



# **S&C Omni-Rupter® Switches**

Outdoor Distribution (14.4 kV and 25 kV)

# S&C Omni-Rupter . . . The Load Interrupter Switch Expressly Designed to Handle the Switching Duties on Today's Overhead Distribution Feeders

## Application

Today's expanding overhead distribution systems are characterized by greater load densities resulting in more load per mile of line, more interconnections, and more laterals and branches. At the same time, there has been an increasing demand for an even higher degree of system reliability. To simplify switching procedures, minimize the scope of outages, and facilitate post-outage cold-load pickup, more and more sectionalizing points are being used. Since sectionalizing practices impose duties beyond the capabilities of ordinary disconnects, interrupter switches have increasingly become the appropriate device for most overhead distribution feeder applications.

S&C Omni-Rupter Switches are expressly designed for the application and economics of overhead feeder switching. In addition, these switches are available in four mounting configurations to accommodate the variety of line constructions encountered on today's distribution systems. Switches in the upright mounting configurations are suitable for horizontal distribution-feeder line configurations; those in the triangular mounting configuration are tailored for use on systems having pole-top or triangular distribution-feeder line configurations; Omni-Rupter Switches in the vertical mounting configuration are ideally suited for use at cable risers and transformer tapoffs from overhead lines; and switches in the tiered-outboard mounting configuration are designed for vertical (phase-over-phase) distribution-feeder line configurations.

Omni-Rupter Switches are rated 900 amperes continuous in voltage ratings through 29 kV and provide no-external-arc interruption, making them ideally suited for the following switching duties:

- **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 switching (parallel or loop switching), load dropping . . . and associated charging currents.

As an added benefit, Omni-Rupter Switches can interrupt currents up to 1000 amperes during emergency switching situations and are capable of carrying up to 1000 amperes continuously. These are definite “pluses” for today's sectionalizing practices, where switching procedures may increase system loading up to maximum conductor ratings.

Omni-Rupter Switches also include two-time and three-time duty-cycle fault-closing capabilities of 20,000 amperes RMS asymmetrical and 15,000 amperes RMS asymmetrical, respectively. Additionally, these S&C Omni-Rupter Switches provide reliable operation even in areas subject to icy weather conditions. Mechanical and electrical operation of the switch is ensured even if it is under an ice buildup of up to  $\frac{3}{4}$  inch.

## . . . The Ultimate in Installation Simplicity

Omni-Rupter Switches are offered in an integer style that is preassembled and factory-adjusted to facilitate installation by eliminating the need for field assembly. All three switch poles come preassembled on a one-piece base with the necessary electrical and mechanical clearances built-in. The switch blades, contacts, and interphase rod are adjusted at the factory to ensure reliable opening and closing operations.

Each Omni-Rupter Switch and its associated operating mechanism are packaged in a single crate suitable for compact storage and easy handling. Once at the site, installation is further facilitated by use of the designed-in lifting means to ensure that the switch is hoisted in a balanced manner. And, because Omni-Rupter Switches are compact lightweight, typically less than 300 pounds, these switches are easy to handle both on the ground and while hoisting. Two through-bolts, lag screws, and a pole band are all that are required to securely mount the switch to the distribution pole. Addition of the operating mechanism, when required, completes the installation of the switch. Installation of an Omni-Rupter Switch and its associated operating mechanism can typically be completed in a few hours, resulting in a low total installed cost. The hookstick-operated version of the switch, which does not require the addition of an operating mechanism on the pole, provides the ultimate solution for a simple, quick, and cost-effective installation.

## Omni-Rupter Switches Rated 14.4 kV



Triangular mounting configuration

Tiered-outboard mounting configuration



## Construction And Operation

### Base and Pole-Unit Construction

Integer style Omni-Rupter Switches include a compact, economical design that eliminates any need for mounting of individual pole-unit bases. Installation time is thus minimized by eliminating many of the field erection procedures associated with other group-operated switches or three-phase installations of single-pole switches.

S&C Omni-Rupter Switches are offered in models with steel bases as well as insulated bases. Steel bases are constructed from a 4" × 4" galvanized electric-welded steel tube. Insulated bases are constructed from a fiberglass-reinforced pultruded structural tube finished with a durable gray polyurethane coating to provide resistance to weathering and protection against ultraviolet radiation. Insulated-base switches include a solid, one-piece fiberglass-reinforced polyester interphase rod, also finished with a polyurethane coating. Each switch is equipped with a rugged galvanized steel pole-mounting plate which can accommodate steel or wood poles in diameters from 5½ inches to 14 inches.

Pole-units are permanently and securely locked to the base using S&C's unique clamping system. The pole-units are self-aligning to ensure precise positioning during assembly. Pole-unit clamping members also serve as dead-ending brackets for each switch pole, thereby eliminating the need for separate dead-ending provisions. Extensive testing confirms the ability of switch poles to withstand mechanical forces far greater than those that will be experienced in service.

Effortless movement of the rotating insulator of each pole-unit is ensured by stainless-steel-sleeved journals that turn within bronze bearings. Bearings are maintenance-free and corrosion resistant to provide smooth, reliable switching even after long exposure to environmental conditions.

For applications where line sensing is desired, the individual pole-unit bases of the Omni-Rupter can be fitted with extension brackets, on which a variety of current and voltage sensors can be mounted.

### Interrupters

S&C Omni-Rupter Switches utilize interrupters that provide circuit interruption without external arc or flame. Arc extinction takes place within the interrupters, which utilize a specially designed trailer and liner to create the necessary de-ionizing gases for efficient circuit interruption. A direct-drive, speed-multiplying, straight-line mechanism within the interrupter ensures reliable performance with every operation. Moving probes, "mousetrap" actuating schemes, and internal latches are not relied on for circuit interruption. Springs are used only as positive open-closed detention devices. And, since circuit interruption takes place in free-venting interrupters, Omni-Rupter Switches do not require the time-consuming inspection and maintenance procedures associated with oil switches or vacuum switches.

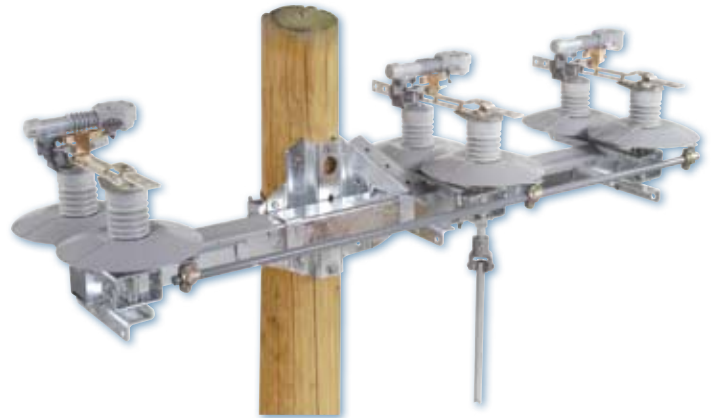
Omni-Rupter Switch interrupter housings are manufactured from molded glass-reinforced polyester and are finished with a two-part urethane coating for resistance to weathering and ultraviolet radiation. The two-part interrupter housings are fully gasketed to prevent water entry and include a labyrinthine exhaust cap to permit venting during circuit interruption. Interrupters have been subjected to a variety of tests—including accelerated weathering tests and leak tests—to verify proper operation under the most demanding environmental conditions.

In typical feeder-switching applications with a mix of duties including switching magnetizing current, line-charging current, moderate-load current, plus occasional switching of full-load current at maximum voltage, these interrupters have a life expectancy of 500 operations. Omni-Rupter switches are designed and tested for a mechanical capability of 2000 operations.



## Wildlife Protection . . . prevents animals from making phase-to-ground contact

The key to the wildlife protection feature is the unique angled wildlife discs that cover the bases of the switch's support insulators—providing an excellent barrier between the energized and grounded parts of the switch. These discs snap together without tools, and fit both Cyproxy® and porcelain insulators. The wildlife discs are made of a durable, flexible, UV-stabilized polycarbonate material. The sloped design provides an uneven foothold for climbing and perching animals, and sheds ice and rain. The slope of the discs also deters nest building under energized parts of the switch. Insulated shields for the switch base and pole-saddle are also included.



**Interrupters** provide no-external-arc interruption. Interrupter housings are molded from glass-reinforced polyester and include a two-part urethane coating for protection against weathering and ultraviolet radiation

**S&C Cyproxy® Insulators** are nontracking, self-scouring, and nonweathering . . . and they're lightweight—typically one-half the weight of porcelain insulators but with longer leakage distances and less susceptibility to breakage

**S&C's unique clamping system** securely and permanently locks pole-units to the base . . . confirmed by test to prevent pole-unit movement even when subjected to repetitive mechanical forces and vibrations far greater than those experienced in the field

**Corrosion-resistant stainless-steel-sleeved journals and bronze bearings** are maintenance-free and provide smooth switching action . . . even after years of service

**Pole-mounting plate** with two through-bolts, lag screws, and a pole band securely attach switch to pole

**Insulated base** is constructed from a 4" × 4" fiber-glass-reinforced pultruded structural tube, finished with a durable polyurethane coating for protection against weathering and ultraviolet radiation

Omni-Rupter Switch rated 14.4 kV in the vertical mounting configuration, with insulated base.



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## Blade and Contact Construction

S&C Omni-Rupter Switches incorporate double-member hard-drawn silver-plated copper blades, plus silver-to-silver contacts throughout the switch. Contact construction includes a bifurcated blade contact with stainless-steel loading springs to ensure optimum multi-point contact pressure.

The silver-plated stationary contact is of formed copper construction and includes a tapered profile to facilitate smooth, positive blade closure. In addition, the stationary contact features a unique “back angled” design to provide positive wiping action during opening and closing, and to ensure that different areas on the blade contact are used for making current and carrying continuous current. The stationary contact also includes a brazed-in-place copper-tungsten tip to provide fault-closing capability. During a closing operation the circuit is established at the copper-tungsten tip, not at the current-carrying main contact area, thus preserving the integrity of the main contacts.

The hinge contact features four silver-plated contact buttons embossed into each switch blade, plus a silver-plated hinge pivot. A stainless-steel loading spring is utilized to provide the optimum combination of contact pressure, operating ease, and terminal-pad stability.

## Switch Operation

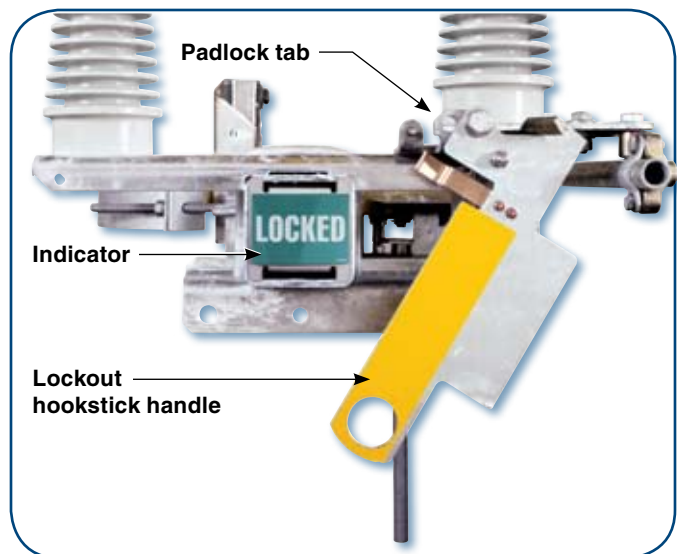
With the switch in the fully closed position, current flows only through the copper switch blades and the silver-to-silver contacts—the interrupter is completely isolated from the circuit.

During a switching operation, circuit interruption is accomplished entirely within the interrupter without external arc or flame. As the blade begins to open, current is transferred to the interrupter by positive wiping action of the spring-tempered phosphor-bronze shunt contact against the interrupter’s external contact *before* the current-carrying main contacts part—thereby preventing commutation arcing. The blade cam then direct-drives the interrupter internal contacts apart. Arc extinction is accomplished by the thermal action of the arc on the specially designed trailer and liner within the interrupter, creating de-ionizing gases that ensure a high rate of recovery of internal dielectric strength for quick, positive circuit interruption. Exhaust is quietly and flamelessly vented through the interrupter’s labyrinthine exhaust cap. The dynamic internal dielectric strength of the interrupter is coordinated with the external leakage distance and strike distance to eliminate any chance of flashover.

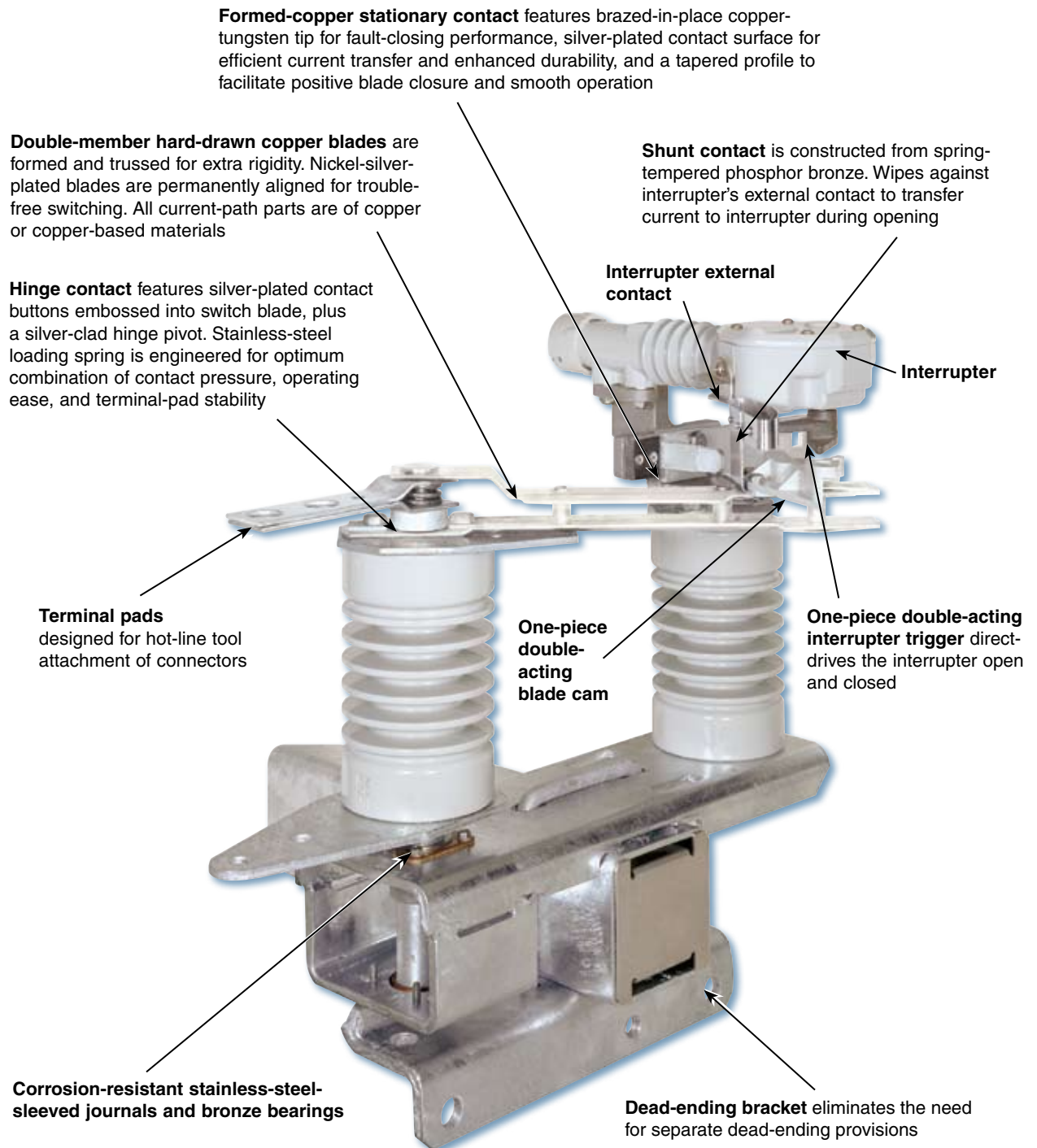
During a closing operation, the blade and interrupter are sequenced to ensure that current is picked up by the fault-closing contact on the tip of the stationary contact. Current is not picked up by the current-carrying main-contact area or the interrupter contacts. Once the circuit is established, the blade cam direct-drives the interrupter closed, resetting it for the next operation.

## Enhanced Hookstick-Operated Lockout-Tagout Device

The enhanced hookstick-operated lockout-tagout device, available for hookstick-operated switches in the upright and tiered-outboard mounting configurations, makes it even easier for line workers to comply with required safety procedures. The new lockout device positively secures the switch in the open position with a simple pull of the hookstick-operated handle . . . revealing a highly visible reflective “locked” indicator. The device is padlockable . . . and can accommodate all sizes of safety padlocks and tagging devices.



25-kV Omni-Rupter with Enhanced Lockout-Tagout.



Pole-unit, blade, and contact construction detail, 14.4-kV pole-unit illustrated.

## Styles

S&C Omni-Rupter Switches are available in the Side-Break Integer Style which is pre-engineered and factory-assembled to eliminate the time-consuming adjustment ordinarily encountered in field erection of group-operated switches. Switches include designed-in lifting means for easy, secure handling during installation. Installation time is thus minimized—two through-bolts, lag screws, and a pole band are all that are required to ensure that the switch is securely mounted to the pole. All operating-mechanism components are included with the switch, as well as an easy-to-read erection drawing and instruction sheet providing the necessary procedures for proper installation.

Omni-Rupter Switches are available in voltages of 14.4 kV and 25 kV with a continuous current rating of 900 amperes. The momentary rating of these switches is 40,000 amperes and the 1-second and 3-second ratings are 25,000 amperes and 16,000 amperes, respectively. Omni-Rupter Switches are also assigned a two-time duty-cycle fault-closing capability of 20,000 amperes RMS asymmetrical (and a three-time duty-cycle fault-closing capability

of 15,000 amperes RMS asymmetrical). The duty-cycle fault-closing capability means Omni-Rupter Switches can be closed into a fault the specified number of times with the switch remaining operable and able to carry and interrupt rated continuous current.

Omni-Rupter Switches are offered in four mounting configurations including upright, vertical, tiered-outboard, and triangular to match the most popular overhead line configurations. Switches in the upright mounting configuration are also available with extra mounting pole clearance (increased spacing between the utility pole and the center phase). Upright, vertical, and tiered-outboard mounted switches are also available with the economical option of three-phase hookstick operation.

Omni-Rupter Switches are available in models with steel bases and insulated bases, with the exception of switches in the triangular mounting configuration which are only offered with steel bases. Models with both base types feature pole-units clamped to the base by means of galvanized steel U-bolts and backup members that also serve as dead-ending brackets.

### Three-Pole Side-Break Integer Style Omni-Rupter Switches

Rating					Mounting Configuration	Catalog Number			
kV			Amperes, RMS			Steel Base		Insulated Base	
Nom.	Max	BIL	Cont.	Mom.		Cyposy Insulators	Porcelain Station Post Insulators	Cyposy Insulators	Porcelain Station Post Insulators
14.4	17.0	110	900	40 000	Upright	147412	147412-SP	147432	147432-SP
					Upright▲	147422	147422-SP	147442	147442-SP
					Upright■★	147412-H	147412-HSP	147432-H	147432-HSP
					Upright■▲★	147422-H	147422-HSP	147442-H	147442-HSP
					Vertical	147512	147512-SP	147532	147532-SP
					Vertical■	147512-H	147512-HSP	147532-H	147532-HSP
					Triangular	147712	147712-SP	—	—
					Tiered Outboard	147812	147812-SP	147832	147832-SP
					Tiered Outboard■★	147812-H	147812-HSP	147832-H	147832-HSP
25	29	150	900	40 000	Upright	147413	147413-SP	147433	147433-SP
					Upright▲	147423	147423-SP	147443	147443-SP
					Upright■★	147413-H	147413-HSP	147433-H	147433-HSP
					Upright■▲★	147423-H	147423-HSP	147443-H	147443-HSP
					Vertical	147513	147513-SP	147533	147533-SP
					Vertical■	147513-H	147513-HSP	147533-H	147533-HSP
					Triangular	147713	147713-SP	—	—
					Tiered Outboard	147813	147813-SP	147833	147833-SP
					Tiered Outboard■★	147813-H	147813-HSP	147833-H	147833-HSP

▲ These switches provide extra spacing between the utility pole and the center phase. Refer to S&C Descriptive Bulletin 765-31 for additional details.

■ These switches are hookstick operated.

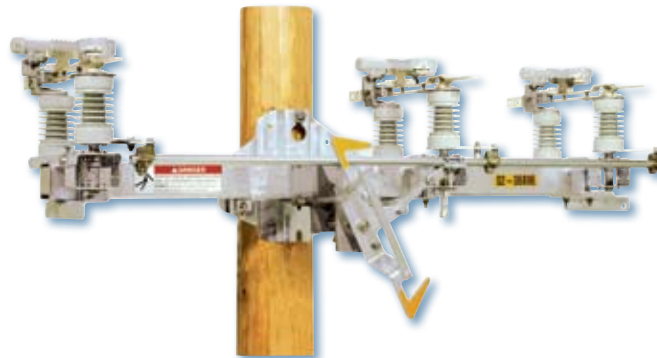
★ An enhanced hookstick-operated lockout/tagout device can be furnished by specifying “-H2” instead of “-H.” (See photo on page 6.)



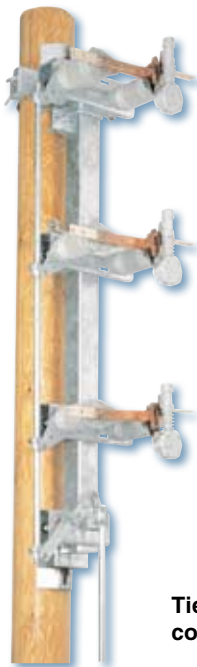


Maximum dead-end loading of 8000 pounds per conductor can be accommodated for both 14.4-kV and 25-kV steel-base switches where equal pull-off forces are applied to each side of the switch. Lower values apply for insulated-base switches and for dead-ending on just one side of the switch. Optional extension-link assemblies and surge arrester brackets are available for ready attachment to the switch. All manually operated Omni-Rupter Switches are capable of being opened and closed under  $\frac{3}{4}$ -inch ice formation. Switches in the horizontal and triangular mounting configurations inherently possess this capability. Switches in the vertical and tiered-outboard mounting configurations require the addition of optional ice shields to ensure  $\frac{3}{4}$ -inch ice-breaking capability.

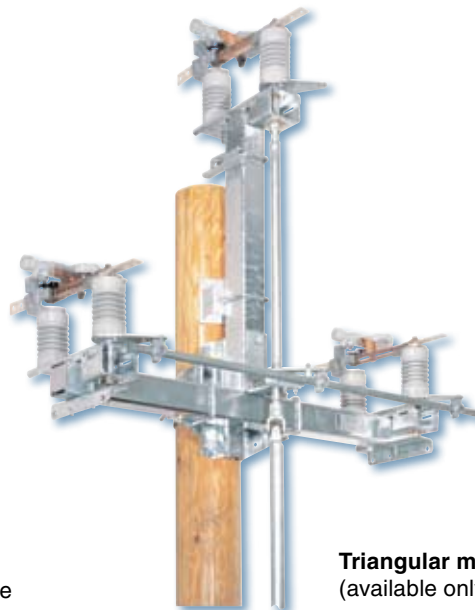
Omni-Rupter Switches are offered with a choice of Cypoxy or porcelain insulators. Cypoxy is S&C's uniquely formulated cycloaliphatic epoxy resin system especially tailored to provide the electrical and mechanical-strength characteristics detailed in industry standards for porcelain insulators, as well as unsurpassed performance in outdoor environments. Cypoxy Insulators are nontracking, self-scouring, nonweathering, and provide generous leakage distances. In addition, Cypoxy Insulators are lightweight—typically one-half the weight of comparable porcelain insulators—so switches equipped with Cypoxy Insulators are significantly lighter and even easier to handle during shipping and installation.



**Upright mounting configuration** with steel base and hookstick operability



**Tiered-outboard mounting configuration** with steel base



**Triangular mounting configuration** (available only with steel base)

**Three-Pole Side-Break Integer Styles, with Cypoxy Insulators; 14.4-kV ratings shown.**



## Mounting Arrangements

### Standard Mounting Arrangements for S&C Omni-Rupter Switches

S&C Omni-Rupter Switches for outdoor distribution are offered in Standard Mounting Arrangements to reduce lead times and cut users' engineering costs. S&C Data Bulletin 765-80, "S&C Omni-Rupter Switches, Outdoor Distribution—Selecting Standard Mounting Arrangements" illustrates 13 Standard Mounting Arrangements. Standard Mounting Arrangements offer many advantages, as discussed below.

### Erection Drawings Immediately Available

Each Standard Mounting Arrangement found in S&C Data Bulletin 765-80 is identified with an "ED" number; this number indicates the erection drawing corresponding to the mounting arrangement. Erection drawings are printed in legible, double-page, 11" × 17" format folded to 8½" × 11" for convenient

filing. They are available at no charge in as many copies as may be required; just ask the local S&C Sales Office for the ED numbers needed.

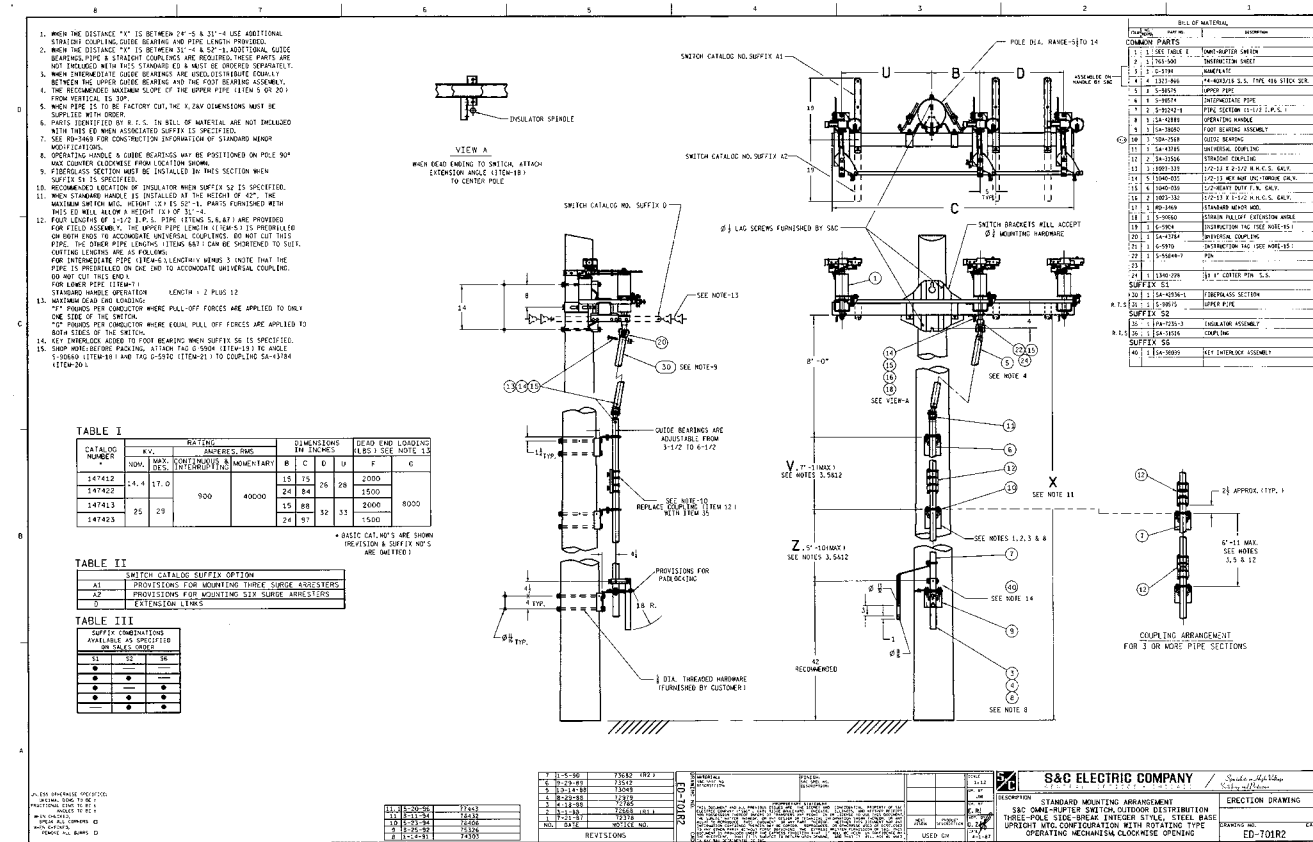
Each erection drawing is complete with detailed installation data, including an outline drawing of the mounting arrangement, switch details, operating-mechanism-component details, a bill of material, installation notes and illustrations, and recommended clearances.

### No Design Delays; No Ordering Delays

Switches can be ordered immediately, and the user can complete the line layout, plus actual design work, from erection drawings that are immediately available. No other drawings are required from S&C to adapt the switches to the majority of applications.

### Reduced Shipping Time

Shipping time is greatly reduced because there is no delay for customized engineering, customer approval, or time-consuming fabrication of special parts.



## Stocking Switches for Immediate Use

Standard Mounting Arrangements make it possible for the user to buy and warehouse a quantity of Omni-Rupter Switches with operating mechanisms for the preferred arrangements. Thus, at any time, a switch may be withdrawn from stock and installed without delay.

## What a Standard Mounting Arrangement Includes

When a Standard Mounting Arrangement is specified, the shipment will include:

- Three-pole switch, complete with interphase rod, factory-assembled on a single base.
- Dead-ending brackets for each switch pole.
- The appropriate detailed erection drawing.
- Complete installation instructions.
- Removable lifting means for switches in the upright and vertical mounting configurations, shipped in place, for convenient rigging and hoisting during installation. Switches in the tiered-outboard and triangular mounting configurations include designed-in lifting means.

In addition, the following items will be provided depending upon the style of operating mechanism:

### **For hookstick-operated switches (ED-700, ED-706, ED-707, ED-710, ED-716, and ED-717):**

- A crossarm mounted pull-pull type manual operating handle, a retention mechanism to hold the switch in the open position and provisions for the switch to be locked/tagged out in the open position. Although these items will be assembled to the switch and adjusted for proper operation at the factory, some minor disassembly is required for shipping purposes. However, no adjustments should be necessary following reassembly in the field.

### **For vertical-operating-shaft switches (all other EDs):**

- Four sections of 6'–10" vertical operating pipe as specified on the erection drawing for the applicable Standard Mounting Arrangement.
- The appropriate set of operating-mechanism components for the vertical operating pipe; e.g., handle, rod guides or guide bearings, and couplings.

## Standard Minor Modifications

Standard Minor Modifications are departures from Standard Mounting Arrangements which are so frequently encountered that they are included on S&C's basic erection drawings. The desired modifications may be specified by adding the appropriate suffixes to the Standard Mounting Arrangement ED number for Omni-Rupter Switches with vertical operating shafts.

- S1 One 2 $\frac{5}{8}$ " diameter tubular fiberglass insulating section in vertical operating shaft (rotating-type operating mechanisms).
- S2 One Cypoxy Insulator unit in vertical operating shaft (specify rotating- or reciprocating-type operating mechanism).
- S6 Key interlock—single lock for "locked-open" application.
- S10 One 1" diameter fiberglass insulating section in vertical operating shaft (reciprocating-type operating mechanisms).★
- S15 Heavy-duty vertical operating shafts—1 $\frac{1}{4}$ " IPS pipe in lieu of  $\frac{3}{4}$ " IPS pipe (reciprocating-type operating mechanisms).

For additional information concerning the application, installation, or operation of Omni-Rupter Switches, consult your nearest S&C Sales Office.

## Accessories

The following accessories can be specified by adding the appropriate suffix to the switch's catalog number.

- A1 Mounting provisions for three surge arresters per switch (applicable for upright, tiered-outboard, and triangular mounting configurations).
- A2 Mounting provisions for six surge arresters per switch (applicable for upright, tiered-outboard, and triangular mounting configurations).
- B Ice shields (applicable for vertical and tiered-outboard mounting configurations).
- C Harsh environment contacts. Greaseless graphite-impregnated contacts for application in high-contamination areas.
- D Extension-link assembly (one set of six, applicable for upright, tiered-outboard, and triangular mounting configurations).
- W Wildlife protection. Helps reduce wildlife related nuisance outages. Made from high-strength, UV-resistant materials. (Upright only.)

★ Not available for switches supplied with heavy-duty vertical operating shafts.



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