Vacuum interrupters
Introduction

The first vacuum interrupter used commercially was a Jennings device. It was installed as a line-and-load dropping switch for a 138 kV transmission line in California in 1955. Jennings has continually expanded its portfolio of vacuum products, including a wide range of vacuum interrupters.

Current interruption in a vacuum is recognized as the ideal switching technology in the medium-voltage range, and it's also applied in high-voltage and low-voltage applications. Excellent switching capabilities and compact design make vacuum interrupters the most economical switching device solutions possible.

Jennings interrupter designs handle a wide range of voltage and current interrupt levels, and high quality and highly reliable interrupters are available for the utility and industrial markets.

Design
Jennings vacuum interrupters feature an evacuated ceramic insulating envelope surrounding two contacts, one fixed and one movable.

The movable contact is operated from the outside through a metallic bellows. Contacts are typically a copper alloy that is developed for use in AC voltage applications. The end plates are made of stainless steel or copper.

Features and benefits
- Long life, high reliability – Vacuum interrupters can be expected to last the life of the equipment in which they are installed
- Controlled contact erosion results in virtually maintenance-free operation
- Fast interrupting speed – The interruption mechanism is independent of current magnitude, so interruption can normally be anticipated at the first current zero with no restriking
- Rapid dielectric recovery – The dielectric strength of the contact gap recovers more rapidly than the recovery voltage can rise, eliminating restriking
- High cycle withstand voltages
- Robust, compact design – Vacuum dielectric enables contacts to be arranged close together so circuit interruptions can be designed in a smaller envelope
- Environmentally friendly – Current interruption occurs in a vacuum, so there is no emission of greenhouse or toxic gases
- Atmospheric contact contamination is eliminated – Oxides and corrosion layers cannot form in the vacuum environment
- Noise-free and flash-free – All arcing is confined within the vacuum interrupter body

Applications
- Load break switches
- Contactors for industrial and motor control (example: Jennings contactors use Jennings vacuum interrupters)
- Capacitor bank switching
- Circuit breakers
- Specialty RF and DC applications

Markets
- Power distribution
- Power transmission
- Industrial
- Airport
- Steel smelters
- Offshore drilling
- Mining
- Rail

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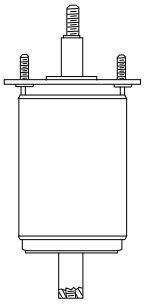
Product offering and selection guide

Product offering

Electrical characteristics

Cat. no.	Operating voltage (kV)	1 Minute DWV (kV)	Rated short circuit current (A RMS)	Rated continuous current (A RMS)	Contact force at contact separation (lbs. max.)	Mechanical life (operations)	Body diameter (in.)	Body length (in.)	Total length (in.)	Stroke (contact gap, in.)
RP158	3.6	45	–	300	7.7±20%	2.0 million	2.44	2.81	4.49	0.110
RP133	1.5	30	–	450	9.7±25%	500,000	2.06	2.25	3.275	0.090
RP233	25.0	40	–	3 at 32 MHz	2 lbs. 8 oz.	1.5 million	1.31	4.18	5.68	0.120
RP173	7.2	28	6,000	450	16.5+ 25%	1.0 million	2.40	4.63	6.84	0.190
RP175	7.2	28	6,000	450	16.5+ 25%	1.0 million	3.00	4.75	7.83	0.190

Selection guide

	RP175	RP173	RP158	RP133
Contactor and switch application – Commercial				
Operating voltage (kV)	7.2	7.2	3.6	1.5
Rated continuous current (A)	450	450	300	450

* Capacitive switch rating

	RP233
RF/DC application	
Operating voltage (kV)	40
Rated continuous current (A)	35 at 32 MHz

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Industrial applications
The unique advantages of switching in a vacuum make vacuum interrupters useful in industrial applications. Many kinds of test, production or processing equipment have requirements for long contact life without maintenance, for low-cost high-voltage control or for sealed contacts because of difficult environmental requirements. Due to recent advances in vacuum interrupter technology and the availability of new low-cost designs, vacuum interrupters are finding many new uses.

Where voltages are high and fault currents relatively low, a vacuum interrupter switch is an attractive alternative to oil circuit breakers. They are smaller, less expensive to install and maintain, provide half-cycle interruption instead of requiring five cycles or more and eliminate danger of explosion and fire.

Vacuum interrupter switches are useful where dust, high humidity or high altitudes make it difficult to maintain dielectric strength with other types of devices. In airborne equipment, for example, their small size is also an important feature. In environments involving explosive or corrosive atmospheres, they provide an additional safety factor. Even when destroyed by high currents, the arc is still completely contained because not enough gas pressure is developed to destroy the protective envelope.

For dielectric and induction heating equipment and x-ray and irradiation equipment used for processing foods and chemicals, vacuum switches can be used directly in the DC circuits for fast, maintenance-free, push-button disconnect.

RF switches
Vacuum interrupter switches have demonstrated superior performance for RF applications, such as:

- Band switching of transmitters
- Switching of filter sections and antenna multicouplers
- Antenna reflector switching
- Tap changing of RF coils in induction and dielectric heating RF generators
- Switching of transmission lines

Most of these applications are in the HF band and involve currents ranging from 20 A to several hundred amperes. At very high currents, switches should be fed symmetrically to avoid uneven current distribution inside the switch. Vacuum interrupter switches, without an actuator, lend themselves to custom-designed tap changing and filter network switching because a number of switches can be driven by cams from a common shaft.