Gas-insulated substations
From 60 kV to 800 kV
Gas-insulated substations
From 60 up to 800 kV

Six factories worldwide
Same industrial concept, top quality

1. Oberentfelden, Switzerland
2. Aix-les-Bains, France
3. Yangzhou, China
4. Wuxi, China
5. Suzhou, China
6. Chennai, India

The most complete and compact range

72.5 kV  145 kV  170 kV  245 kV  300 kV  363 kV  420 kV  550 kV  800 kV

31.5 kA
40 kA
50 kA
63 kA
Worldwide field-proven experience
44 years of state-of-the-art technology

Our aim is to provide you with an innovative and superior range of high voltage GIS to fit your most extreme technical requirements while remaining adaptable to the changing business environment.

44 years of experience
In 1966, we manufactured the world’s first large 245 kV substation for EDF in France. Alstom Grid has worldwide, field-proven experience: we have provided more than 2,000 substations worldwide, comprising over 20,000 bays - and successfully installed on all five continents, under all environmental conditions.

Up to 800 kV
To meet world market requirements, the GIS range was extended to higher voltages. We constructed the first 420 kV substation for France in 1978 and 550 kV substations for Canada in 1979. In the same year, the world’s first 800 kV gas-insulated substation was also commissioned at Joshua Falls in the USA for the American Electric Power network.

Since then, our products have proven the benefits of our high-performance GIS concept and state-of-the-art technical innovations. In 1995, we developed the first 420 kV single-break circuit-breaker.

GIL
In 2001, we commissioned the longest (17 km) gas-insulated lines (GIL) in the world. Alstom Grid GIS has more than 50 km of GIL in operation throughout the world covering diverse applications.

Mechanical drives
Alstom Grid has more than 70 years of experience in the development, manufacture and operation of mechanical spring-operated mechanisms for all types of high voltage circuit breakers.

Today, 180,000 spring-operated mechanisms for high voltage circuit breakers are in use worldwide, to the full satisfaction of our customers. In 2003, we commissioned the first 420/500 kV GIS circuit-breaker operated by a spring mechanism.
Diverse applications
Our gas-insulated substations are optimal solutions for a variety of applications

**Space and aesthetic conditions**
Full integration into surroundings to meet aesthetic requirements with better public acceptance

**245 kV AIS converted into GIS**
GIS requires minimal space compared to AIS solutions

**Footprint reduction**
420 kV GIS extension because of space requirements

**245 kV AIS converted into GIS**
GIS in trenches, galleries, buried or above the ground enable optimal connections to overhead lines and power transformers

**Severe conditions**
GIS in industrial environments
The best solution for industrial installations in highly polluted or corrosive environments

**GIS in severe weather conditions**
GIS is an optimal solution for high-altitude requirements

**Pre-fabricated solutions**
- Offshore substations for windfarms
- ‘Plug-and-Play’ pre-fabricated substations
  - Optimal grid connection

**Power generation**
420 kV power plant equipped with instrumentation/control system for several generating units with secured interconnection

**Mobile substation**
This 4-bay mobile substation can power the distribution grid in case of an emergency
Optimal solutions

Nowadays, emerging and rapidly changing markets demand innovations in higher ratings and cost-effectiveness, as well as environmental-friendliness.

**Equipment flexibility**
Alstom Grid GIS are suitable for all types of single-line diagrams, arrangements and building dimensions. They are perfectly adaptable to any operating situation and are suitable for future modifications and extensions, thus optimising capital costs.

**Increased compactness**
Alstom Grid GIS are compact, with components designed to ensure unquestionable advantages. For example, our 170 kV is the most compact of its category with a bay width of only 1 metre.

**Safe operation and easy servicing**
Alstom Grid GIS require minimal maintenance and can be serviced without the use of heavy equipment.

**High reliability**
With 44 years of experience and 20,000 bays in operation, our GIS deserve their reputation of reliability.

**Standardised equipment**
Components and arrangements are standardised to reduce delivery and commissioning times.

**Easy transportation**
Proper sizing of transport units allows convenient handling. Comprehensive factory tests ensure that the equipment is ready-to-operate.

**No environmental constraints**
Our GIS can withstand the most severe ambient constraints: marine installations, industrial pollution, earthquakes, high altitudes or extreme climates are not a problem.
Proven technology
A superior range of gas-insulated substations to fit your requirements

**Aluminium alloy enclosures**
Our aluminium alloy enclosures are dielectrically optimised and comply with relevant pressure vessel codes. They are light-weight and corrosion resistant. The enclosures may be equipped with viewing windows to inspect the position of disconnectors and earthing switches.

**Perfect SF6 sealing**
The Alstom Grid sealing system uses original patented gaskets which actually provide three concentric seals and ensure that substation’s gas leakage rate is less than 0.5% per year, as specified by the latest IEC standards.

**High-quality insulators and conductors**
Conductors and live parts are mounted on insulators. Tested shapes and creepage distances jointly ensure the high and long-term voltage withstand of the insulation. The barrier insulator positions are selected to minimise the out-of-service section of the GIS during extension and maintenance and also to resist internal arcing and prevent its propagation to the next compartment. Connecting conductors are mainly made of aluminium or copper tubes with silver-plated contacts.

The sliding feature allows thermal expansion without transmitting mechanical stress to insulators. Specific design enables easier and shorter assembly or dismantling.

**Ideal SF6 accessories**
Each SF6 compartment has a filling valve, a moisture absorber, a safety pressure relief device and a temperature compensated density switch or sensor. Density thresholds can be tested without depressurising the main gas compartment. Digital monitoring systems offer valuable solutions for SF6 management and trend analysis.

**Superior spring mechanisms**
The FK3-X spring-operated mechanisms equip the entire range of gas-insulated substations, from 72.5 up to 550 kV, covering a wide range of closing energies while optimising the energy ratings of each GIS.

**Proven technology**
A superior range of gas-insulated substations to fit your requirements. The FK3-X was developed from the beginning as a product family which provides major advantages for the suppliers, the manufacturer and of course for the customers. The FK3-X family is a modern, simple, precise and robust system of operating mechanisms for the latest switchgear generation.

**Interconnection elements**
Telescoping coupling elements allow the removal and installation of components for assembly extension and maintenance work, without dismantling extra switchgear parts. Expansion bellows, wherever necessary, mitigate thermal expansion movements and positioning tolerances.

**Customised instrument transformers**
The switchgear is equipped with conventional or non-conventional instrument transformers. They are always customised to the user’s needs. The ratings reflect the customer’s distribution, protection and instrumentation configuration.

**High voltage interfaces**
The substations can be directly connected to high voltage cables, to transformers, or to overhead lines.

**Overhead lines**
The GIS connect to overhead lines with busducts and SF6 air bushings. Porcelain or composite insulators are filled with SF6 at rated pressure. A range of insulators allows external creepage distances to meet specific customer requirements. Composite insulators are light-weight and explosion-proof, a valuable safety feature.

**Power transformer/reactor**
GIS may be directly connected to power transformers by means of gas-insulated busducts and a specific enclosure which houses the gas-tight oil-SF6 bushing.

**High-voltage cables**
All types and sizes of cables (oil-paper or XLPE types) can be connected.
**Local control**
The local control cubicle is generally associated to each circuit breaker bay. This cubicle may provide all or part of the following functions:
- Control - means of opening and closing all switches (circuit-breaker, disconnectors and earthing switches)
- LV supply protection
- Display of switch position
- Voltage supply (SF6 thresholds, voltage supply, etc.)
- Safety electrical interlocks, using CB, DS and ES auxiliary contacts
- Current / voltage meters
- Interfacing terminals for remote control

The implemented technology may be digital (based on microprocessors), or conventional (based on electromechanical relays).

**Monitoring**
Despite its already superior levels, GIS availability may be further enhanced by means of condition monitoring. Among all available monitoring systems, SF6, circuit-breaker and partial discharge monitorings are the most valuable. Today, the most modern GIS condition monitoring systems are digital and monitor many parameters. They anticipate events, which bring the advantage of predictive, instead of preventive maintenance.

**Protection and control**
Alstom Grid provides all the state-of-the-art functions required for safe and reliable GIS operation while maintaining a very cost-effective solution. Protection and control units can be installed in standalone cubicles or directly inside the GIS local control cubicles. The use of fibre-optic links for serial communication ensures reliable and disturbance-free communications.

**GIS specialists at your service**
From training to installation and commissioning through to all kinds of after-sales service, Alstom Grid contributes to the exemplary operation of GIS. Service units are located all around the world for fast interventions.

---

**With more than 2,000 substations and over 20,000 bays delivered and in operation throughout the world over the past 44 years, we are recognized as a leader that ensures the reliability and safety of your operations.**