Fig.4 Main busbar assembly (HMGS-G30)
Installation of Current Transformer
Current transformer can be installed inside of CB compartment or cable connection compartment depending on the type of switchgear.

For HMGS-G11, G81, G83, G30, G38
• 1 Ring type CT per phase in the cable compartment (Fig.5-a).
• 1 ZCT in the cable tray under cable compartment, or in the cable compartment if there is space.

For HMGS-G82 and optional for HMGS-G81, G83
• 1 Block type CT per phase in the CB compartment when less than 1 inner socket of size 2 and 3 inner socket of size 3 per phase are used (Fig.5-b).
• 2 Block type CT per phase in the CB compartment when 2 inner socket of size 3 per phase are used on request (Fig.5-c).
• 1 ZCT in the cable trace under the cable compartment, or in the cable compartment if there is space.

Installation of Voltage Transformer, Voltage Detector, Lightning Arrestor and Surge Absorber
Voltage transformer, voltage detector, lightning arrestor, and surge absorber can be installed in the switchgear. According to the switchgear type, plug-in type voltage transformer with fuse can be installed as follows:

• HMGS-G11: In cable compartment (Fig.6-a)
• HMGS-G30 and G38: In cable compartment and main busbar (Fig.6-a, b)
• HMGS-G81, G82 and G83: In cable, rear bus, and metering compartments, and lower side of busbar compartment (Fig.6-a, c, d)
**Gas Monitoring System**

In the gas tight compartment, SF$_6$ gas is filled as the insulation medium, and is equipped with a gas pressure transmitter, a gas filling inlet for each gas compartment, and a gas meter for a panel. The gas monitor, HDM3 can indicate the absolute pressure in bar for up to three gas compartments. It can provide visual alarm by lighting a lamp and send signal via a contact if the pressure is less than minimum level.

- Operating zone: ≥ 1.2 bar.abs, green lamp
- Low zone: 1.1~1.2 bar.abs, yellow lamp, and signal
- Low low zone: < 1.1 bar.abs, red lamp, and signal

**Cable Socket**

Inner cone plug-in system of socket size 2, 3, and 4 according to DIN EN 50181 can be used for the cable connection. Quantity of socket per phase according to the switchgear current rating and request of customer is as follows:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Q'ty</th>
<th>Socket size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 800 A</td>
<td>1</td>
<td>Size 2 or 3</td>
</tr>
<tr>
<td>Up to 1,250 A</td>
<td>1 or 2</td>
<td>Size 2 or 3</td>
</tr>
<tr>
<td>Up to 2,000 A</td>
<td>1 or 2</td>
<td>Size 4</td>
</tr>
<tr>
<td>Up to 2,500 A</td>
<td>2 or 3</td>
<td>Size 3</td>
</tr>
<tr>
<td>Up to 3,150 A</td>
<td>3 or 4</td>
<td>Size 3</td>
</tr>
<tr>
<td>Up to 4,000 A</td>
<td>4</td>
<td>Size 3</td>
</tr>
</tbody>
</table>

**Fig. 7** Gas pressure transmitter and gas filling inlet

**Fig. 8** Gas monitor

1. Operating zone lamp of each of P1, 2, 3 (green)
2. Low zone lamp of each of P1, 2, 3 (yellow)
3. Low-low zone lamp of each of P1, 2, 3 (red)
4. Channel indicating lamp of each of P1, 2, 3 (green)
5. PV indicator
6. Dot indicator
7. Set key

**Fig. 9** Inner cone plug-in system

**Fig. 10** Outer cone plug-in system

1. Plug per phase
2. 2 Plug per phase

※ Cable and cable plug are purchased separately
The switchgear, HMGS-G11 is designed for use up to 24 (25.8) kV three phase system of single bus in compliance with IEC 62271-200.

Panels available for this switchgear are as follows:

- CB panel (Incoming/Outgoing feeder, Bus-tie, Bus-riser)
- ALTS panel (Incoming feeder)
- LBS panel (Bus-tie/Outgoing feeder)
- MOF panel

### Type

<table>
<thead>
<tr>
<th>Type</th>
<th>Type</th>
<th>HMGS-G11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>24 (25.8)</td>
<td></td>
</tr>
<tr>
<td>Panel</td>
<td>CB</td>
<td>LBS</td>
</tr>
<tr>
<td>Power frequency withstand voltage (kV)</td>
<td>50 (70)</td>
<td></td>
</tr>
<tr>
<td>Lightning impulse withstand voltage (kV)</td>
<td>125 (150)</td>
<td></td>
</tr>
<tr>
<td>Rated frequency (Hz)</td>
<td>50/60</td>
<td></td>
</tr>
<tr>
<td>Normal current [A]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main-bus</td>
<td>≤ 2,000</td>
<td>≤ 2,000</td>
</tr>
<tr>
<td>Feeder</td>
<td>630 / 1,250 / 2,000</td>
<td>630</td>
</tr>
<tr>
<td>Rated short time withstand current, 3s (kA)</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Rated peak withstand current (kA, peak)</td>
<td>65</td>
<td>52</td>
</tr>
<tr>
<td>Rated short circuit breaking current (kA)</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Rated short circuit making current (kA)</td>
<td>65</td>
<td>52</td>
</tr>
<tr>
<td>Rated operating sequence</td>
<td>O-0.3s-CD-3min-CD</td>
<td>C-O-C</td>
</tr>
<tr>
<td>Closing time</td>
<td>≤ 70 ms</td>
<td>≤ 2 sec</td>
</tr>
<tr>
<td>Opening time</td>
<td>≤ 50 ms</td>
<td>≤ 2 sec</td>
</tr>
<tr>
<td>Breaking time (cycle)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Auxiliary voltage (V)</td>
<td>DC110 / 125</td>
<td>DC110 / 125</td>
</tr>
<tr>
<td>Insulation gas</td>
<td>SF₆</td>
<td>SF₆</td>
</tr>
<tr>
<td>Rated pressure at 20°C bar (g)</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Minimum operating pressure at 20°C bar (g)</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Arc classification</td>
<td>A - FLR, 25 kA / 1s</td>
<td></td>
</tr>
<tr>
<td>Busbar system</td>
<td>Single</td>
<td></td>
</tr>
</tbody>
</table>

### Size (mm)

<table>
<thead>
<tr>
<th>Size (mm)</th>
<th>Width (W)</th>
<th>Depth (D)</th>
<th>Height (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 1,250 A</td>
<td>550 (700)</td>
<td>1,200 (1,300)</td>
</tr>
<tr>
<td></td>
<td>2,000 A</td>
<td>650 (700)</td>
<td>1,200 (1,300)</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>1,200 (1,300)</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>2,400</td>
</tr>
</tbody>
</table>

1) The value in “( )” is for the system according to the series II of IEC 62271-1 or relevant standard on request.
2) The auxiliary voltage can be changed on request.
3) The size of actual panel can be different according to the rating, quantity, and arrangement of components.
4) Width of the panel is 700 mm when voltage transformer is installed.
5) Width of the panel is 700 mm when power fuse is installed.
6) Depth of the panel can increase by 1,300 mm according to the numbers and size of components of LV compartment.
The switchgear, HMGS-G30 is designed for use up to 36 kV three phase system of single bus in compliance with IEC 62271-200.

And HMGS-G38 is designed for use up to 36(38) kV three phase system of single bus in compliance with IEC 62271-200.

Panels available for this switchgear are as follows:

- Incoming/Out going feeder
- Bus-tie with VT
- Bus-riser with VT

<table>
<thead>
<tr>
<th>Type</th>
<th>HMGS-G30</th>
<th>HMGS-G38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Power frequency withstand voltage (kV)</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Lightning impulse withstand voltage (kV)</td>
<td>170</td>
<td>170</td>
</tr>
<tr>
<td>Rated frequency (Hz)</td>
<td>50 / 60</td>
<td>50 / 60</td>
</tr>
<tr>
<td>Normal current [A]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main-bus</td>
<td>≤ 2,000</td>
<td>≤ 2,500</td>
</tr>
<tr>
<td>Feeder</td>
<td>1,250 / 2,000</td>
<td>1,250 / 2,000</td>
</tr>
<tr>
<td>Rated short time withstand current, 3s (kA)</td>
<td>31.5</td>
<td>40</td>
</tr>
<tr>
<td>Rated peak withstand current (kA, peak)</td>
<td>82</td>
<td>104</td>
</tr>
<tr>
<td>Rated short circuit breaking current (kA)</td>
<td>31.5</td>
<td>40</td>
</tr>
<tr>
<td>Rated short circuit making current (kA)</td>
<td>82</td>
<td>104</td>
</tr>
<tr>
<td>Rated operating sequence</td>
<td>O-0.3s-CO-15s-CO</td>
<td>O-0.3s-CO-3min-CO</td>
</tr>
<tr>
<td>Closing time (ms)</td>
<td>≤ 70</td>
<td>≤ 70</td>
</tr>
<tr>
<td>Opening time (ms)</td>
<td>≤ 50</td>
<td>≤ 50</td>
</tr>
<tr>
<td>Breaking time (cycle)</td>
<td>≤ 3</td>
<td>≤ 3</td>
</tr>
<tr>
<td>Auxiliary voltage (V)</td>
<td>DC110 / 125</td>
<td>DC110 / 125</td>
</tr>
<tr>
<td>Insulation gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main-bus</td>
<td>Silicon</td>
<td>Silicon</td>
</tr>
<tr>
<td>Circuit breaker</td>
<td>SF₆</td>
<td>SF₆</td>
</tr>
<tr>
<td>Rated pressure at 20˚C bar (g)</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Minimum operating pressure at 20˚C bar (g)</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Arc classification</td>
<td>A FLR, 31.5 kA / 1s</td>
<td>A FLR, 40 kA / 1s</td>
</tr>
<tr>
<td>Busbar system</td>
<td>Single</td>
<td>Single</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Size (mm)</th>
<th>Width (W)</th>
<th>Height (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 1,250 A</td>
<td>600 [650] 4)</td>
<td>2,200</td>
</tr>
<tr>
<td>≥ 2,000 A</td>
<td>650</td>
<td></td>
</tr>
</tbody>
</table>

※ 1) The value in "( )" is for the system according to the GOST 1516.3, GB 3906 or relevant standard on request.
※ 2) The auxiliary voltage can be changed on request.
※ 3) The size of actual panel can be different according to the rating, quantity, and arrangement of components.
※ 4) Width of the panel in "( )" is incase voltage transformer is installed.
※ 5) Depth of the panel can increase according to the numbers and size of components of LV compartment.

36 kV Switchgear (Busbar Silicon Insulated)
The switchgear, HMGS-G81 is designed for use up to 36kV three phase system for single bus and double bus according to the IEC 62271-200.

HMGS-G82 is designed for use up to 38 kV three phase system with plug-in type circuit breaker for double and transfer bus according to the IEEE C37.100.1 and related international standards. And HMGS-G83 is designed for use up to 40.5kV three phase system for single bus and double bus according to the COST 1516.3-96.

Type of available panel is as follows:
- Incoming/Out going feeder
- Bus-coupler (Bus-tie/Bus-riser)
- Bus-section and bus-riser

<table>
<thead>
<tr>
<th>Type</th>
<th>HMGS-G81</th>
<th>HMGS-G82</th>
<th>HMGS-G83</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>36</td>
<td>38</td>
<td>40.5</td>
</tr>
<tr>
<td>Power frequency withstand voltage (kV)</td>
<td>70</td>
<td>80</td>
<td>95</td>
</tr>
<tr>
<td>Lightning impulse withstand voltage (kV)</td>
<td>170</td>
<td>150</td>
<td>190</td>
</tr>
<tr>
<td>Rated frequency (Hz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal current [A]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main-bus</td>
<td>≤ 4,000</td>
<td>≤ 2,500</td>
<td>≤ 2,500</td>
</tr>
<tr>
<td>Feeder</td>
<td>1,250 / 2,000 / 2,500 / 3,150</td>
<td>1,250 / 2,000 / 2,500</td>
<td>1,250 / 2,000 / 2,500</td>
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<tr>
<td>Rated short time withstand current, 3s (kA)</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Rated peak withstand current (kA, peak)</td>
<td>104</td>
<td>104</td>
<td>104</td>
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<tr>
<td>Rated short circuit breaking current (kA)</td>
<td>40</td>
<td>40</td>
<td>40</td>
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<tr>
<td>Rated short circuit making current (kA)</td>
<td>104</td>
<td>104</td>
<td>104</td>
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<tr>
<td>Rated operating sequence</td>
<td>0-0.3s-CO-15s-CO</td>
<td>0-0.3s-CO-15s-CO</td>
<td>0-0.3s-CO-15s-CO</td>
</tr>
<tr>
<td>Closing time (ms)</td>
<td>≤ 70</td>
<td>≤ 70</td>
<td>≤ 70</td>
</tr>
<tr>
<td>Opening time (ms)</td>
<td>≤ 50</td>
<td>≤ 40</td>
<td>≤ 40</td>
</tr>
<tr>
<td>Breaking time (cycle)</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Auxiliary voltage (V)</td>
<td>DC110 / 125 1)</td>
<td>DC110 / 125 1)</td>
<td>DC110 / 125 1)</td>
</tr>
<tr>
<td>Insulation gas</td>
<td>SF₆</td>
<td>SF₆</td>
<td>SF₆</td>
</tr>
<tr>
<td>Rated pressure at 20°C bar [g]</td>
<td>0.3</td>
<td>0.4</td>
<td>0.3</td>
</tr>
<tr>
<td>Minimum operating pressure at 20°C bar [g]</td>
<td>0.2</td>
<td>0.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Arc classification</td>
<td>B FLR 40 kA / 1s</td>
<td>B FLR 40 kA / 1s</td>
<td>B FLR 40 kA / 1s</td>
</tr>
<tr>
<td>Busbar system</td>
<td>Single / Double</td>
<td>Single / Double / Transfer</td>
<td>Single / Double</td>
</tr>
<tr>
<td>Size (mm) 2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width (W)</td>
<td>≤ 1,250 A</td>
<td>600 (800) 3)</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>2,000 / 2,500 / 3,150 A</td>
<td>800</td>
<td>800 (1,100) 5)</td>
</tr>
<tr>
<td>Depth (D)</td>
<td>1,760 (1,960) 4)</td>
<td>1,960</td>
<td>1,960</td>
</tr>
<tr>
<td>Height (H)</td>
<td>2,400</td>
<td>2,400</td>
<td>2,400</td>
</tr>
</tbody>
</table>

1) The auxiliary voltage can be changed on request.
2) The size of actual panel can be different according to the rating, quantity, and arrangement of components.
3) Width of the panel in "1 " is incase voltage transformer is installed.
4) Depth of the panel can increase according to the number and size of components of LV compartment.
5) Upon customer request.
Outgoing Feeder (CB, 1,250 A)

1) 3 Position disconnector
2) 3 Position disconnector mechanism
3) Circuit breaker mechanism
4) Relay
5) Vacuum interrupter
6) Busbar connector
7) Bushing
8) Bursting disc
9) Current transformer
10) Lightning arrester/Surge absorber
11) Inner cone socket
12) Cable & Cable plug

※ 1) Outer cone socket is available instead of inner cone socket on request.
   2) Cable and cable plug is out of scope of supply.
Circuit Diagram and Sections

HMGS-G11, 2,000 A Panel

Circuit Diagram for Typical Unit

Incoming Feeder (CB, 2,000 A)

1. 3 Position disconnector
2. 3 Position disconnector mechanism
3. Circuit breaker mechanism
4. Relay
5. Vacuum interrupter
6. Busbar connector
7. Bushing
8. Bursting disc
9. Voltage transformer
10. Current transformer
11. Lightning arrester/Surge absorber
12. Out cone socket
13. Cable plug & Cable

※ 1) Inner cone socket is available instead of outer cone socket on request.
   2) Cable and cable plug is out of scope of supply.
Circuit Diagram for Typical Unit

Incoming Feeder | Outgoing Feeder | Bus-Tie | Bus-Riser
---|---|---|---
[Diagram showing component layout]

Outgoing Feeder

1. 3 Position disconnector
2. 3 Position disconnector mechanism
3. Circuit breaker mechanism
4. Relay
5. Vacuum interrupter
6. Busbar connector
7. Bushing
8. Bursting disc
9. Lightning arrester/Surge absorber
10. Current transformer
11. Outer cone socket
12. Cable plug & Cable

※ 1) Inner cone socket is available instead of outer cone socket on request.
2) Cable and cable plug is out of scope of supply.
HMGS-G81, Single Bus System

Circuit Diagram and Sections

Circuit Diagram for Typical Unit

Incoming Feeder

1) 3 Position disconnector
2) 3 Position disconnector mechanism
3) Circuit breaker mechanism
4) Relay
5) Vacuum interrupter
6) Busbar connector
7) Bushing
8) Bursting disc
9) Current transformer
10) Lightning arrester/Surge absorber
11) Inner cone socket
12) Voltage transformer
13) Cable plug & Cable

※ 1) An arc way is needed at the each side of end panel.
   2) Cable and cable plug is out of scope of supply.
**Circuit Diagram for Typical Unit**

1) An arc way is needed at each side of the end panel.
**Circuit Diagram and Sections**

**HMGS-G82**

**Circuit Diagram for Typical Unit**

![Circuit Diagram](image)

**Outgoing Feeder**

1. Main bus 3 Position disconnector
2. Main bus 3 Position disconnector mechanism
3. Circuit breaker mechanism
4. Relay
5. Vacuum interrupter
6. Busbar connector
7. Bushing
8. Bursting disc
9. Bal seal connector
10. Current transformer
11. Inner cone socket
12. Transfer busbar
13. Plenum duct
14. Camera view port

**Note:** An arc way is needed at the both side of end panel.
Fixed vacuum circuit break is installed in the switchgear which is designed and verified according to IEC 62271-100.

The pole parts of the circuit breaker are horizontally installed in the CB compartment, and the operating mechanism is easily accessible from the front side of the switchgear. The vacuum interrupters retain high dielectric strength and short-circuit breaking capability with the high vacuum degree of $10^{-7}$ mbar, and they are mounted rigidly in the pole part so that they can withstand forces arising from switching operation and contact pressure.

The operating mechanism is motor-spring stored-energy type. It consists of charging mechanism, closing spring, trip spring, motor, solenoids, auxiliary switches, spring charged and on/off indicators. The released closing spring is automatically recharged by the charging motor, and capable of the operating sequences "open-close-open" which is required when unsuccessful auto-reclosing operation is attempted.

**Classification**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Mechanical endurance</td>
<td>M2</td>
</tr>
<tr>
<td>Electrical endurance</td>
<td>E2</td>
</tr>
<tr>
<td>Capacitive current switching</td>
<td>C2</td>
</tr>
<tr>
<td>Circuit breaker class</td>
<td>G81</td>
</tr>
<tr>
<td>Others</td>
<td>S1</td>
</tr>
<tr>
<td></td>
<td>S2</td>
</tr>
<tr>
<td>Charging motor</td>
<td>500 VA at DC110 V / 220 V</td>
</tr>
<tr>
<td>Closing coil</td>
<td>150 VA at DC110 V / 220 V</td>
</tr>
<tr>
<td>Opening coil</td>
<td>300 VA at DC110 V / 220 V</td>
</tr>
<tr>
<td>Auxiliary contact</td>
<td>6NO, 6NC or 10NO,10NC</td>
</tr>
</tbody>
</table>

**Control and Auxiliary Circuit**

- Close/Open indicator
- Hole for manual charging
- Trip spring
- Auxiliary switch (S1)
- Mechanism housing
- Manual opening push button
- Spring charge indicator
- Contact pressure spring
- Motor (M1)
- Manual closing push button
- Charging mechanism
- Tripping coil (Y1)
- Vacuum interrupter
- Operating counter
- Closing spring
- Closing coil (Y9)
- VI housing
3-position disconnector is designed and verified in compliance with IEC 62271-102 and interlocked with circuit breaker according to IEC 62271-200.

- Disconnector class of operating endurance: M1
- Operating motor: 90 W at DC110 V / 125 V
- Auxiliary contact: 5NO + 5NC

The switching operating of the disconnector can be performed electrically with the operating motor or manually with the operating handle.

The moving contact for the switchgear, HMGS-G30, 81, 82 and G11, 2000 A is longitudinally, and the contact for HMGS-G11, 1250 A is rotated through an threaded screw.

The 3-position disconnector have connected, disconnected and ready to grounded position. And, for grounding the cable connection compartment, 3-position disconnector should be in the grounded position and the circuit breaker is in closed position.

**Interlocks**
- 3-position disconnector can only be operated when circuit breaker is in open position.
  If the circuit breaker is closed, 3-position disconnector can not be operated by the mechanical interlock with circuit breaker and/or by prohibiting the manual handle inserting hole of the 3-position disconnector to be opened electromagnetically.
- The circuit breaker can be operated when the 3-position disconnector is in the connected, disconnected or earthed position.
- Manual handle can not be removed until switching operation has been completed
- Locking device for 3-position disconnector
- Electromagnetic interlocks (Optional)

**Fig.11 3 Position disconnector**
Minimum Dimensions for the Switchgear Room

HMGS-G11, G30, G38

※ A: ≥ 1,500 mm, B: ≥ 700 mm, C: ≥ 500 mm, D: ≥ 500 mm
- For detailed dimension regarding actual project, contact Hyundai switchgear team.

HMGS-G81, G82, G83

※ A: ≥ 2,200 mm, B: ≥ 700 mm, C: ≥ 500 mm, D: ≥ 500 mm
- For detailed dimension regarding actual project, contact Hyundai switchgear team.
# HYUNDAI ELECTRIC

## KOREA

<table>
<thead>
<tr>
<th>Category</th>
<th>Address</th>
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<tbody>
<tr>
<td>Headquarter (Financial)</td>
<td>Hyundai Bldg, 75, Yuldok-ro, Jongno-gu, Seoul, Korea Tel: +82-2-746-7646 / Fax: +82-2-746-7441</td>
</tr>
<tr>
<td>Sales &amp; Marketing (Seongnam)</td>
<td>5th Floor 55, Bundang-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea Tel: +82-31-8006-6635 / Fax: +82-31-8006-6686</td>
</tr>
<tr>
<td>Main Factory (Ulsan)</td>
<td>700, Bangeojinsunhwan-doro, Dong-gu, Ulsan, Korea Tel: +82-52-202-8114 / Fax: +82-52-202-8010</td>
</tr>
<tr>
<td>Seonam Factory (Ulsan)</td>
<td>223, Sapyeong-ro, Nam-gu, Ulsan, Korea Tel: +82-52-202-8114</td>
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<tr>
<td>R&amp;D Center (Yongin)</td>
<td>17-10, 240-gil, Mabuk-ro, Giheung-gu, Yongin-si, Korea Tel: +82-31-289-5114 / Fax: +82-31-289-5040</td>
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## OVERSEAS

### Branch Offices

<table>
<thead>
<tr>
<th>Region</th>
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<tbody>
<tr>
<td>Japan (Osaka)</td>
<td>5th Floor Nagahori Plaza Bldg. 2-4-8 Minami Sembia, Chuoku, Osaka 542-0081, Japan Tel: +81-6-6261-5767 / Fax: +81-6-6261-5818</td>
</tr>
<tr>
<td>Saudi Arabia (Riyadh)</td>
<td>Office number 404, 4th floor Akaria-3 building, Olaya street, P.O Box 8072, Riyadh, 11482, Kindom of Saudi Arabia Tel: +966-11-464-4696, 9366 / Fax: +966-11-462-3522</td>
</tr>
<tr>
<td>Russia (Moscow)</td>
<td>World Trade Center, Ent.3, #703, Krasnopresenskaya Nab 12, Moscow, 123610, Russia Tel: +7-495-298-1381</td>
</tr>
<tr>
<td>U.A.E</td>
<td>Unit 205, Emaar Square Building No 4 Sheikh Zayed Road, Dubai 252458, U.A.E Tel: +971-4-425-7995 / Fax: +971-4-425-7996</td>
</tr>
<tr>
<td>Germany (Frankfurt)</td>
<td>Mendelsohn strabe 55-59 Frankfurt 60325, Germany Tel: +49-69-4699-4988</td>
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<tr>
<td>Thailand (Bangkok)</td>
<td>19th Floor, Unit 1908, Sathorn Square Office Tower, 98 North Sathorn Road, Silom, Bangrak, Bangkok 10500, Thailand Tel: +66-02-115-7920 / Fax: +66-2-115-7898</td>
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### Subsidiaries

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<tbody>
<tr>
<td>Bulgaria (Sofia)</td>
<td>41, Roiem Blvd., 1271 Sofia, Bulgaria Tel: +359-2-803-5200, 3210, 3220 / Fax: +359-2-803-3203, 3242</td>
</tr>
<tr>
<td>China</td>
<td>No.9, Xianadi Road, Xiniia Scientific and Technologic Zone, Yangzhong, Jiangsu, P.R.C. Zip:212212, China Tel: +86-511-8842-0966, 0500 / Fax: +86-511-8842-0698, 0231</td>
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<tr>
<td>India</td>
<td>5-289-4, Near Amuktheshwara Temple, Penukonda Mandal, Penukonda, Anantapur Dist, Andhrapradesh-515110, India Tel: +91-88962-5137</td>
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### R&D Centers

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<tbody>
<tr>
<td>Hungary (Budapest)</td>
<td>Hyundai Technologies Center Hungary Ltd., 1146, Budapest, Hermina ut 22, Hungary Tel: +36-1-273-3733 / Fax: +36-1-220-5708</td>
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<tr>
<td>China</td>
<td>Room 10102, Building 10, No.498, Guoshouting Road, Pudong, Shanghai, China Tel: +86-21-5013-3393 #108 / Fax: +86-21-5013-3393 #105</td>
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<tr>
<td>Switzerland</td>
<td>Hardturmstrasse 135, CH-8035, Zurich, Switzerland Tel: +41-44-527-0-56</td>
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