High performance for the power supply of tomorrow

High-current and generator switchgear from Siemens

siemens.com/generatorswitchgear
Generator switchgear –
With matured vacuum switching technology

As one of the pioneers of vacuum switching technology for reliable power transmission and distribution in the medium-voltage range, and with its many years of experience and strong customer orientation, Siemens provides the right solutions.

Therefore, Siemens continues to develop its portfolio of high-current and generator switchgear in the 10- to 400-MW range, so as to provide optimized customer solutions for the high requirements of the constantly evolving market for power generating plants.

Under the high thermal and mechanical stress of generator switching applications, generator switchgear with vacuum switching technology serves as an important operational equipment for the protection of transformers and generators.

It is used in hydro, pumped storage, gas-fired or steam power plants, as well as in coal-fired, solar thermal and geothermal power plants. It offers solutions for retrofit projects as well as for new power plant constructions.
Siemens generator switchgear with vacuum switching technology is the result of more than 20 years of continuous development, and so it fulfills the highest technological and quality requirements.

It offers numerous advantages regardless of the type of power plant. Due to the use of tested and durable components with a service life of more than 20 years, a high level of operational reliability and availability is achieved that leads to increased profitability. The use of maintenance-free vacuum switching technology and maintenance-free components in the generator switchgear guarantees minimum maintenance costs.

Siemens generator switchgear ensures a high degree of personnel safety thanks to its internal arc classification. Technical expertise gained in many years of experience, ongoing quality controls, and type tests for our switchgear and components also stand for high operational reliability.

Our customers profit from continuously increasing cost-efficiency and uninterrupted operation.

Customer benefits
- Increases cost-efficiency and service continuity
- Stands for optimal personal safety
- Preserves the environment
- Minimizes installation and maintenance costs
- Offers tailored solutions according to the customer requirement
The HB3 generator switchgear is suitable for power plants up to 400 MW, depending on the type of power plant and the operating voltage.

The HB3 is the first generator switchgear worldwide with vacuum generator circuit-breakers for ratings up to 12,500 A, with natural cooling, and a switching capacity of 100 kA type-tested according to the IEEE C37.013 standard. It offers maximum operational reliability and a high degree of personal safety, as short circuits between phases are excluded due to the single-phase encapsulation.

As a result of the flexibility of the phase spacing and diameters of the single-phase encapsulated IPBs, the HB3 fulfills all requirements for integration into the generator leads. The switchgear can be operated with the overpressure needed for the IPB system.

The switchgear is type-tested in accordance with the IEC 62271-200 and IEEE/IEC 62271-37-013 standards.

Optionally, the switchgear can be equipped with a start-up disconnector for running up the turbine.

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**i(t) in kA**

- $I_{ac} = 100$ kA
- $I_{dc} = 100$ kA first zero crossing
- $I_{dc} = 86.7$ kA DC 67%
- $t_{arc \text{ min}} = 4.4$ ms
- $t_{arc \text{ total}} = 8$ ms
The HB1 generator switchgear with horizontal busbars is suitable for power plants up to 170 MW, depending on the type of power plant and the operating voltage.

As a compact solution, the HB1 can be adapted to the customers' specific requirements. The switchgear is especially suited for industrial power plants with medium-sized gas and steam turbines, as well as for solar power plants.

The air-insulated, three-phase encapsulated generator switchgear is available for indoor and outdoor installation. In addition, it enables in a wide area of applications thanks to its flexible connection concept using bus ducts, cables and solid-insulated busbars.

A high degree of personnel safety is achieved by resistance to internal faults up to 72 kA.

HB1 – Generator circuit-breaker switchgear

Thanks to the type-tested fixed-mounted design with proven and reliable components, the HB1 also guarantees high service continuity.

The factory-tested switchgear can be easily installed and put into operation after delivery.
The VB1 generator switchgear is highly flexible, with a modularly expandable concept that makes it suitable for a power range up to 140 MW.

This switchgear features a highly compact and customizable design with space for modular extension. This characteristic makes it especially interesting for power plants that are operated with multiple generators, or feeders for auxiliary supply, excitation, or brake disconnectors. Because of the high requirements in terms of switching capacity, space constraints and accessibility, this switchgear is frequently used in hydropower plants and retrofit projects.

As a containerized solution, the VB1 switchgear meets the highest requirements even under extreme climatic conditions, e.g. in desert regions, or when exposed to corrosive effects like those encountered in the chemical industry.

Multiple generator circuit-breakers can be employed in a single switchgear. Thanks to internal partitioning, the loss of service continuity category LSC 2A is possible. Thus, the switchgear can be used in partial operation, while other areas of the switchgear are accessible for personnel.

VB1 – Generator circuit-breaker switchgear
VB1-D –

With circuit-breaker truck for 63 kA

The VB1-D generator switchgear with vertical busbar and truck-type design provides a high switchgear availability for safe and cost-efficient power generation. Installation and maintenance are easy to perform thanks to the uncomplicated technology.

The switchgear is suitable for power ratings up to 110 MW.

VB1-D offers maximum personal safety through the internal arc classification IAC A FLR 63 kA, 0.3 s, and maximum availability through the loss of service continuity category LSC 2B as well as through the partition class PM.

The air-insulated, metal-enclosed switchgear is type-tested according to IEC 62271-200, and is suitable for indoor installation.

Its compact dimensions make it especially adequate for hydropower plants. The switchgear can be extended, allowing for multi-generator applications.
The HIGS generator switchgear was developed specifically for Siemens industrial gas turbines SGT-600 to SGT-800, as well as for steam turbines SST-400 to SST-600 in the power range of up to 55 MW. It can be adapted to the requirements of other types of gas and steam turbines.

The switchgear is connected directly to the generator, thus combining the conventional generator terminal box with the functionality of a generator switchgear. It is also possible to implement the neutral point connection and an auxiliary feeder.

Profitability is increased by reduced interfaces and space requirements.

The HIGS switchgear is suitable for indoor and outdoor installation. The factory-tested switchgear can be easily installed and put into operation after delivery.
The extendable medium-voltage NXAIR switchgear up to 17.5 kV, 50 kA uses withdrawable technology, and is especially suitable for generator switching applications in small industrial power plants up to 65 MW.

NXAIR offers maximum personal safety through the internal arc classification IAC A FLR 50 kA, 1 s, maximum availability through the loss of service continuity category LSC 2B, as well as maximum reliability through the partition class PM.

The NXAIR can also be equipped with generator circuit-breakers tested in accordance with the IEEE C37.013 and IEE/IEC 62271-37-013 standards. This enables the generator and auxiliary supply application to be combined in a joint switchgear, which reduces space requirements and interfaces, and increases the profitability.

NXAIR –
For generator applications
## Technical data

<table>
<thead>
<tr>
<th>Generator switchgear</th>
<th>HB3</th>
<th>HB1</th>
<th>VB1</th>
<th>VB1-D</th>
<th>HIGS</th>
<th>NXAIR</th>
</tr>
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<tbody>
<tr>
<td><strong>Rated voltage</strong></td>
<td>up to 24 kV</td>
<td>up to 24 kV</td>
<td>up to 24 kV</td>
<td>up to 17.5 kV</td>
<td>up to 15 kV</td>
<td>up to 17.5 kV</td>
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<td><strong>Normal current</strong></td>
<td>up to 12,500 A</td>
<td>up to 6,700 A</td>
<td>up to 5,500 A</td>
<td>up to 5,100 A</td>
<td>up to 3,700 A</td>
<td>up to 4,000 A</td>
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<tr>
<td><strong>Rated short-time withstand current/duration</strong></td>
<td>up to 100 kA/3 s</td>
<td>up to 72 kA/1 s</td>
<td>up to 72 kA/1 s</td>
<td>up to 63 kA/3 s</td>
<td>up to 50 kA/3 s</td>
<td>up to 50 kA/3 s</td>
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<tr>
<td><strong>Rated peak withstand current</strong></td>
<td>up to 274 kA</td>
<td>up to 180 kA</td>
<td>up to 180 kA</td>
<td>up to 173 kA</td>
<td>up to 125 kA</td>
<td>up to 125 kA</td>
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<td><strong>Internal arc classification</strong></td>
<td>up to IAC A FLR 63 kA/3 s</td>
<td>up to IAC A FL 72 kA/0.1 s</td>
<td>up to IAC A FLR 63 kA/3 s</td>
<td>IAC A FLR 50 kA/1 s</td>
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<td>IP4X, IP54</td>
<td>IP4X, IP54</td>
<td>IP4X</td>
<td>IP42, IP54</td>
<td>IP3XD</td>
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<td>LSC 1</td>
<td>LSC 2A</td>
<td>LSC 2B</td>
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<td>LSC 2B</td>
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<td>• Outdoor</td>
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<tr>
<td><strong>Type of connection</strong></td>
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<td>• Cable</td>
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<td>• Cable</td>
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<td>• Cable</td>
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<tr>
<td></td>
<td>• Solid-insulated busbars</td>
<td>• Bus duct • Solid-insulated busbars • IPB</td>
<td>• Bus duct • Solid-insulated busbars</td>
<td>• Bus duct • Solid-insulated busbars</td>
<td>• Directly at generator terminal</td>
<td>• Cable • Bus duct</td>
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<td>Direction of connection: front/rear</td>
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<td>Direction of connection: lateral</td>
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<td>Auxiliary feeder</td>
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<td>Exciter feeder, start-up switch</td>
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<td></td>
<td>Multi-generator switchgear</td>
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An extract from our references

Hydropower plants  Geothermal power plants  Oil and gas industry

Pumped storage power plants  Gas-fired and steam power plants  Solar thermal power plants

Abu Dhabi  Afghanistan  Argentina  Australia  Austria  Belgium  Bolivia  Brazil  Brunei  Bulgaria  Canada  Chile  China  Colombia  Costa Rica  Croatia  Cyprus  Czech Republic  Denmark  Egypt  Ethiopia  Finland  Germany  Ghana  Great Britain  Hungary  India  Indonesia  Iraq  Ireland  Italy  Japan  Latvia  Malta  Mauritius  Mexico  Mongolia  Netherlands  New Zealand  Norway  Peru  Philippines  Poland  Portugal  Romania  Russia  Saudi Arabia  Singapore  Slovakia  Slovenia  South Africa  South Korea  Spain  Sweden  Switzerland  Taiwan  Tanzania  Thailand  Turkey  Ukraine  USA  Venezuela  Vietnam