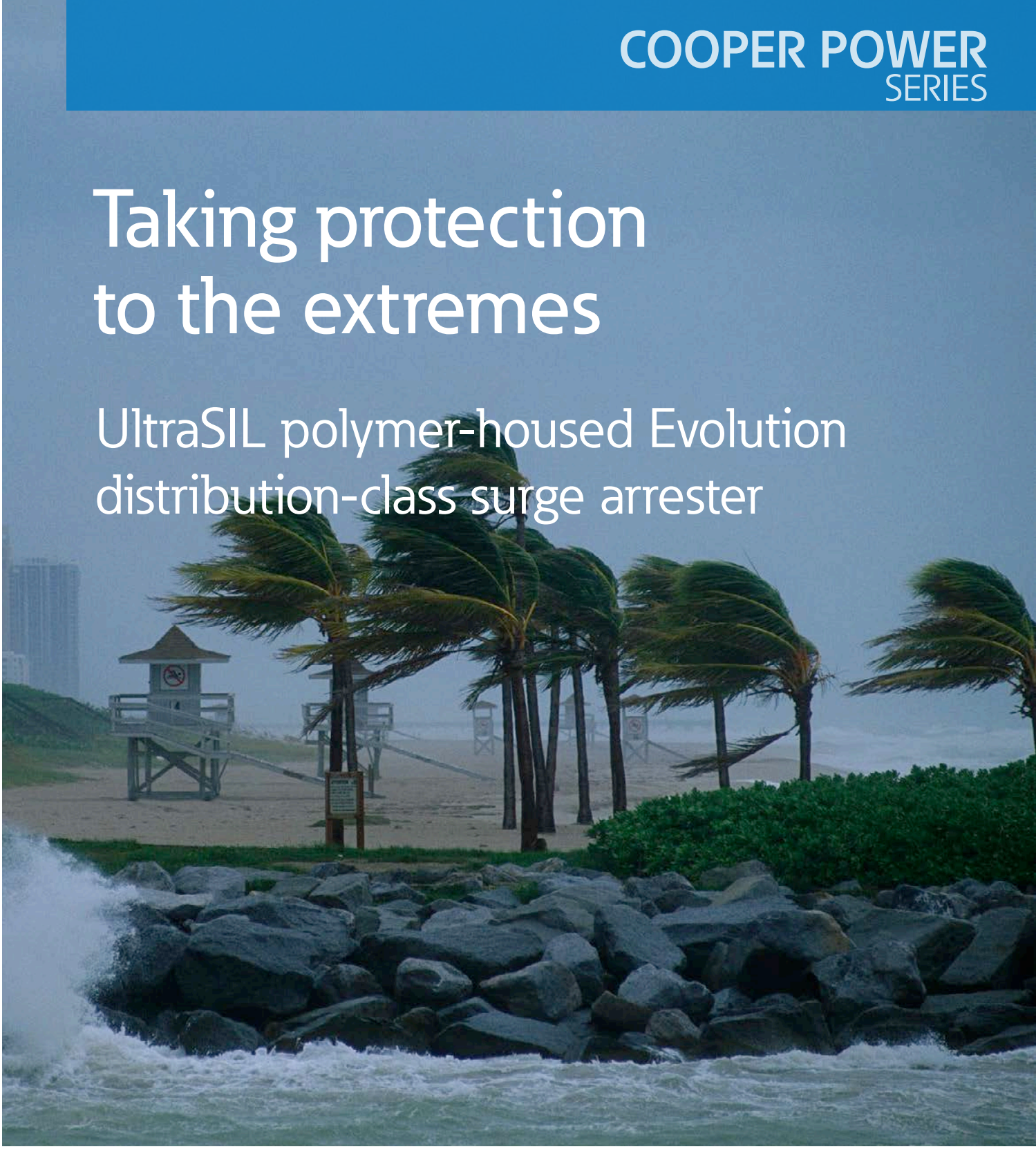
COOPER POWER SERIES

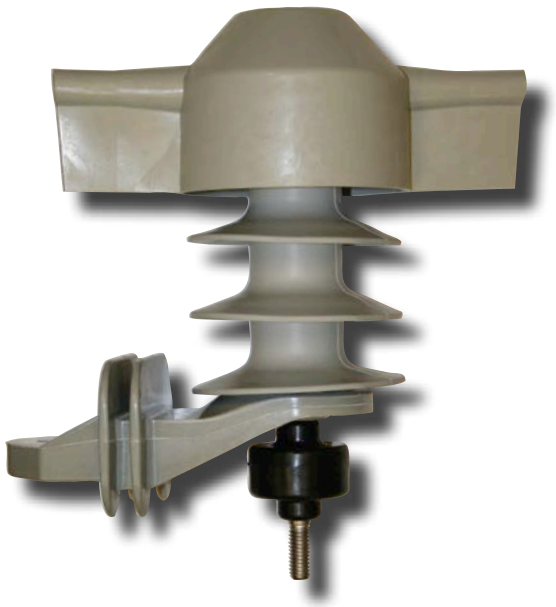
Taking protection to the extremes

UltraSIL polymer-housed Evolution distribution-class surge arrester



EATON

Powering Business Worldwide



Evolution surge arrester

Engineered to survive the elements and protect system assets, Eaton's Cooper Power™ series UltraSIL™ polymer-housed Evolution™ distribution-class surge arrester is designed and engineered to provide utilities with proven reliability and field-tested construction.

Environmental stewardship

Utilities are facing increased pressure to lower their carbon dioxide emissions. The Evolution surge arrester offers the opportunity to lower carbon dioxide emissions while enabling them to demonstrate their environmental stewardship.

Wide-ranging benefits

Whether the goal is enhanced asset protection, reduced equipment failures or improved supply chain management, the Evolution surge arrester meets customers' needs.

Superior performance

Eaton has taken a quantum leap in surge arrester technology with the introduction of the Evolution surge arrester, offering a superior level of performance with revolutionary insulating materials capable of withstanding extreme electrical and environmental conditions.

The Evolution surge arrester from Eaton—that's the extreme advantage.

Environmental stewardship: One small, cost-effective, modern, energy-efficient design.

Many experts agree that carbon dioxide (CO_2) emissions are at their highest levels in recorded history. Since these emissions result primarily from the combustion of fossil fuels, the electric power industry has become a target of these concerns. Utilities face increasingly strong pressure to lower their CO_2 emissions; therefore, their mission is changing to accommodate use of products and services that result in significantly lower energy use.

Eaton's Cooper Power series Evolution surge arrester presents utilities with the opportunity to significantly lower their CO_2 emissions and demonstrate an increased commitment to environmental stewardship.

Here's how:

For a standard 10 kV arrester, average watts loss = 500 mW
Evolution surge arrester, maximum watts loss = 20 mW
Loss avoidance per arrester = 480 mW.

Environmental stewardship is driving demand for energy-efficient technologies.

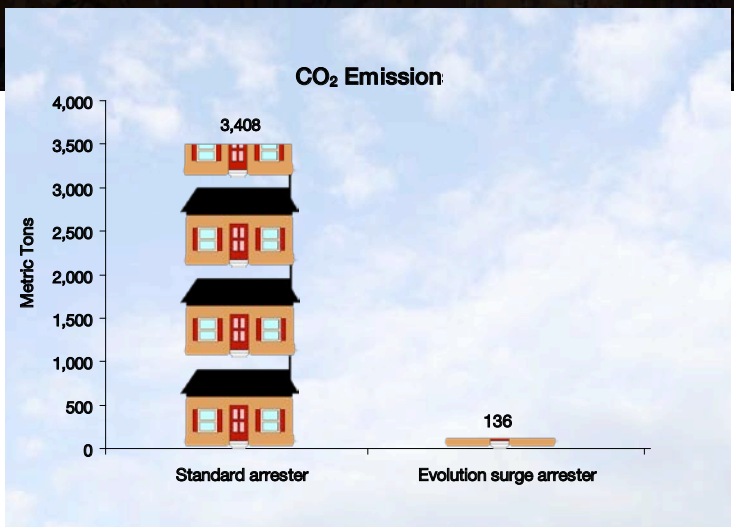
An example:

Some large investor-owned utilities estimate that their distribution class arrester installed base exceeds one million arresters. For a system of that size, energized 24 hours a day, protected by standard arresters, inefficiencies would represent 4,380,000 kWh of unbilled energy, generating 3,408* metric tons of CO_2 emissions annually. Evolution surge arresters used in the same application would generate only 136 metric tons of CO_2 emissions annually.

In this example, the utility company could avoid emitting 3,271 metric tons of CO_2 into the atmosphere annually.

Eaton is taking steps towards impacting the climate one arrester at a time.

*EPA Emissions Green Power Equivalency Calculator 7.78 X 10^{-4} metric tons CO_2/kWh



As a point of reference, in 2001 electricity consumed by a single-family home generated 7.55 metric tons of CO_2 annually. On large investor-owned utility systems, annual reductions in emissions can be realized at levels indicated in the chart above.

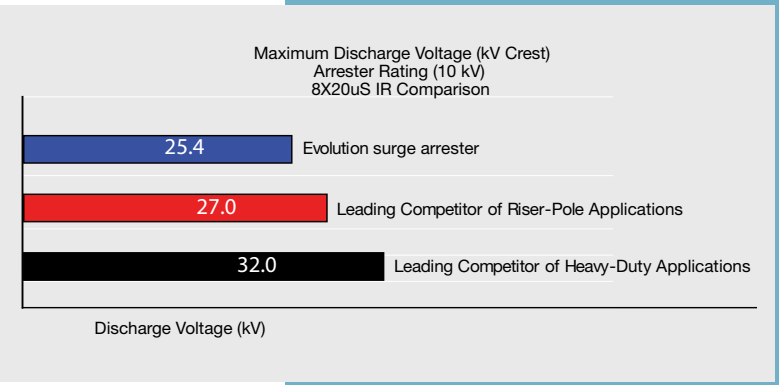
Eaton is a world-class arrester manufacturer, utilizing the highest technology available to design innovative products that provide enhanced reliability. The company remains committed to delivering products that provide end-user value, while providing efficient and reliable system operation.

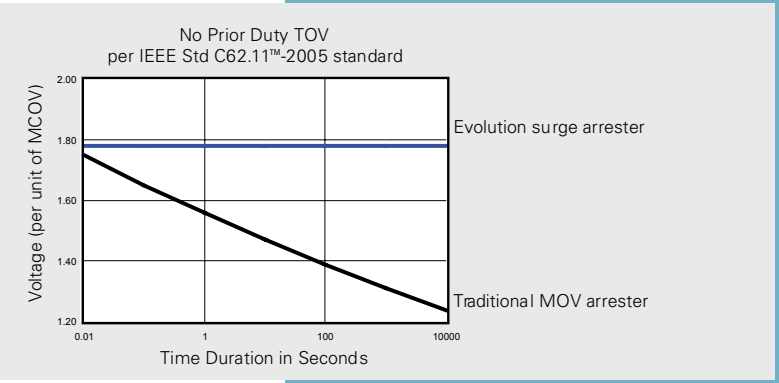
Wide-ranging benefits

When protection is your priority, the Evolution surge arrester provides benefits critical to your operation.

Reliability

Insulation impulse withstand, loadability, maintenance, diagnostics, and fire protection are critical when specifying transformers for data center applications.





The Evolution surge arrester provides better protection than traditional heavy-duty or riser-pole arresters.

The surge arrester leads the way in reducing equipment failure rates by vastly improving discharge voltages which reduces the total voltage impressed upon the equipment. It has lower discharge voltages as compared to traditional heavy-duty and riser-pole arresters, as shown, eliminating the need for specialty ratings and multiple arrester types for each application.

The surge arrester offers substantial improvements in temporary overvoltage performance when compared to conventional MOV (metal oxide varistor) designs. Competitive comparisons of TOV (temporary overvoltage) withstand curves are provided in the "No Prior Duty" curve shown above. Standard MOV arresters are unable to tolerate voltages above the MOV turn-on voltage for long periods of time. In contrast, the Evolution surge arrester is capable of withstanding overvoltage conditions caused by line-to-ground faults for as long as fault conditions exist. Extending the Evolution surge arrester's performance during 60 Hz overvoltage conditions also reduces system maintenance and helps improve system reliability.

The Evolution surge arrester provides a non-decaying TOV (temporary overvoltage) curve with overvoltage protection far superior to standard MOV arresters.

Improvements in equipment protection and supply chain management

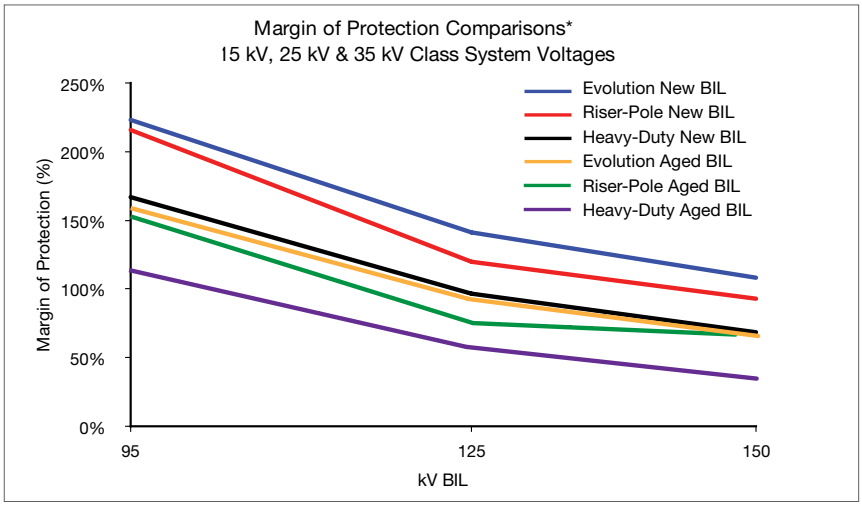
The Evolution surge arrester's margin of protection exceeds protective levels offered by standard MOV arresters.

The IEEE Std C62.22™ standard recommends at least a 15–20% margin of protection for equipment insulation. Industry experts may require as much as 50% or more based on the importance, age, and cost of the equipment being protected. The Evolution surge arrester exceeds protective levels offered by standard MOV arresters, including riser-pole arresters. In addition it helps compensate for two variables related to installation practices and equipment protection:

- Excessive lead length
- Aged equipment insulation

The Evolution surge arrester is an effective insurance policy against premature equipment failure.

The Evolution surge arrester meets the need for better discharge voltages and improved margins of protection. It will provide better protection than traditional heavy-duty and riser-pole arresters. Customers currently using a heavy-duty and/or riser-pole arrester can now standardize with one—the Evolution surge arrester. Customers will benefit from inventory reduction and supply chain improvements. Line crews will be delighted.



***Parameters for MOP Calculations:**

System

System Voltages: 15 kV, 25 kV & 35 kV

Transformer

New Transformer BIL: 95 kV, 125 kV & 150 kV
Aged Transformer BIL: 76 kV, 100 kV & 120 kV
Considerations for Aged BIL: 10 years of service with 20% reduction of BIL

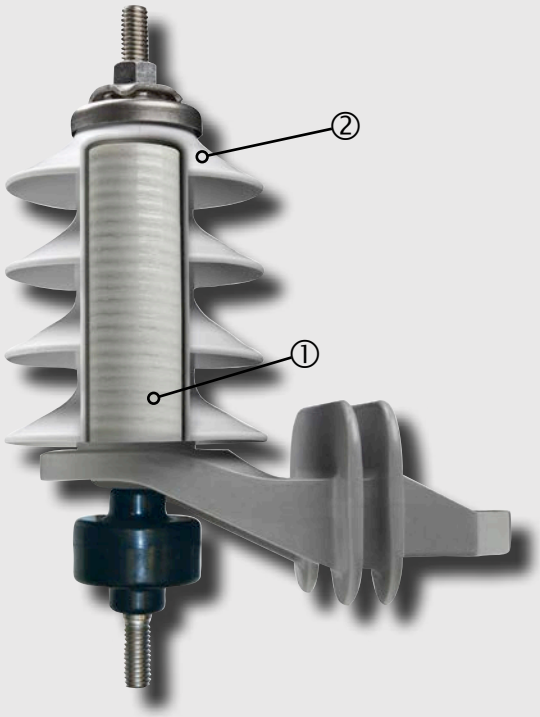
Arrester

Arrester Ratings: 10 kV, 18 kV & 27 kV
Cross-Arm Installation: 8' of lead length
Inductive Voltage Drop Across Lead Length = 4 kV

The Evolution surge arrester eliminates the need for specialty ratings and multiple arrester types for various applications.

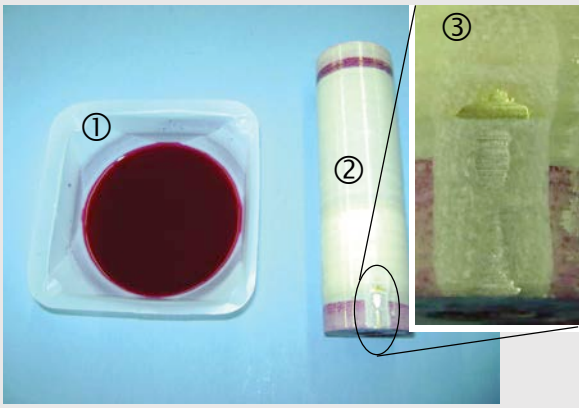
Find out how you can customize your distribution system by visiting **Eaton.com/cooperpowerseries**

Superior performance



1. Eaton's composite matrix material provides superior performance and structural integrity.

2. 100% silicone rubber material provides excellent protection against water, extreme heat and cold.



1. Fuchsin dye
2. Composite matrix material
3. Magnified cross-section

Dependable by design

Composite matrix

Eaton's manufacturing process utilizes a high-strength composite matrix to encapsulate the arrester's internal components and provide structural strength. In addition to strength, moisture impermeability is a unique characteristic of Eaton's composite matrix material.

100% silicone rubber material

Another proven characteristic of the Evolution surge arrester is its use of the industry-preferred silicone rubber material. Independent laboratories have verified the superiority of 100% silicone rubber for its resistance to UV degradation, contaminated environments, and temperature stability (+200 °C to –70 °C). Years of field experience demonstrate that silicone rubber will remain hydrophobic in all types of environments, a feature not found in all polymeric materials.

Water immersion test

Eaton performed the Water Immersion portion of the Moisture Ingress Test (IEEE Std C62.11™-2005 standard) on the Evolution surge arrester with the silicone rubber housing material removed. The composite-matrix-wrapped module passed all verification tests and results of the testing are outlined in test report 5A1-316-16.

This test is above and beyond what the IEEE® standard requires for testing of medium-voltage arresters.

The combination of the composite matrix and silicone rubber materials provide the Evolution surge arrester with primary and secondary moisture seals to ensure a long, reliable life.

Dye penetration test

Eaton performed further material integrity testing in the form of submerging a composite-matrix-wrapped module assembly in Fuchsin dye. Fuchsin dye has extremely low surface tension, which makes it ideal for identifying hair-line cracks invisible to the naked eye. This test involved submerging an end of a composite-wrapped module in a tray of Fuchsin dye for a 24-hour test cycle. (See photo to the left.) After completion of the test, the composite-wrapped module assembly was removed from the Fuchsin dye, allowed to dry, and the submerged portion of the module assembly was sanded. A magnified cross-section showing the sanded portion of the module assembly proves Fuchsin dye was unable to penetrate the high-strength composite matrix material.

Benefits

Protection, safety, performance, and environmental issues: solutions designed for the extreme advantage.

Utilities that standardize on the Evolution surge arrester are positioned to:

- Reduce equipment failure rates
- Simplify the procurement process
- Better match supply with demand
- Provide line crews with the right arrester at the right time
- Reduce CO_2 emissions
- Demonstrate environmental stewardship
- Experience a long, reliable life-cycle of the arrester

Find out how you can customize your distribution system by visiting **Eaton.com/cooperpowerseries**

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
United States
Eaton.com/cooperpowerseries

Printed in USA
Publication No. BR235001EN / Z20828
Supersedes B235-08033
April 2018

Follow us on social media to get the latest product and support information.