Reducing arc-flash energy

SIEBREAK-VCB™
5-15 kV metal-enclosed interrupter switchgear

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Reducing the arc-flash incident energy in low-voltage substation applications with SIEBREAK-VCB™ metal-enclosed interrupter switchgear with OMARS

Operation and maintenance arc-flash reduction system (OMARS)

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SIEBREAK-VCB

Metal-enclosed load-interrupter switchgear with fixed-mounted vacuum circuit breaker up to 1,200 A and up to 15 kV.

Siemens SIEBREAK-VCB metal-enclosed switch and circuit breaker combination is modular assembly consisting of a load-interrupter switch mechanism connected in series with a Siemens vacuum circuit breaker to provide a safe, cost-effective, reliable, and flexible solution for use in standalone, low-voltage substations transformer primary, and lineup configurations. Visible disconnect is provided by the load-interrupter switch and protection is provided by the fixed-mounted vacuum circuit breaker.

Virtual main application
Implemented as a virtual main for a low-voltage substation, SIEBREAK-VCB can eliminate the need for a low-voltage main circuit breaker in a low-voltage switchgear or switchboard lineup. This configuration can save space in your electrical room and cost of the substation while increasing safety against arc-flash hazards.

Arc-flash mitigation is at the forefront today
NFPA 70E Standard for Electrical Safety in the Workplace® has increased the emphasis for greater measures for reducing arc-flash hazards in the secondary bus protection in the substation. Siemens SIEBREAK-VCB with operation and maintenance arc-flash reduction system (OMARS) offers a practical approach to providing both primary and secondary bus protection to reduce the incident energy associated with an arcing fault on the line side of the low-voltage main circuit breaker, or on the low-voltage main bus if there is no low-voltage main circuit breaker.

The right solution to arc-flash hazard
SIEBREAK-VCB with OMARS solves the arc-flash safety hazard situation present in many existing installed substations in operation today with the traditional fused load-interrupter switch.

The fused primary load-interrupter switch in the existing substations can be replaced with SIEBREAK-VCB with OMARS to reduce the arc-flash hazard.

Configuration
Current transformers or sensors and protective relays can be installed in the low-voltage switchgear or switchboard for input into SIEBREAK-VCB circuit protection system. In this configuration, the bus protection will be provided on the both the primary and secondary bus to reduce the arc-flash incident energy on the secondary.

Three ways for reducing the arc-fault incident energy
SIEBREAK-VCB is available in three advanced ways for reducing the incident arc-fault energy on the secondary bus of substation:

• Relay maintenance mode setting
• Fiber optics arc-flash detection system
• Short-circuit relay protection on the secondary bus.
Double-ended substation arrangement features and options
SIEBREAK-VCB applied in a double-ended substation arrangement offers several optional features including:

- Short-circuit protection on the secondary side of each transformer (secondary bus in the low-voltage equipment)
- Increased reliability and protection with redundancy between the protective relays located in each SIEBREAK unit
- Power metering with voltage transformer installed in SIEBREAK or the secondary equipment
- Transformer differential relay (87T) protection for enhanced system and transformer protection
- Arc-flash detection fiber for increased the safety against arc flash can be installed throughout the low-voltage equipment.

Operation and maintenance arc-flash reduction system (OMARS)

SIEBREAK-VCB configuration in low-voltage or medium-voltage substations

Reduction of arc-flash incident energy

For the configurations where SIEBREAK-VCB is used as the transformer primary for the low-voltage substation that is configured with the arc-flash reduction technology, the incident energy can be reduced to as low as 2.1 cal/cm² with an interrupting time of 60 ms.

By contrast, for the scenario where the traditional fused load-interrupter switch is used as the transformer primary for the low-voltage substation, the incident energy can be as high 38.3 cal/cm² (or even higher) with an interrupting time of 900 ms.

SIEBREAK-VCB is available in four advanced configurations for reducing the incident arc-fault energy on the secondary bus of substation:

<table>
<thead>
<tr>
<th>Components¹</th>
<th>Low-voltage circuit breaker configuration²</th>
<th>Virtual main configuration²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#1</td>
<td>#3</td>
</tr>
<tr>
<td>Siemens 7UT8 protective relay</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>Siemens 7UT8 protective relay with arc-flash module</td>
<td>◊</td>
<td>◊</td>
</tr>
<tr>
<td>Siemens 7SJ82 protective relay</td>
<td>◊</td>
<td>◊</td>
</tr>
<tr>
<td>Siemens 7SJ82 protective relay with arc-flash module</td>
<td>◊</td>
<td>◊</td>
</tr>
</tbody>
</table>

Footnotes:
1. Consult factory for alternate relays and options.
Configurations #1 and #3: Low-voltage circuit breaker configurations
SIEBREAK-VCB equipped with a Siemens 7UT8 transformer differential protective relay along with an additional set of current transformers located in the auxiliary compartment of the low-voltage equipment provides a reliable system for reducing the incident energy on the secondary bus thus reducing the arc-flash hazard in this area. Optionally, the protective relay can be equipped with an arc-flash detection module for additional arc-flash protection and mitigation.

Configurations #2 and #4: Virtual main configuration
Same as configurations #1 and #3 except the low-voltage equipment is installed remote from the SIEBREAK-VCB panel. The current transformers in the low-voltage auxiliary compartment will be hardwired directly to the 7UT8 protective relay in the SIEBREAK-VCB panel. The type Siemens 7SJ82 protective relay located in the low-voltage switchgear or switchboard is used primarily for the optional arc-flash detection system to transfer the trip signal to the 7UT8 protective relay. For this option, the 7SJ82 protective relay connection is hardwired or fiber-optic cable connected to the 7UT8 protective relay located in the SIEBREAK-VCB panel. The type or connection is depended upon the customer's preference to run hardwires or fiber-optic cables. In most cases, the decision on whether to use hardwire or fiber optic is based on various factors. Please consult factory.
## Technical data

### SIEBREAK switchgear ratings

<table>
<thead>
<tr>
<th>System design voltage kV</th>
<th>Dielectric withstand voltage</th>
<th>Main bus(^1) continuous current A rms</th>
<th>Short-circuit current unfused kA sym</th>
<th>Fault-closing current unfused kA rms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Power frequency kV rms</td>
<td>Impulse kV peak</td>
<td>600</td>
<td>1,200</td>
</tr>
<tr>
<td>5.0</td>
<td>19</td>
<td>60</td>
<td></td>
<td></td>
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<tr>
<td>15.0</td>
<td>36</td>
<td>95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Footnotes:
1. Main bus is not provided on single-unit arrangements.
2. Short-circuit current and closing and latching current are limited to the capabilities of the load-interrupter switch.

### Type SBVCB vacuum circuit breaker ratings

<table>
<thead>
<tr>
<th>System design voltage kV</th>
<th>Dielectric withstand voltage</th>
<th>Continuous current A rms</th>
<th>Short-circuit current(^2) kA sym</th>
<th>Circuit breaker type</th>
<th>Closing and latching current(^1) kA sym</th>
<th>Closing and latching current(^2) kA rms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Power frequency kV rms</td>
<td>Impulse kV peak</td>
<td>600</td>
<td>1,200</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>4.76</td>
<td>19</td>
<td>60</td>
<td>25</td>
<td>05-SBVCB-25-0600-65</td>
<td>25</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>38(^3)</td>
<td>05-SBVCB-25-1200-65</td>
<td>40</td>
<td>59</td>
</tr>
<tr>
<td>15.0</td>
<td>36</td>
<td>95</td>
<td>25</td>
<td>15-SBVCB-25-0600-65</td>
<td>25</td>
<td>39</td>
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<td></td>
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<td>15-SBVCB-25-1200-65</td>
<td>40</td>
<td>59</td>
</tr>
</tbody>
</table>

### Circuit breaker options:

<table>
<thead>
<tr>
<th>Features</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control voltage</td>
<td>120 Vac(^1), 230 Vac(^1), 48 Vdc, 125 Vdc, 250 Vdc</td>
</tr>
<tr>
<td>Interrupting time</td>
<td>3-cycle standard</td>
</tr>
<tr>
<td>Trip coil</td>
<td>1 x trip coil</td>
</tr>
<tr>
<td></td>
<td>2 x trip coil</td>
</tr>
<tr>
<td></td>
<td>1 x trip coil and under voltage</td>
</tr>
<tr>
<td>Auxiliary contact</td>
<td>6 NO/6 NC, 12 NO/12 NC</td>
</tr>
</tbody>
</table>

Footnote:
1. For ac control voltage, tripping employs capacitor trip.
Features and benefits

Ratings:
• 5 kV and 15 kV voltage classes
• 600 A and 1,200 A continuous current
• 25 kA and 38 kA (40 kA circuit breaker) interrupting
• 1,200 A and 2,000 A main bus assembly.

Enclosures:
• Indoor type 1 enclosure
• Indoor type 2 drip-proof
• Indoor type 12 dust resistant
• Outdoor non-walk-in type 3R.

Configurations:
• Single switch-circuit breaker
• Duplex switch-circuit breaker.

Applications:
• Standalone bay
• Transformer primary
• Lineups.

Lineup configurations:
• Main with feeders
• Main with tie and feeders
• Main-main for transfer
• Main service disconnect.

Optional:
• UL or C-UL Listing
• High-track resistance bus supports
• Auxiliary switches (2 NO-2 NC)
• Mimic bus
• Ground studs (ball stud) type
• Screens and filters (indoor)
• Tin-plated copper bus (silver-plated standard)
• Second set of CTs.

Standards:
• ANSI/IEEE C37.20.3
• ANSI/IEEE C37.20.4
• ANSI/IEEE C37.04
• ANSI C37.54
• ANSI C37.57
• ANSI C37.58
• CSA 22.2 No. 31 (for Canada)
• CSA 22.2 No. 58 (for Canada)
• CSA 22.2 No. 193 (for Canada).

Modular configurations to mount:
• Surge arresters
• Instrument transformers
• Control power transformers
• Power meters.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>600 A or 1,200 A interrupter switch</td>
</tr>
<tr>
<td>B</td>
<td>Fixed-mounted vacuum circuit breaker</td>
</tr>
</tbody>
</table>