Gas Insulated Switchgear
Up to 145kV

LSIS
LSIS’s GIS satisfying your various needs

LSIS offers the range of GIS (gas-insulated switchgear) from 25.8kV to 420kV for many types of power plants and substations to satisfy customers various needs.

LSIS’s GIS meets the electric systems requirements of increasing capacity according to expansion of consumers and large plants.

By opening and closing the circuit breaker under normal and fault condition, customer can prevent & protect the implemented facilities over the whole system.

LSIS’s compact size GIS is comparable with other manufactures within the same rating while the design and constitution of our GIS offers high reliability, safety and convenience.

We also provide economical & feasible solutions for limited space.

Our products are designed and tested according to the latest international standards to give our customers the highest quality product.

LSIS also adopts procedures for production, delivery and technical service which are fully environment-friendly under control of ISO 14001 for our future generation, which include minimizing the use of SF6 gas.
Gas Insulated Switchgear 145kV

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4 Line-up
6 Modular design
8 Circuit breaker module
10 3 position switch & HSES
12 Termination
13 PDPS
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19 Quality assurance

- High reliability and safety
- Easy installation and maintenance convenience
- Compact design
- Environmental-friendliness and minimal maintenance cost
**GIS Characteristics**

Leading the future with world class products

<table>
<thead>
<tr>
<th></th>
<th>25.8/36kV</th>
<th>72.5kV</th>
<th>145kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>25.8/36</td>
<td>72.5</td>
<td>145</td>
</tr>
<tr>
<td>Rated current (A)</td>
<td>~3150</td>
<td>2000</td>
<td>~3150</td>
</tr>
<tr>
<td>Rated breaking current (kA)</td>
<td>~40</td>
<td>20/31.5</td>
<td>40</td>
</tr>
<tr>
<td>Power frequency withstand voltage (kV)</td>
<td>70</td>
<td>140</td>
<td>275</td>
</tr>
<tr>
<td>Lightning impulse withstand voltage (kV)</td>
<td>~170</td>
<td>325</td>
<td>650</td>
</tr>
<tr>
<td>Voltage (kV)</td>
<td>Current (A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>245</td>
<td>362</td>
<td>420</td>
</tr>
<tr>
<td>1250~4000</td>
<td>~3150</td>
<td>4000~6300</td>
<td>4000</td>
</tr>
<tr>
<td>50</td>
<td>40/50</td>
<td>50/63</td>
<td>50</td>
</tr>
<tr>
<td>325</td>
<td>460</td>
<td>520</td>
<td>650</td>
</tr>
<tr>
<td>750</td>
<td>1050</td>
<td>1175</td>
<td>1425</td>
</tr>
</tbody>
</table>
GIS Characteristics

Economical efficiency
Compact design can reduce space requirement and operating costs. Modular system cuts construction time and saves costs.

Environmental-friendliness
Modules are designed to fit in optimal space for installation, while protecting the environment thanks to minimal use of SF₆ gas.

High appliance
Modular system can satisfy customers’ various needs and layout requests.

Convenience
Modular system makes our GIS easier to operate.

Reliability
Maximize system security with a minimum of maintenance.

All typical configuration can be realized with only a few modules
72.5kV & 145kV GIS construction

72.5kV GIS

1. Circuit breaker
2. Bus disconnector
   with maintenance earthing switch
3. Current transformer
4. Line DS/ES
5. High speed earthing switch (HSES)
6. Cable head
7. Operating mechanism for CB
8. Potential transformer

145kV GIS

1. Circuit breaker
2. Bus disconnector
   with maintenance earthing switch
3. Current transformer
4. Line DS/ES
5. High speed earthing switch (HSES)
6. Cable head
7. Operating mechanism for CB
8. Potential transformer
CB & CT module
The 3-phase common circuit breaker (CB), a core equipment of the GIS, is composed with current transformer (CT) in one module, the 3-phase interrupter is simultaneously run by a motor operation or hydraulic operation. The motor mechanism is disposed at the bottom part of the interrupter. The CT can be installed to incoming or outgoing side, and also can be composed of several units by number of CTs.

Operating mechanism for CB
The operating mechanism for circuit breaker is spring stored-energy type that is installed at the bottom of the circuit breaker in parallel, for manual operation and easy to check close-open status for convenient maintenance. The circuit breaker mechanism is composed of separate module which make it a simple design, highly reliable apparatus made from the latest technology. The circuit breaker has a mechanical endurance capability over 10,000 operations with minimal use of each part. Also, the circuit breaker mechanism minimizes the influence of temperature.
Gas Insulated Switchgear 145kV

Interrupter unit

The interrupter unit is applied thermal expansion double flow puffer (self-expansion) type, the most effective arc quenching method. This ensures high reliability to terminate accidental electric current, and minimal mechanical movement from at low operation energy to minimize stress delivered to the enclosure. Also, the 3-phase common enclosure is used to minimize the width of bay through interrupt principle and electric field analysis.

Arc quenching principle

<table>
<thead>
<tr>
<th>Closed position</th>
<th>Contact separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The current flows continuously through the main contacts.</td>
<td>The arc is started between the arcing contacts. The gas flows to the arcing contact from the compression chamber through the expansion chamber.</td>
</tr>
</tbody>
</table>

Arc quenching

<table>
<thead>
<tr>
<th>Arc quenching</th>
<th>Open position</th>
</tr>
</thead>
<tbody>
<tr>
<td>The arc is developed and elongated between contacts. Pressure rise in expansion chamber due to the arc. The expanded and compressed gas blast into the open gap of arcing contacts when the current reach to zero and then extinguish arc.</td>
<td>Current does not flow any more, and recovers the dielectric strength between main contacts.</td>
</tr>
</tbody>
</table>
GIS

Characteristics

3 position switch

The 3 position switch is combination of disconnector and earthing switch put together, and is composed of finger and tulip type contact design. This eliminates the need for an additional mechanical interlock between the disconnector and earthing switch, and also electric interlock.

The 3 position switch is installed inside the 3-phase common type enclosure which operates simultaneously by motor operation, and can be manually operated in case of emergency.

Line DS/ES & HSES module

1. Enclosure
2. Gas barrier
3. Conductor
4. Moving Contact
5. Fixed contact (DS)
6. Fixed contact (ES)
7. Earthing Terminal
8. High Speed earthing switch
9. Operating mechanism for HSES
High speed earthing switch (HSES)

High speed earthing switch has finger type construction. It is operated by motor spring mechanism and its moving part is inserted in the finger type contact parts with high speed when it is operated.

Operating principle

The 3 position switch operates with conductor rotating twice. The conductor operates clockwise and closes DS when DS and ES is in open, neutral state. In order to close the ES, the conductor rotates counter-clockwise in first stage and in second stage the DS is open to a neutral state and closes the ES.

<table>
<thead>
<tr>
<th>Neutral position</th>
<th>Disconnector closed</th>
<th>Earthing switch closed</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Neutral position" /></td>
<td><img src="image2.png" alt="Disconnector closed" /></td>
<td><img src="image3.png" alt="Earthing switch closed" /></td>
</tr>
<tr>
<td>HSES closed</td>
<td>HSES open</td>
<td></td>
</tr>
<tr>
<td><img src="image4.png" alt="HSES closed" /></td>
<td><img src="image5.png" alt="HSES open" /></td>
<td></td>
</tr>
</tbody>
</table>

The termination units of the GIS connect to the following equipment:

- Overhead line
- Underground cable
- Transformer

Gas to air bushing unit

SF6 gas-to-air bushing is a method that is generally used to connect overhead line with GIS or GIS and transformer connection. The bushing can be made of porcelain or composite material to satisfy customer requirement.

Cable connection unit

The 3-phase encapsulated type cable termination is used to connect high voltage cable to GIS. This connecting method is applied with conventional type cable sealing end and plug-in type, and with no special request given by the user the IEC regulation is applied.

TR termination

This method is used when connecting directly to the GIS and transformer. The 3 phase segregated unit of the GIS is used to connect to gas-to-oil bushing of the transformer, and expansion joint is provided to absorb vibration and temperature change caused by transformer.
Through regular monitoring of major power equipment, accidents can be prevented. Also database management system supports efficient management of events and history for each unit.

**PDPS (Power Equipment Diagnosis & Preventive System)**

- Partial discharge (UHF PD)
- SF6 gas density monitoring
- Analysis of circuit breaker operating & condition
- Cumulative breaking current
- Cable PD monitoring
- Lightening arrester leakage current

**GIS diagnosis**

- Oil contained gas concentration
- Insulated oil / winding temperature
- FAN driving current / time
- PUMP driving current / time
- OLTC operating current / time

**GIS / TR/ switchgear diagnosis HMI**

1GBps fiber switched ethernet

[DNP3.0 over TCP/IP]
**GIS Characteristics**

### 72.5kV typical bay arrangements

<table>
<thead>
<tr>
<th>Double bus system (Cable connection)</th>
<th>Double bus system (Gas to air bushing)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Single bus system (Cable connection)</th>
<th>Bus coupler</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>
### 145kV typical bay arrangements

<table>
<thead>
<tr>
<th></th>
<th>Double bus system (Cable connection)</th>
<th>Double bus system (Gas to air bushing)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagram 1</strong></td>
<td><img src="image1" alt="Diagram 1" /></td>
<td><img src="image2" alt="Diagram 2" /></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>2,650 x 3,000</td>
<td>2,650 x 3,000</td>
</tr>
<tr>
<td></td>
<td>6,100 x 3,000</td>
<td>6,100 x 3,000</td>
</tr>
<tr>
<td><strong>Diagram 2</strong></td>
<td><img src="image3" alt="Diagram 3" /></td>
<td><img src="image4" alt="Diagram 4" /></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>3,850 x 2,850</td>
<td>3,850 x 2,850</td>
</tr>
<tr>
<td></td>
<td>4,650 x 2,850</td>
<td>4,650 x 2,850</td>
</tr>
</tbody>
</table>

| **Diagram 3**            | ![Diagram 5](image5)                | ![Diagram 6](image6)                  |
| **Dimensions**           | 2,650 x 3,000                      | 2,650 x 3,000                         |
|                         | 5,100 x 3,000                      | 5,100 x 3,000                         |
| **Diagram 4**            | ![Diagram 7](image7)                | ![Diagram 8](image8)                  |
| **Dimensions**           | 3,000 x 4,650                       | 3,000 x 4,650                         |
|                         | 3,000 x 5,100                       | 3,000 x 5,100                         |

### Bus coupler

![Bus coupler](image9)
**GIS Characteristics**

**Mobile type**
- Service for mobility and flexibility
- Standby or temporary power supply
- Service for over-load area
- Replacement in case of equipment failure
- Power supply for isolated areas
- Reduced works and maintenance costs
- Connectivity with the renewable energy

<table>
<thead>
<tr>
<th></th>
<th>GIS</th>
<th>AIS</th>
<th>Power transformer</th>
<th>Switchgear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage level, Capacity</td>
<td>Up to 245kV</td>
<td>Up to 145kV</td>
<td>31.5MVA</td>
<td>Up to 36kV</td>
</tr>
</tbody>
</table>

**HV trailer**

**MV/LV trailer**

**Single line diagram**

Cable
### Technical data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV, rms)</td>
<td>72.5</td>
<td>145</td>
</tr>
<tr>
<td>Rated frequency [Hz]</td>
<td>50 / 60</td>
<td>50 / 60</td>
</tr>
<tr>
<td>Rated normal current (A, rms)</td>
<td>2000</td>
<td>Up to 3,150</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Common (kV, peak)</td>
<td>140</td>
<td>275</td>
</tr>
<tr>
<td>- Across the isolating distance (kV, peak)</td>
<td>160</td>
<td>315</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Common (kV, rms)</td>
<td>325</td>
<td>650</td>
</tr>
<tr>
<td>- Across the isolating distance (kV, rms)</td>
<td>375</td>
<td>750</td>
</tr>
<tr>
<td>Rated short-circuit breaking current (kA, rms)</td>
<td>31.5</td>
<td>40</td>
</tr>
<tr>
<td>Rated break time [Cycle]</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Rated short-time withstand current (kA, rms)</td>
<td>31.5</td>
<td>40</td>
</tr>
<tr>
<td>Rated peak withstand current (kA, peak)</td>
<td>79</td>
<td>100</td>
</tr>
<tr>
<td>Rated duration of short-circuit [sec]</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Phase arrangements</td>
<td>3 phase common encapsulated</td>
<td></td>
</tr>
<tr>
<td>Applicable standards</td>
<td>IEC 62271-203, IEC 62271-100, IEC 62271-102</td>
<td></td>
</tr>
</tbody>
</table>
GIS Characteristics

LSIS obtained certification about major research and development tasks in some leading countries and continues to invest in developing the best GIS product for our customers worldwide. To produce highest quality GIS, optimized design is conducted through 3D electric field analysis, arc diagnosis and structure & temperature analysis.

Electro technology R&D center

PT&T is a KOLAS-qualified (Korea Laboratory Accreditation Scheme) accredited testing laboratory and provides worldwide testing service with its 1,600MVA-capacity high power laboratory, high voltage laboratory and reliability testing laboratory.

Multi-physics technology

PT&T

DS/ES unit temperature prediction using electro-Magnetic field and temperature flow analysis.

Optimized electric field control

DS electric field analysis is used for effective space design and optimization

Interruption performance analysis

Arc movement prediction to evaluated breaker capability

High Voltage Test | Impulse Test
Quality assurance

Providing high quality products and services to lead customer satisfaction is the motto of LSIS, and it is what motivates the company to perfecting zero-defect product.

The quality assurance program by LSIS provides strict quality control from promotion, manufacture and delivery in compliance to ISO 9001. LSIS’s GIS fully comply with the latest international standards, and acquired type test certificates for efficient design and excellent quality.

It is our goal to provide world-best product to our customers, only to be done by maintaining the latest quality system and service.

Certificates

ISO 9001
ISO 14001
OHSAS 18001
KERI
CESI
KEMA
For your safety, please read user's manual thoroughly before operating.

- Contact the nearest authorized service facility for examination, repair, or adjustment.
- Please contact qualified service technician when you need maintenance.
  Do not disassemble or repair by yourself!
- Any maintenance and inspection shall be performed by the personnel having expertise concerned.

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