



VACUFUSE® II SELF-RESETTING INTERRUPTER

Fault-testing at the grid edge eliminates nuisance outages, saving truck-roll costs and improving customer satisfaction

Overview

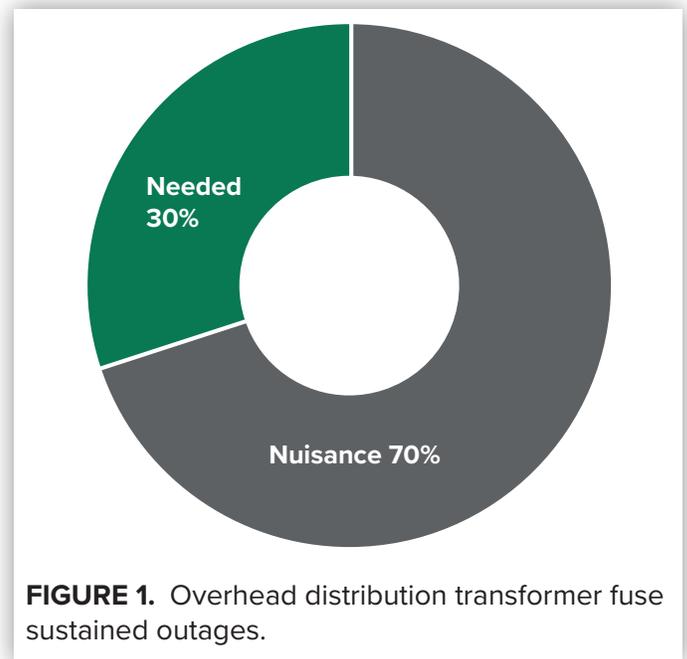
Improve customer satisfaction

As storms become more severe and as more and more people work from home, outages at the edge of the grid are having a greater impact than ever. Often, the cause is a blown fuse above an overhead distribution transformer that can occur regardless of whether the fault was temporary or permanent.

Issues at the edge of the grid tend to cluster into pockets, and these troublesome areas often remain undetected when averaging interruption metrics, such as with SAIDI (System Average Interruption Duration Index) and SAIFI (System Average Interruption Frequency Index), across the system. Yet, these hotspots are clear when using consumer-centric metrics, such as CEMI (Customers Experiencing Multiple Interruptions).

Repeated disruptions impact customer satisfaction and increase maintenance costs from unnecessary truck rolls. In fact, industry sources reveal that 70%

of overhead distribution transformer fuse operations are classified as nuisance outages, where no other repair work is needed. See **Figure 1**.



Lateral protection—even at the edge of the grid

The VacuFuse II Self-Resetting Interrupter brings fault-testing technology all the way to the grid edge. As a result, it boosts grid-edge reliability, prevents unnecessary sustained outages, and subsequently lowers maintenance expenses.

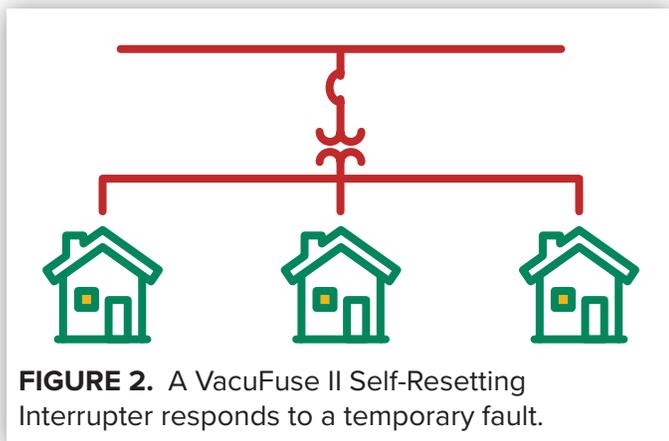
This depth of lateral protection not only optimizes system performance, but also crews' time by eliminating the cost of sending teams to work on avoidable or nuisance repairs. And because the device is designed for easy deployment, installation takes only minutes when using existing S&C cutout mountings.

Application

How it Works

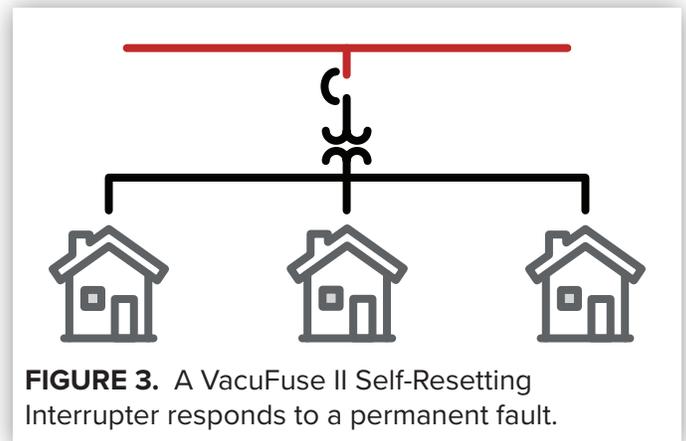
VacuFuse II Self-Resetting Interrupters solve the nuisance outages that occur on overhead distribution transformers. As a single-phase, self-resetting interrupter intended for use on single-phase overhead distribution transformers on 15-kV class systems (transformer primary voltages of 7.2 kV–9.0 kV), it replaces fuses in these locations. When the self-resetting interrupter detects a fault, its vacuum interrupter will open to interrupt the fault current.

If the fault is temporary, the self-resetting interrupter will restore power. See **Figure 2**.



This saves temporary faults from becoming permanent outages and eliminates the maintenance costs otherwise associated with re-fusing and restoration.

If the fault is permanent, the self-resetting interrupter will interrupt the fault current, wait 45 seconds, reclose, and then interrupt the fault current and deenergize the transformer. See **Figure 3**.



Like a standard fuse or the TripSaver® II Cutout Mounted recloser, the VacuFuse II Self-Resetting Interrupter drops open on permanent outages. After the line crew has cleared the fault, the self-resetting interrupter can be closed back into the cutout mounting, restoring power to the transformer after 45 seconds.

This self-resetting interrupter comes factory-configured with a user-designated time-current characteristic (TCC) curve.

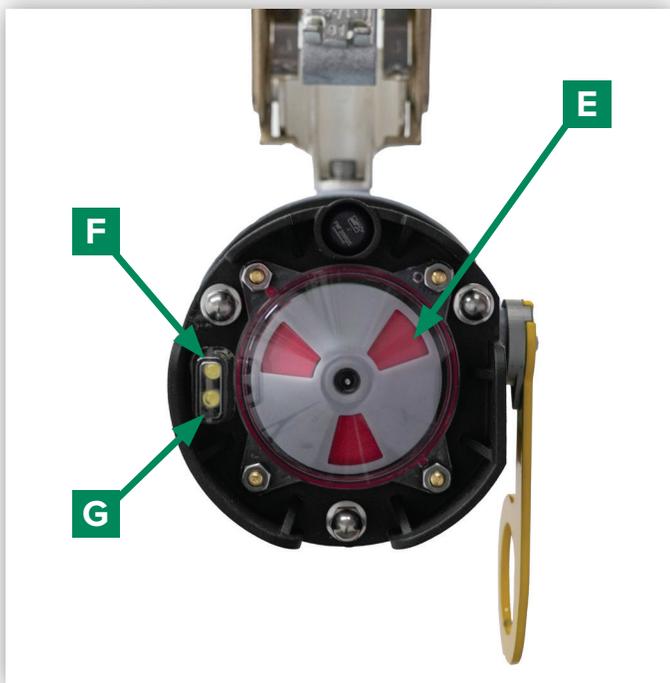
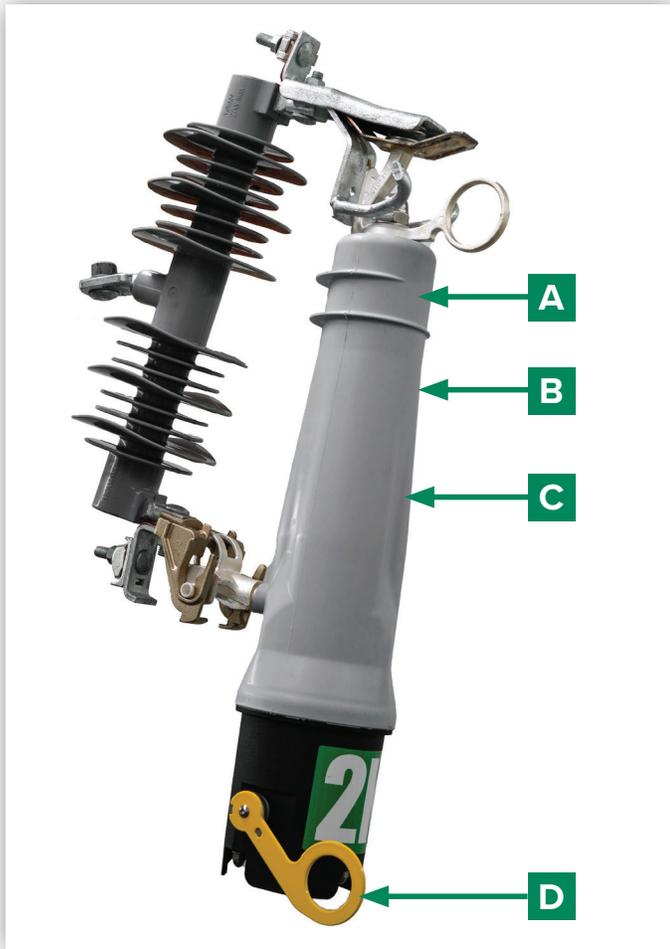
Utilities can choose from any of the following TCC curves: K, KS, T, TXP, ST, QR, NK, or DE speeds.

If a company's operating procedures allow for selecting a new TCC curve, consider selecting the TXP Speed curves, which hug the transformer damage curve, keeping the transformer protected and further reducing nuisance tripping compared to fuse-emulation curves.

A VacuFuse II Self-Resetting Interrupter can easily be placed above single-phase overhead distribution transformers up to 167 kVA on 15-kV class systems, and can be mounted in either a 15-kV or 25-kV class cutout mounting.

VACUFUSE® II SELF-RESETTING INTERRUPTER

Construction



- A** Silicone overmolded enclosure—A weather-resistant enclosure houses the vacuum interrupter.
- B** Vacuum interrupter—Located in the upper insulator, it quietly contains and interrupts the fault without exhaust or sparking.
- C** Hand grip—The body shape and material allow easy handling and installation.
- D** Manual operating lever—This lever allows manual closing (with sufficient voltage present) and manual opening of the vacuum interrupter. When the lever is moved to the **Down** position, the vacuum interrupter will open immediately. Moving the lever to the **Up** position closes the vacuum interrupter only after the unit has achieved full charge, as indicated by the solid white **READY TO CLOSE** LED at the bottom of the unit. The manual operating lever features a ring that can be used to apply tags. **Note:** When the VacuFuse II Self-Resetting Interrupter trips, the lever does not move. The lever only indicates the last manual operation, not the **Open** or **Closed** state of the vacuum interrupter.
- E** Position indicator—This indicates the position of vacuum interrupter, with a red color signaling closed and a green color signaling open. **Note:** Refer only to the **Position** indicator, not to the manual operating lever, for vacuum interrupter status.
- F** **CHARGING** LED—When powered and the vacuum interrupter is open, this white LED will flash at one-second intervals to indicate the device is charging. Charging time is 45 ± 10 seconds. When performing an automatic delayed close, the **CHARGING** LED will continue flashing while the **READY TO CLOSE** LED is illuminated. When the device is not powered or when the vacuum interrupter is closed, this LED will not flash.
- G** **READY TO CLOSE** LED—This white LED will remain lit when the unit has achieved full charge and is ready to close the vacuum interrupter.

Options

TCC Curves

VacuFuse II interrupters come ready to install, streamlining the commissioning process and lessening the amount of training for line crews. Eight TCC speed families are available, all of which are optimized for transformer protection. The K, KS, T, ST, QR, NK, and DE speed fuse emulations have definite times at high current for single-cycle clearing of high-magnitude faults. S&C's TXP speed curve has these definite time elements while hugging the transformer damage curve at lower currents—providing maximum protection against nuisance tripping.

Non-Fault-Testing Models

In addition to fault-testing models, VacuFuse II interrupters are also available without fault-

testing. Non-fault-testing (single-shot) VacuFuse II interrupters have an **Open-Dropout** operating sequence and are well-suited for transformer protection applications where reclosing is not desirable.

Multi-Pack Packaging

Large orders of VacuFuse II interrupters can be shipped palletized in multi-pack boxes to enable easier bulk handling, a reduction in packaging materials, and outdoor storage. Single-pack packaging is also available for individual handling and is for indoor storage only.

Reverse-Color Position Indicator

For customers in regions that use red to signify an **Open** position and green to signify a **Closed** position.

Ratings

Cutout Mounting Size, kV	Phase-to-Neutral Voltage Rating, kV	BIL, kV ¹	Amperes Cont., RMS ²	Amperes Interr., Sym
15	7.2–9.0	110	20	6 300
25	7.2–9.0	150	20	6 300

TABLE 1. Complete VacuFuse II Self-Resetting Interrupter—for a new installation; includes VacuFuse II interrupter, cutout mounting (less mounting bracket), and connectors

- 1 BIL is achieved with the VacuFuse II interrupter dropped open.
- 2 Available in 2–20 ampere models, with minimum trip currents from 4 to 40 amperes.

Cutout Mounting Size, kV	Phase-to-Neutral Voltage Rating, kV	BIL, kV ¹	Amperes Cont., RMS ²	Amperes Interr., Sym
15	7.2–9.0	110	20	6 300
25	7.2–9.0	125/150	20	6 300

TABLE 2. VacuFuse II Self-Resetting Interrupter Only—for retrofit in an existing present-production (“-R10” or “-R11”) S&C-only cutout mounting

- 1 BIL is achieved with the VacuFuse II interrupter dropped open, and is dependent on the cutout mounting into which the interrupter is installed.
- 2 Available in 2–20 ampere models, with minimum trip currents from 4 to 40 amperes.

VACUFUSE® II SELF-RESETTING INTERRUPTER

TXP Speed	“K” Speed	“T” Speed	“KS” Speed	“ST” Speed ¹	“QR” Speed ²	“NK” Speed ³	“DE” Speed ⁴
2TXP	2K	2T	2KS	2ST	2QR	2NK	2DE
3TXP	3K	3T	3KS	3ST	3QR	3NK	3DE
--	--	--	--	--	--	--	4DE
5TXP	5K	5T	5KS	5ST	5QR	5NK	5DE
6TXP	6K	6T	--	--	--	--	--
7TXP	--	--	7KS	7ST	7QR	--	7DE
8TXP	8K	8T	--	--	8QR	8NK	--
10TXP	10K	10T	10KS	10ST	10QR	10NK	10DE
12TXP	12K	12T	--	--	--	--	--
15TXP	15K	15T	15KS	15ST	15QR	15NK	15DE
20TXP	20K	20T	20KS	20ST	20QR	20NK	20DE

TABLE 3. Available Ampere Ratings and TCC Curves⁵

- 1 ST TCC curves emulate S&C Standard speed Positrol® Fuse Links with definite time elements.
- 2 QR TCC curves emulate S&C QR speed Positrol Fuse Links with definite time elements.
- 3 NK TCC curves emulate Cooper Power™ series Kearney™ N-Speed (Type 200™) Fuse Links, manufactured by the Eaton Corporation, with definite time elements.
- 4 DE TCC curves emulate Cooper Power™ series Edison™ D-Speed Fuse Links, manufactured by the Eaton Corporation, with definite time elements.
- 5 K, T, KS, ST, QR, NK, and DE Speed curves for VacuFuse II interrupters are fuse emulations with definite time elements at high current. See Information Bulletin 466-211 and TCC Number 466-7 for complete TCC information.



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