

# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker



**EATON**

*Powering Business Worldwide*



Automotive



Aerospace



Truck



Hydraulics

Electrical

# Powering business worldwide

Eaton delivers the power inside hundreds of products that are answering the demands of today's fast changing world.

We help our customers worldwide manage the power they need for buildings, aircraft, trucks, cars, machinery and entire businesses. And we do it in a way that consumes fewer resources.

## Next generation transportation

Eaton is driving the development of new technologies – from hybrid drivetrains and emission control systems to advanced engine components – that reduce fuel consumption and emissions in trucks and cars.

## Higher expectations

We continue to expand our aerospace solutions and services to meet the needs of new aviation platforms, including the high-flying light jet and very light jet markets.

## Building on our strengths

Our hydraulics business combines localised service and support with an innovative portfolio of fluid power solutions to answer the needs of global infrastructure projects, including locks, canals and dams.

## Powering Greener Buildings and Businesses

Eaton's Electrical Group is a leading provider of power quality, distribution and control solutions that increase energy efficiency and improve power quality, safety and reliability. Our solutions offer a growing portfolio of "green" products and services, such as energy audits and real-time energy consumption monitoring. Eaton's Uninterruptible Power Supplies (UPS), variable-speed drives and lighting controls help conserve energy and increase efficiency.





# MV switchgear technology is in our DNA

Eaton Corporation is a worldwide leader in the design, manufacture, and sale of safe, reliable and high-performance medium voltage power distribution equipment in accordance with IEC, GB and ANSI standards.

## Complete Global Medium Voltage Switchgear Solutions

Eaton, a premier leader in designing and manufacturing power distribution and protection equipment in the electrical industry, offers a comprehensive range of medium voltage (MV) solutions to meet the needs of virtually every application. From products that feature cutting-edge design that allow for easy access, maintenance and space savings, to arc-resistant products that enhance safety, Eaton's medium voltage solutions provide a variety of products for every need. Additionally, Eaton's global service network provides maximum customer support in all regions of the world.

As one of the few completely vertically integrated and diversified industrial manufacturers in the world, Eaton designs not only MV assemblies, but also the key components that comprise the MV solutions – from steel housing and circuit breaker compartments to vacuum interrupters, circuit breakers, bus systems and fuses.

Eaton's MV heritage, strengthened by acquisitions such as Westinghouse DCBU, Cutler Hammer, MEM and Holec, has resulted in breakthrough MV technologies and numerous international patents over the years.

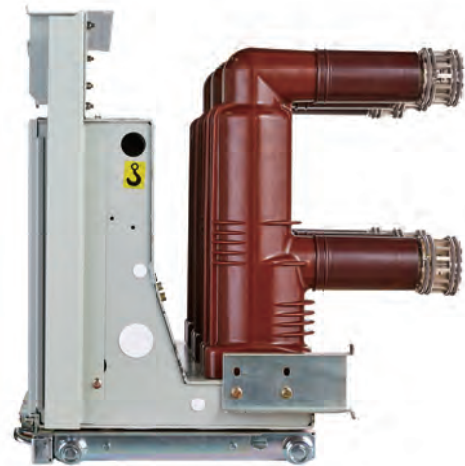
Part of Eaton's complete electrical PowerChain Solutions – which help businesses minimize risks while realizing greater reliability, cost efficiencies, capital utilization and safety – Eaton's medium voltage equipment meets all applicable standards and certifications such as IEC, NEMA / ANSI, GB, UL, IEEE, KEMA and CSA.

When it comes to medium voltage solutions, you can trust the one name with a long history of proven performance: Eaton.



# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker

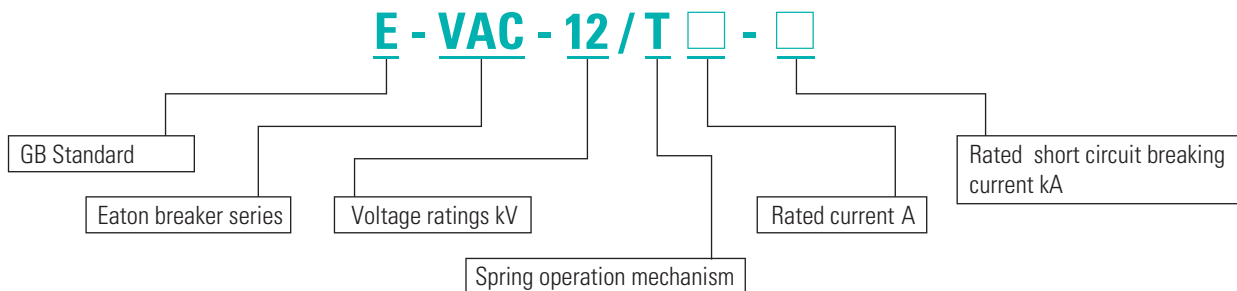
## E-VAC EP Vacuum Circuit Breaker



E-VAC EP Series medium voltage vacuum circuit breakers from Eaton Electrical combine our excellent vacuum technology with decades of experience in designing and manufacturing power distribution system. They offer high reliability, ease of handling and maintenance, high cost efficiency for Chinese users.

- Meet GB and DL standards.
- E-VAC equipped with new generation vacuum interrupter, suited for technologies and operation condition of power system.
- E-VAC utilizes solid-enveloped pole of Eaton Electrical, offers superior and reliable solid enveloping insulation performance, passes condensation test, suitable for safely operating in harsh environment. It offers better creepage distance and clearance compared to the requirements in GB standards.
- Ideal contact material and geometry ensure low chopping current and reliable contact resistance.
- A few components and compact and reasonable structure ensure more reliable and safer operation.
- Enable ideal cutoff and close of resistance, inductance load and capacitive load.
- Secondary plug, chassis, moving contact and grounding methods are specially designed to Chinese users, completely compatible with domestically dominant medium voltage switchgear KYN28.

## Product models







## Application condition

- Ambient air temperature not exceeding 40 C, and the average value measured within 24 hours not exceeding 35 C. The minimum ambient air temperature is -15 C.
- The effect by solar radiation can be ignored.
- The ambient air is not obviously polluted by dust, smoke, corrosive or flammable gases, vapor or salt mist.
- Seismic intensity not exceeding 8 degree.
- Amplitude of electromagnetic interference induced in secondary system not exceeding 1.6kV.

## Technical features

- E-VAC utilizes mature spring operating mechanism, offers reliable and stable performance, long service life, ease of operating, excellent corrosion protection and low maintenance within the lifetime
  - E-VAC EP series 12kV vacuum circuit breaker adopts mature APG process to enclose vacuum interrupter and main conductive circuit in a insulation tube, thoroughly eliminating the environmental impact on insulated parts which weakens the voltage withstanding capacity, ensuring the vacuum interrupter suitable for harsh environment.
  - E2 level electrical life extended and M2 level mechanical life extended as per GB1984-2003, capacitive current breaking and making having extremely low-re-breakdown probability C2 level, having completed the type test.
  - Outline dimension and distribution panel interlocking method completely compatible with domestically dominant medium voltage switchgear KYN28, high universality, significantly reduce design cost
- Product assembly utilizes tooling method to ensure dimension consistency. All products have been subject to the push panel test for standard panel, ensuring product interchangeability and universality.
  - All products have been subject to hundreds of mechanical operation running-in tests before leaving the factory, ensuring the product performance in the most stable phase.
  - Utilize advanced imported testing equipment, exactly record no-load mechanical characteristics of each product, and provide users with these characteristic curves, ensure product reliability.

## Temperature condition

- The average of relative humidity measured within 24 hours not exceeding 95%.
- The average vapor pressure measured within 24 hours not exceeding 2.2kPa.
- The average of relative humidity measured within one month not exceeding 90%.
- The average vapor pressure measured within one month not exceeding 1.8kPa.



# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker



## Application areas

- Chemical industry
- Oil industry
- Piping industry
- Offshore mining
- Shipbuilding
- Paper making industry
- Opencast coal mine
- Substation
- Cement industry
- Automotive industry
- Power plant
- Textile and food industries
- Metallurgical industry

## E-VAC vacuum circuit breaker requires almost no relevant maintenance

Simple structure design of E-VAC vacuum circuit breaker further minimizes fault occurrence, simplifies daily maintenance. With the indicator on the circuit breaker panel, no detection instrument is required, facilitating the judgment of working state of circuit breaker.

The circuit breaker utilizes the world's first class Eaton Electrical's vacuum interrupter with vacuum degree up to 10<sup>-6</sup>Pa, low air leakage, and ensure 50-year life with no maintenance required.

## Optional accessories



Charging handle



Trolley handle



Lifter

## Technology creation history

As the manufacturer of the world's first vacuum interrupter, the pioneer of vacuum technology, Eaton Electrical has been committed to the research, development and

manufacturing of vacuum interrupters for over 70 years, and gathered plenty of experience. Westinghouse has become the synonym of quality and reliability.

We own the world's largest and globally leading vacuum interrupter plant and the only vacuum interrupter plant that is equipped with large capacity high voltage laboratories.

Our manufacturing capacity and design and development always maintain a leadership position.

## Ideal for control and protection in medium voltage power supply and distribution system

The circuit breaker is equipped with superior spring charging mechanism, utilizes modular design, offering optimized mechanism main part distribution, simpler structure and more reliable performance. The whole mechanism is composed by three modules: charging, closing, opening. Assembly and maintenance of these three parts are very simple. The spring charging mechanism composed by ratchet wheel mechanism, oscillator and closing spring is compact and smart. The operating mechanism is usually equipped with manual charging device and electric charging device, enabling automatic reclosing function.

The circuit for manual charging operating mechanism is provided with manual opening and closing operation buttons, circuit breaker position indicator and spring mechanism charging status indicator, switch operations counter, shunt release auxiliary switch, position and fault signals, etc..

The circuit breaker of electric charging operating mechanism: added with spring charging motor, shunt release, trip free relay, and auxiliary switch for spring charging motor release.

The following accessories can also be provided as needed: undervoltage release, overcurrent relay, etc..

# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker

## Main specification and technical parameters

Item	Unit	Value						
Rated voltage	kV	12						
Rated short-time power frequency withstand voltage (1 min)		42 (phase to ground, phase to phase) 48 (gap)						
Rated lightning impulse withstand voltage (peak)		75 (phase to ground, phase to phase) 85 (gap)						
Rated frequency	Hz	50						
Rated current	A	630	630	1250	1250	1600	1250	1600
		1250	1600	2000	2000	2500	2000	2500
		2500	2500	3150	3150	4000 <sup>(1)</sup>	3150	4000 <sup>(1)</sup>
Rated short-circuit breaking current	kA	25	31.5		40		50	
Rated short-time withstand current (4s)		25	31.5		40		50	
Rated peak withstand current	kA	63	80		100		125 <sup>(2)</sup>	
Rated short circuit making current		63	80		100		125 <sup>(2)</sup>	
Secondary circuit power frequency withstand voltage (1 min)	V	2000						
Opening time	ms	20-50						
Closing time		35-70						
Mechanical endurance	time	30000 (1600A/31.5kA and below), 20000 (2000A and above, 40kA), 10000(50kA)						
Rated current breaking endurance		30000 (1600A/31.5kA and below), 20000 (2000A and above, 40kA), 10000(50kA)						
Rated short circuit current breaking endurance	time	50 (1600A/31.5kA and below), 30 (2000A and above, 40-50kA)						
Allowable accumulated wearingthickness of moving/fixed contact	mm	3						
Rated closing operating voltage	V	AC 110/220 DC 110/220						
Rated opening operating voltage								
Rated voltage of spring charging motor	V	AC 110/220 DC 110/220						
Rated power of spring charging motor	W	55-90						
Charging duration	s	≤ 15						
Rated operating sequence		O-0.3s-CO-180s-CO (40kA and below), O-180s-CO-180s-CO (50kA)						

**Note:** <sup>(1)</sup> Forced air cooling is required at 4000A; <sup>(2)</sup> For higher parameters, please contact the Eaton Corp.

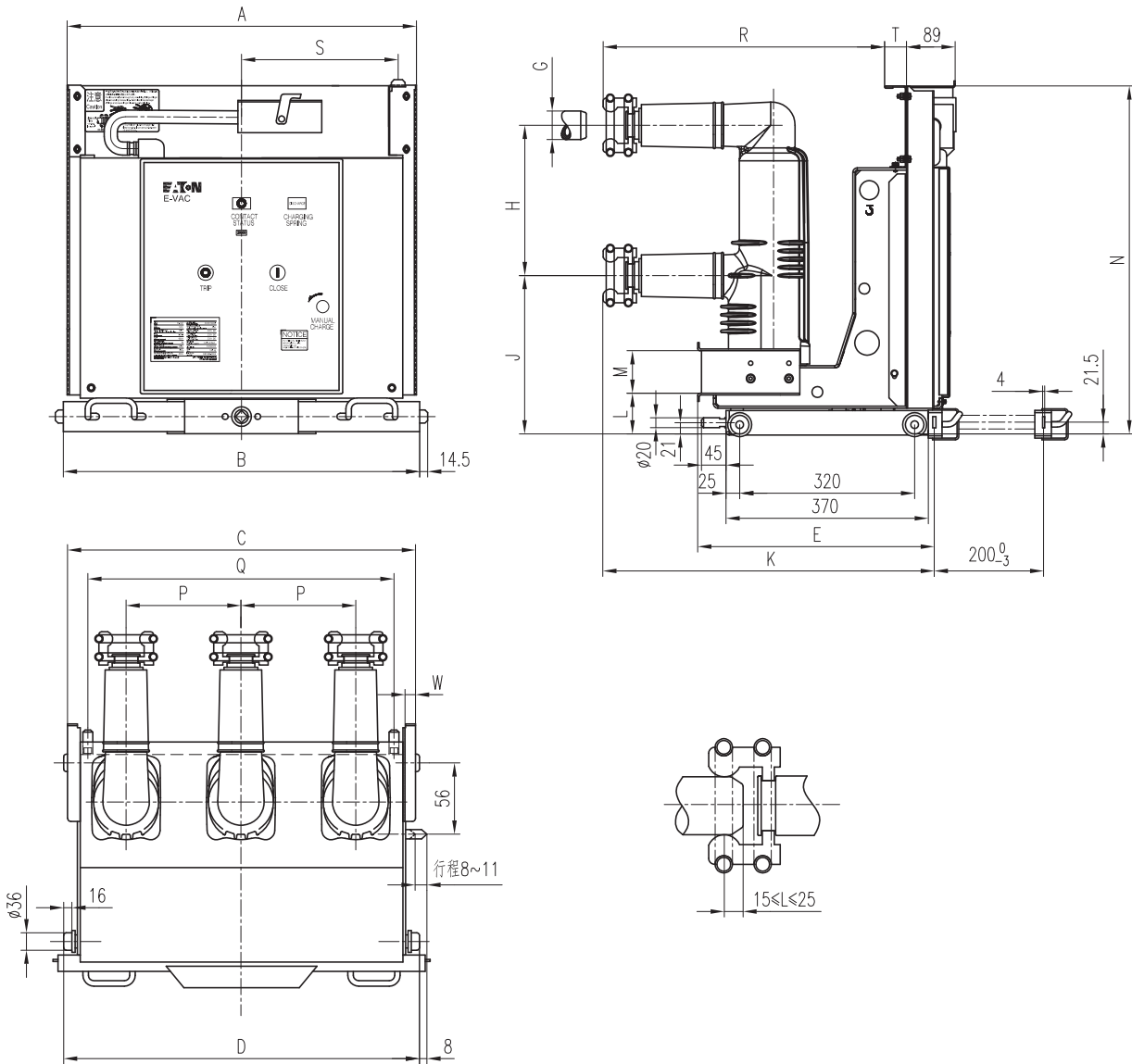
## Technical parameters for trip/close coils

Name	Parameter	
Rated operating voltage (V)	AC, DC110	AC, DC220
Rated operating current of close coil (A)	2.0	1.0
Rated operating current of trip coil (A)	1.8 (40kA and above is 2.6)	0.9 (40kA and above is 1.6)
Normal operating voltage range	Closing: 80%~110% of rated operating voltage Opening: 65%~120% of rated operating voltage, opening will not occur when the normal operating voltage is less than 30% of rated operating voltage	



# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker

## Outline and dimension of E-VAC EP circuit breaker (drawout type)



Distribution panel width (mm)	Rated current (A)	Rated short circuit breaking current (kA)	P	H	A	B	C	D	E	G	J	K	L	M	N	R	S	T	W	Q
800	630	25~31.5	210	275	638	652	640	650	433	Φ35	280	598	76	78	637	508	277	40	23	/
800	1250	25~40	210	275	638	652	640	650	433	Φ49	280	598	76	78	637	508	277	40	23	550*
800	1600	31.5	210	275	638	652	640	650	433	Φ55	280	598	76	78	637	508	277	40	23	/
800	2000	40	210	310	638	652	640	650	361	Φ79	295	586	77	88	698	536	277	0	23	550
800	1250~2000	50	210	310	638	652	640	650	361	Φ79	295	586	77	88	698	536	277	0	19	550
1000	2500	31.5	275	310	838	852	838	850	361	Φ109	295	586	77	88	698	536	377	0	31	/
1000	3150	31.5	275	310	838	852	838	850	361	Φ109	295	586	77	88	725	536	377	0	31	/
1000	2500~4000	40~50	275	310	838	852	838	850	361	Φ109	295	586	77	88	725	536	377	0	31	750**

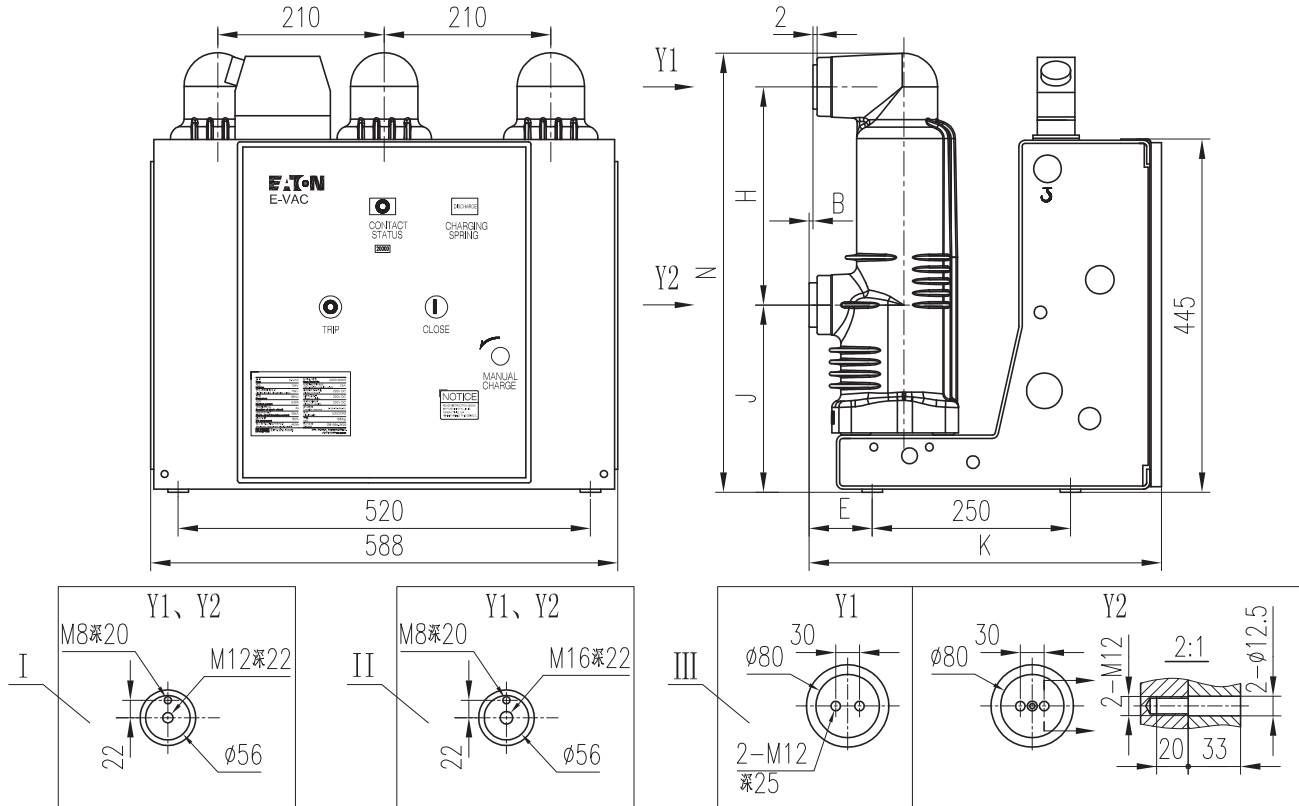
**Note:** Forced air cooling is required at 4000A. \* 40kA only. \*\* 50kA only.



# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker

## Outline and dimension of E-VAC EP circuit breaker (fixed type)

E-VAC fixed type vacuum circuit breaker (210 phase space)

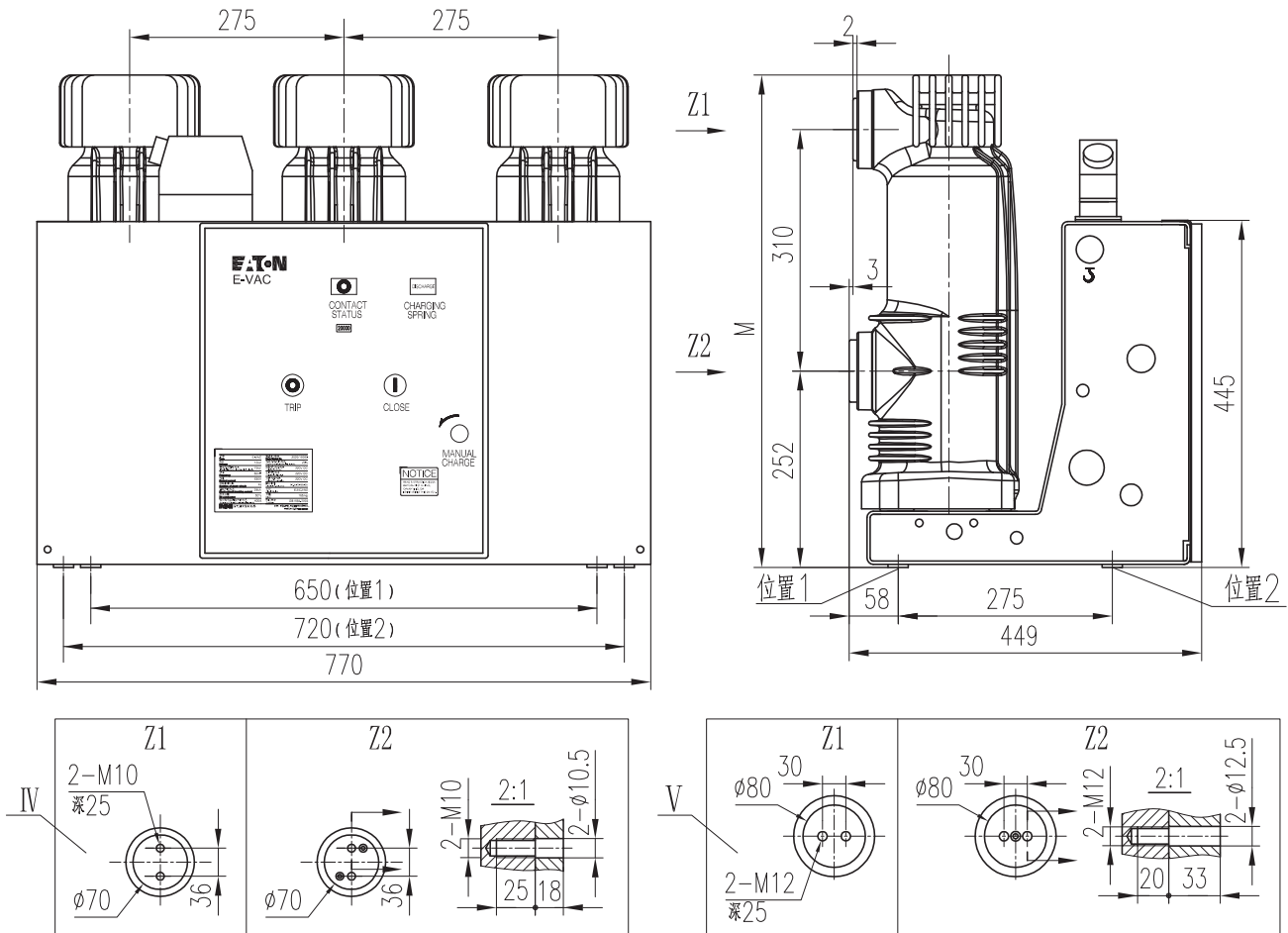


Rated current (A)	Rated short circuit breaking current (kA)	H	J	E	K	B	N	Y1Y2
630-1250	25-31.5	275	237	71.5	437	0	555	I
1250	40	275	237	71.5	437	0	551	II
1600	31.5-40	275	237	71.5	437	0	551	II
2000	40	310	252	80	449	3	614	III
1250-2000	50	310	252	80	449	3	614	III

# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker

## Outline and dimension of E-VAC EP circuit breaker (fixed type)

E-VAC fixed type vacuum circuit breaker (275 phase space)

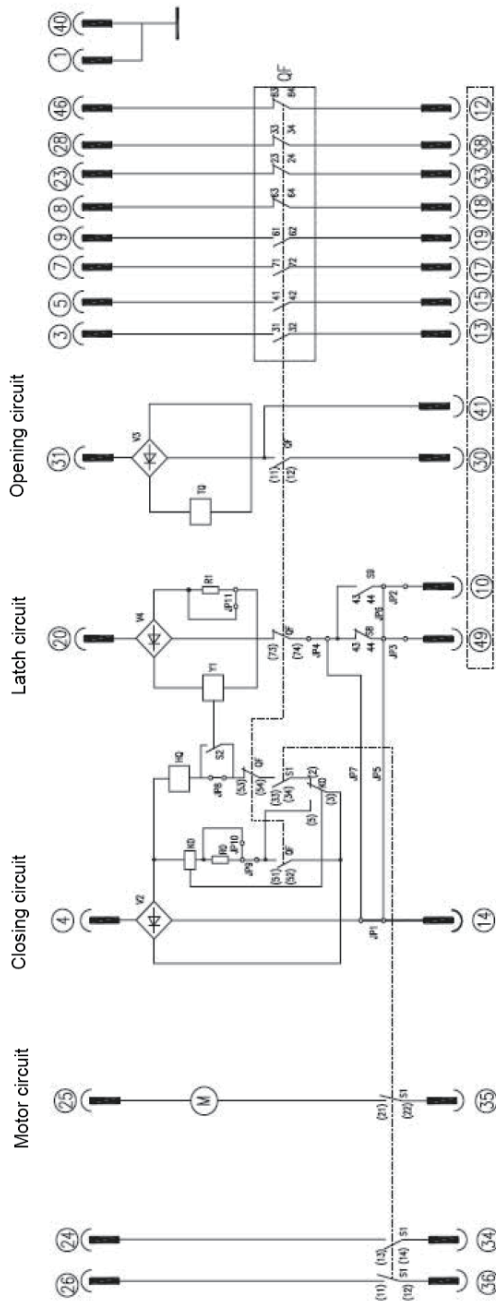


Rated current (A)	Rated short circuit breaking current (kA)	M	Z1\Z2
2500	31.5	628	IV
3150	31.5	678	V
2500-4000	40-50	678	V

# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker

## Secondary control connection diagram of E-VAC EP series vacuum circuit breaker (drawout type)

The diagram shows the circuit breaker in test position, opening, discharged states



Connection setting for optional parts

Configuration	Jumper state	JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8	JP9
With anti pump	With latch	✓	✓	✓	✓	✓	✓	✓	✓	✓
Without anti pump	Without latch	✓	✓	✓	✓	✓	✓	✓	✓	✓
With anti pump	With latch	✓	✓	✓	✓	✓	✓	✓	✓	✓
Without anti pump	Without latch	✓	✓	✓	✓	✓	✓	✓	✓	✓

Operating power supply option:

Operating power supply	Jumper	JP10	JP11
AC/DC 220V	✓	✓	✓
AC/DC 220V	✓	✓	✓

Note: " / " denotes disconnected; " ✓ " denotes connected.

HQ: close coil

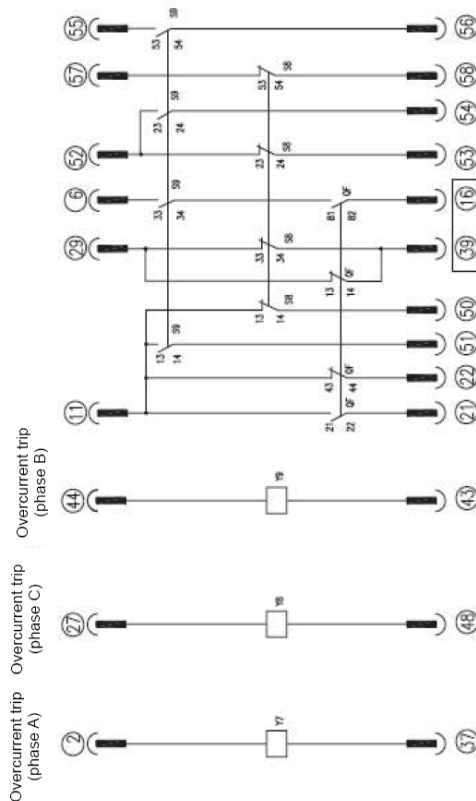
TQ: trip coil

R0-R1: resistance

M: spring charging motor

JP1-JP11: jumper

Note: for DC operating power supply, the polarities in the dashed box should be consistent.

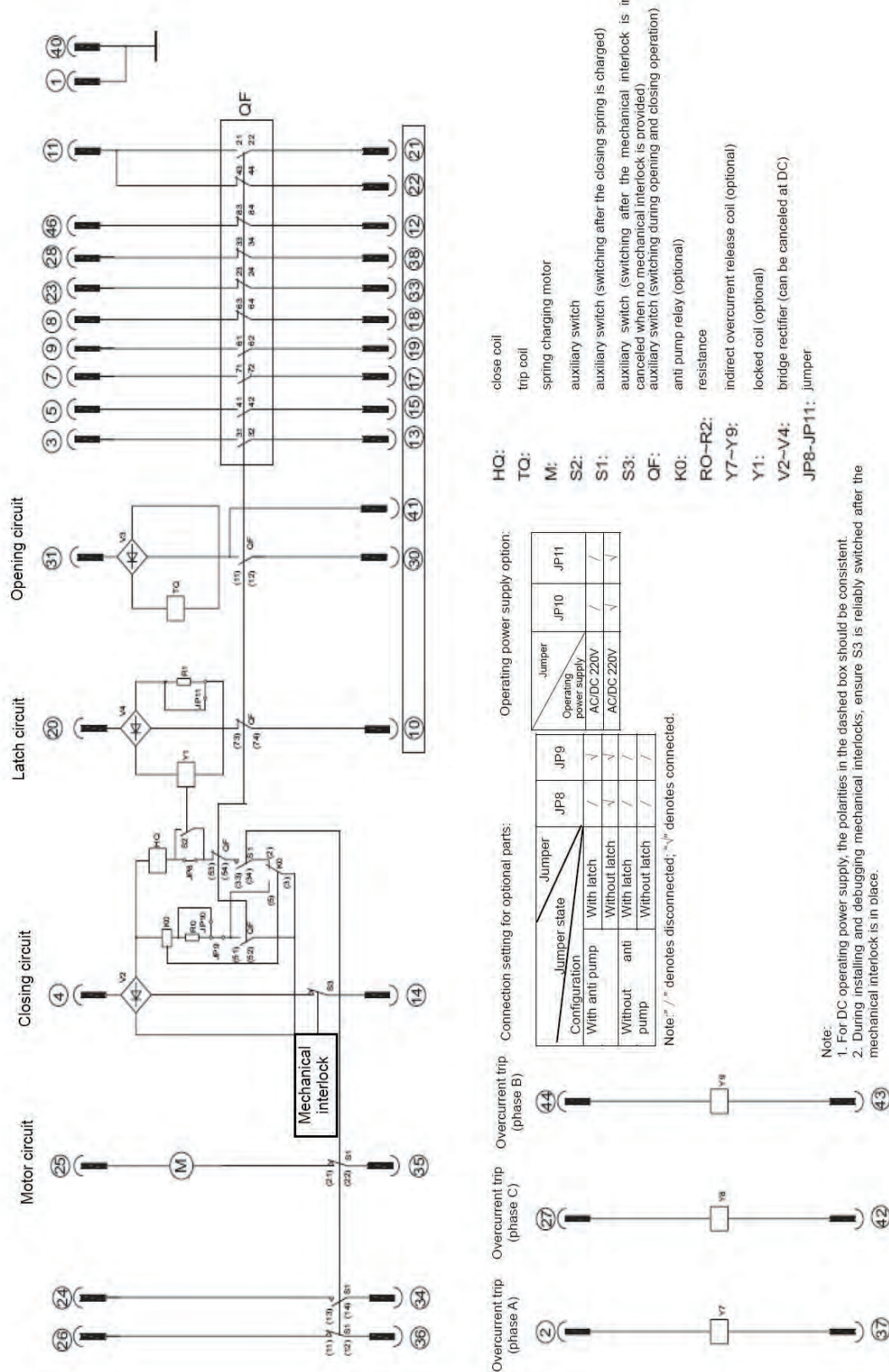




# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker

## Secondary control connection diagram of E-VAC EP series vacuum circuit breaker (fixed type)

The diagram shows the circuit breaker in opening, discharged states



# E-VAC EP Series Medium Voltage Vacuum Circuit Breaker

## E-VAC EP series vacuum circuit breaker selection table

### 1. Circuit breaker models

E-VAC (drawout type)                       E-VAC (fixed type)

### 2. Parameters of E-VAC EP series vacuum circuit breaker

Panel width (mm)	Breaker phase spacing(mm)	Rated short circuit breaking current (kA)	Rated working current (A)						
			<input type="checkbox"/> 630	<input type="checkbox"/> 1250	<input type="checkbox"/> 1600	<input type="checkbox"/> 2000	<input type="checkbox"/> 2500	<input type="checkbox"/> 3150	<input type="checkbox"/> 4000*
800	210	25	<input type="checkbox"/> 630	<input type="checkbox"/> 1250					
		31.5	<input type="checkbox"/> 630	<input type="checkbox"/> 1250	<input type="checkbox"/> 1600				
		40	<input type="checkbox"/> 1250	<input type="checkbox"/> 1600	<input type="checkbox"/> 2000				
		50	<input type="checkbox"/> 1250	<input type="checkbox"/> 1600	<input type="checkbox"/> 2000				
1000	275	25	<input type="checkbox"/> 2500						
		31.5	<input type="checkbox"/> 2000	<input type="checkbox"/> 2500	<input type="checkbox"/> 3150				
		40	<input type="checkbox"/> 1250	<input type="checkbox"/> 1600	<input type="checkbox"/> 2000	<input type="checkbox"/> 2500	<input type="checkbox"/> 3150	<input type="checkbox"/> 4000*	
		50	<input type="checkbox"/> 1250	<input type="checkbox"/> 1600	<input type="checkbox"/> 2000	<input type="checkbox"/> 2500	<input type="checkbox"/> 3150	<input type="checkbox"/> 4000*	

\* Forced air cooling is required at 4000A.

\* \* The specifications such as the need to purchase, please contact Eaton.

### 3. Technical parameters of spring operating mechanism

Opening power supply (V)                       DC110    AC110    DC220    AC220  
 Closing power supply (V)                       DC110    AC110    DC220    AC220  
 Spring charging motor power supply (V)    DC110    AC110    DC220    AC220

### 4. Optional configuration (standard option includes trip free device. Please note if the trip free device has to be canceled)

Overcurrent release                       2 Overcurrent                       3 Overcurrent                       A  
 Closing latch                                       V  
 Position latch                                       V  
 Trip free relay                                       V  
 Undervoltage release                       V  
 Operating handle                               Quantity needed



**Note:** Technical parameters of products will be changed without notice. Please confirm with Eaton corporation before ordering.



# Energizing that demands more.

## We deliver:

- **Electrical solutions** that use less energy, improve power reliability and make the places we live and work safer and more comfortable
- **Hydraulic and electrical solutions** that enable machines to deliver more productivity without wasting power
- **Aerospace solutions** that make aircraft lighter, safer and less costly to operate, and help airports operate more efficiently
- **Vehicle drivetrain and powertrain solutions** that deliver more power to cars, trucks and buses, while reducing fuel consumption and emissions

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As a global diversified power management company, we help customers worldwide manage the power needed for buildings, aircraft, trucks, cars, machinery and businesses.

Eaton's innovative technologies help customers manage electrical, hydraulic and mechanical power more reliably, efficiently, safely and sustainably.

We provide integrated solutions that help make energy, in all its forms, more practical and accessible.

With 2014 sales of \$22.6 billion, Eaton has approximately 99,000 employees around the world and sells products in more than 175 countries.



*Powering Business Worldwide*



Eaton is a power management company with approximately 97,000 employees. The company provides energy-efficient solutions that help our customers effectively manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. Eaton sells products to customers in more than 175 countries. For more information, visit [www.eaton.com](http://www.eaton.com).

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