SF₆ Gas Insulated Metal-clad Switchgear
SF₆ Gas Insulated Metal-clad Switchgear is an integrated assembly of vacuum circuit breaker, 3-position switch, disconnector, bus connecting system and control devices coordinated electrically and mechanically for medium voltage circuit protection.
We build a better future!

CONTENTS

General ..................................................... 4
Features .................................................. 6
Application Data ................................. 8
Technical Data ..................................... 10
Unit Type and Versions ............. 12
Specification Guide ................. 13
Certificate ......................................... 18
HMGS-G10 is an integrated assembly of vacuum circuit breaker, 3-position switch, disconnector, bus connecting system and control devices coordinated electrically and mechanically for medium voltage circuit protection.

The Metal-clad design provides high reliability, economical benefit, user friendly operation and safety.

The switchgear is isolated by grounded metal plates so that any live part is not exposed to the operator when the door is opened.

Compact design with three-phase enclosure allows very systematic construction. In addition, the switching section can be dismantled or added in a very short time without the busbar being disconnected.

The switchgear is applicable at voltage ratings up to 24 kV (25.8 kV) for indoor installation. The switchgear and all components are designed, manufactured and tested in accordance with the latest standards including:

- IEC 60298 (1998)
- IEC 62271-102 (2001)
- IEC 60694 (2001)

### Description and Application

- All live parts are hermetically sealed.
- The circuit breaker compartment and busbar compartment are completely enclosed by welded stainless steel switchgear container which has separated compartments.
- CB poles are horizontally installed in the circuit breaker compartment.
- The three position switch in the bus compartment prepares 3 conditions
  - Current interrupted condition (“OPEN”)
  - Current alive condition (“CLOSED”)
  - Earthing condition (“EARTH”)
- All operating mechanisms are fitted outside of the gas compartment.
- Mechanical interlocks ensure safe operating sequence.

### Definition

The switchgear is an optimum assembly by the following features:
Environmental Qualification

The switchgear equipments is evaluated by optimum analysis and test for easy maintenance and long lifetime.

Hermetically sealed primary enclosure for protection against environmental conditions (dirt, moisture, vermins and insects etc.).

Quality Assurance

Advanced Quality Assurance Program is applied.

The program comply with the requirement of ISO fully.
Features

Compactness

The switchgear provides dimensional compactness.

Unified standard frame saves and simplifies the layout.
It also permits complete allocation of space for future extension.

The switchgear enables optimum access and easy installation.
**Bay control and protection unit HIMAP-BC** provides the benefits of the following.

- Economic advantage
- State-of-the-art technology
- Reliability and availability
- International standard
- Flexibility
- Experience sharing
- Easy operation and mounting
- Simple interface and application

This unit is divided into five completely separate areas each with its own front doors.

<table>
<thead>
<tr>
<th>Safe Compartment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus compartment</td>
</tr>
<tr>
<td>Circuit breaker compartment</td>
</tr>
<tr>
<td>Cable compartment</td>
</tr>
<tr>
<td>Low voltage compartment</td>
</tr>
<tr>
<td>Gas duct</td>
</tr>
</tbody>
</table>

**Economy and Convenience**

- Compact and systematical design
- Optimum engineering
- Modular design
- Intelligent digital control and protection system
- High reliable vacuum interrupters
- Panels coupled by plug-in connecting system
- Extension capability of existing systems to the both sides
- Factory-assembled panels with insulating gas at operating pressure

**Automation**

Bay control and protection unit HIMAP-BC provides the benefits of the following.

- Economic advantage
- State-of-the-art technology
- Reliability and availability
- International standard
- Flexibility
- Experience sharing
- Easy operation and mounting
- Simple interface and application

**Safety and Maintenance**

- High reliability and safety
- Safe operation
- Interlock system and monitoring
- Three-position switch mechanically interlocked with circuit breaker
- Circuit breaker function accompanied by earthing function in combination with a three position switch
- Operating mechanism to be accessed from outside of enclosure.
- Independent compartments
- Duct for pressure relief
- Inert SF₆ insulating gas prevents fire in the system and contact to oxidation.
- Safe manual closing of energy storage circuit breaker with spring charge mechanism.
Application Data

Front View & Diagram

1. Incoming Panel
2. Outgoing Panel
3. Bus-tie Panel
4. Bus sectionalize Panel
5. Voltage Transformer Panel
6. Bus connection Panel
HMGS-G10 meets applicable IEC standards. The design criteria dictate that all performance tests meet the requirements of the standards.

The basic IEC test series include short circuit, BIL, dielectric continuous current, mechanical life, thermal and environmental conditions.

HMGS-G10 is certified by Korea Electrotechnology Research Institute (KERI).
Technical Data

Type HMGS-G10 Switchgear Section View

1. Gas Duct
2. Bursting Disc
3. Bus Connector
4. Disconnector
5. Current Transformer
6. Cable Socket
7. Pressure Relief Device
8. Power Cable
9. Circuit Breaker Mechanism
10. 3-Position Switch Mechanism
11. Bay Control Unit (HIMAP-BC)
HMGS-G10 Technical Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>IEC Standard ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>12 kV</td>
<td>24 (25.8)</td>
</tr>
<tr>
<td>Maximum operating voltage</td>
<td>12 kV</td>
<td>24 (25.8)</td>
</tr>
<tr>
<td>Rated power frequency withstand voltage</td>
<td>28 kV</td>
<td>50 kV</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td>75 kV</td>
<td>125 kV</td>
</tr>
<tr>
<td>All voltage values apply for an insulating gas pressure, absolute, 20°C</td>
<td>bar 1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50 Hz / 60 Hz</td>
<td>50 Hz / 60 Hz</td>
</tr>
<tr>
<td>Rated busbar current</td>
<td>A</td>
<td>up to 2000</td>
</tr>
<tr>
<td>Rated feeder current</td>
<td>A 630 / 1250 / 2000</td>
<td>630 / 1250 / 2000</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>65 kA</td>
<td>65 kA</td>
</tr>
<tr>
<td>Rated short time current, 3 seconds</td>
<td>25 kA</td>
<td>25 kA</td>
</tr>
<tr>
<td>Rated short circuit breaking current of circuit breaker</td>
<td>25 kA</td>
<td>25 kA</td>
</tr>
<tr>
<td>Rated short circuit making current of circuit breaker</td>
<td>65 kA</td>
<td>65 kA</td>
</tr>
<tr>
<td>Rated operating sequence</td>
<td>O - 0.3s - CO - 3min - CO 5cycle</td>
<td></td>
</tr>
<tr>
<td>Closing time</td>
<td>ms 75</td>
<td>75</td>
</tr>
<tr>
<td>Opening time</td>
<td>ms 60</td>
<td>60</td>
</tr>
<tr>
<td>Break time</td>
<td>5cycle</td>
<td></td>
</tr>
<tr>
<td>Insulating gas</td>
<td>SF₆ 3)</td>
<td></td>
</tr>
<tr>
<td>Design pressure, absolute, 20°C</td>
<td>bar 1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Rated filling pressure, absolute, 20°C</td>
<td>bar 1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Minimum operating pressure, absolute, 20°C</td>
<td>bar 1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>Rated data: Auxiliary voltage</td>
<td>V 110 / 125DC 5)</td>
<td></td>
</tr>
<tr>
<td>Degree of protection (IEC 60529, DIN VDE 0470)</td>
<td>IP 65</td>
<td>IP 65</td>
</tr>
<tr>
<td>High voltage live parts</td>
<td>IP 4X 5)</td>
<td>IP 4X 5)</td>
</tr>
<tr>
<td>Ambient temperature 6)</td>
<td>°C +40</td>
<td>+40</td>
</tr>
<tr>
<td>Minimum value</td>
<td>°C -5</td>
<td>-5</td>
</tr>
<tr>
<td>Altitude for erection above sea level 7)</td>
<td>m 1000</td>
<td>1000</td>
</tr>
<tr>
<td>Dimensions :</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>mm 2300</td>
<td>2300</td>
</tr>
<tr>
<td>Depth</td>
<td>mm 1720</td>
<td>1720</td>
</tr>
<tr>
<td>Width</td>
<td>mm 600 / 650 7)</td>
<td>600 / 650 7)</td>
</tr>
</tbody>
</table>

1) Higher values as per international standards on request
2) Other sequences on request
3) Insulating gas : sulphur hexafluoride
4) Other auxiliary voltages on request
5) Higher values on request
6) Adaption required at greater altitude
7) 650 mm for rated current 2000 A
8) Special service conditions on request

※ The above technical data may change without prior notice for the quality improvement.
Optimum user-friendly control for digital type bay control unit, HIMAP-BC. HMGS-G10 is suitable for both single and double bus systems.
SF₆ Gas Insulated Metal-clad Switchgear

Specification Guide

General

SF₆ Gas Insulated Metal-clad switchgear, HMGS-G10 designed up to 24,000 volts 3-phase 3 wire 50/60 Hz system.

The switchgear shall be rated up to 24,000 volts and has horizontally installed vacuum circuit breakers.

The switchgear includes vacuum circuit breakers, meters, relays, etc.

The switchgear is certified by Korea Electrotechnology Research Institute.

Stationary Structure

The switchgear consists of bus compartments and circuit breaker compartment that are hermetically pressure sealed with SF₆ gas.

- Welded stainless steel enclosure
- Modular design
- Duct for pressure relief
- Panels coupled by plug in bus connectors
- Cable connection inner cone plug in system

Specification Guide

Note: Color denoted information to be provided to the purchaser regarding:

1. Choice of alternates
2. Addition of optional features
3. Specific information

Circuit Breaker Compartment

Circuit breaker(CB) compartment contains feeder busbars (tie off conductors), Vacuum Interrupter(VI), Current Transformer(CT) and cable sockets.

CB compartment is filled with SF₆ gas and equipped with a safety device (bursting disc) activated by overpressure.
Bus Compartment

Bus(BB) compartments contain main busbar, feeder busbar (tie off conductors) including the 3-position switch(3PS) or disconnector(DS) and filled with SF6 gas with safety devices (bursting disc) activated by overpressure.

Low Voltage Compartment

Low voltage compartment contains CB operating mechanism, 3PS and DS operating mechanisms, bay control unit and mounting plate.

Bay Control Unit, HIMAP-BC

HIMAP-BC is a bay control unit, based on the micro processors and integrated with the new electrical, electronic and mechanical technologies.

HIMAP-BC provides the multi protection, measuring, bay control, transducer, fault recording, programmable outputs, event recording, human machine interface, self-supervision, programmable logic control and communication.

Gas Duct

Gas duct on the top/rear is to guide the exhausted hot gas flow from the gas filled compartments(CB, BB compartments) when the internal arc fault occur.
**Cable Compartment**

Cable compartment contains the incoming or outgoing cable supports, earthing busbars and fixing facilities.

The cable compartment is closed by metal walls.

The relief device, easy-to-open door to the rear gas duct, exhausts, hot gas flow can be opened when internal arc fault occur.
The circuit breaker rated up to 24,000 volts, 50/60 Hz, up to 2,000 Amps.

The circuit breaker consists of Vacuum Interrupters(VI), insulator frame and operating mechanism.

The circuit breaker poles are installed horizontally in this compartment.

The vacuum interrupter is supported by the insulator frame located in this compartment.

The circuit breaker operated by energy storage mechanism is normally charged by a small universal motor. But it can be also charged by a manual handle for emergency manual closing and testing.

The circuit breaker has three independent vacuum interrupters.

### 3-position Switch and Disconnector

The 3-position switch has disconnecting and earthing functions and disconnector rated up to 24,000 volts and up to 2,000 Amps and it is a motor operating rod-type switch.

Live switch components(busbar, insulated spindle with moving contact) are located inside the gas compartment while operating mechanism(drive motor, position indicator and emergency manual operation) is located outside.
Panels are connected electrically by the connecting set patented by HHI since 2001, via conductor covered space.

Each sealed flange has multiple contact points for easy-link on the sides of the panels to be linked.

Bus Connector

Delivery

The switchgear ‘HMGS-G10’ is delivered in panels filled with SF₆ gas at operating pressure.

Each panel of the switchgear is suitable for handling by a crane or forklift truck.

Inspection and Maintenance

The switchgear ‘HMGS-G10’ is maintenance free inside of the gas compartment under normal service conditions.

The inspection shall be carried out by visual inspection and predominant functional tests.
Certificate of type conformity

Certificate scheme: KE0-HV Certification scheme
Manufacturer: KOREA ELECTRIC RESEARCH INSTITUTE
Product: SF6 gas insulated metal-clad switchgear
Type: KE0-HV-9109
Rating: 24kV, 900A, 63kA, 5s
Applicant: KOREA ELECTRIC RESEARCH INSTITUTE
Manufacturer: KOREA ELECTRIC RESEARCH INSTITUTE

The certificate includes the demonstration & evaluation of the SF6 gas insulated metal-clad switchgear assigned by the manufacturer to the dealer in the evaluation report of the technical documents.

The SF6 gas insulated metal-clad switchgear is manufactured according to the relevant standards & technical documents that were issued to the manufacturer.

The certificate is limited only to the sample verified & tested, and the responsibility for designing or developing other products staying the same design as those certified by KERI, remains with the manufacturer.

The parties of the certificate shall not be reproduced except in full, without the written approval of KERI.

SF6 Gas Insulated Metal-clad Switchgear