SIEMENS
Ingenuity for life

Medium-voltage vacuum replacement circuit breakers and switchgear for generator applications

For applications rated up to 24kV, 12,500A, and 100kA

Siemens' line of generator switching products provide a cost effective way to upgrade aging infrastructure to current vacuum technology while increasing equipment reliability and minimizing downtime.

Siemens offers a full line up of generator switching products, from type tested generator switchgear designed and shipped ready for installation, to custom designed direct fit generator circuit breaker (GCB) replacements for leading OEM models for voltages up to 24 kV with interrupting capabilities up to 100 kA for both indoor and outdoor applications.

Benefits of Siemens vacuum GCBs

Increased reliability and performance

- Expected life of 30,000 mechanical operations utilizing Siemens 3AH operator
- Up to 50 full-fault interruptions

Reduced operating and maintenance expenditures

- Significantly lower lifecycle cost than gas and air circuit breakers
- No major maintenance required for 10 years or 10,000 mechanical operations

Improved employee and environmental safety

- Eco-friendly vacuum interruption with low carbon footprint
- No gas handling equipment required
- No toxic byproducts associated with the switching process

Direct fit replacements for customers to preserve investment in existing infrastructure

Reduced downtime and minimal changeover time during installation

3AH operator features

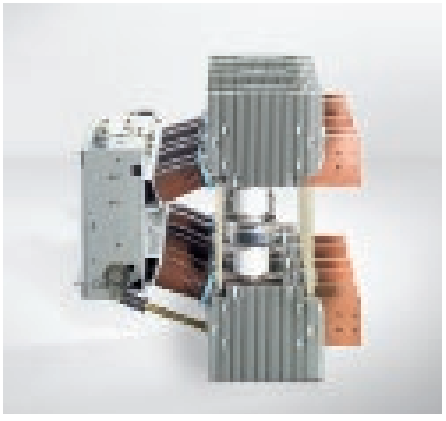
- Spring charge motor mechanism – lifetime lubricated gear box
- Operating linkages – machine parts versus stamped metal
- Change-out of components – easily accessible
- Vacuum interrupters are maintenance free for life

3AH vacuum circuit breakers for generator applications

All Siemens generator switching products are tested according to IEC/IEEE 62271-37-013.

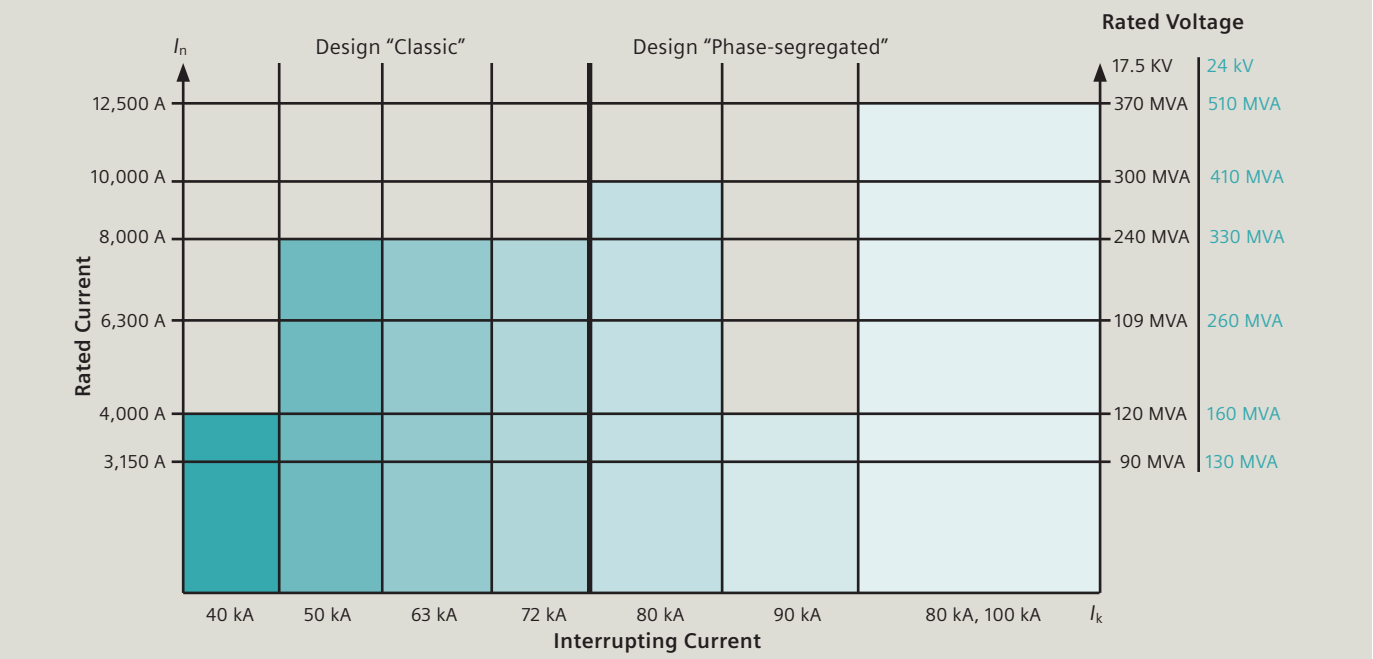
Replacement applications

Siemens replacement GCBs serve all types of generation to increase safety and reliability while reducing expenditures.



Siemens 3AH37 Generator Circuit Breaker operator, utilized in custom replacements

Siemens generator circuit breaker offerings



Replacement vacuum circuit breakers for generator switching applications for 17 kV and 24 kV. Graph represents ratings and offerings covering Siemens' complete line of GCBs.

Medium-voltage vacuum GCB overview

Circuit breakers applied to generator switching applications are subject to conditions quite different from those of a normal distribution circuit breaker used in industrial, commercial and utility systems.

Delayed current zeroes

One of the distinguishing characteristics of applications to generator switching is that generators have a limited rotating inertia and slow down during short circuits. This introduces a problem. The AC component is no longer a constant RMS value, but, in fact, decays. This condition is most severe with low inertia machines, such as gas turbines, where the time constant of decay of the AC component can be faster than the corresponding DC decay. Under this condition, the superposition of the DC component on the AC component will result in a potentially long period in which the actual fault current does not pass through zero. This is a problem as circuit breakers, including vacuum circuit breakers, actually interrupt as the current passes through a normal current zero. This phenomenon is referred to in IEEE C37.013 as "delayed current zeroes" and is a condition for which the performance of the generator circuit breaker must be determined by testing.

Transient recovery voltage (TRV)

Another aspect of a GCB application is that the transient recovery voltage (TRV) across the interrupter opens is much greater than for a distribution circuit breaker. For typical 15 kV distribution circuit breakers, the rate of rise of TRV during a symmetrical fault interruption at 100 percent of rating is 0.92 kV/µs. In contrast, for generator circuit breaker applications, the corresponding value is 3.2 to 4.5 kV/ µs for systems ranging from 10 MVA up to 400 MVA (based on transformer size).

For an in-depth view of medium-voltage generator applications, please refer to Siemens TechTopics 44, 71, 72, and 73 at www.usa.siemens.com/techtopics.

Siemens HB3 modular generator switchgear, ready for installation

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