

# Omni-Rupter<sup>®</sup> Switches

Outdoor Distribution (14.4 kV through 34.5 kV)



The dependable choice for  
distribution feeder switching.

# Omni-Rupter® Switches

Interrupter switches are widely used for sectionalizing today's power distribution systems. They're so common, some utilities view them as commodity products. However, not all interrupter switches are created equal; poor design can lead to issues that prevent switches from performing as intended.



One common pitfall of poor design is operational uncertainty. Interrupter switches are outdoor devices with exposed live parts, and several environmental factors can affect an interrupter switch's operation.

Birds, squirrels, climbing animals, ice, pollution, and other contaminants can all have an impact on interrupter switches—from causing faults to causing the switch to seize when operating.

With some poorly designed interrupter switches, the switch blades can become out of sequence with the interrupters. And there's no way to tell from ground level whether the blade and interrupter are out of sequence. The next time a switch in this state is operated, there's no current transfer into the interrupter—resulting in a flashover and exposing the operator to an external arc. Crews expect an interrupter switch, but with interrupters out of sequence they are really getting a disconnect with no load-interrupting capability.



Installation headaches are another pitfall of poor design. A common difficulty during an interrupter-switch installation is connecting jumpers to the switch terminal pads. Large conductor sizes produce heavy and unwieldy jumpers. If these jumpers are not formed to be in line

with the terminal pad and switch blade, the force on the switch can cause undue stress, resulting in uneven loading, overheating, and difficulty operating the switch.

Some poorly designed interrupter switches are shipped as individual phases, requiring crews to mount each phase individually to a user-furnished structure, connect the phases together, and check and adjust for three-phase simultaneity. These complex steps add to installation times, preventing crews from moving on to other jobs. In addition, these steps create more opportunity for error, especially in the three-phase gang-operation of the switch. Non-simultaneous operation of all three phases caused by installation errors could lead to the tripping of neutral relays or single-phasing of three-phase loads. Improper adjustments could turn a three-phase interrupter switch into a single-phase switch.



Poor design can also lead to stranded assets. Interrupter switches are expected to handle all switching duties found on distribution feeders, including load interrupting, closing under load, and even fault-closing. As the grid evolves and becomes more

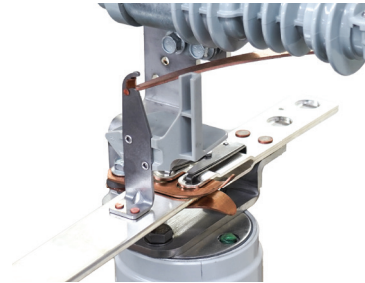
dynamic, customer demands for reliability are increasing as well. These requirements put additional importance on interrupter switches. Without sufficient capabilities to accommodate a modern grid's requirements, an interrupter switch could become an inoperable piece of buswork.

For many utilities, these issues are viewed as a cost of doing business. Interrupter switches may not operate properly all the time, but crews expect something to go wrong occasionally and have mitigation plans when switches don't operate as expected. Installations may be time-consuming, but it's always been that way. There may be operating constraints on interrupter switches because of limited capabilities, but stranded assets are unavoidable.

A better-designed interrupter switch exists today. It avoids these issues, operates dependably, is simple to install, and has robust capabilities. S&C Omni-Rupter Switches meet all three criteria for a well-designed interrupter switch:

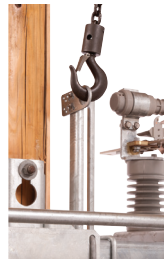
## Dependable Operation

Omni-Rupter Switches are designed to be maintenance-free under normal operating conditions, and they only require periodic inspection following utilities' standard inspection schedules for pole-mounted distribution equipment. The interrupter shunt arm and the auxiliary return arm on the blade cam work together to ensure the interrupter is closed when the switch is closed, and they are ready to interrupt current when called upon. All Omni-Rupter Switches come factory-aligned for three-phase simultaneity with no field adjustment. This ensures they will remain three-phase switches—on day one and years down the road. Multiple options for environmental resiliency (detailed in the "Options" section on page 7) ensure the switch is well-suited for the challenges of its environment.



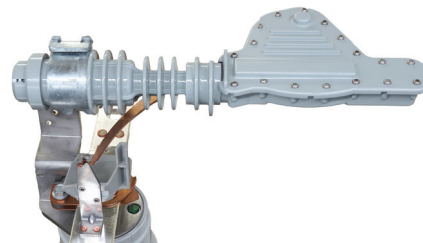
## Simple Installation

Integer-style Omni-Rupter Switches ship factory-assembled on a single-base for easy-up installation. The single-point lifting bracket provides a simple means to lift the switch into position, and the bracket stays on the switch without interfering with built-in dielectric clearances. The articulating hinge-end terminal pad accommodates conductor misalignment that can come from large, difficult-to-train jumpers while it ensures the switch blade is aligned properly and will be consistently easy to operate.



## Robust Capabilities

Omni-Rupter Switches are capable of interrupting up to 900 A through 29 kV and 630 A through 38 kV, and are rated for switching duties including load-dropping, loop-splitting, and line- and cable-charging. See Tables 1 and 2 on page 8 for complete ratings information. Spring-driven interrupters provide a consistent interrupting speed, ensuring full interrupting capability regardless of the speed of operation. Field-replaceable sacrificial guide fingers serve as fault-closing contacts and ensure the main current-carrying contacts and interrupter are protected—enabling substantial two-time and ten-time fault-closing capabilities.



With more than 30,000 units installed worldwide, from the frigid cold of Canada's north, to the harsh heat of Saudi Arabia, to salty coastal environments such as California and New Zealand, Omni-Rupter Switches are the best interrupter switch available for a utility's network.



## Designed to Handle Distribution Feeder Switching Duties

Omni-Rupter Switches are rated 900 amperes continuous in voltage ratings through 29 kV, and 630 amperes continuous in voltage ratings through 38 kV. Arc extinction takes place within the interrupters, which use a specially designed trailer and liner to create the necessary gasses for efficient circuit interruption. The latch-and-spring mechanism inside the interrupter provides a consistent speed of interruption, guaranteeing full interrupting capability regardless of the speed of operation. These interrupters help make Omni-Rupter Switches ideally suited for:

**Line switching**—Load splitting (parallel or loop switching), load dropping, and associated charging currents

**Transformer switching**—Load dropping, including associated magnetizing currents

**Cable switching**—Load splitting (parallel or loop switching), load dropping, and associated charging currents

Omni-Rupter Switches provide dependable operation even in areas subject to icy weather conditions. Mechanical and electrical switch operation is ensured even under an ice buildup of up to  $\frac{3}{4}$ -inch (19 mm), depending on the mounting configuration.

## Applicable for a Variety of Line Constructions

Omni-Rupter Switches are available in five mounting configurations:

- **Upright**—For horizontal distribution-feeder line configurations
- **Inverted**—For horizontal distribution-feeder line configurations in environments where raptors and other large birds are prevalent

- **Tiered-outboard**—For vertical (phase-over-phase) distribution-feeder line configurations
- **Vertical**—For cable risers and transformer tap-offs from overhead lines
- **Triangular**—For pole-top or triangular distribution-feeder line configurations

## Operating Sequence

When the switch is fully closed, current flows only through the nickel-silver-plated copper switch blades and silver-to-silver contacts, not through the interrupter. Each interrupter shunt arm is positioned between the auxiliary return arm and the shunt contact. See Figure 1. The return arm is extra assurance the interrupter was reset into the **Closed** position and is ready for the opening operation.

As the switch is opened, each interrupter shunt arm engages the shunt contact to transfer current through the interrupter. See Figure 2. The curved shape of the shunt contact guides the shunt arm through its travel and keeps the arm engaged on the contact surface. A copper-bronze alloy inset minimizes display.

As each blade nears 45 degrees open, the latch inside the interrupter holding the spring-loaded trailer releases, providing a consistent interrupting speed. As the blades open to 90 degrees, the interrupter shunt arm snaps back into position beneath the interrupter.

As the switch is closed, each interrupter shunt arm is guided into position by the curved back of the shunt contact as the blade closes into the jaw-contact guide fingers. See Figure 3. The shunt arm again comes to rest between the return arm and the shunt contact, as shown in Figure 1.

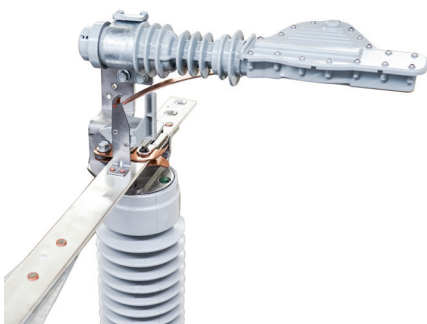


Figure 1. The switch in the Closed position.

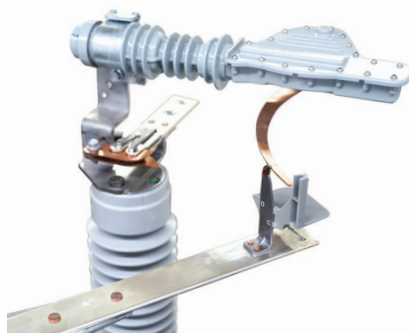


Figure 2. The switch during opening.

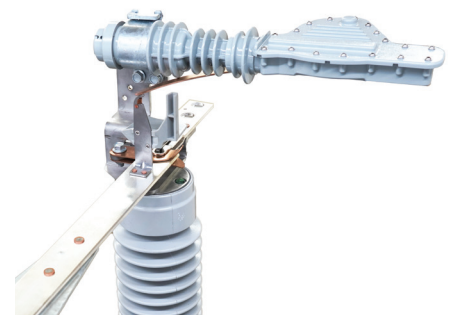
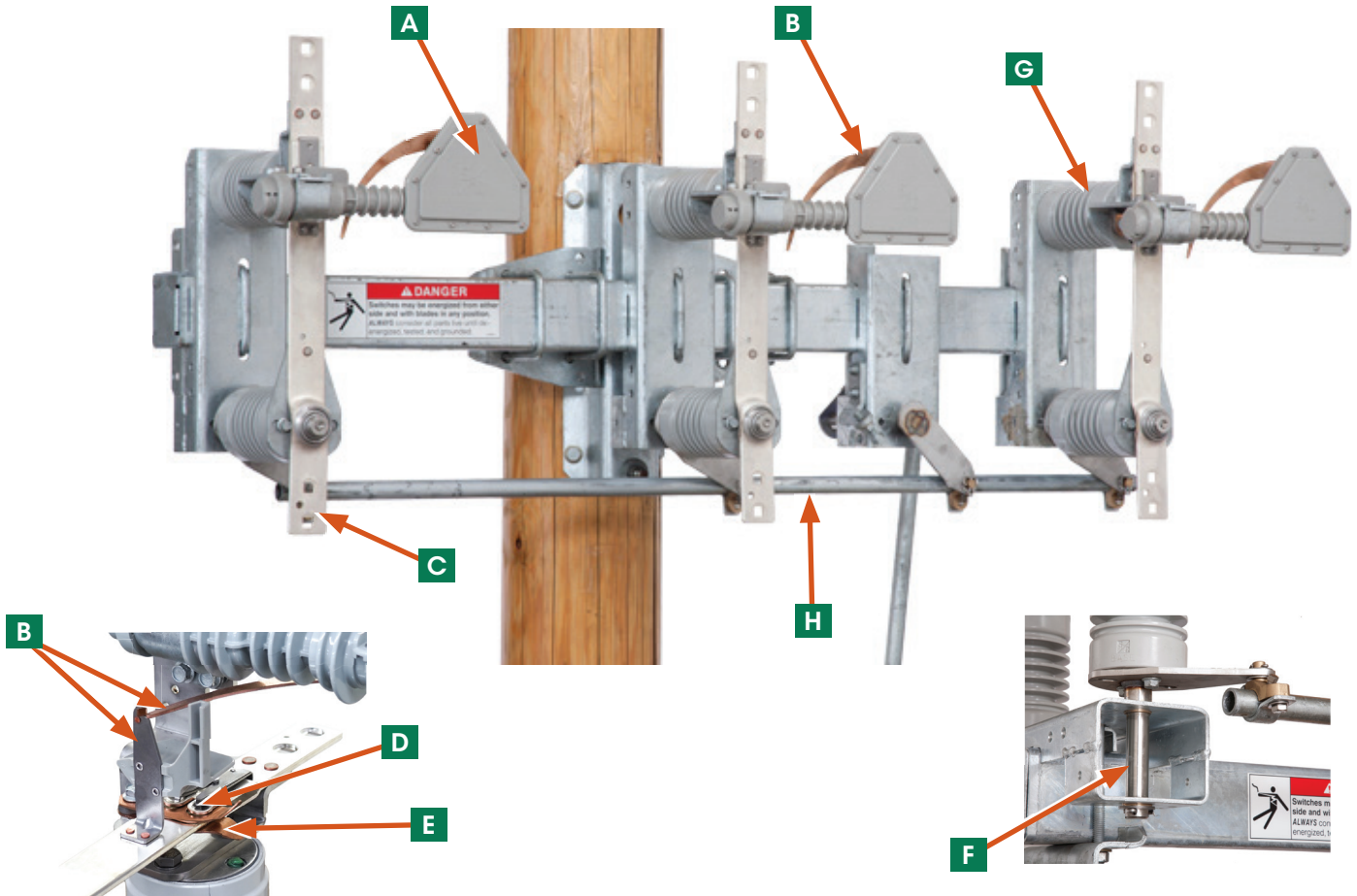


Figure 3. The switch during closing.



**A Interrupter**—The maintenance-free interrupter provides consistent no-external-arc circuit interruption regardless of the speed of operation. Interrupter housings are made of a UV-resistant polycarbonate thermoplastic and are fully gasketed to prevent water entry.

**B Shunt Arm and Shunt Contact**—The spring-loaded copper-bronze alloy shunt arm and copper-bronze alloy shunt contact work together to smoothly and consistently transfer current into the interrupter without external arc. The shunt arm snaps back to the **Closed** position after opening, reset and ready for the next operation.

**C Articulating Hinge-End Terminal Pad**—The terminal pad pivots to accommodate misalignment common with large, difficult-to-train jumpers without imposing undue forces on the blade or contacts.

**D Jaw Contact**—Floating contact buttons provide even contact forces between the upper and lower jaw contacts, reducing friction during operation.

**E Sacrificial Guide Fingers**—These help align the blade in the jaw contact and protect the current-carrying contacts when the switch is closed into a fault.

**F Corrosion-Resistant Stainless Steel Shaft and Drive Lever and Phosphor-Bronze Bearing**—Superior materials provide smooth operation even in harsh environments.

**G Cypoxy™ Insulators**—S&C's unique, non-weathering, lightweight epoxy resin replaces porcelain insulators as standard and provides superior mechanical strength, generous leakage distances, and unsurpassed performance in outdoor environments.

**H One-Piece Interphase Pipe**—This ensures three-phase switching simultaneity from the factory without any requirement for field adjustment.

# Features

**Multi-purpose operating cams** ensure consistent current transfer into the interrupters for no-external-arc switching. The auxiliary return arm provides added assurance the interrupters are closed when the switch is closed, eliminating the possibility to get out of sequence. The cam serves as an ice shield for upright and triangular mounting configurations.

**Single-piece blade** is made of nickel-silver-plated copper and is aligned at the factory without any requirement for field adjustment. The copper-tungsten arcing tip embedded in the blade provides resiliency to withstand fault-closing operations.

**Overtoggle mechanism and visual overtoggle indicator** provide mechanical and visual assurance the switch blades are fully closed and will stay fully closed, eliminating contact creep and overheating even if the utility pole warps over time. See Figures 4 and 5.

**Single-piece base** is factory-assembled and adjusted for three-phase simultaneity and easy-up installation. Switches can be furnished with either a steel base or an insulated base (steel base only for triangular mounting configurations).

**Single-point lifting bracket** provides a simple means to lift the switch into position. The lifting bracket stays on the switch without interfering with built-in dielectric clearances. See Figure 6.

**Unique clamping system** securely and permanently locks pole-units to the base, ensuring three-phase simultaneity with no need for adjustment.

**Galvanized steel pole-mounting bracket** accommodates steel or wood poles from 5½ inches (140 mm) to 14 inches (356 mm) in diameter to suit a wide variety of installations.

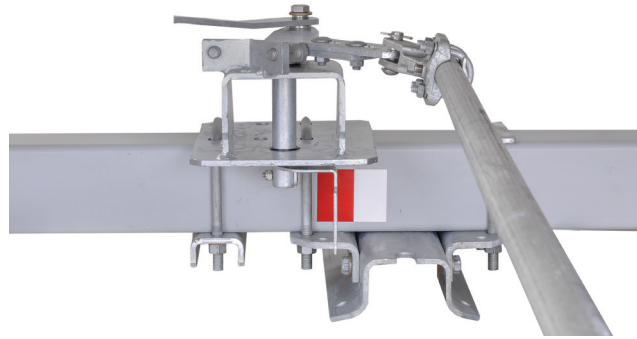


Figure 4. Reciprocating and hookstick mechanism overtoggle indicator.

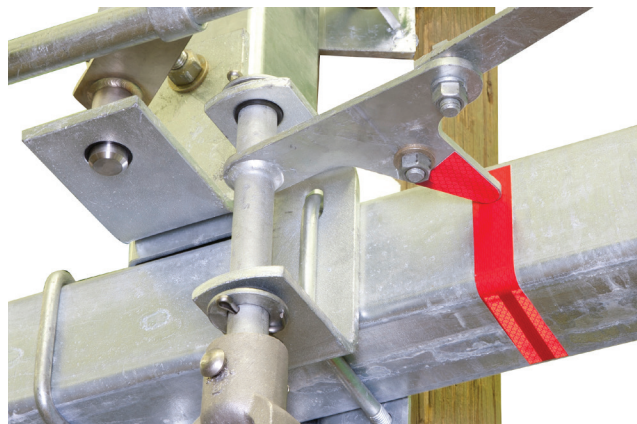


Figure 5. Rotating mechanism overtoggle indicator.

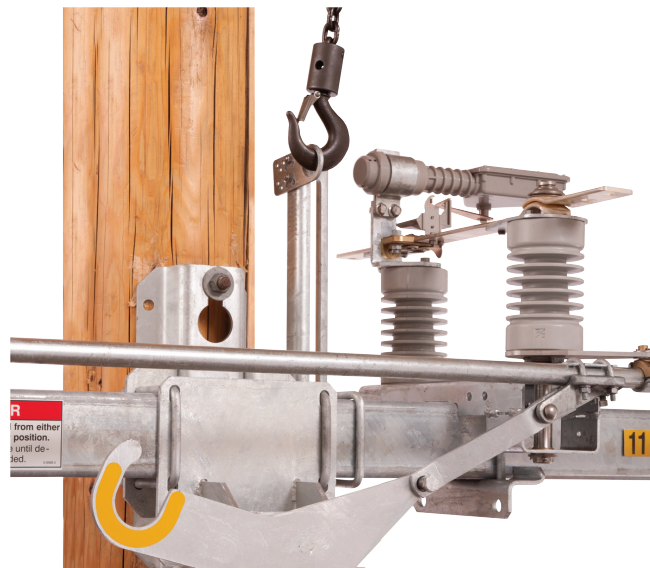


Figure 6. Retractable single point lifting bracket.



The hookstick operating mechanism cuts installation time by up to 60% by eliminating the need to install vertical operating pipe, guide bearings, a ground-level operating handle, and a grounding mat, providing the ultimate solution for a simple, quick, and cost-effective installation. The curved hookstick mechanism is shaped to guide a hotstick into the large reflective U-shaped pull-rings, making the switch easy to operate at night and during inclement weather. The mechanism is mounted at switch level, enhancing security by eliminating the possibility for vandals to damage the switch. A lockout/tagout hasp is incorporated into the operating handle for easy visibility and compliance with required safety procedures. See Figure 7.

**An enhanced hookstick-operated lockout/tagout device (for hookstick-operated switches)** positively secures the switch in the **Open** position via a pull-ring and displays a highly reflective locked indicator.

**Greaseless graphite-impregnated contacts** self-lubricate, eliminating the need to grease and re-grease contacts, providing long-term performance in contaminated environments.

**Provision for power operation** using the S&C 6801M Automatic Switch Operator provides an all-in-one motor operator and control with advanced communication capabilities. Switch adjustment is easy using the **Set Travel Limits** procedure; no time-consuming adjustments of mechanical limit switches are required.

**Phase-to-ground wildlife protection** covers the bases of the support insulators, providing an excellent barrier between the energized and grounded parts of a switch. These discs snap together around the insulators without tools and fit both Cypoxy and porcelain insulators. The wildlife discs are made of a durable, flexible, UV-stabilized polycarbonate material. Perforations in the discs provide easy visibility of the **Open** or **Closed** position of the switch blades. For steel-base switches, this option includes insulated covers for the switch base and a fiberglass interphase rod to further eliminate the possibility of perching birds or climbing animals making phase-to-grounded part contact. This option is fully retrofittable to installed switches without removing them from the utility pole. See Figure 8.

**Open-gap wildlife protection** deters squirrels and other small animals from making contact across the open gap of an Omni-Rupter Switch. Sectionalizing switches in the normally **Open** position or opened to de-energize a section of line for maintenance do not discourage squirrels from traversing power lines. S&C's blade-mounted, retrofittable barriers force climbing animals to jump over the insulated panel, making it more difficult for these animals to bridge an open gap. See Figure 9.

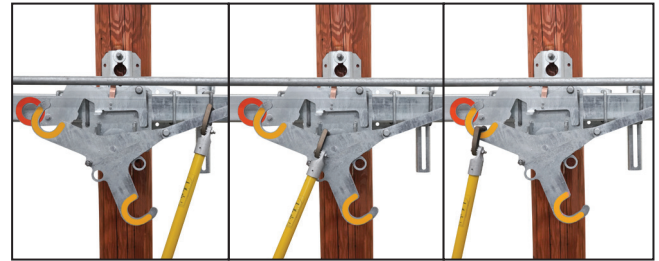


Figure 7. Curved hookstick mechanism guides hotstick into pull rings for ease of operation in all weather conditions.

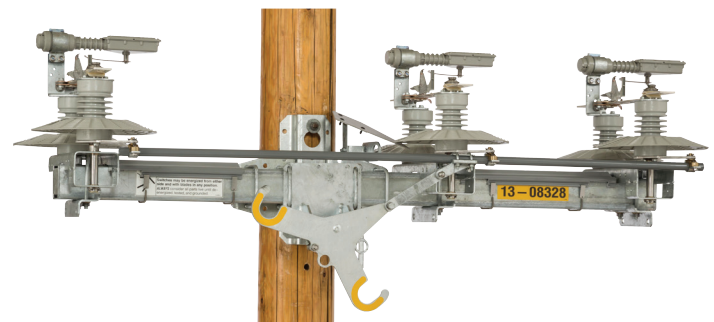


Figure 8. Phase-to-ground wildlife protection.

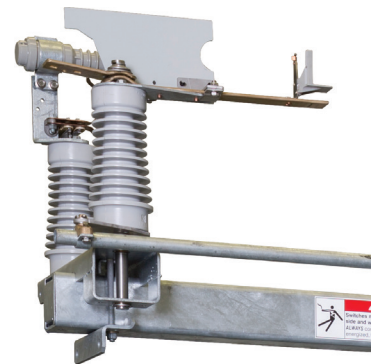


Figure 9. Open-gap wildlife protection.

**Provisions for surge arresters** allow for easy installation of arresters to protect against transient overvoltages.

**Extension-link assemblies** allow for dead-ending conductors directly to the switch. A pole-band and J-bolts are required when dead-ending.

**A key interlock** provides a built-in locking mechanism on the operating handle for sequencing operations.

Refer to Specification Bulletin 765-31 for a full list of options.

# Ratings

Table 1. Switch Ratings<sup>①</sup>

kV			Amperes					Fault-Closing Capability, Amperes Peak <sup>③</sup>	
Nominal	Maximum	BIL	Continuous	Interrupting <sup>②</sup>	Peak	One-Second, RMS Sym.	Three-Second, RMS Sym.	Two-Time Duty Cycle	Ten-Time Duty Cycle
14.4	17.0	110	900	900	65 000	25 000	20 000	42 000	21 000
25	29	150	900	900	65 000	25 000	20 000	42 000	21 000
34.5	38	200	630	630	65 000	25 000	20 000	32 500	21 000

① Ratings apply to Omni-Rupter Switches with catalog number revision "R4." For ratings for previous versions of Omni-Rupter Switches, please contact your nearest S&C Sales Office.

② Refer to Specification Bulletin 765-31 for a full list of interrupting ratings.

③ Two-time duty-cycle fault-closing rating of 32,500 amperes peak for 14.4-kV and 25-kV switches when power-operated with an S&C 6801M Automatic Switch Operator.

Table 2. Interrupting Ratings

Application Class		Maximum Amperes	
		14.4-kV and 25-kV Switches	34.5-kV Switches
Transformer switching	Parallel switching <sup>①</sup>	900	630
	Load dropping <sup>②</sup>	900	630
Line switching	Load splitting (parallel or loop switching)	900	630
	Load dropping	900	630
	Line dropping	10	10
Cable switching	Load splitting (parallel or loop switching)	900	630
	Load dropping	900	630
	Cable dropping (charging current)	20	20

① Applies to the switching of the primary of a transformer that remains energized from the secondary bus or to the disconnecting of a loaded secondary bus from one of the two transformers supplying that bus while the primary side of the transformer remains energized.

② Omni-Rupter Switches can also switch the magnetizing currents associated with such loads.

