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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)

Table of contents

SIEBREAK-VCB metal-enclosed load-interrupter switchgear with fixed-mounted vacuum circuit breaker	03
SIEBREAK-VCB configuration in low-voltage substations	04
Double-ended substation arrangement features and options	04
Reduction of arc-flash incident energy	04 - 05
Technical data	06
Features and benefits	07

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:

Components ¹	Low-voltage circuit breaker configuration ²		Virtual main configuration ²	
	#1	#3	#2	#4
Siemens 7UT8 protective relay	■	■	■	■
Siemens 7UT8 protective relay with arc-flash module	◇	◇	◇	◇
Siemens 7SJ82 protective relay	◇	◇	◇	◇
Siemens 7SJ82 protective relay with arc-flash module	◇	◇	◇	◇

Footnotes:

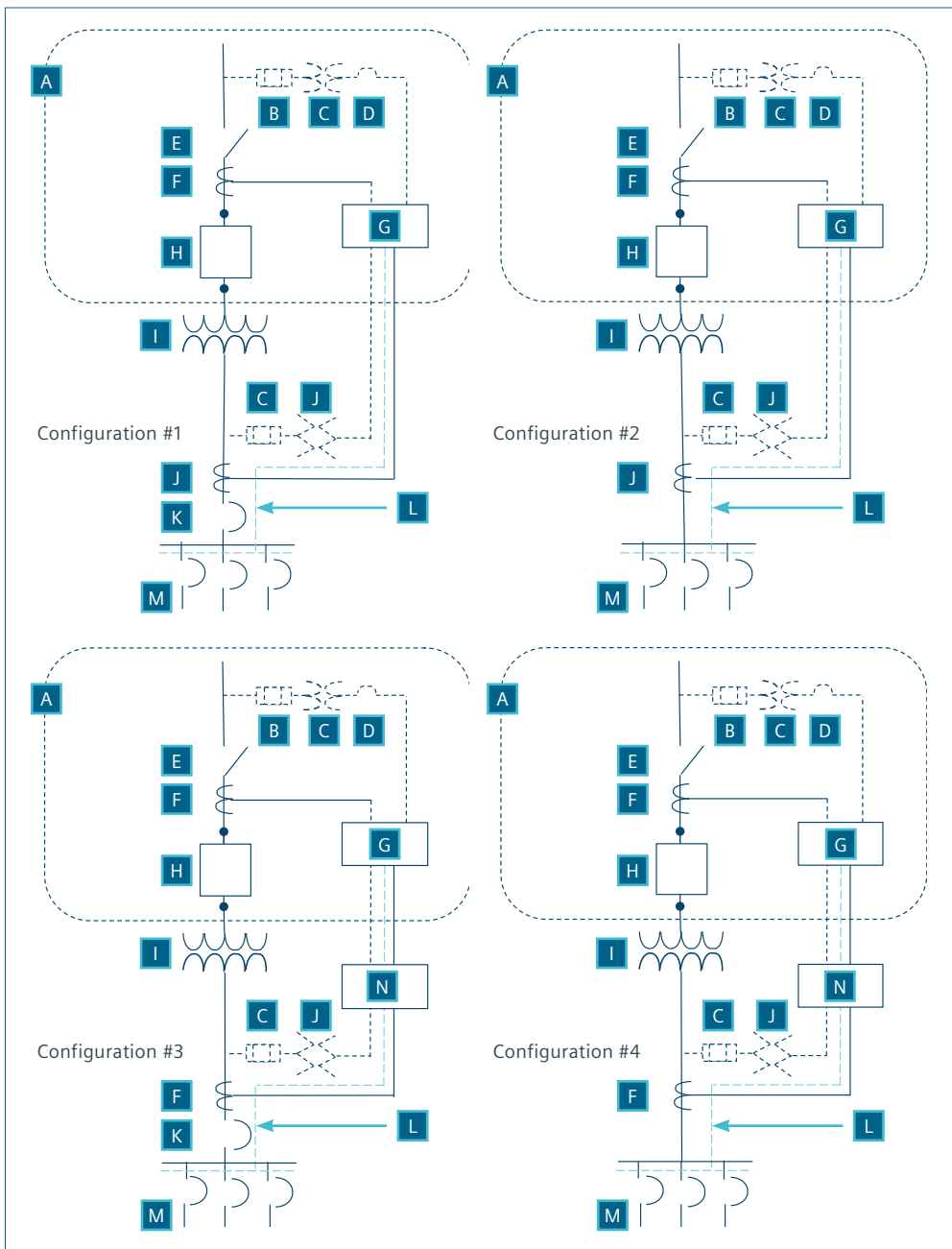
1. Consult factory for alternate relays and options.
2. ■ Standard features. ◇ Optional features.

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.



Item	Description
A	SIEBREAK-VCB with OMARS
B	Fuses
C	Optional control power transformer
D	Secondary circuit breaker
E	Load-interrupter switch
F	Phase current transformers
G	7UT8 protective relay
H	600 A or 1,200 A fixed-mounted vacuum circuit breaker
I	Unit substation transformer
J	Optional voltage transformers
K	Low-voltage main circuit breaker
L	Optional arc-detection fiber
M	Low-voltage switchboard or switchgear
N	7SJ82 protective relay

Technical data

SIEBREAK switchgear ratings					
System design voltage kV	Dielectric withstand voltage		Main bus ¹ continuous current A rms	Short-circuit current Unfused kA sym	Fault-closing current Unfused kA rms
	Power frequency kV rms	Impulse kV peak			
5.0	19	60	600	25	39
			1,200	38	59
			2,000		
15.0	36	95	600	25	39
			1,200	38	59
			2,000		

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							
System design voltage kV	Dielectric withstand voltage		Continuous current A rms	Short-circuit current ² kA sym	Circuit breaker type	Closing and latching current ² kA sym	Closing and latching current ² kA rms
	Power frequency kV rms	Impulse kV peak					
4.76	19	60	600 1,200	25	05-SBVCB-25-0600-65 05-SBVCB-25-1200-65	25	39
				38 ³	05-SBVCB-40-0600-104 05-SBVCB-40-1200-104	40	59
15.0	36	95	600 1,200	25	15-SBVCB-25-0600-65 15-SBVCB-25-1200-65	25	39
				38 ³	15-SBVCB-40-0600-104 15-SBVCB-40-1200-104	40	59

Circuit breaker options:

Features	Options
Control voltage	120 Vac ¹ , 230 Vac ¹ , 48 Vdc, 125 Vdc, 250 Vdc
Interrupting time	3-cycle standard
Trip coil	1 x trip coil
	2 x trip coil
	1 x trip coil and under voltage
Auxiliary contact	6 NO/6 NC, 12 NO/12 NC

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:

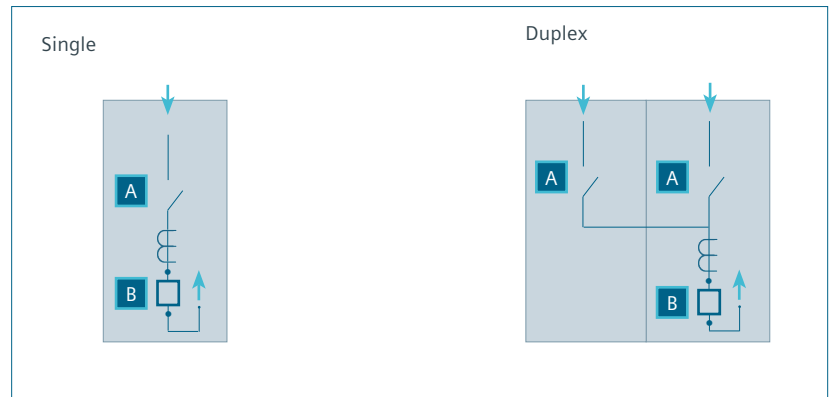
- UL or C-UL Listing
- High-track resistance bus supports
- Auxiliary switches (2 NO-2 NC)
- Mimic bus
- Ground studs (ball stud) type
- Screens and filters (indoor)
- Tin-plated copper bus (silver-plated standard)
- Second set of CTs.

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.



Item	Description
A	600 A or 1,200 A interrupter switch
B	Fixed-mounted vacuum circuit breaker

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