

# DISCONNECTORS

## Flexible and Reliable Layout Configurations up to 1,200 kV

### Why a Disconnecter?

Taking economic savings to an extreme, some companies choose to reduce their safety equipment. For over a century, the visible gap provided by disconnectors (or disconnect switches) has made the difference between life and death - not having them is a risk simply not worth taking.

Disconnectors are built in a variety of physical forms. Based on the substation configuration, different designs are available according to overhead and interphase clearances. When necessary, space-saving configurations can be taken into account in your design by, for example, using pantograph and semi-pantograph disconnectors instead of horizontal isolators.

Outdoor disconnectors are an essential element of electrical power transmission systems. As breakers divert loads and protect all the other equipment, instrument transformers ensure current metering as well as information flow.



### Our Basic Design Principles

- Proven protection against surges (insulation coordination)
- Interlocking system reliability
- Signalization system reliability
- Safe on-site installation of each component
- Reliable mastering of normal and exceptional stresses
- Reduced maintenance
- Environmentally compatible technology and materials
- Cost-effective designs and production techniques
- Adaptable and flexible products for customized design requirements

Disconnectors ensure the safety of the people working on the high voltage network, providing visible and reliable air gap isolation of line sections and equipment.

Grid Solutions at GE Vernova is the world's leading manufacturer of disconnectors.



## Global Leader in Disconnectors

### Extensive Portfolio and Installed Base

Grid Solutions at GE Vernova is a global leader for disconnectors (disconnect switches) since the 1960s, with eight production facilities and 500,000+ installed poles in more than 130 countries around the world. The extensive portfolio includes disconnectors for AC applications up to 1,200 kV, for DC applications up to 1,000 kV and for railway applications.

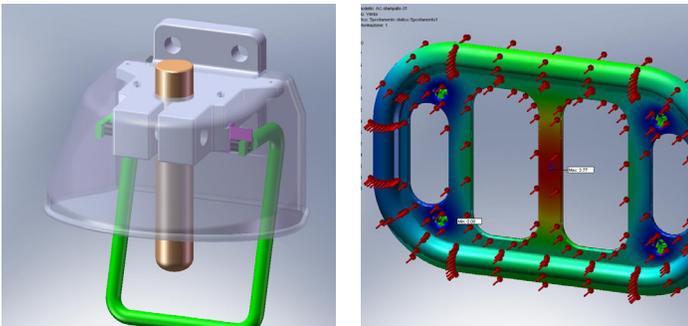
Grid Solutions' disconnectors have proven their reliability in the torrid climates of Arizona (USA), Australia, and Sudan; in the extremely cold territories of Canada, Russia, and Sweden; in the tropical weather conditions of Panama, Indonesia, Malaysia, and Venezuela; and in regions with intense seismic activities such as Chile and California (USA).



### Efficient Design Department and Innovative Products

High-performance and innovative products are essential to the existence and growth of our company and yours, and are the prime result of our research and development projects.

Our highly experienced engineers and technicians use modern design tools such as 3D computer-aided design (CAD) and electric/magnetic field analysis software. Considerable investments have been made in the design and development of new, more cost-efficient products. Highly experienced teams of engineers constantly contribute to the continuous development of Grid Solutions' disconnectors.



## Research and Development

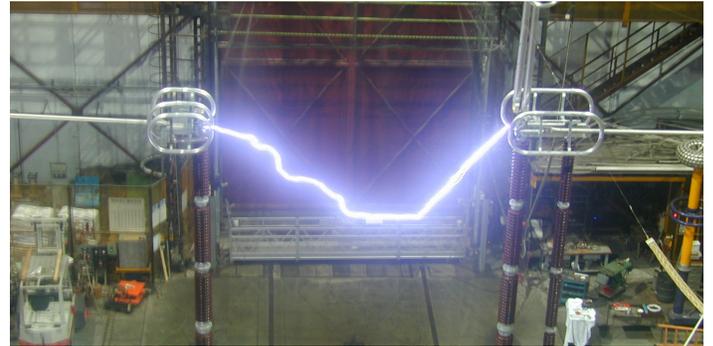
### Quality-oriented Facilities

To remain one of the world's largest manufacturers of disconnectors means constantly improving our technologies. Our modern production facilities in Europe, the Americas, and Asia are always seeking newer and more efficient organizational structures.

Our facilities were developed to grow with the requirements of evolving technologies in order to perfectly manage the quality of components and the essential elements of disconnectors.

### Customer Benefits

- High safety and reliability
- Top performance
- Certified quality according to ISO 9001 and ISO 14001
- Minimal maintenance
- Global service teams
- Easy installation and commissioning



## Applications and Performance

### Center Break

In the center break design, the two arms rotate and the disconnecter opens in the center. It is the most commonly used disconnecter and offers ratings up to 550 kV. The center break requires an increased interphase distance.

#### RATINGS

Voltage	40.5 kV to 550 kV
Nominal current	up to 6,000 A
Short circuit	up to 80 kA, 1 s



### V-Type Center Break

The V-type center break has two moving insulators mounted on a small common base. It can be mounted on simplified and cost-effective supporting structures. Available up to 145 kV.

#### RATINGS

Voltage	72.5 kV to 145 kV
Nominal current	up to 2,000 A
Short circuit	up to 50 kA, 5 s



### Earthing Switches

Earthing switches are used to connect to ground sections of a substation or HV line to ensure personnel safety. They can be combined with any disconnecter type or installed independently with their own insulator.

#### RATINGS

Voltage	40.5 kV to 800 kV
Short circuit	up to 80 kA, 3 s



### Double-Side Break

The double-side break design features three insulators. The end insulators are fixed while the center one pivots and provides two breaks in series. Contrary to the other two horizontal break designs, it requires a minimal interphase distance and allows higher loads on high voltage terminals.

#### RATINGS

Voltage	40.5 kV to 550 kV
Nominal current	up to 5,000 A
Short circuit	up to 63 kA, 3 s



### Vertical Break

The vertical break also has two fixed and one moving insulator. It requires a minimal interphase distance.

#### RATINGS

Voltage	24 kV to 800 kV
Nominal current	up to 4,000 A
Short circuit	up to 80 kA, 3 s



## Pantograph and Semi-Pantograph Solutions

### Pantograph and Semi-Pantograph

Both disconnector types feature one fixed and one rotating insulator and are usually used to connect the two busbars of double decker substations. Placed diagonally to the axis of the busbars and feeder, they offer a very clear - and therefore safe - arrangement and space-saving solution.

#### RATINGS

Voltage	72 kV to 1,000 kV
Nominal current	up to 4,000 A
Short circuit	up to 80 kA, 1 s



#### RATINGS

Voltage	123 kV to 1,000 kV
Nominal current	up to 5,000 A
Short circuit	up to 80 kA, 3 s



## Knee-Type

The knee-type has two fixed and one moving insulator and requires limited overhead clearance due to its folding-arm design.

#### RATINGS

Voltage	245 kV to 1,200 kV
Nominal current	up to 4,000 A
Short circuit	up to 63 kA, 3 s



Special ratings are also available to meet specific customer needs.

## Heavy Duty Solutions

Grid Solutions also offers solutions to interrupt induced currents with ground switches. These currents occur when an earthed line runs parallel to a live line. Grid Solutions manufactures various models of earthing switches which meet IEC 622-71-102 Class A or B and for inductive current values of up to 525 A at 70 kV.

### Standards & Environmental Conditions

Grid Solutions has developed products that meet international IEC and IEEE standards, as well as GB Chinese national standards. Our range of disconnectors can be adapted to meet almost any specific customer requirement for virtually all environmental conditions.

- Temperatures from -55 °C to +55 °C
- Ice breaking capacity up to 42 mm
- Pollution levels from low to very high
- Seismic withstand capability up to 1.0 g
- Altitudes above 1,000 meters require de-rating



## Interrupting Capabilities

The constant evolution of power system characteristics increasingly challenges the interrupting capacities of disconnectors. Grid Solutions offers innovative solutions for the following disconnector applications:

### Transformer magnetizing current interruption:

- Arcing horns
- Whips

### Busbar switching contacts (up to 1600 A, 300 V) line and cable charging currents switching:

- Whips
- SF<sub>6</sub> interrupters

### Load-breaking:

- SF<sub>6</sub> or vacuum interrupter



## Type Testing Facilities

All Grid Solutions disconnector manufacturing sites are ISO 9001 and ISO 14001 certified. Grid Solutions has a clear environmental policy and believes that sustainable development of the company must be achieved in harmony with the environment and natural resources.

The Grid Solutions disconnector competence center located in Noventa di Piave near Venice, Italy, is equipped with its own high-performance testing facility.

The high-voltage testing laboratory, built in 1973 and measuring 32 x 32 x 25 m, obtained ISO/IEC 17025 certification from the Italian accreditation entity Accredia in 2012. This recognition confirms the technological vocation of the Noventa di Piave site, assuring a high level of competence and the reliability of the results enabling the laboratory to supply independent testing services for:

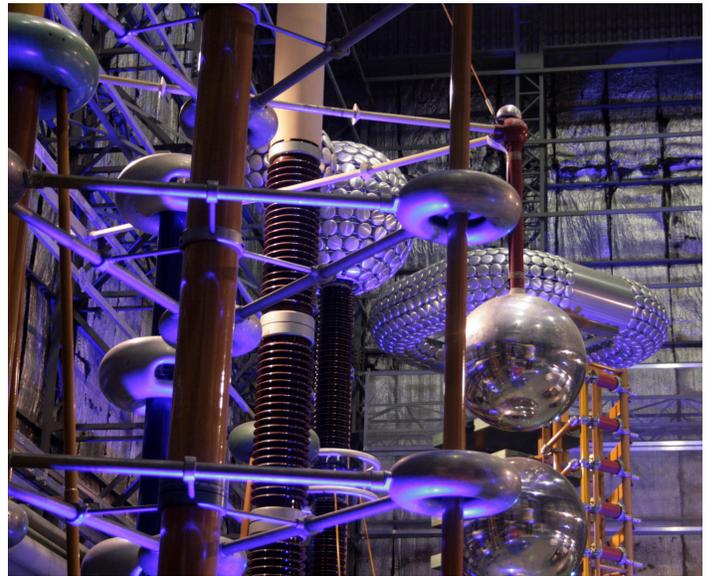
- Power frequency voltage tests up to 640 kV rms
- Atmospheric impulse tests up to 1.6 MV
- Manoeuvre impulse tests up to 1.2 MV
- Radio interference voltage (RIV) tests up to 350 kV rms
- AC/DC temperature rise tests up to 8,000/12,000 A
- Mechanical endurance tests of line and earthing disconnectors

### Quality and Reliability

The quality assurance goal at Grid Solutions can be summarized as follows:

- To ensure that the equipment complies with all of the client's requirements and conditions and that it is built according to our own very strict manufacturing standards. To this end, Grid Solutions maintains control over the manufacturing of all equipment elements, insisting that its suppliers provide the same quality levels as our own workshops.
- To ensure that all equipment gives the final user the highest level of satisfaction, while offering reliability, continuity of service and ease of maintenance - thus offering lower operating costs.

Disconnectors are subjected to a complete set of type and routine tests in compliance with international standards.



## Service and Support

### Your Asset Management Partner

#### Customer Satisfaction

From project design through commissioning to after-sales customer service, Grid Solutions places great emphasis on maintaining long-term relationships with its clients. Our worldwide network of representatives remain in close contact with their customers around the world: we help utilities and industry to tackle grid challenges.

#### Service

Grid Solutions specialists are available to ensure rapid disconnector installation and erection supervision, if the customer requires it.

#### Training

Training courses are available for all of Grid Solutions' principle units, either on-site or in our training facilities. These training courses facilitate the transfer of knowledge and techniques to its customers concerning installation, general operation and eventual equipment maintenance.

#### Maintenance

Grid Solutions disconnectors are designed to offer a working life of over 40 years of trouble-free service with reduced maintenance.

Substitution, upgrading or overhaul of disconnectors is possible. Our teams work closely with our customers to save costs by using new or refurbished components on existing equipment whenever possible.



For more information  
visit [governova.com/grid-solutions](https://governova.com/grid-solutions)

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