

Eaton vacuum interruption  
(EVI) technology



**Proven vacuum interruption technology**  
Environmentally focused circuit protection for global innovation

**EATON**

*Powering Business Worldwide*



An Eaton Green Solution



# Innovation and global reach

At Eaton, we're committed to delivering the right solution for the application. That's why the industry turns to us for an unwavering commitment to personal support that makes customer service a top priority. With global reach to more than 150 countries, we ensure that you have the products and support you need, where and when you need them.

Eaton's Electrical Sector is a leading provider of solutions that offer a growing portfolio of green products and services, such as energy audits and real-time energy consumption and monitoring.

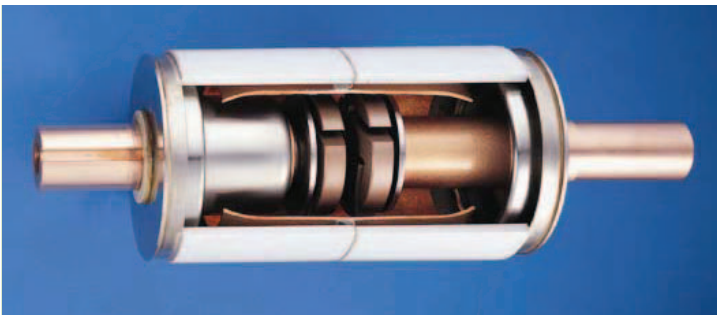
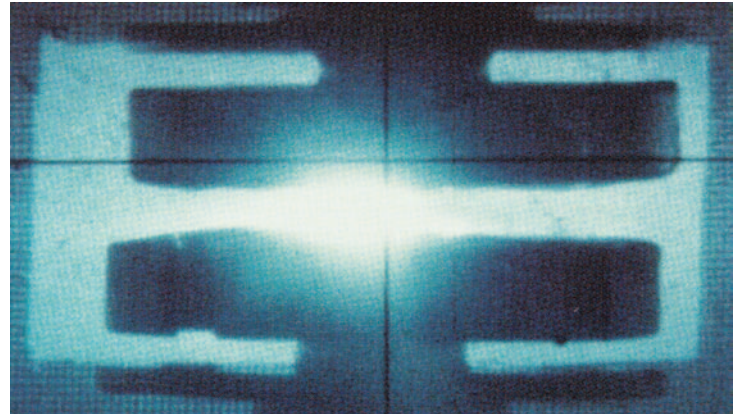
To ensure that Eaton vacuum interrupters meet or exceed IEEE® UL®/CSA® IEC and GB/DL standards, we manufacture our vacuum interrupters in ISO®-9001- and ISO-14001-certified facilities under strict quality procedures.



# Vacuum interruption technology

Eaton's vacuum interruption technology is used for repetitive switching, motor inrush current interruption, fault protection, and overcurrent and short-circuit protection. Eaton's environmentally friendly medium voltage interrupters are capable of reliably switching high-stress currents robustly and carrying their rated continuous current without forced cooling.

- Controlled contact erosion results in long life and maintenance-free operation
- Hard contact material minimizes contact sticking in a vacuum and is ideal for high-current applications
- Atmospheric contact contamination is eliminated because oxides and corrosion layers cannot form on the contacts
- Noise and flash free: All arcing is confined in the vacuum interrupter
- Environmentally friendly: Unlike other solutions that use SF<sub>6</sub> (a highly hazardous gas) for insulation, Eaton's vacuum interrupters feature current interruption that occurs in a vacuum and does not emit greenhouse or toxic gasses
- Low average chopping current results in a minimal induced transient voltage spike; therefore, suppressors are often not required
- Vacuum dielectric permits contacts to be arranged closer together, allowing circuit interruptions to be designed in a smaller envelope
- Solid insulation increases external dielectric performance



Internal view of a vacuum interrupter

## The industry standard in quality

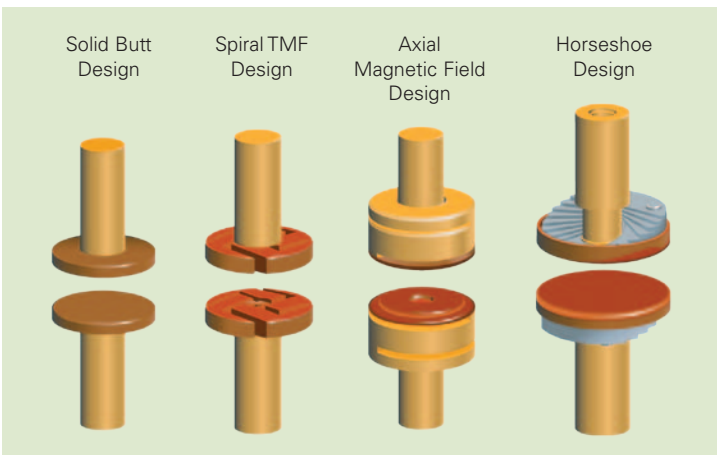
- Each Eaton vacuum interrupter is tested throughout the manufacturing process and once again before packaging
- A dielectric withstand test and a vacuum assurance test are performed on every interrupter
- Additionally, Eaton also incorporates a sequential bar code that allows us to track material lots, as well as the operators involved with building each interrupter in a database
- With well over three million Eaton vacuum interrupters in service around the world, our customers testify that our vacuum interrupters are one of the most critical and reliable components

## State-of-the-art testing

Using our two high-power test labs, a single-phase development lab in the United States and a three-phase KEMA®-certified lab in Europe, Eaton systematically tests new designs before certification by the customer.

A team of scientists and design engineers creates our vacuum interrupters to meet customer specifications, many of which push the limits of industry standards. Some distinguishing features include:

- Solid dielectric encapsulation
- Customer-specific terminal designs
- Features for ease of assembly
- Custom internal and external threads
- Anti-twist bushings
- Custom contact design: butt contacts, transverse magnetic field (TMF) contacts, axial magnetic field (AMF) contacts of the coil and horseshoe styles



Contact types used in vacuum interrupters

# Product offering



## Circuit breaker/recloser vacuum interrupters

- Rated line-to-line voltages (50/60 Hz) 4.76–40.5 kV
- Rated short-circuit current (symmetrical) 6–80 kA
- Rated continuous current 630–4000A
- Offerings to meet IEEE/ANSI, IEC and GB/DL standards
- Solid insulation for increased external dielectric performance



## Contactor vacuum interrupters

- Rated line-to-line voltages (50/60 Hz) 1.5–15 kV
- Rated short-circuit current (symmetrical) 1.5–12 kA
- Rated continuous current 150–1400A
- Offerings to meet IEEE/ANSI, IEC and GB/DL standards



## Load break switch vacuum interrupters

- Rated line-to-line voltages (50/60 Hz) 4.76–38 kV
- Rated short-circuit breaking current 2 kA
- Rated continuous current 200–1250A
- Offerings to meet IEEE/ANSI, IEC and GB/DL standards
- Solid insulation for increased external dielectric performance

### Eaton Vacuum Interrupter Sizes Available: from 25 mm to 182 mm in diameter

Description	Units	Tap Changer	Contactor	Load Break Switch	Circuit Breaker	Recloser	Generator Breaker
<b>Voltage Ratings at Rated Contact Stroke</b>							
Rated maximum line-to-line AC voltage (50/60 Hz)	Kilovolts	1.5–4	1.5–15	4.76–38	4.76–40.5	12–38	12–15
Rated continuous current	Amperes	450–630	150–1400	200–1250	630–4000	200–1250	2000–4000
Rated breaking current (symmetrical)	Kiloamps	1.25–2.5	1.5–12	0–2	12.5–80	4–25	50–75

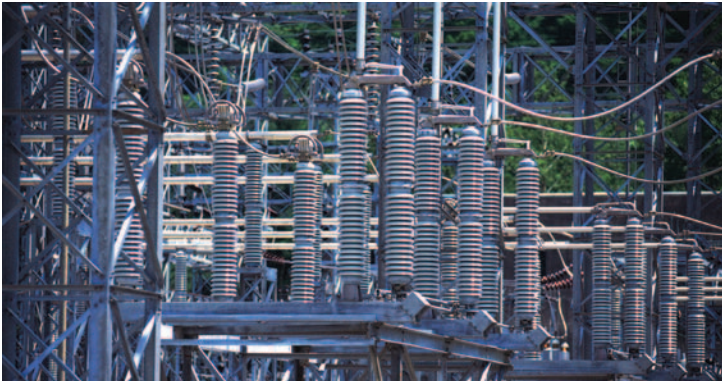
**Note:** Refer to vacuum interrupter technical document for further details at [www.eaton.com/vi](http://www.eaton.com/vi).

# Major vacuum interrupter applications



## Circuit breakers

Eaton vacuum interrupters are used in circuit breakers in the most demanding electrical circuit protection applications to minimize damage caused by electrical overloads or short circuits.



## Load break switches

Eaton vacuum interrupters are used in load break switches to connect and disconnect electrical load currents providing limited load switch capacity.



## Reclosers

Eaton vacuum interrupters are used in reclosers to automatically open and close distribution circuits in response to transient overload and fault conditions.



## Contactors

Eaton vacuum interrupters are used in contactors in demanding applications that require a high number of operations switching a power circuit in electric motors, lighting and heating devices, capacitor banks, and the like.



## Tap changers

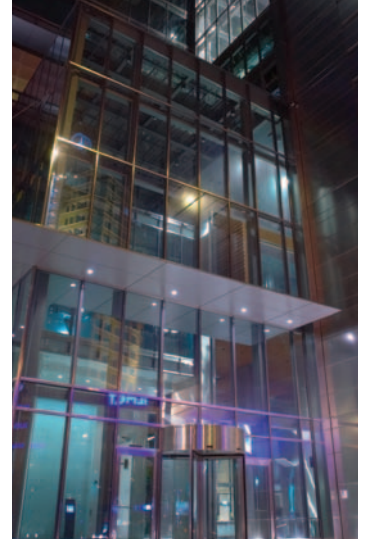
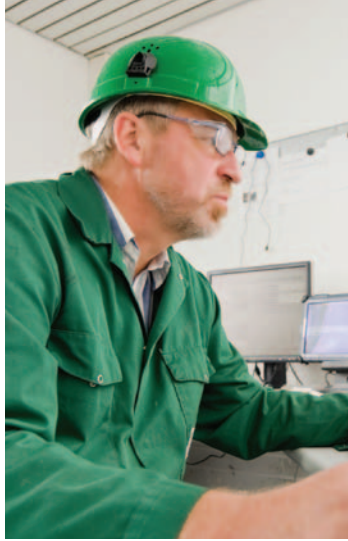
Eaton vacuum interrupters are used in tap changers inside transformers to change the winding connections to deliver the required voltage.



## Railway circuit breakers

Eaton vacuum interrupters are installed in the circuit breakers on top of this special locomotive to supply electrical energy to railway locomotives' electric drive motors.

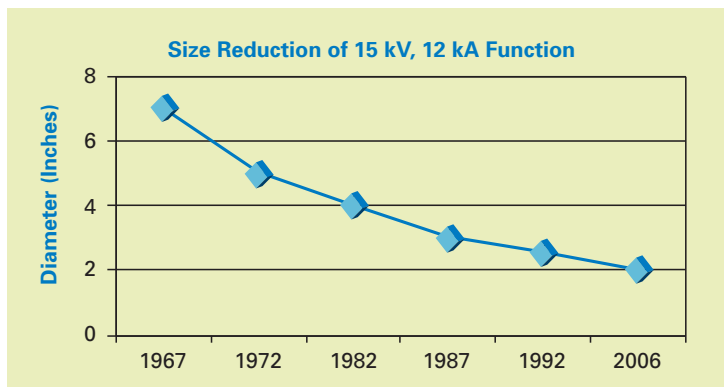




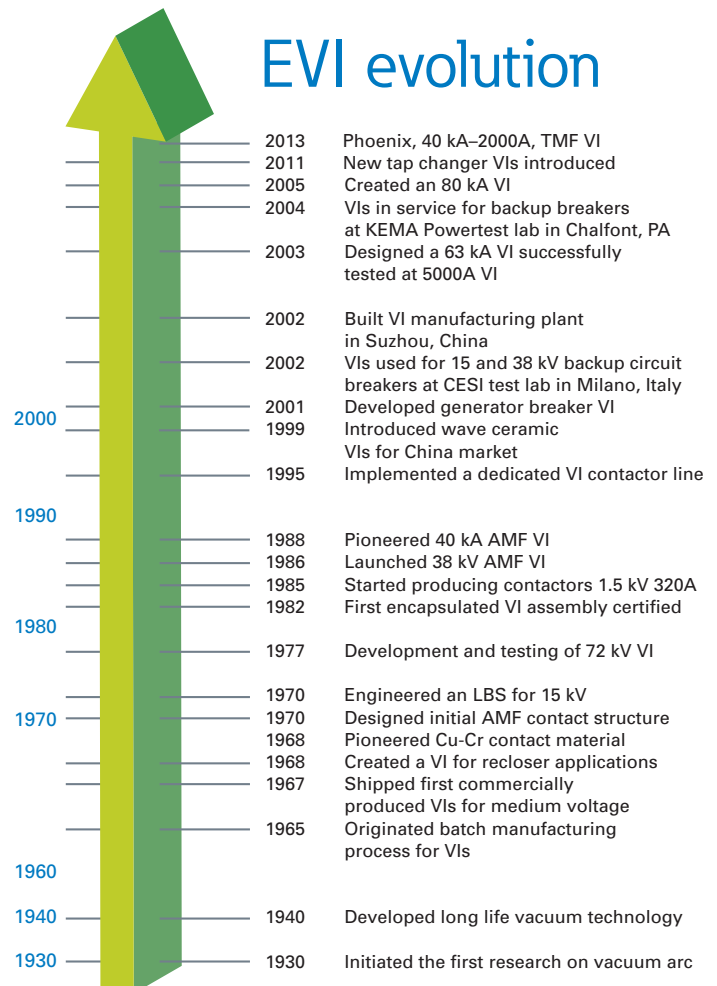
# A single-source provider for low, medium and high voltage technology

## Leading the power switching industry

- Since the first developments to build an efficient and economic vacuum interrupter over 100 years ago, Eaton has been on the forefront of vacuum interruption technology
- Using 3-D solid modeling, finite element analysis and two high-power test labs, Eaton creates many of the highest interrupting applications with the smallest envelopes in the industry
- Eaton, as one of the few worldwide leaders in vertical manufacturing integration, is able to implement an easy transition from designing components to assemblies
- With unsurpassed expertise, we are able to design housing and circuit breaker compartments to vacuum interrupters, circuit breakers, bus systems and fuses
- By promoting application-oriented relationships, confidential research and development partnerships, responsive testing, and certification, we are able to achieve outstanding global innovation
- Our heritage, strengthened by acquisitions such as Westinghouse® DCBU, Cutler-Hammer®, MEM® and Holec®, has resulted in breakthrough medium voltage technologies and numerous international patents over the years



## EVI evolution



# The perfect fit for various markets and applications

Eaton's vacuum interrupters span a broad range of industry segments, including:

- Oil and gas/  
petrochemical
- Data centers
- Mining
- Utilities
- OEMs
- Military
- Institutional
- Commercial
- Wind power



## Vacuum interrupter applications

Eaton has combined over 100 years of global innovation and design investments to deliver environmentally ideal vacuum interrupter solutions for targeted applications. Eaton's vacuum interrupters are available in a wide range of ratings backed by a broad list of capabilities:

- High AC currents and voltages
- Generator protection for short-circuit current interruptions up to 75 kA
- Rapid prototyping
- Compact bottle volumes
- Negligible erosion and wear
- Dielectric encapsulation
- Mechanism assistance
- Custom-specific designs
- Personal sales and support services
- Close and confidential R&D services
- Manufacturing economies of scale
- Product test labs and support services
- Global, regional and local availability
- Application consultation



---

## An Eaton Green Solution

### Eaton's "Green Leaf" label

The Eaton Green Leaf label is our promise of exceptional, documented, environmental performance to customers, consumers and our communities.

Though all of Eaton's products and solutions are designed to meet or exceed government standards for protecting the environment, our products and solutions with the Green Leaf designation go well beyond normal standards to provide "exceptional environmental benefit."

### How it works

Eaton's Green Leaf designation begins with existing global standards for environmental claims, but then adds tougher requirements, including:

- Third-party certifications and endorsements
- Analysis of potential negative attributes, trade-offs and risks
- Thorough documentation
- Higher level of customer environmental benefits

A panel of representatives from various Eaton business functions, corporate groups and main businesses review the application and make a decision to award the Green Leaf. Ultimately, our customers and consumers will provide the final—and highest—level of approval by choosing our products for superior environmental performance.

Eaton, Suzhou  
2 Lou Yang Road  
Suzhou, P.R. China

Eaton, Horseheads  
200 Westinghouse Circle  
Horseheads, NY 14845 USA

**Eaton Corporation**  
Electrical Sector  
1111 Superior Avenue  
Cleveland, OH 44114 USA  
Eaton.com

© 2012 Eaton Corporation  
All Rights Reserved  
Printed in USA  
Publication No. BR01306001E / Z13015  
December 2012

Eaton is a registered trademark  
of Eaton Corporation.

All other trademarks are property  
of their respective owners.



Powering Business Worldwide