

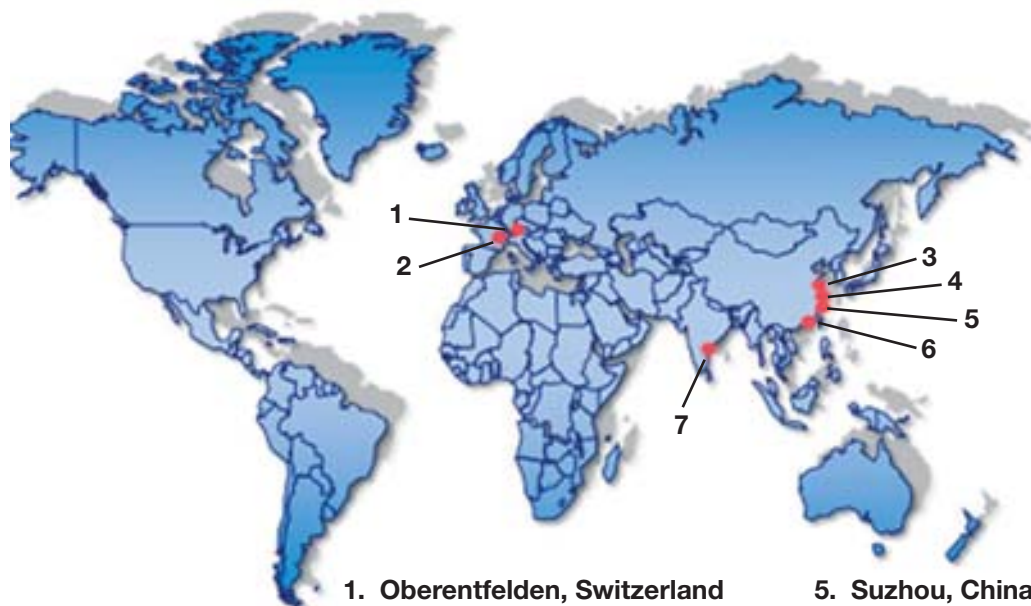


**Gas-insulated Substations
72.5 up to 800 kV**





Seven factories worldwide: same industrial concept, same quality



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



The most complete and compact range

	72.5 kV	145 kV	170 kV	245 kV	300 kV	362 kV	420 kV	550 kV	800 kV
31.5 kA									
40 kA									
50 kA	F35 B65		B105		T155				
63 kA									
 GIL									



World-wide field proven experience 40 years with state-of-the-art technology



Our aim is to provide you with innovative, superior range high voltage GIS to fit your most severe technical requirements and changing business environment.

40 years experience

In 1966, we manufactured the first large 245 kV substation in the world for EDF in France.

AREVA has provided **more than 1,500 substations** world-wide, comprising **over 15,000 bays**, successfully installed on all five continents, under all environmental conditions.

Up to 800 kV

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

Since then, our products have proved the benefits of our high-performance GIS concept and state-of-the-art technical innovations.

In 1995, we developed the first 420 kV circuit breaker with only one interrupting chamber per pole.

GIL

In 2001, we commissioned the longest gas-insulated lines in the world at PP9 Power Station in Saudi Arabia. AREVA T&D GIS has **more than 100 km of GIL** in operation over the world for diverse applications.

In 2003, we commissioned the first 420 and 500 kV GIS with circuit-breaker operated by a spring operating mechanism.

Mechanical drives

AREVA looks back on more than seventy years of experience in the development, manufacture and operation of mechanical spring operating mechanisms for all types of high voltage circuit breakers.

Today, **140,000 spring operating mechanisms** for high voltage circuit breakers are in use world-wide to the full satisfaction of our customers.



Diverse applications

Our gas-insulated substations are optimal solutions for various applications

City installations, in buildings or underground, requiring minimal space and providing an economical and esthetic solution.



B105 GIS 245 kV in a city center.

Substations in power plants close to the generators to optimize the general installation.



This 500 kV GIS feeds a transmission system with power generated by a hydraulic power plant.



Full integration in surrounding to meet esthetic requirements with better public acceptance in a tourist area.

Increase in performances or extension of existing substations with very limited space available.



T155 400 kV GIS extension because of space requirements.

Industrial installations in highly polluted or corrosive environment or other severe ambient local conditions.



F35 72 kV integrated solution in pre-engineered building for Oil & Gas

GIL connections of very long runs in shafts, underground galleries or at ground level to connect the GIS to overhead lines with the minimum number of interfaces.



420 kV GIL: 17 km in a thermal power plant.



GIS in severe conditions.

Mobile substation



This 4-bays mobile substation is intended to power the distribution grid in case of emergency.



A competitive solution

With energy markets undergoing major and rapid change, electricity suppliers need novel solutions for peak performance and cost-effectiveness



Equipment flexibility

AREVA's 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 enabling the optimization of capital costs.

High reliability

With 40 years of experience and 15,000 bays in operation, our GIS have earned a reputation of reliability. The GIS has a reduced number of parts and components which increases the operational reliability.

Increased compactness

AREVA T&D's GIS equipment is compact, with components designed to ensure unquestionable advantages. For example, the F35 170 kV is the most compact of its category with only 1 meter bay width.

No environmental constraints

GIS-insulated systems are not affected by the environmental conditions. GIS substations perform at high parameter in the sea proximity, industrial pollution, storms, earthquakes, high altitudes or extreme climates.

Standardized equipment

The components and arrangements are standardized, thus the delivery and commissioning times are reduced.

Easy transport and short commissioning time

Proper sizing of transport units allows convenient handling. Comprehensive factory tests ensure that the equipment is ready-to-operate. With very little structural steelwork, the GIS support frames are just bolted to the concrete slab or floor by means of conventional anchoring bolts.

Safe operation and easy servicing

AREVA T&D's GIS require minimal maintenance and can be serviced without the use of heavy equipment. They can also be swiftly dismantled and reconfigured thanks to busbar coupling elements.



Proven technology

A superior range of gas-insulated substations to fit your requirements



Aluminum alloy enclosures

The aluminum alloy enclosures are dielectrically optimized and comply with relevant pressure vessel codes.

They are light-weight and corrosion-resistant with excellent withstand whatever the atmosphere. The enclosures may be equipped with viewing windows to inspect the position of disconnectors and earthing switches.

Perfect SF₆ sealing

The AREVA sealing system uses original patented gaskets which actually provide three concentric sealings 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 high and long-term voltage withstand of the insulation.

The barrier insulator positions are selected to minimize 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 high-grade silver-plated contacts at the ends. 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 depressurizing the main gas compartment. Digital monitoring systems offer valuable solutions for SF₆ management and trend analysis.

Superior spring mechanism

The spring operating mechanisms FK3-X equip the entire range of gas-insulated substations from 72.5 up to 550 kV, covering a wide range of closing energies and optimizing the energy ratings of the individual types.

The FK3-X was developed from the beginning as a product family which results in 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 further switchgear parts.

Expansion bellows, wherever necessary, mitigate thermal expansion movements and positioning tolerances.

Customized instrument transformers

The switchgear is equipped with conventional or non-conventional instrument transformers. They are always customized 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.

Connection to overhead lines

GIS is connected 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.

Connection to 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.

Connection to 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 GIS circuit breaker bay. This cubicle may provide all or part of the following functions:

- Control, i.e. means of opening and closing all switches (circuit-breaker, disconnectors and earthing switches),
- LV supply protection,
- Display of switch position,
- Alarm display (SF₆ thresholds, supply voltage, 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, i.e. based on microprocessors, or conventional, i.e. based on electro-mechanical relays.

Monitoring

Despite its superior reliability, GIS availability may be enhanced by means of condition monitoring systems. Today the most modern GIS condition monitoring systems are based on digital technology. They enable to monitor various parameters, to anticipate trends and they provide the following features:

- Predictive, instead of preventive, maintenance,
- Early warnings, SF₆ trends analysis
- Time-tagged event recording.

SF₆ circuit-breaker and partial discharge monitoring are the most valuable systems.

Protection and control

AREVA's MiCOM-family provides all state-of-the-art functions required for the safe and reliable GIS operation and represents a cost-effective solution.

MiCOM protection and control units may be mounted in separate cubicles close to the substation or directly inside the GIS local control cubicles.

The use of fiber optic links for serial communication guarantees reliable and disturbance-free communication.

MiCOM-family offers a complete range of functions and units. It provides homogeneous hardware and software concepts and supports futures extensions or refurbishments.

When using IEC 61850 protocol, MiCOM grants the step-by-step extension of the control system starting with the basic

protection functions and then be further up-graded to the complete digital substation control, in order to support customer's higher demand of energy.

GIS specialists at your service

From project startup through commissioning and after sales services, AREVA T&D emphasizes long-term partnerships with its customers.

AREVA's GIS feature near-zero maintenance as well as the superior reliability and availability. This results in inspections at distant intervals and long life duration for mechanical and electrical parts.

Comprehensive services

AREVA provides global service offer, support through by local resources:

- Network consulting,
- Equipment expertise and diagnosis,
- Erection and commissioning supervision,
- Maintenance and spare parts management,
- Repair and emergency support,
- Renovation and refurbishment.

An inspection and maintenance plan may be concluded to support the equipment throughout its entire life cycle.

With more than 1,500 substations and over 15,000 bays delivered and in full operation throughout the world over the past 40 years, we are recognized as a technological leader who ensures the reliability and safety of your operation at optimized cost.



With manufacturing facilities in 40 countries and a sales network in more than 100, AREVA offers customers reliable technological solutions for CO₂-free power generation and electricity transmission and distribution.

We are the world leader in nuclear power and the only company to cover all industrial activities in this field.

Our 71,000 employees are committed to continuous improvement on a daily basis, making sustainable development the focal point of the group's industrial strategy.

AREVA's businesses help meet the 21st century's greatest challenges: making energy available to all, protecting the planet, and acting responsibly towards future generations.

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