Eaton Vacuum Interruption Technology (EVI)

Product Focus

Eaton Vacuum Interruption Technology

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1. EVIs Protect Generators Such as Those Depicted for Short Circuit Current Interruptions Up to 75 kA

2. Partner with the Inventor and Innovation Leader in VI Technology

While growing as the world leader of Vacuum Interrupter Technology, Eaton has taken the values and technology from acquisitions and combined those with organic development to create one vertically integrated business, establishing itself at the forefront of Vacuum Technology. Utilizing 3-D solid modeling, FEA analysis and our two-high power test labs, Eaton is able to create many of the highest interrupting applications with the smallest envelopes in the industry.

Eaton Vacuum Interrupters (EVIs) Are at the Heart of the Escalating Growth in Worldwide Demand for Electricity

World demand for electricity is escalating with the use of more efficient medium voltage power distribution systems. Utilities are pursuing higher power generation systems using fossil, nuclear, hydro and wind power to supply an increasing number of transmission networks internationally. Network substations are distributing power to a greater number of consumers regionally. Power consumers are insisting on environmentally friendly protection equipment and switchgear compact enough to fit within their site space constraints. Improving power reliability is a growing requirement for medium voltage protection and switching equipment manufacturers as critical power consumption continues to grow.

At the Core of the Conundrum, an Ideal Protection and Switching Solution

Medium voltage power switching is one demanding application in today's green world. Continuous current and interruption requirements continue to increase as lower impedance systems are deployed. Packaging volumes and cooling capabilities continue to decrease due to site space constraints. The challenge is at the core of every switchgear, ring main unit, pad mount unit, circuit breaker, recloser, tap changer, contactor and switch. The ideal solution is an environmentally friendly medium voltage interrupter, capable of reliably switching high stress currents robustly, without the need for unreliable cooling or ventilation systems.

An Ideal Solution, Developed Through Years of Innovation

The solution starts with the customer's needs at the center, driven by decades of American ingenuity in vacuum interruption invention, expanded by years of European attention to detail in design for today's green environment. These facets coupled with quality improvements made by U.S. and Chinese manufacturing operations, the ideal solution custom-fits the customer's application and competitively interrupts greater power with less wear and maintenance over its life-cycle. This solution requires innovation that leverages expertise in IEEE, IEE/EN, UL®/CSA®, IEC and GB/JB/DL vacuum interruption requirements and applications.

Years of Innovation and Experience

Global innovation can only be achieved through long-term commitment to the customer's total product life cycle. Eaton promotes application oriented sales relationships, confidential R&D partnerships, responsive testing and certification support of customer's products. In addition to aftermarket technical and cost-out consulting services, Eaton pays attention to the details that deliver the ideal product solution for a problem application, ultimately resulting in the optimization of the customer's product design investments.

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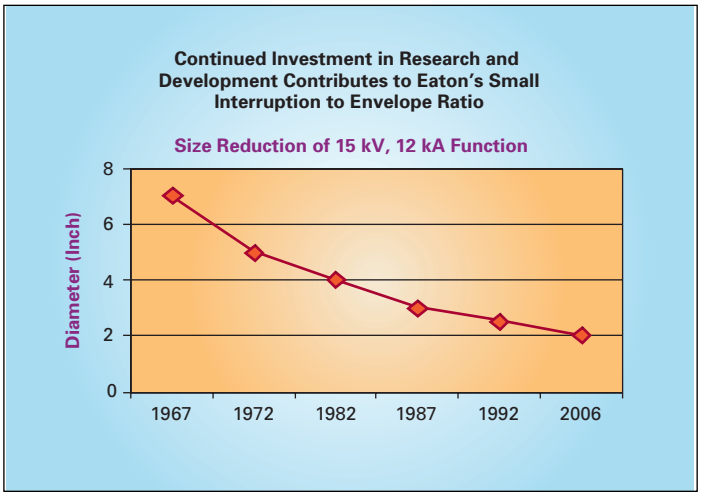

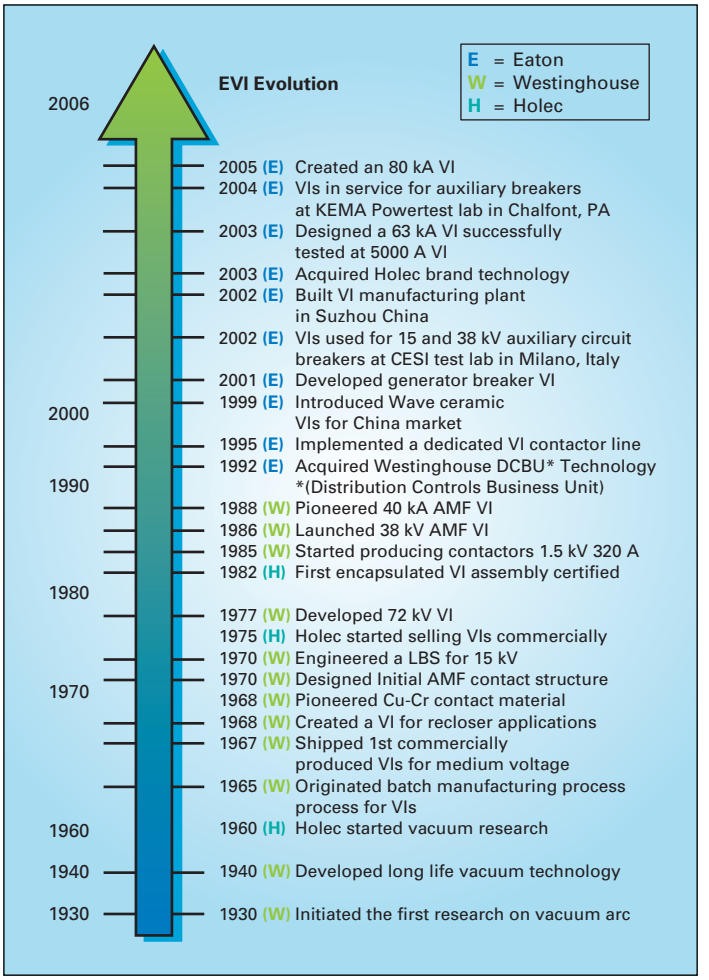

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3. EVIs are Available for Rail Applications Requiring a 250 kV Lightning Impulse Withstand Rating

4. The Eaton Vacuum Interrupter — the Solution for Your Targeted Application Needs

5. Available Contact Geometries

For Your VI Investment, Eaton has the Answer

Eaton has combined more than 100 years of global innovation and design investments made by Westinghouse®, Cutler-Hammer® and Holec® to deliver an environmentally ideal Vacuum Interrupter Solution for your targeted applications. EVIs are available in a wide range of ratings backed by a broad list of capabilities:

- High ac currents and voltages
- 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

With EVIs, the Answer is "Always Yes"

Eaton has what you need from an investment partner: custom-designed leading technology, product innovation partnership, product pre-qualification certification, responsive just-in-time manufacturing and shipping, and aftermarket emergency and life-cycle support. With EVIs, you are not just buying a VI — you are teaming with a global partner to help optimize returns on your investment, from the time you begin your product design to aftermarket support following the commissioning of your customer's end application.

With EVIs, Say Goodbye to VI Supplier Problems

You will never know if you are working with the right partner until something goes wrong — your customers pull-in their orders, you need to expedite partial shipments to a critical job, your customers forgot to enter their orders to you, your customers demand additional tests at the last minute. That is when you can count on the global presence of Eaton to go to great lengths and protect your investment. We have kept customers coming back across the life-cycle of their products for over 40 years.

A Perfect Fit for Many Applications

Eaton has the broadest product offering in the industry with vacuum interrupters for application in:

- Load break switches
- Motor contactors
- Circuit breakers
- Reclosers
- Transportation breakers
- Ring main / pad mount units
- Specialized dc applications
- Generator breakers
- Distribution circuit breakers
- Medium voltage switchgear

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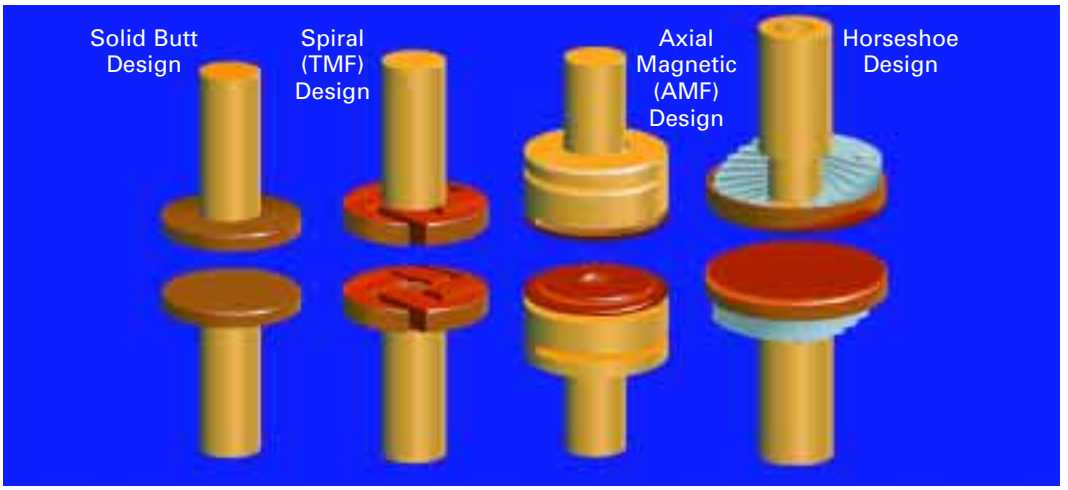

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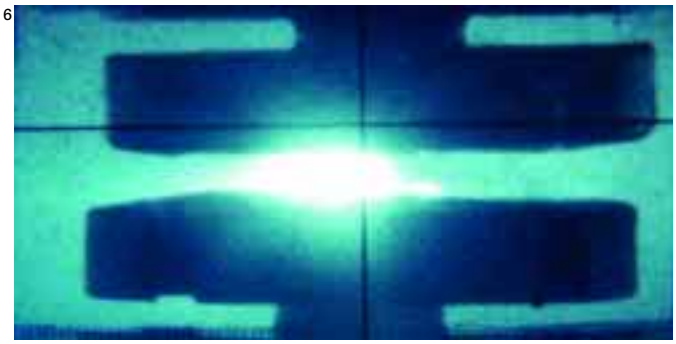

6. Arc Research Using High-Speed Digital Photography

7. Vacuum Interruption — A Definitive Worldwide Trend

When buying EVI technology, you are receiving proven reliability, pre-tested interruption ratings, and knowledgeable customer support throughout the world, for a technology that is clearly the future for medium voltage circuit interruption.

State-of-the-Art Testing Facilities to Protect Your Design Investment

Through the use of Eaton's two-high power test labs, a single-phase development lab in the U.S. and a three-phase, KEMA certified lab in Europe, Eaton is able to systematically test new designs prior to certification by the end user. Every new design is stringently life tested to ensure switching life, as well as interruption ability. Our production units undergo quality assurance inspections throughout every critical aspect of the manufacturing process. Our team of scientists and design engineers create VIs to meet our customer's specifications, many of which push the limits of industry standards. Some of the distinguishing design 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 (AMF, TMF, horseshoe and butt styles)

EVI SIZES AVAILABLE FROM 25 MM TO 182 MM IN DIAMETER

Description	Units	Contactor	Load Break Switch	Circuit Breaker	Recloser	Generator Breaker
Voltage Ratings at Rated Contact Stroke						
Rated Maximum Line to Line ac Voltage (50/60 Hz)	**kilovolts**	1.5 – 15	4.76 – 38	4.76 – 72	12 – 40.5	12 – 15
Rated Continuous Current	**amperes**	150 – 1400	200 – 1250	630 – 4000	200 – 1250	2000 – 4000
Rated Short Circuit Current (Symmetrical)	**kA**	1.5 – 12	4.4 – 2	12.5 – 80	6 – 20	50 – 75
Mechanical Requirements / Data						
Contact Stroke	**mm**	2 – 6	4.75 – 9.5	8 – 30	9 – 12	8 – 10
Opening Speed, Average to 75% of Rated Stroke	**m/second**	0.25 – 0.61	0.46 – 1.1	1 – 2.3	1 – 1.5	1 – 1.5
Closing Speed, Average of Last 33% of Rated Stroke	**m/second**	0.2 – 0.3	0.27 – 0.91	0.75 – 1.5	0.75 – 1	0.75 – 1
Life						
Mechanical Life at Required Contact Stroke and Operating Speeds	**operations**	500,000 – 2,500,000	10,000 – 50,000	5,000 – 30,000	10,000	10,000
Electrical Life at Rated Current	**operations**	600,000 – 1,000,000	10.000 – 50,000	5,000 – 30,000	10,000	10,000
Contact Erosion Limit	**mm**	2	3	3	3	3

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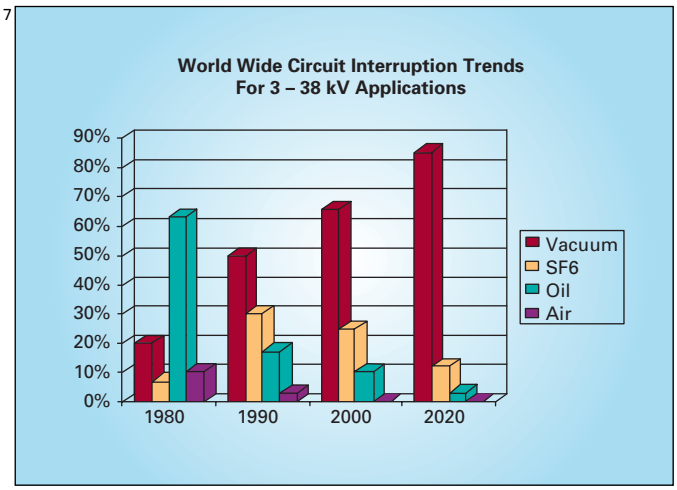

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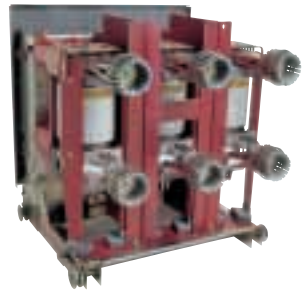

8. VIs Used for Wind Power Generation

9. Medium Voltage Breaker Showing VI

EVIs: Commitment to Quality, Performance Tested to the World's Standards

The greatest advantage to the utilization of an EVI in medium voltage distribution switchgear is its compact size. A vacuum dielectric allows contacts to be arranged closer together so circuit interruptions can be designed in a smaller envelope. To meet IEC, ANSI and GB/JB/DL standards, EVIs are manufactured in ISO®-9001 certified and ISO-14001 certified facilities under strict quality procedures. Each EVI is tested throughout the manufacturing process and once again before packaging. A dielectric withstand, as well as a vacuum assurance test, is performed on every interrupter created. In addition to the testing process, 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 an electronic database. The true test of our product range is conducted day after day, year after year in the field. With well over 3 million EVIs in service around the world, our customers testify that the EVI is one of the most critical and reliable components in their end product.

Eaton's electrical business is a global leader in electrical control, power distribution, and industrial automation products and services. Through advanced product development, world-class manufacturing methods, and global engineering services and support, Eaton's electrical business provides customer-driven solutions under brand names such as Cutler-Hammer®, Powerware®, Durant®, Heinemann®, Holec® and MEM®, which globally serve the changing needs of the industrial, utility, light commercial, residential, and OEM markets. For more information, visit www.EatonElectrical.com.

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