HYOSUNG

creativity inspired

HV Gas Insulated Switchgear

Since 1978

1. Introduction to Hyosung GIS
2. Why Hyosung GIS

1. Introduction to Hyosung GIS
   - Overview
   - Product Line-up
2. Why Hyosung GIS

Overview – Production system

- **Line-Up for GIS/GCB**

  - 72.5kV 25/31.5kA
  - 145~170kV 31.5/40/50kA
  - 245~362kV 40/50/63kA
  - 420~550kV 50/63kA
  - 800kV 50kA
  - 1100kV 50kA (Developed)

- **Production Capability**

  2,000 bay/year

  (Based on 145kV GIS)

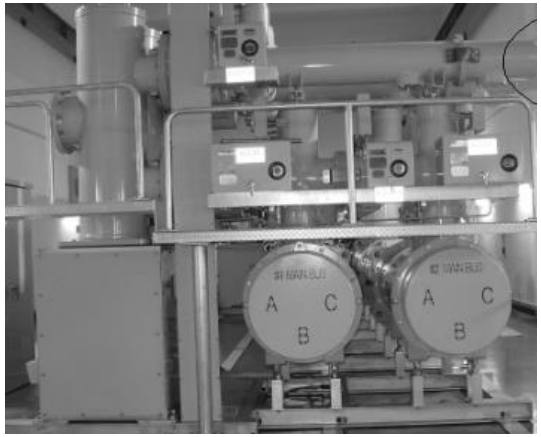
- **Features & Advantages**

  - Over 18,000 sets operated over 35 years / Environmental experience
  - High Reliability
  - Flexible Design as per Customer Requirements
  - Full Compliance with IEC/ANSI/GOST Standards

Overview – History

- **More than 35 years of Manufacturing & Service experience**

- 1st 170kV GIS in 1978



- 1100kV CB in 2007

- 1978 Developed 170kV Gas Circuit Breaker (1st in Korea)
- 1980 Developed 170kV Gas-Insulated Switchgear (1st in Korea)
- 1983 Developed 362kV 40kA GIS (1st in Korea)
- 1992 Delivered 145kV 40kA GIS toTNB, MALAYSIA
- 1999 Developed 800kV 50kA GIS (3rd in the World)
- 2004 Delivered 800kV 50kA GIS to China
- 2007 Developed New Spring type 300kV 50kA GIS
  Developed 1100kV 50kA CB for GIS
- 2009 Developed 420kV 63kA GIS
- 2012 Developed 550kV 63kA GIS
- 2015 Developed 245kV 50kA GIS (3-phase encapsulated)
- 2016 Developed 300kV 63kA GIS

1. Introduction to Hyosung GIS
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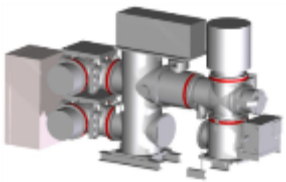
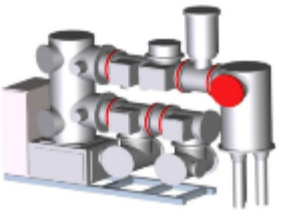
Product Line-Up

- Totally 17 types of GIS (72.5kV ~ 1100kV)



[72.5kV] HSG-074A

[145kV] HSG-144D



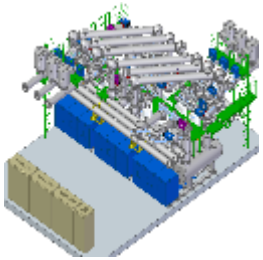
[170kV] HSG-175

[245kV] HSG-305C

[300kV] HSG-305B

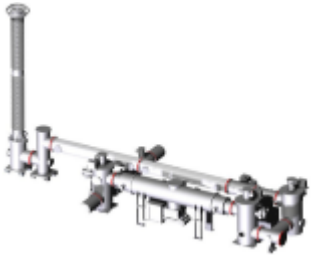
[362kV] HSG-365

[420kV] HSG-426C

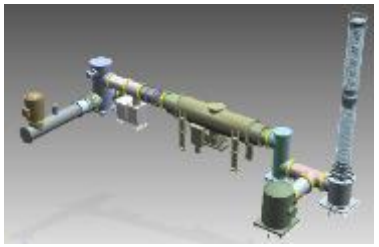


[420kV] HSG-426A

[550kV] 550HGS



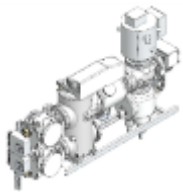
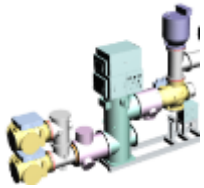
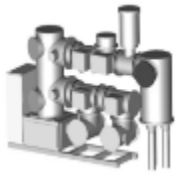
[800kV] 800HGS50



[1100kV] HSG-115

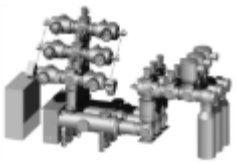
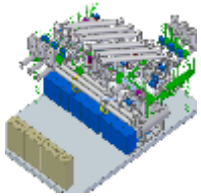
Product Line-Up

- **Spring-type up to 300kV, type tested and certified**

GIS Type							
Model	**HSG-074A**	**HSG-144D**	**HSG-144C**	**HSG175**	**HSG-305C**	**HSG-305B**	**HSG-246A**
Rated Voltage [kV]	72.5	145	170	170	220	245/300	252/300
Breaking Current [kA]	40	40	40	50	50	50	63
Rated Current [A]	2500	3150	2500	4000	3150	4000	4000
Phases per enclosure	3	3	3	1/3	3	1	1
Breaks per pole	1	1	1	1	1	1	1
Breaking times [cycles]	3	3	3	3	3	3	3
First Pole to Clear Factor	1.5	1.3/1.5	1.3/1.5	1.3	1.3	1.3/1.5	1.3
Mechanical Endurance	M2	M2	M2	M2	M2	M2	M2
Operating Mechanism	Spring	Spring	Spring	Spring	Spring	Spring	Spring
BIL [kVp]	325	650	750	750	1050	1050	1050
Type Test Certified by	CESI/KERI	CESI/KERI	CESI/KERI	KERI	CESI/KERI	CESI/KERI	CESI/KERI

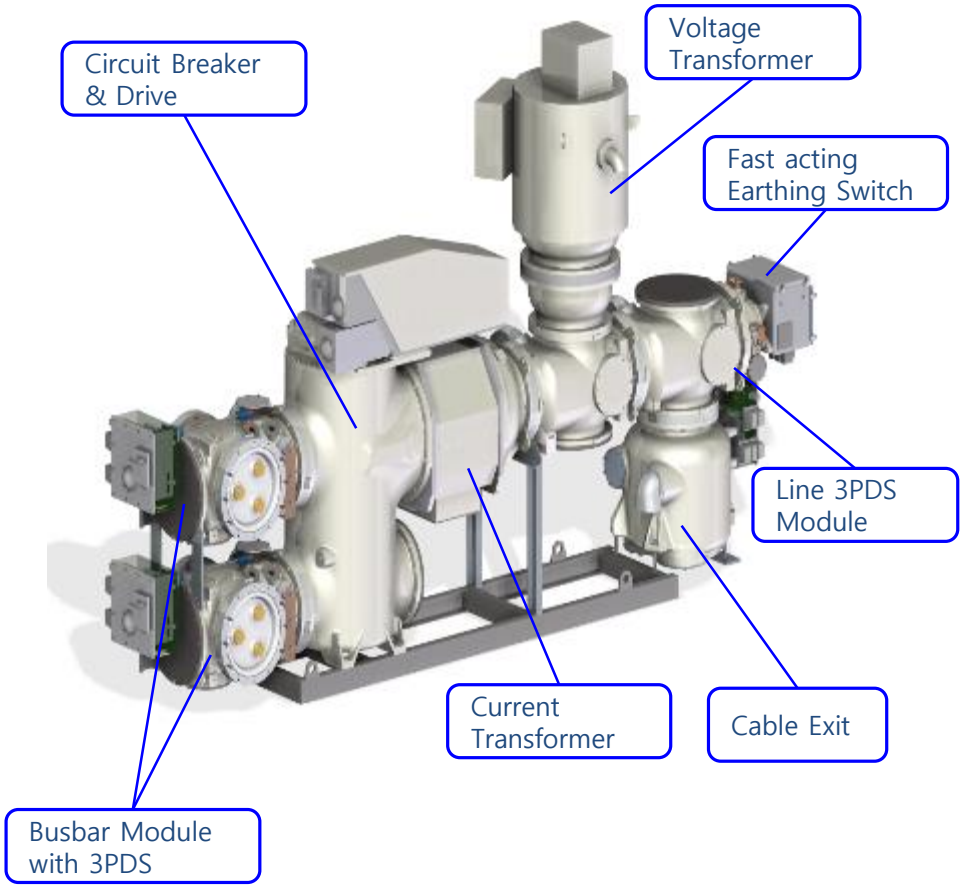
Product Line-Up

- Hydraulic-type for above-362kV-class (spring type currently under development)
- Available up to 1100kV GIS

GIS Type						
Model	**HSG362**	**HSG-426C**	**HSG-426A**	**550HSG**	**800HSG50**	**HSG115**
Rated Voltage [kV]	362	420	420	550	800	1100
Breaking Current [kA]	63	50	63	63	50	50
Rated Current [A]	6300	4000	4000	4000	8000	8000
Phases per enclosure	1	1	1	1	1	1
Breaks per pole	1/2	1	1	2	2	2
Breaking times [cycles]	3	2	2	2	2	2
First Pole to Clear Factor	1.5	1.5	1.3/1.5	1.3	1.3	1.3/1.5
Mechanical Endurance	M2	M2	M2	M2	M2	M2
Operating Mechanism	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic
BIL [kVp]	1175	1425	1425	1550	2100	2100
Type Test Certified by	KERI	CESI/KERI	CESI/KERI	CESI/KERI	KERI	KERI

145kV 40kA GIS (HSG-144D) – Typical Bay Design

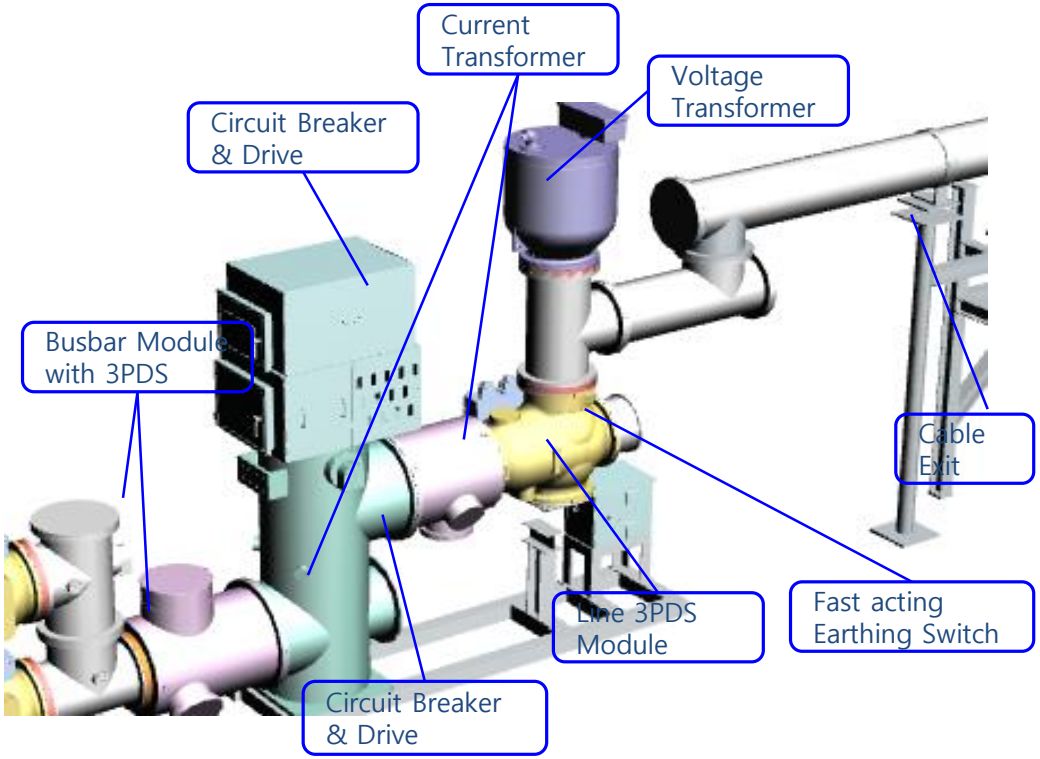
- **Typical bay of Hyosung 145kV GIS with Plug-in type Cable Sealing End**



Nominal Voltage	**110/ 115/ 132kV**
Rated Voltage	**145kV**
Frequency	**50/60Hz**
Breaking Current (Short-time Withstand)	**40kA (3sec)**
Breaking Time	**3 Cycles**
Making Current	**100/104kAp**
Breaker Per Pole	**1**
First pole to clear factor	**1.3/1.5**
Rated Current	**2500 / 3150A**
Rated power frequency withstand voltage (1 min)	**275kV/315kV**
Rated lightning impulse withstand voltage (1.2/50 μs)	**650kV/750kV**
Operating Mechanism	**Spring**
Mechanical Endurance Class	**M2(10,000)**
Capacitive current switching class	**C2**
Electrical Endurance Class	**E1**
Re-Closing Duty	**O-0.3s-CO-3min-CO**
Type Test Certified by	**CESI/KERI**

170kV 40kA GIS (HSG-144C) – Typical Bay Design

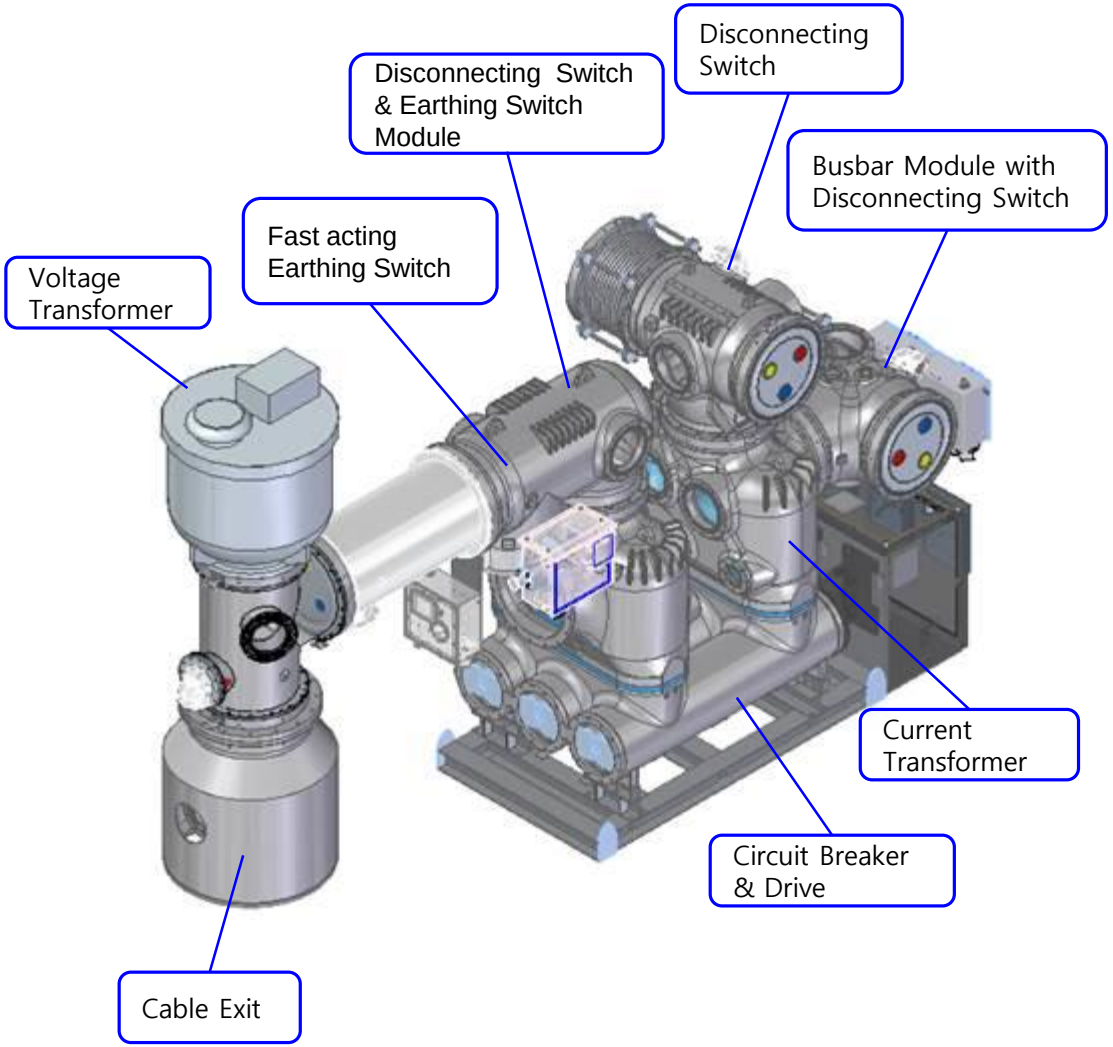
- **Typical bay of Hyosung 170kV GIS with Cable Sealing End**



Nominal Voltage	**154 kV**
Rated Voltage	**170kV**
Frequency	**50Hz**
Breaking Current (Short-time Withstand)	**40kA (3sec)**
Breaking Time	**3 Cycles**
Making Current	**100 kAp**
Breaker Per Pole	**1**
First pole to clear factor	**1.3/1.5**
Rated Current	**2500A**
Rated power frequency withstand voltage (1 min)	**325kV**
Rated lightning impulse withstand voltage (1.2/50 μs)	**750kV**
Operating Mechanism	**Spring**
Mechanical Endurance Class	**M2(10,000)**
Capacitive current switching class	**C2**
Electrical Endurance Class	**E1**
Re-Closing Duty	**O-0.3s-CO-3min-CO**
Type Test Certified by	**CESI/KERI**

245kV 50kA GIS (HSG-305C) design

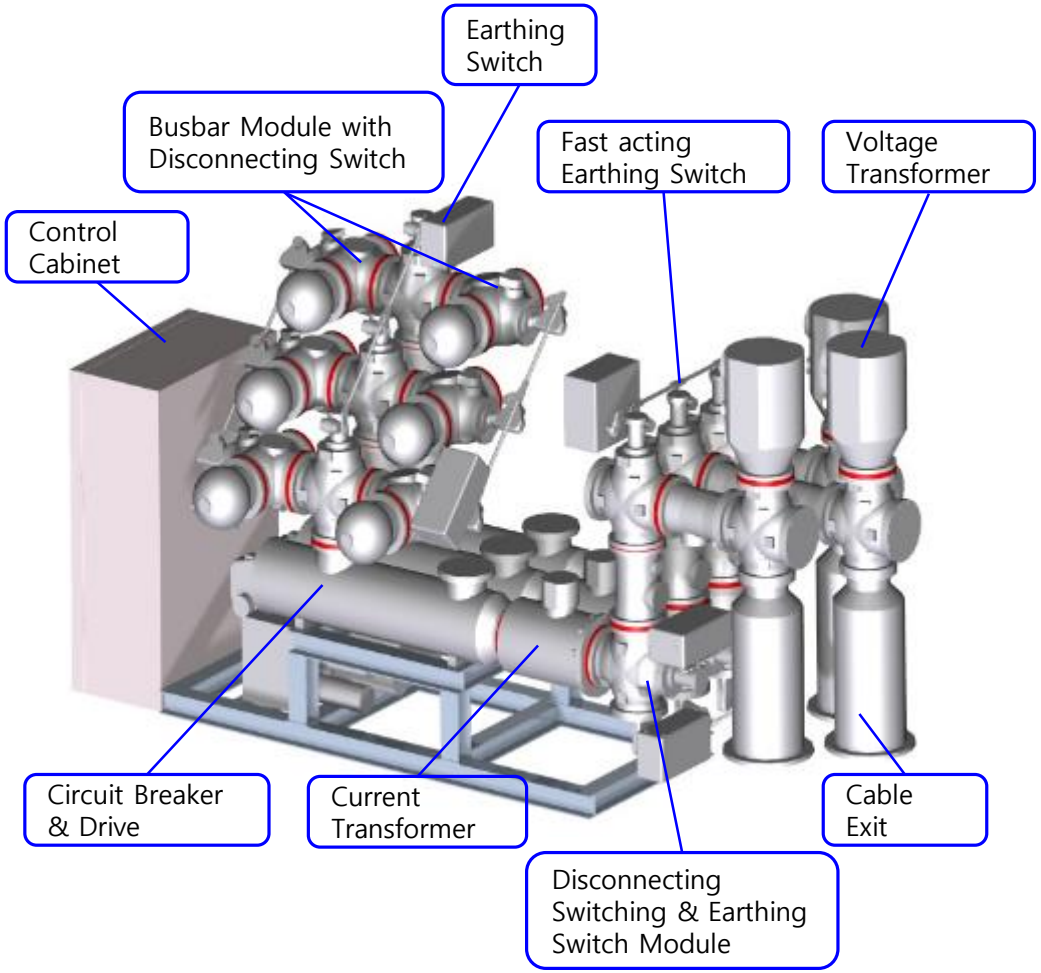
- **Typical bay of Hyosung 245kV GIS with Cable Sealing End**



Nominal Voltage	**220kV**
Rated Voltage	**245kV**
Frequency	**50Hz**
Breaking Current (Short-time Withstand)	**50kA (1sec)**
Breaking Time	**3 Cycles**
Making Current	**125 kAp**
Breaker Per Pole	**1**
First pole to clear factor	**1.3**
Rated Current	**3150 A**
Rated power frequency withstand voltage (1 min)	**460kV/530kV**
Rated lightning impulse withstand voltage (1.2/50 μs)	**1050kV/1200kV**
Operating Mechanism	**Spring**
Mechanical Endurance Class	**M2(10,000)**
Capacitive current switching class	**C2**
Electrical Endurance Class	**E1**
Re-Closing Duty	**O-0.3s-CO-3min-CO**
Type Test Certified by	**CESI/KERI**

300kV 50kA GIS (HSG-305B) design

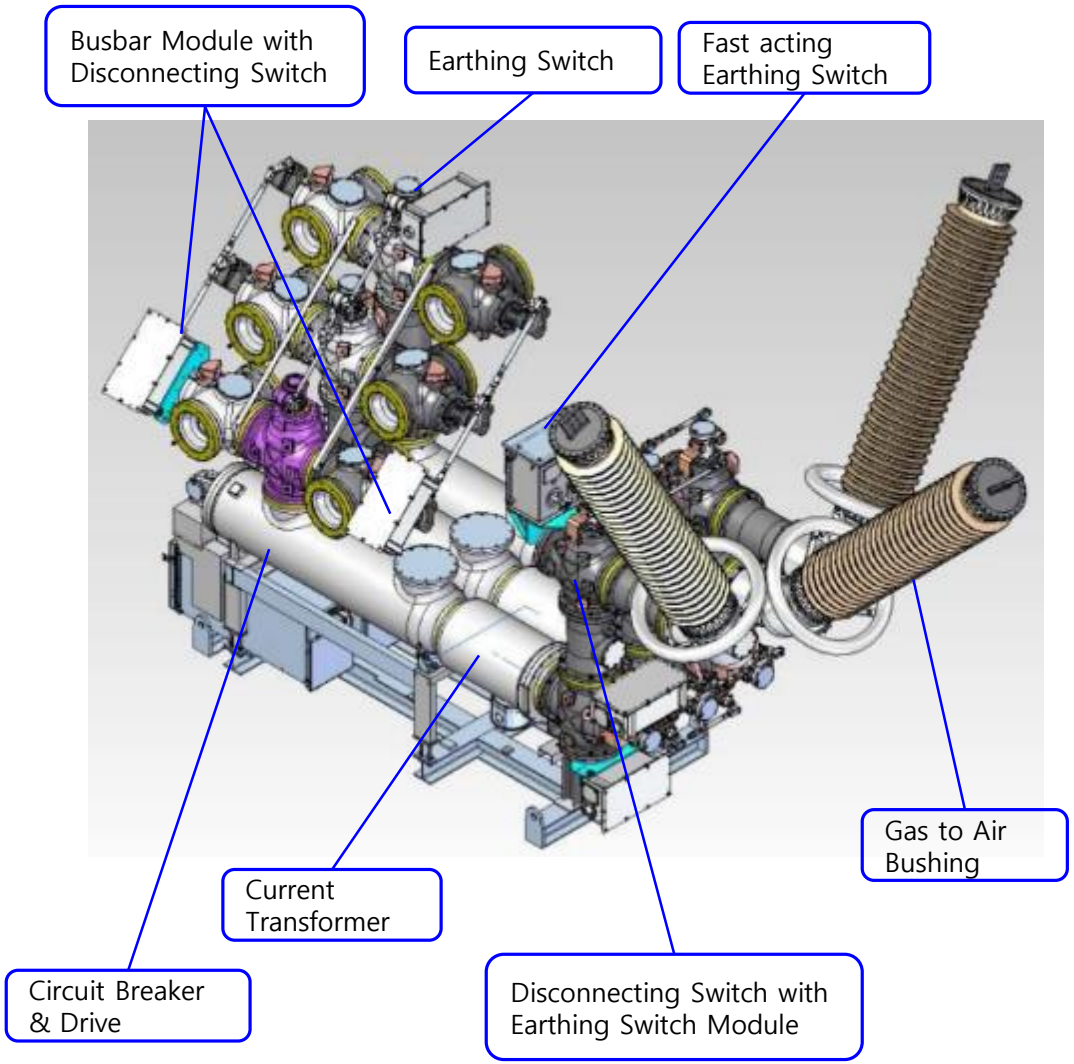
- **Typical bay of Hyosung 300kV GIS with Cable Sealing End**



Nominal Voltage	**220/245kV**
Rated Voltage	**300kV**
Frequency	**50Hz**
Breaking Current (Short-time Withstand)	**50kA (3sec)**
Breaking Time	**3 Cycles**
Making Current	**130 kAp**
Breaker Per Pole	**1**
First pole to clear factor	**1.3/1.5**
Rated Current	**4000 A**
Rated power frequency withstand voltage (1 min)	**460kV/530kV**
Rated lightning impulse withstand voltage (1.2/50 μs)	**1050kV/1050(+170)kV**
Operating Mechanism	**Spring**
Mechanical Endurance Class	**M2(10,000)**
Capacitive current switching class	**C2**
Electrical Endurance Class	**E1**
Re-Closing Duty	**O-0.3s-CO-3min-CO**
Type Test Certified by	**CESI/KERI**

300kV 63kA GIS (HSG-246A) design

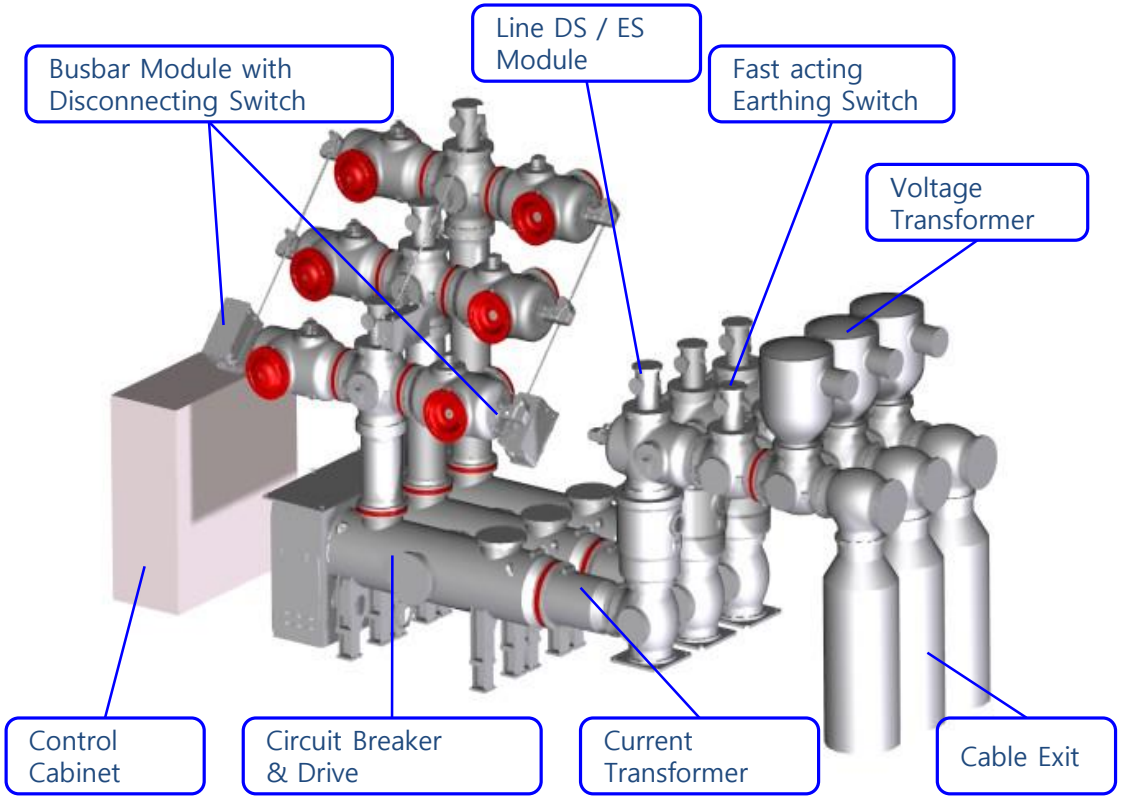
- **Typical bay of Hyosung 300kV GIS**



Nominal Voltage	**252kV**
Rated Voltage	**300kV**
Frequency	**50Hz**
Breaking Current (Short-time Withstand)	**63kA (3sec)**
Breaking Time	**3 Cycles**
Making Current	**157.5 kAp**
Breaker Per Pole	**1**
First pole to clear factor	**1.3**
Rated Current	**4000 A**
Rated power frequency withstand voltage (1 min)	**460kV/530kV**
Rated lightning impulse withstand voltage (1.2/50 μs)	**1050kV/1050(+170)kV**
Operating Mechanism	**Spring**
Mechanical Endurance Class	**M2(10,000)**
Capacitive current switching class	**C2**
Electrical Endurance Class	**E1**
Re-Closing Duty	**O-0.3s-CO-3min-CO**
Type Test Certified by	**CESI/KERI**

420kV 50kA GIS (HSG-426C) design

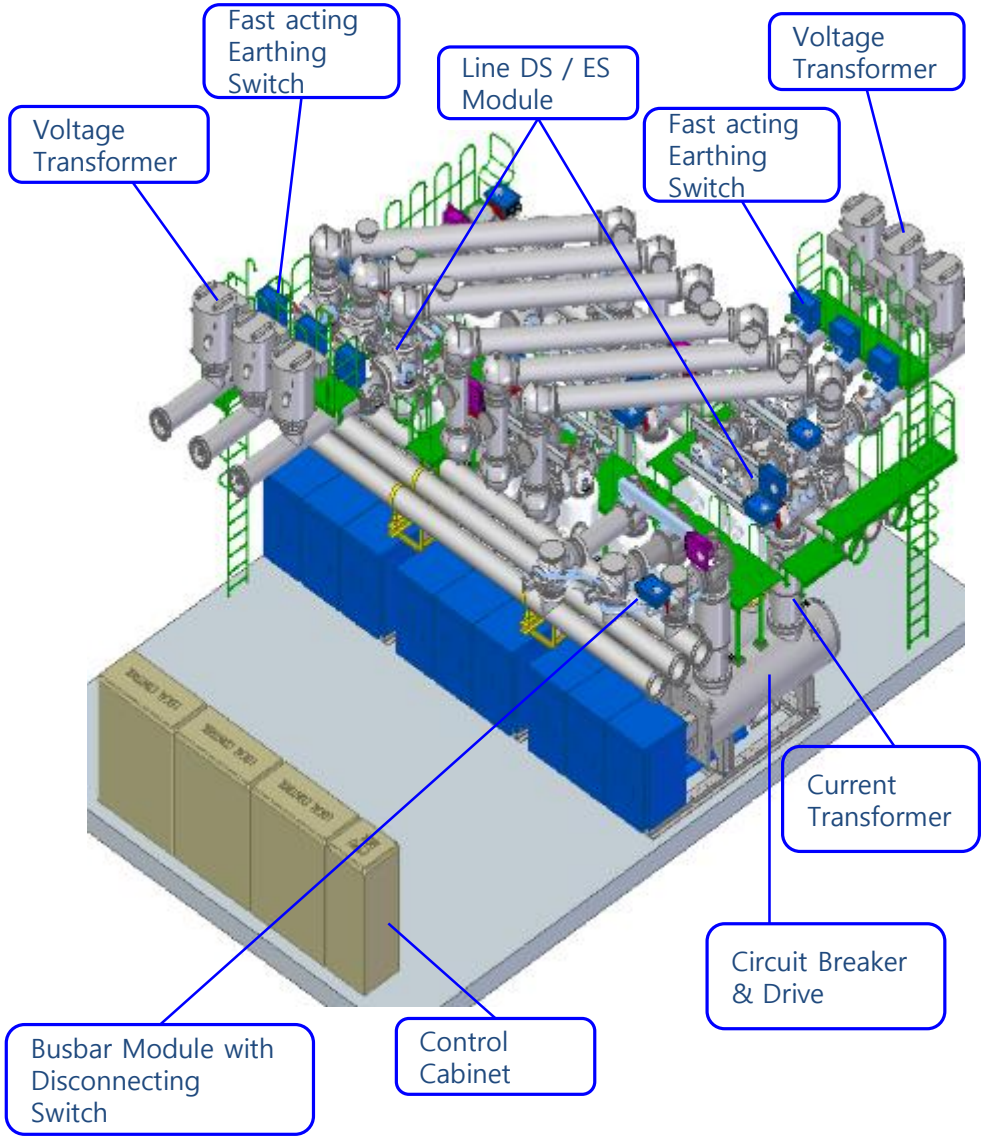
- **Typical bay of Hyosung 420kV GIS with Cable Sealing End**



Nominal Voltage	**380/400kV**
Rated Voltage	**420kV**
Frequency	**50Hz**
Breaking Current (Short-time Withstand)	**50kA (3sec)**
Breaking Time	**2 Cycles**
Making Current	**125 kAp**
Breaker Per Pole	**1**
First pole to clear factor	**1.5**
Rated Current	**4000 A**
Rated power frequency withstand voltage (1 min)	**650kV/815kV**
Rated lightning impulse withstand voltage (1.2/50 µs)	**1425kV/1425(+240)kV**
Operating Mechanism	**Hydraulic**
Mechanical Endurance Class	**M2(10,000)**
Capacitive current switching class	**C2**
Electrical Endurance Class	**E1**
Re-Closing Duty	**O-0.3s-CO-3min-CO**
Type Test Certified by	**CESI/KERI**

420kV 63kA GIS (HSG-426A) design

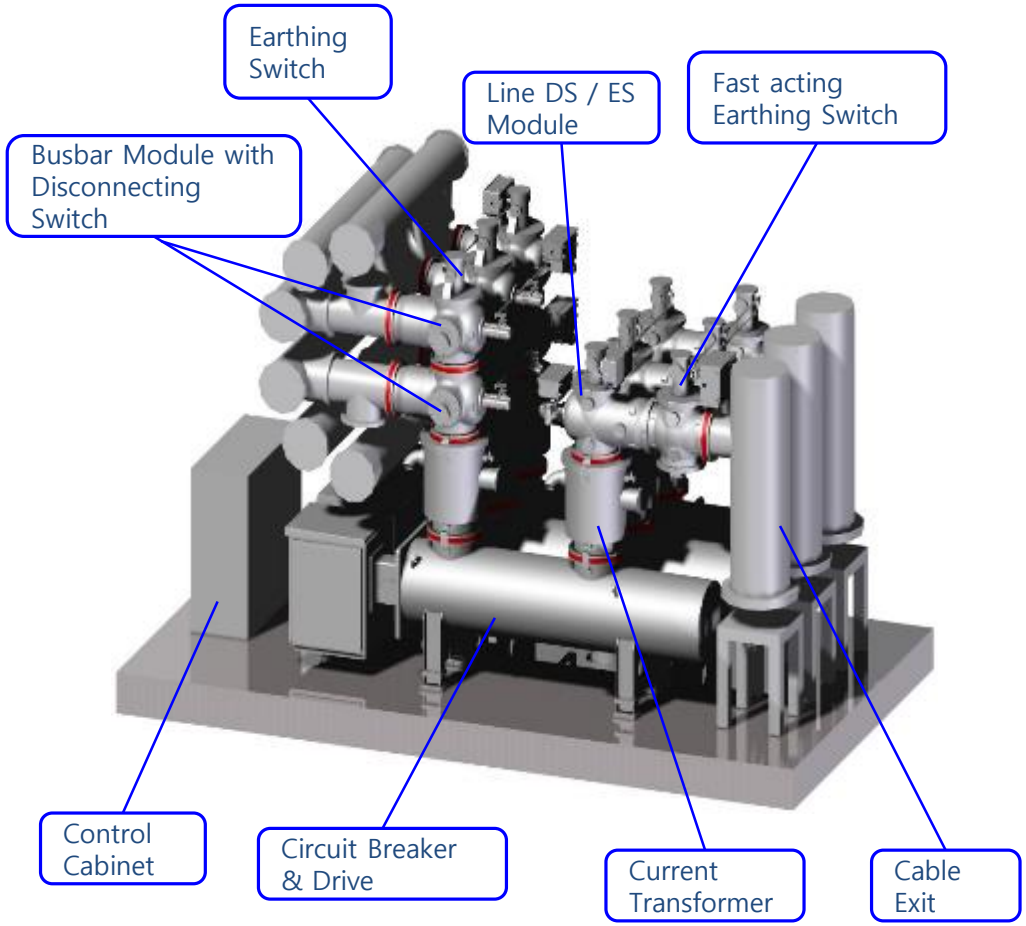
- **Typical bay of Hyosung 420kV GIS with One & Half**



Nominal Voltage	**400kV**
Rated Voltage	**420kV**
Frequency	**50/60Hz**
Breaking Current (Short-time Withstand)	**63kA (3sec)**
Breaking Time	**2 Cycles**
Making Current	**157.5/163.8kAp**
Breaker Per Pole	**1**
First pole to clear factor	**1.3/1.5**
Rated Current	**4000A**
Rated power frequency withstand voltage (1 min)	**650kV**
Rated lightning impulse withstand voltage (1.2/50 μs)	**1425kV**
Operating Mechanism	**Hydraulic**
Mechanical Endurance Class	**M2(10,000)**
Capacitive current switching class	**C2**
Electrical Endurance Class	**E1**
Re-Closing Duty	**O-0.3s-CO-3min-CO**
Type Test Certified by	**CESI/KERI**

550kV 63kA GIS (550HSG) design

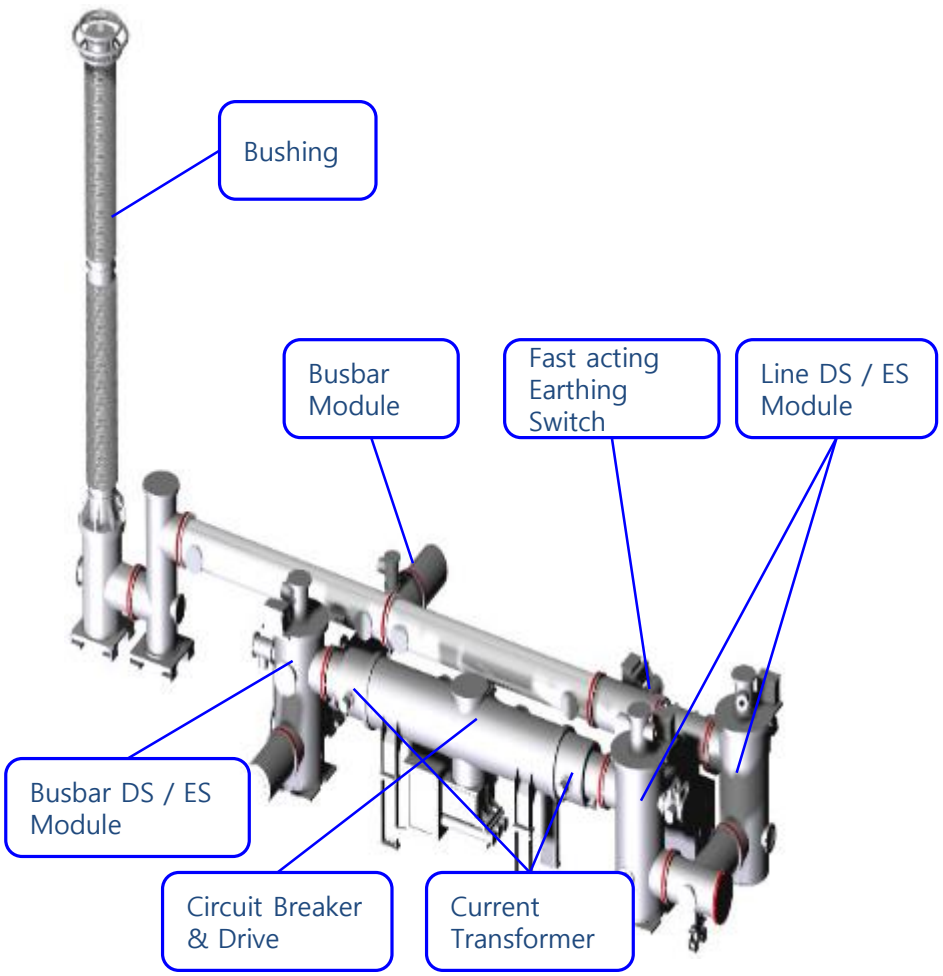
- **Typical bay of Hyosung 550kV GIS with Cable Sealing End**



Nominal Voltage	**500kV**
Rated Voltage	**550kV**
Frequency	**50/60Hz**
Breaking Current (Short-time Withstand)	**63kA (3sec)**
Breaking Time	**2 Cycles**
Making Current	**157.5/171 kAp**
Breaker Per Pole	**1**
First pole to clear factor	**1.3**
Rated Current	**4000 A**
Rated power frequency withstand voltage (1 min)	**710kV/925kV**
Rated lightning impulse withstand voltage (1.2/50 μs)	**1550kV/1550(+315)kV**
Operating Mechanism	**Hydraulic**
Mechanical Endurance Class	**M2(10,000)**
Capacitive current switching class	**C2**
Electrical Endurance Class	**E1**
Re-Closing Duty	**O-0.3s-CO-3min-CO**
Type Test Certified by	**CESI/KERI**

800kV 50kA GIS (800HSG50) design

- Typical bay of Hyosung 800kV GIS



Nominal Voltage	**765kV**
Rated Voltage	**800kV**
Frequency	**50/60Hz**
Breaking Current (Short-time Withstand)	**50kA (1sec)**
Breaking Time	**2 Cycles**
Making Current	**125/130 kAp**
Breaker Per Pole	**2**
First pole to clear factor	**1.3/1.5**
Rated Current	**4000/8000 A**
Rated power frequency withstand voltage (1 min)	**960kV/1270kV**
Rated lightning impulse withstand voltage (1.2/50 μs)	**2250kV/2100(+457)kV**
Operating Mechanism	**Hydraulic**
Mechanical Endurance Class	**M2(10,000)**
Capacitive current switching class	**C2**
Electrical Endurance Class	**E1**
Re-Closing Duty	**O-0.3s-CO-3min-CO**
Type Test Certified by	**KERI**

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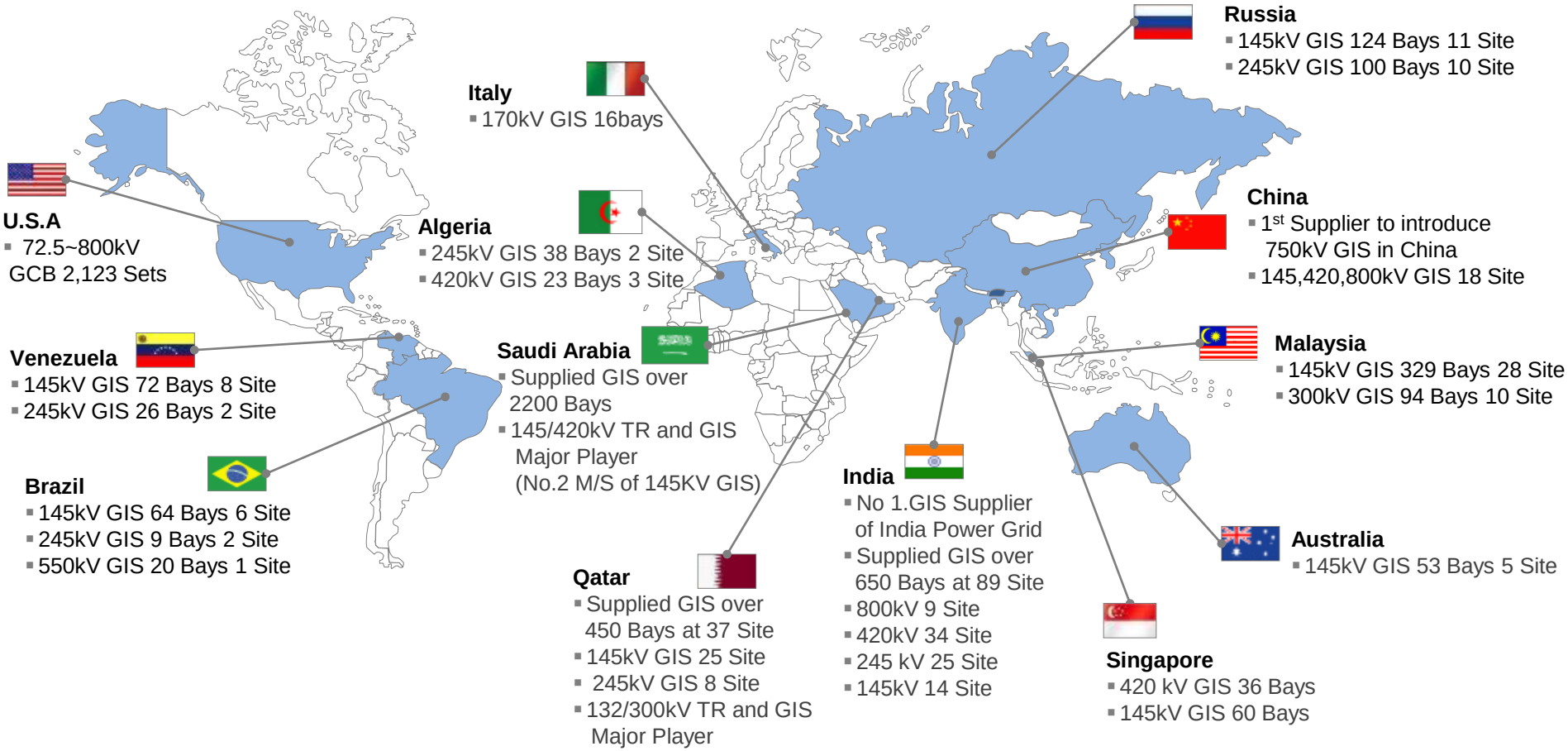
2. Why Hyosung GIS

- Global Achievements
- Competitiveness of Product
- Systematic Process & Service

Global Achievements

- With over 13,600 GIS bays and 4,500 GCB sets supplied around the world
- Domestic market share 60%, Global market share 20%



Global Achievements

- With over 13,600 GIS bays and 4,500 GCB sets supplied around the world
- Domestic market share 60%, Global market share 20%

▼ 145kV 8128 S/S in Saudi Arabia

▼ 170kV Terna S/S in Italy

▼ 300kV Koysug S/S in Russia

▼ 420kV Koteshwar S/S in India

▼ 550kV Transener S/S in Argentina

▼ 800kV Tang-Jin Thermal Power Plant in Korea

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2. Why Hyosung GIS

- Global Achievements
- Competitiveness of Product
- Systematic Process & Service

Competitiveness of Product – Easy Maintenance & Repair

- **Hyosung GIS is not only compact, but also guarantees easy maintenance and operation.**

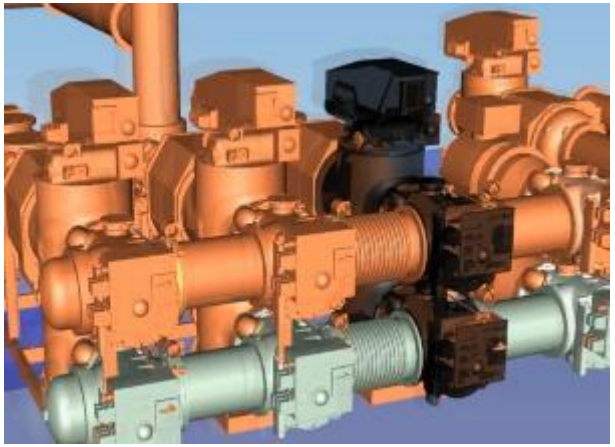
Example of 145KV 40kA GIS

"As the whole operation mechanism box is located in the same aisle as the operator would stand, the operator can check the main bus 3PDS, the line-side HES operation mechanism, and the indicator all in one check up."

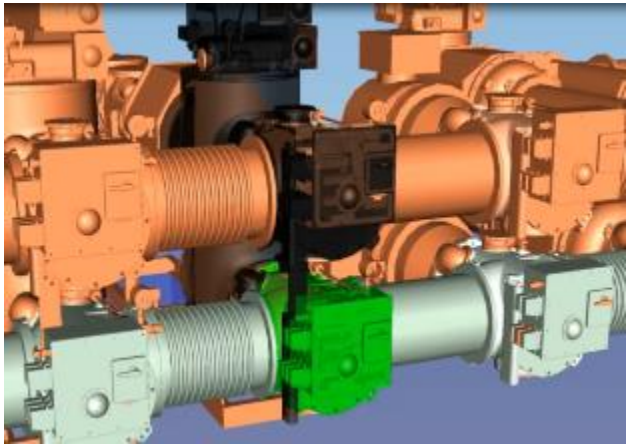
Competitiveness of Product – Easy Maintenance & Repair

- **Hyosung GIS is not only compact, but also guarantees easy maintenance and operation.**

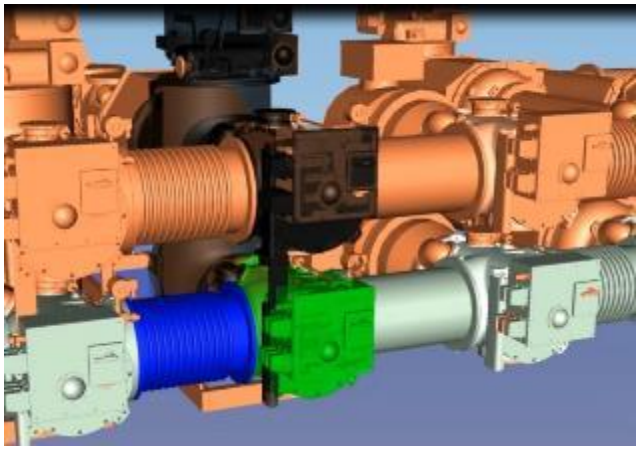
[Example case – replacing main bus ES/DS Module]



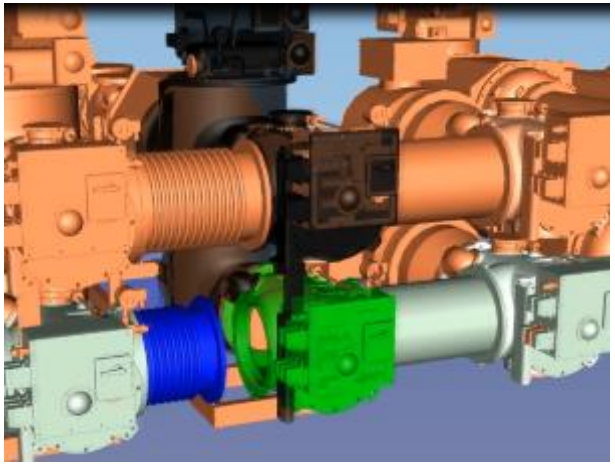
Main bus, CB, ES,DS Off



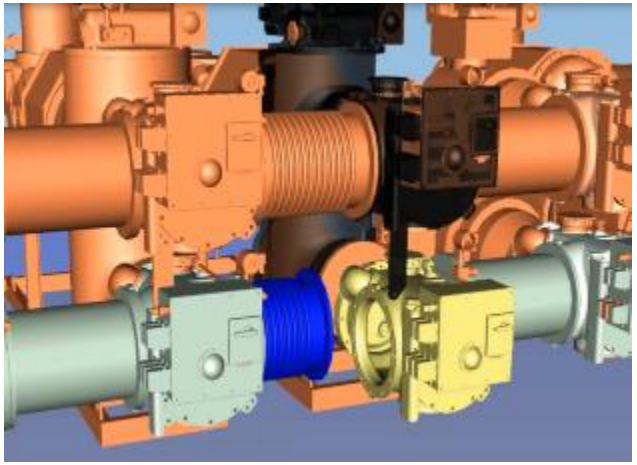
ES on



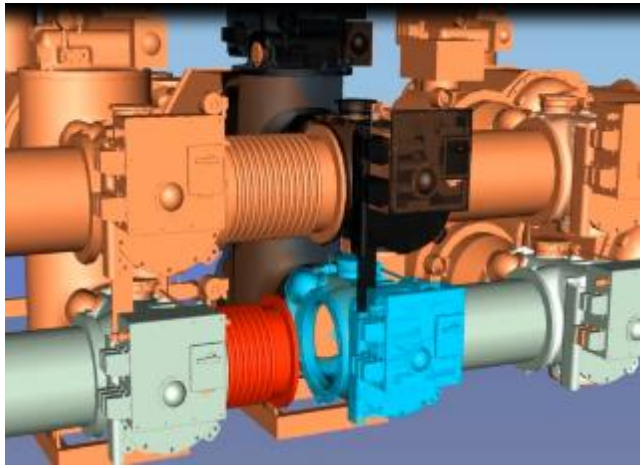
Compressing Bellows
to dismantle DS/ES



Dismantling ES/DS



Retrofitting new ES/DS



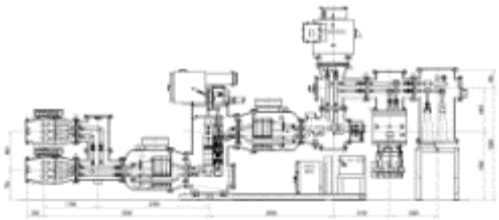
Decompressing Bellows

Competitiveness of Product – Customization

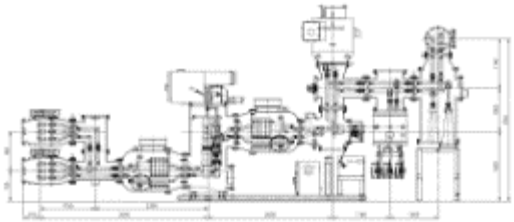
- **We can fulfill any layout the customer request: not only standardized layout but also with flexible module design concept. We value our customer's requirements and respond flexibly.**

145kV bay types

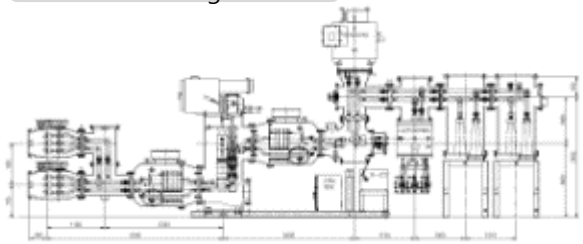
Dual CT



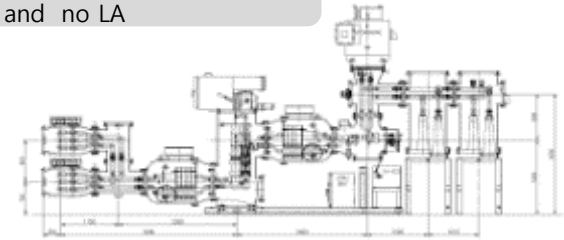
Dual CT with
three Cable sealing ends



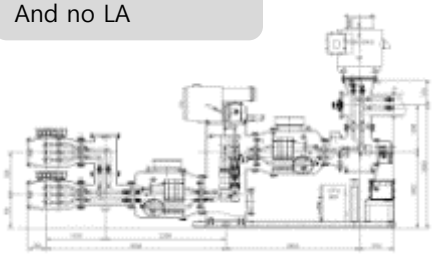
Dual CT with
two Cable sealing ends



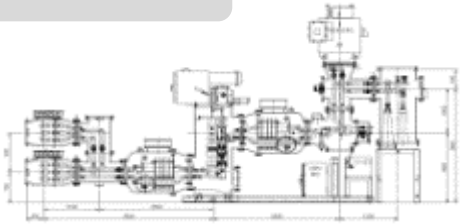
Dual CT with
two cable sealing ends
and no LA



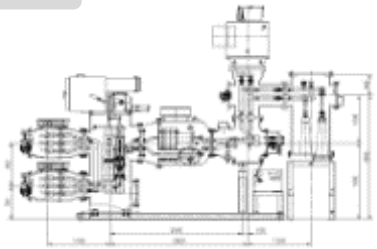
Dual CT with GIB
And no LA



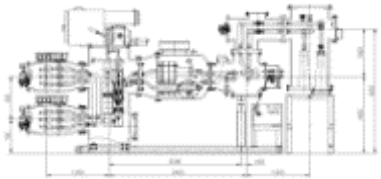
Dual CT without LA



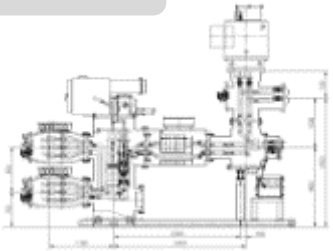
Single CT



Single CT without VT



Single CT with GIB



Competitiveness of Product – Reliability

- **Hyosung GIS are operating successfully in special conditions including extremely high and low temperature conditions.**

Russia/
220kV GIS


Venezuela/
JBA Outdoor GIS

Qatar/
Semaisma 132 kV GIS


Korea/
Shin Bundang Underground S/S GIS

1. Introduction to Hyosung GIS

2. Why Hyosung GIS

- Global Achievements
- Competitiveness of Product
- Systematic Process & Service

Systematic Process & Service – Overview

Advanced Design Verification

- Seismic Analysis
- Gas Density/Flow Analysis
- Electric Field & Structural Analysis

Manufacturing process

- In-house product for key components
- Operating Mechanism

Assembly process

- Helical Coil Application
- Long term test on insulator

Shop test process

- 1 bay or substation unit test
- 200 times no-load operation test

Transportation process

- 1-2 Bay unit transportation
- Shock and vibration control

Installation process

- Temporary clean room
- Inspection of internal part through manhole

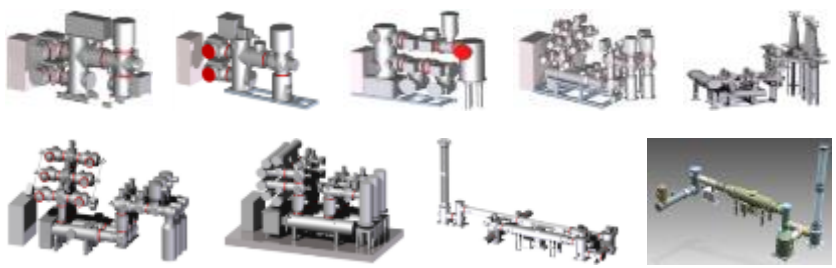
Site test process

- AIA or UHF PD measurement upon request

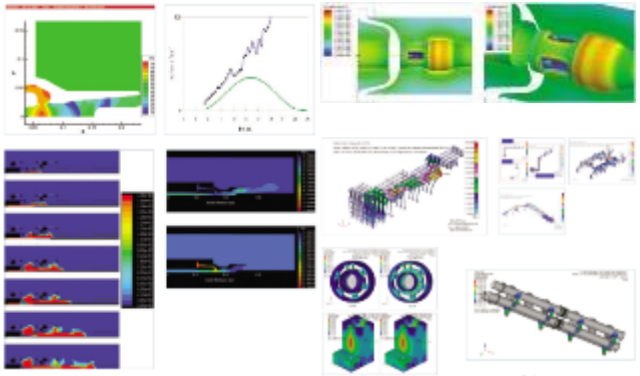
Systematic Process & Service – Research & Development

- We have well formulated R&D process. All models have been developed according to this process.

Basic Design



Detail Design



Assembling

Testing

Systematic Process & Service – Research & Development

- Our factory has sizable GIS R&D center equipped with various test facilities which are being well cared for.

Systematic Process & Service – Manufacturing

- **We have large-scale production facilities for systematic manufacturing.**

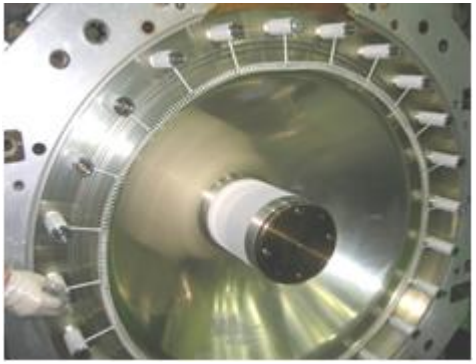
Systematic Process & Service – Manufacturing

- **Insulators are produced in-house. Hence, additional insulator will be provided quickly so that replacement can be carried out easily.**

In-House Products

Epoxy Resin Insulator

Mold Separation



Assembly

Dimension Check

Leakage Test

Routine Test Items

- ✓ X-Ray Test
- ✓ PD Measurement
- ✓ AC HV Test
- ✓ Leakage Test

Sample Test Items

- ✓ Material Test
  : Tg, Bending Stress, Specific Gravity, Ash Test

X-ray Test

Electric Test

Systematic Process & Service – Shop Test

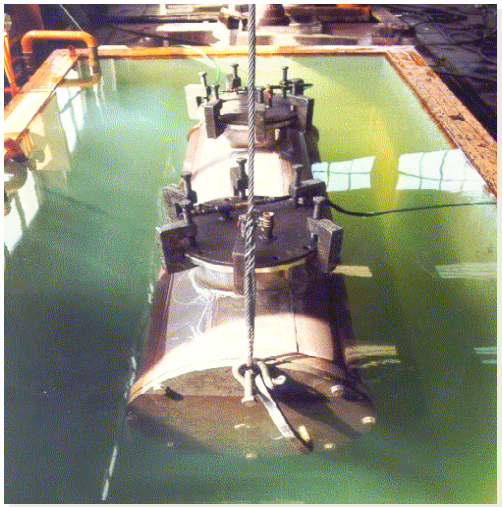
- **Our factory is equipped with various shop test facilities which are being well cared for.**

Systematic Process & Service – Shop Test

- **After manufacturing, completely assembled bays are shop tested based on IEC standards. Accordingly, test list and procedure(ITP) are submitted to customer for approval.**

HV/PD Test

PD Sensor Application based on UHF



Hydrostatic & Leakage Test

Mechanical Operation Test

Systematic Process & Service – Transportation

- **1 or 2 complete bays are packed and transported so that quality in factory can be maintained to site and assembly work at site can be reduced.**

1~2 Complete bay unit transportation

- ✓ Maintain quality from factory to site
- ✓ Reduce site assembly works
- ✓ Save installation lead time

Packing in wooden box with shock indicator/recorder

- ✓ Protect GIS from damage by external shock
- ✓ Prevent failure by impact during transportation
- ✓ Possible to long-term storage

Systematic Process & Service – Installation

- **Installation and assembly works at site are carried out by an established procedure.**

Checking the packing status of all box

Checking dimensions for installation

Marking lines for embedded base

Unpacking main body

Delivery to GIS room

Arranging bays

Cleaning internal parts of docking points

Docking

Welding all bays to embedded base

Systematic Process & Service – Installation

- **Installation and assembly works at site are carried out by an established procedure.**

GIB docking

Assembling Voltage Transformer

Assembling Gas to Air bushing

Assembling platform and working for cabling

Testing of contact resistance

Testing of dew point

Vacuuming before the gassing works

Gassing

Systematic Process & Service – Site Test

- For quality assurance purposes, site tests are carried out based on IEC standards. Accordingly, test list and procedure(STP) are submitted to customer for approval.

Oscillating Impulse Test
1800kV 72.5kJ

UHF External Sensor

UHF Internal Sensor

Dielectric Test

- Oscillating Impulse Test
- AC HV Test with PD Measurement via AIA and UHF System

Systematic Process & Service – Training

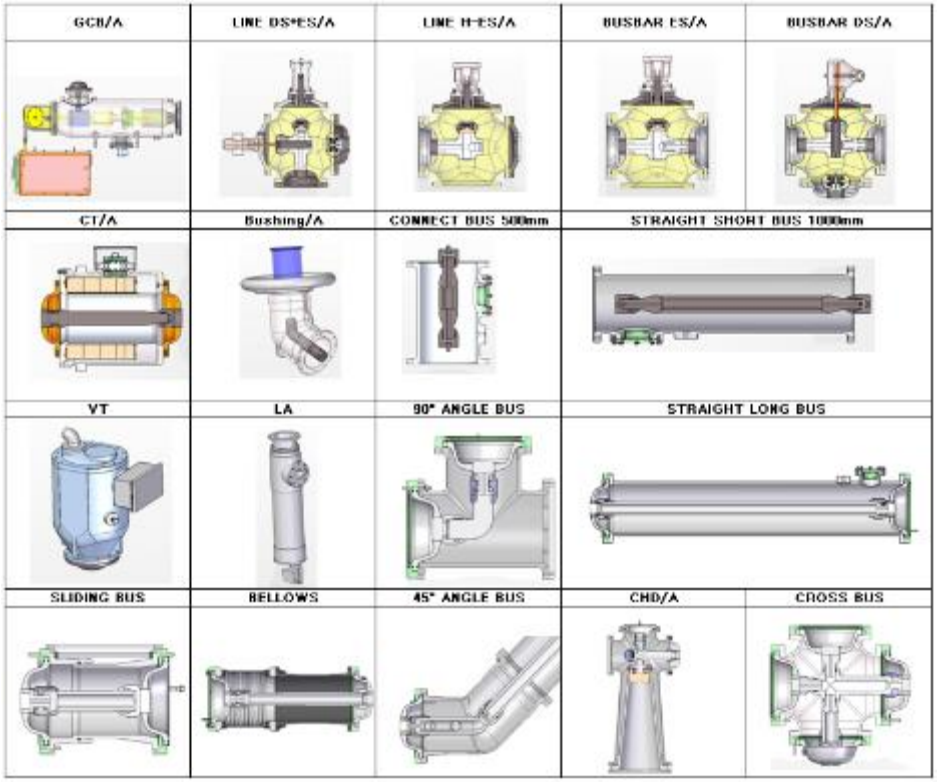
- **Hyosung provides training in the theory and practice for customers at Hyosung factory in Korea.**

Training for customer

- ✓ Small group training is recommended for efficiency.
- ✓ If requested, courses on the customer's job site is also provided.

Systematic Process & Service – Repair & Maintenance

- **Hyosung is providing all type of service (Emergency, In maintenance plan, Out of plan) by certified service engineers from Korean factory.**
- **3rd party or prepared spare part kit is available for all type of electronic/electric part used in Hyosung GIS to resolve emergency case during installation, operation.**
- **Hyosung is controlling inventory stock of every module to provide on time service up to customer's requirement.**



GIS Modules prepared by Hyosung for service

Certified engineer is always ready for site service

Systematic Process & Service – Certificate

- **All procedures of Hyosung production system are guaranteed by ISO / OSHAS Certificates.**

ISO 9001 Certificate
since 1993


BUREAU VERITAS
Certification

Certification

HYOSUNG CORPORATION – CHANGWON PLANT

ISO 9001:2000 / KS A 9001:2001

ISO 14001 Certificate
since 2000

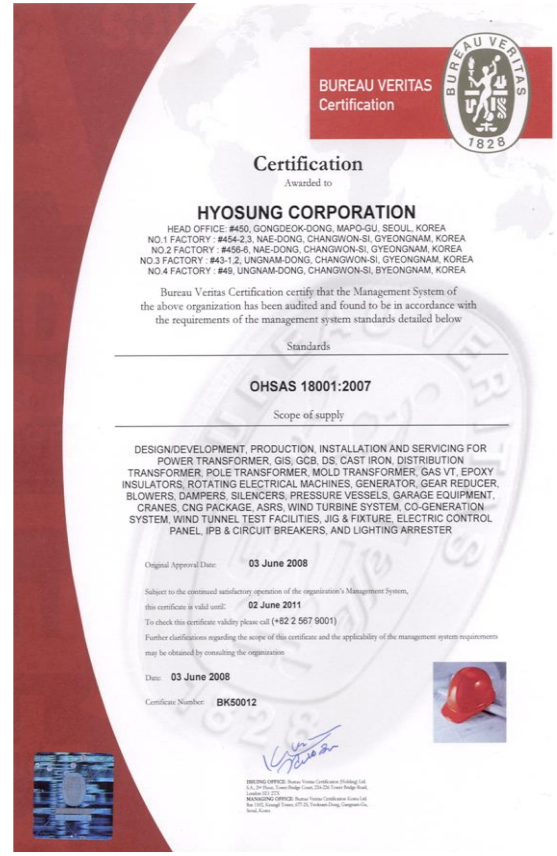

BUREAU VERITAS
Certification

Certification

HYOSUNG CORPORATION – CHANGWON PLANT

ISO 14001:2004 / KS A 14001:2004

OSHAS 18001 Certificate
since 2008


BUREAU VERITAS
Certification

Certification

Awarded to

HYOSUNG CORPORATION

HEAD OFFICE: #450, GONGDEOK-DONG, MAPO-GU, SEOUL, KOREA
NO.1 FACTORY : #454-2,3, NAE-DONG, CHANGWON-SI, GYEONGNAM, KOREA
NO.2 FACTORY : #456-6, NAE-DONG, CHANGWON-SI, GYEONGNAM, KOREA
NO.3 FACTORY : #43-1,2, UNGNAM-DONG, CHANGWON-SI, GYEONGNAM, KOREA
NO.4 FACTORY : #49, UNGNAM-DONG, CHANGWON-SI, BYEONGNAM, KOREA

Bureau Veritas Certification certify that the Management System of the above organization has been audited and found to be in accordance with the requirements of the management system standards detailed below

Standards

OHSAS 18001:2007

Scope of supply

DESIGN/DEVELOPMENT, PRODUCTION, INSTALLATION AND SERVICING FOR POWER TRANSFORMER, GIS, GCB, DS, CAST IRON, DISTRIBUTION TRANSFORMER, POLE TRANSFORMER, MOLD TRANSFORMER, GAS VT, EPOXY INSULATORS, ROTATING ELECTRICAL MACHINES, GENERATOR, GEAR REDUCER, BLOWERS, DAMPERS, SILENCERS, PRESSURE VESSELS, GARAGE EQUIPMENT, CRANES, CNG PACKAGE, ASRS, WIND TURBINE SYSTEM, CO-GENERATION SYSTEM, WIND TUNNEL TEST FACILITIES, JIG & FIXTURE, ELECTRIC CONTROL PANEL, IPB & CIRCUIT BREAKERS, AND LIGHTING ARRESTER

Original Approval Date: 03 June 2008

Subject to the continued satisfactory operation of the organization's Management System, this certificate is valid until: 02 June 2011

To check this certificate validity please call (+82 2 567 9001)

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization

Date: 03 June 2008

Certificate Number: BK50012

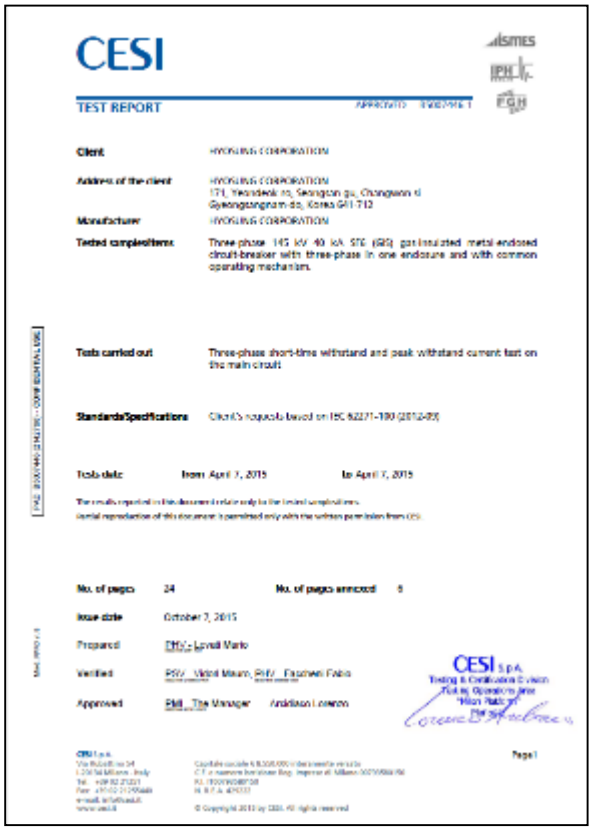
Systematic Process & Service – Certificate

- **All types of Hyosung GIS have been certificated by CESI or KERI in accordance with IEC standards.**

[HSG-144A]


Test Report CESI Page 1

[HSG-144D]


CESI

TEST REPORT

Client HYOSUNG CORPORATION

Address of the client HYOSUNG CORPORATION 171, Yeonsedae-ro, Seongjon-gu, Changwon-si Gyeongsangnam-do, Korea 641-712

Manufacturer HYOSUNG CORPORATION

Tested complete item Three-phase 145 kV 40 kA SF6 (GIS) gas insulated metal-enclosed circuit-breaker with three-phase in one enclosure and with common operating mechanism.

Tests carried out Three-phase short-time withstand and peak withstand current test on the main circuit

Standards/Specifications Client's requests based on IEC 62271-100 (2012-08)

Tests date from April 7, 2015 to April 7, 2015

No. of pages 24 No. of pages annexed 8

Issue date October 7, 2015

Prepared DHV - Lovati Mario

Verified PRV - Vidoni Mauro, PRV - Faccinetti Fabio

Approved PMB - The Manager Andriolo Lorenzo

CESI S.p.A. Testing & Certification Division Head Operations area High Power Lab. The Manager

Page 1

[HSG-305B]


TEST REPORT

CLASSIFICATION

APPARATUS

DESIGNATION

RECEIPT No.

APPLICANT HYOSUNG CORPORATION

MANUFACTURER HYOSUNG CORPORATION

DATE OF TESTS

DATE OF ISSUE

Prepared by Kim, Ik-Soo

Verified by (Technical manager) Kim, Kyoung-Roon

Approved by Park, Byung-Rae

High Power High Voltage Testing & Evaluation Division

KERI KOREA ELECTROTECHNOLOGY RESEARCH INSTITUTE

Systematic Process & Service – Certificate

- **Item and procedure of type tests are in compliance with relevant IEC standards.**

Description of Tests	Standard	Clause
Dielectric tests	IEC 62271-203	6.2
Radio interference voltage test	IEC 62271-203	6.3
Measurement of the resistance of circuits	IEC 62271-203	6.4
Short-time and peak withstand current tests	IEC 62271-203	6.4
Temperature-rise tests	IEC 62271-203	6.5
Basic short circuit tests (T10, T30, T60, T100a, T100s(a), T100s(b))	IEC 62271-100	6.6
Line-charging & cable-charging current switching tests (LC1,2/CC1,2)	IEC 62271-100	6.111
Short-line fault tests (L75, L90)	IEC 62271-100	6.109
Out-of-phase making and breaking tests (OP2, Pre-arcing time check)	IEC 62271-100	6.11
Short-circuit current making tests	IEC 62271-102	6.101
Verification of the protection	IEC 62271-203	6.7.1
Gas tightness tests	IEC 62271-203	6.8
Additional tests on auxiliary and control circuits	IEC 62271-203	6.1
Mechanical and environmental tests	IEC 62271-203	6.102
Proof tests for enclosures	IEC 62271-203	6.103
Pressure test on partitions	IEC 62271-203	6.104
Internal arc fault tests	IEC 62271-203	6.105
Insulator tests	IEC 62271-203	6.106
Bus-transfer current switching tests	IEC 62271-102	6.106
Electrostatically induced current switching tests	IEC 62271-102	6.107
Electromagnetically induced current switching tests	IEC 62271-102	6.107
Single-phase fault tests	IEC 62271-100	6.108

Systematic Process & Service – Academic activities

- **Hyosung periodically participates in International Academic & Exhibition Activities.**

CIGRE	IEEE PES	GD (Gas Discharges)	ISH

- CIGRE Study Committees A3/B3 Working Group Member
  - A3: High Voltage Equipment, Representative of CIGRE KOREA
  - B3: Substations, Representative of CIGRE KOREA

- Presenting 36 times of thesis at the conference since 2000
  - "Development of 245kV 40kA/50kA SF6 Gas Insulated Switchgears using non-conventional technology" CIGRE SC A3 Colloquium, Rio, Brazil

- **Attending Exhibitions annually**


Thank You!
HYOSUNG
Always by your side
Hyosung works in a variety of industrial and technology areas that make your lifestyle more convenient and more comfortable. In fact – from the fibers that make the fabric in your clothes, the materials for the tires and seatbelts that keep you and your car safe and the power transmission lines that provide electricity to your home, to other day-to-day items such as plastic drinking bottles, ATM machines, motors, pumps, carpets and plastic wrapping films – Hyosung and its innovative products are already closer to you than you think. You may not know us, but we are always working for you – Hyosung is always behind you.