

VCP-W Vacuum Circuit Breakers
VCP-WG Vacuum Circuit Breakers for Export Generators



Powering Business Worldwide



Automotive



Aerospace



Truck



Hydraulics



Electrical

Powering business worldwide

Eaton delivers the hundreds of power distribution 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, ANSI and GB / DL 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 standards and certifications such as IEC, NEMA / ANSI, GB / DL, 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.

Eaton's range of
SF₆ free switchgear
for Medium Voltage



An Eaton Green Solution





VCP-W Vacuum Circuit Breakers



V-Flex system

World-class VCP-W vacuum circuit breakers are designed with a patented V-Flex non-sliding current transfer system.

Beginning with early research in 1929, we have been a leader in the vacuum interrupter field. Production was launched in the mid-1960s. Eaton's vacuum breakers have superior operating features with our continuous research, development and perfection of each technical rating. Since that time, hundreds of thousands of vacuum interrupters have been in reliable operation worldwide.

Eaton's experience has resulted in many significant vacuum interrupter breakthroughs including:

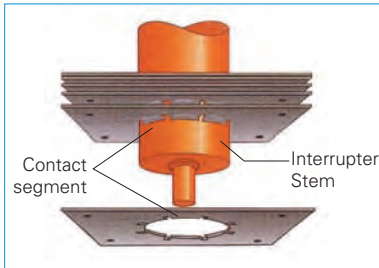
- Copper chrome contact materials that provide longer life.
- Lower chop currents.
- Improved field strength.

Consequently, Eaton's vacuum interrupters are maintenance free with increased service life and optimum operator safety.

VCP-W vacuum circuit breakers are designed with the patented V-Flex non-sliding, non-rolling current transfer system.

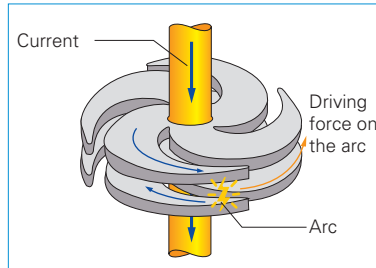
Current transfer system consists of a series of tinplated, high-conductivity copper leaf conductors that are embedded onto the movable interrupter stem. Unique embedded design benefits include:

- Improved current flow because the multipoint contact offers very low resistance.
- Unlike sliding or rolling designs, there are no moving parts to wear out. Therefore, no maintenance is needed.
- Longer circuit breaker service life.



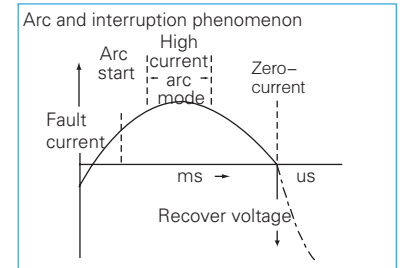
Nonsliding Current Transfer System

Connecting each leaf conductor to the vacuum interrupter stem initiates a flattening operation of the segments which are, in turn, embedded into contact with the stem. Each leaf, therefore, provides a multipoint connection. As the stem moves up and down, the V-Flex system flexes, eliminating the sliding action to provide a minimal wear and maintenance-free system.



Arcing and Interruption in Vacuum

Inside the vacuum bottle, the spiral contact design is adopted. This type of arc control prevents hot spot formations and minimizes electrode erosion, providing the smallest possible envelope size.



Arcing and Interruption Phenomena of Relevance to AC Switching

The important arcing and interruption phenomena that occur during fault current interruption in a vacuum are depicted above. These phenomena influence the design of the interrupter, particularly its size, configuration and material of the contacts. Full dielectric strength is re-established to withstand transient recovery voltage (TRV) within a few microseconds, the fastest available.

Industry-Leading Vacuum Technology Provides Unequaled Reliability

Eaton now provides a complete family of technologically advanced vacuum circuit breakers with voltage levels at 5 kV, 15 kV, 27 kV and 38 kV. VCP-W vacuum circuit breakers incorporate many design features which have been field proven with over 50 years of vacuum interrupter design and manufacturing experience...coupled with over 75 years of power circuit breaker design and manufacturing experience.

VCP-W vacuum circuit breakers are available in a complete range of ANSI and IEC ratings:

- ANSI 5 kV through 38 kV, continuous currents from 600 till 3000 amperes.
- GB 12 kV, continuous currents from 1250 till 2000 amperes (air cooling up to 6300A).

Working Conditions

- Ambient temperature: -15°C ~40°C ;
- Altitude ≤ 1000m ;
- Monthly average relative humidity: ≤ 90% (at 25 °C), daily average: ≤ 95% (at 25 °C) ;
- Earthquake intensity: not over 8 degrees ;
- No fire, explosion, chemical corrosion and violent vibration.

*Any other requirements, please contact Eaton

VCP-W Vacuum Category

- VCP-W(Standard)
- VCP-WC(High Capacity)
- VCP-WG(Dedicated for Generators)

ISO Certification

VCP-W Vacuum Circuit Breakers, including the vacuum interrupter, are assembled by Eaton in ISO 9002 certified facilities. The breakers are fully tested to ANSI and IEC standards and each is provided with its unique Quality Assurance Certificate that documents all tests and inspections performed.



Vacuum Circuit Breaker VCP-W

Key features

Easy for operation, inspection and maintenance

User-Friendly Operation

VCP-W vacuum circuit breaker controls and indicators are functionally grouped on the front control panel, including: contact position indicator, closing spring status, close and trip button, operation counter, and a "T" type racking out handle (located at the bottom of the control panel). The simplified design includes five major components: vacuum interrupter, stored energy mechanism, push rod assembly, primary disconnecting contacts, and removable glass polyester insulating barriers.

Convenient Inspection

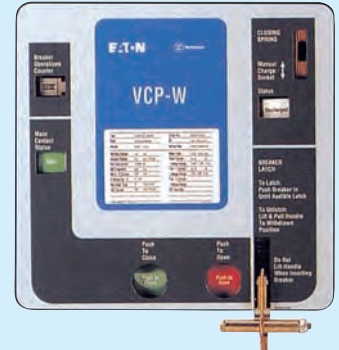
The breaker can be withdrawn in and out on extension rails and no separate lifting device is required. There is no need to remove the breaker completely from the switchgear. With the breaker withdrawn, both the compartment and contact erosion indicator, and "T" cutout loading spring indicator can be visually inspected. Both stored energy mechanism and control components are conveniently located behind the easily removed front panel.

Easy Maintenance

VCP-W vacuum circuit breakers are easily maintained. The mechanism is easy and reliable. The control components can be conveniently inspected and only minor maintenance (such as lubricating the mechanism) is required.

A Standardized Line

VCP-W vacuum circuit breakers represent a standard line that utilizes common parts. Standardization decreased total number of parts which, in turn, reduces spare parts inventory. For same range of VCP-W vacuum circuit breakers, over 70% parts are in common use.

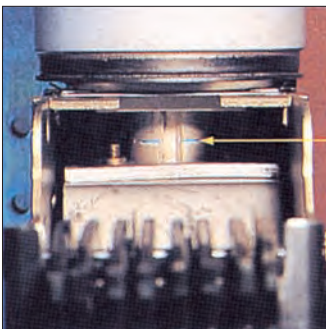


Control and operations are integrated in the panel, easy to operated

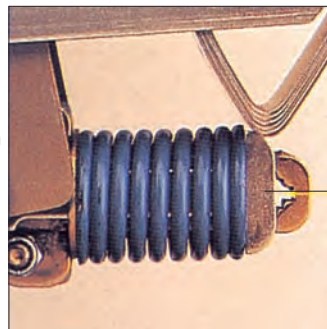


Internal Operating Mechanism

Easy to see indication check, Maintenance in ease



Contact Erosion Indicator



"T" Cutout Indicator

Easy-to-See Contact Erosion Indicator

The vacuum interrupter's contact erosion indicator is easy and clearly visible. Only periodic inspection of the erosion indicator is required.

"T" type cutout indicator

"T" type cutout indicator ensures that when closing the breaker, the springs are applying proper pressure to the contacts.

Vacuum Circuit Breakers

VCP-W MV Vacuum Circuit Breakers

Like all Eaton's vacuum circuit breakers, VCP-W vacuum circuit breakers with standard design has the reliability which been approved by 70 years design and manufacture experiences. This type of design is used in 36 inches switchgears. ANSI rated voltages are 5 to 38kV, while GB rated voltage is 12kV.



VCP-WC MV Vacuum Circuit Breakers

VCP-WC MV vacuum circuit breakers are designed for high capacity VCB used in 36 inches switchgears, including Epoxy insulation and Polyolefin insulated control wires. This type of breakers has ANSI rated voltages from 5.95 to 27kV.



VCP-WV Vacuum Circuit Breakers Technical Data

Breaker Type	Voltage		Insulation level		Current	
	Rated voltage (kV)	Maximum working Voltage (kV)	Power frequency (kV)	Impulse Withstand (kV)	Rated Current 60Hz (A)	Short-Circuit Breaking Current (kA)
75VCP-W500	7.2	8.25	36	95	1200/2000/3000	33
150VCP-W500	13.8	15	36	95	1200/2000/3000	18
150VCP-W750	13.8	15	36	95	1200/2000/3000	28
150VCP-W1000	13.8	15	36	95	1200/2000/3000	37
150VCP-W50W	12	15	42	75	1250/2000/3150(50Hz)	50
120VCP-W63W	10	12	42	75	4000/6300FC(50Hz)	63
150VCP-W1500(63)	13.8	15	36	95	1200/2000/3000	63
270VCP-W750	27	27	60	125	600/1200/2000	16
270VCP-W1000	27	27	60	125	600/1200/2000	22
270VCP-W1250	27	27	60	125	600/1200/2000	25
270VCP-W1600	27	27	60	125	1200/2000	31.5
270VCP-W2000	27	27	60	125	1200/2000	40
380VCP-W16	34.5	38	80	170	600/1200 1600/2000	16
380VCP-W25	34.5	38	80	170	600/1200 1600/2000	25
380VCP-W32	34.5	38	80	170	600/1200 1600/2000 3000FC/2500	31.5
380VCP-W40	34.5	38	80	170	1200/2000 3000FC/2500	40

Vacuum Circuit Breaker VCP-W

Technical data, dimension

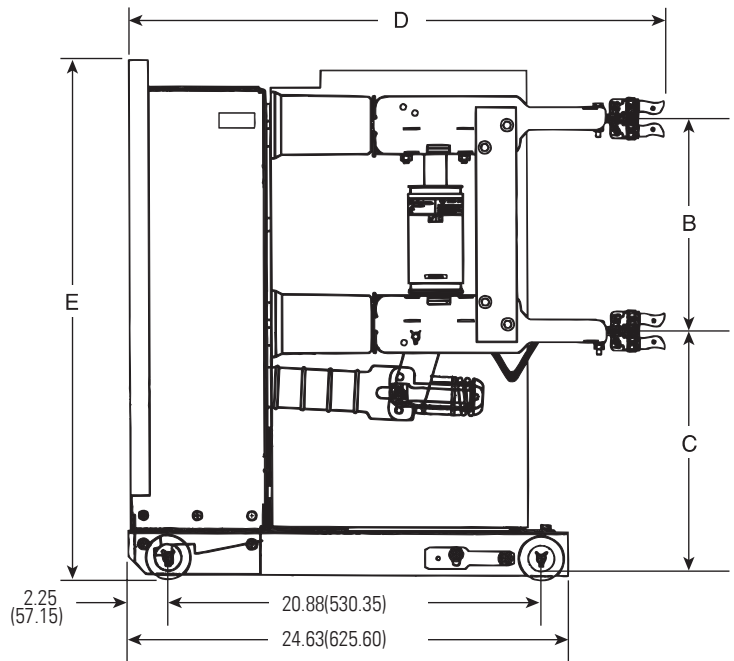
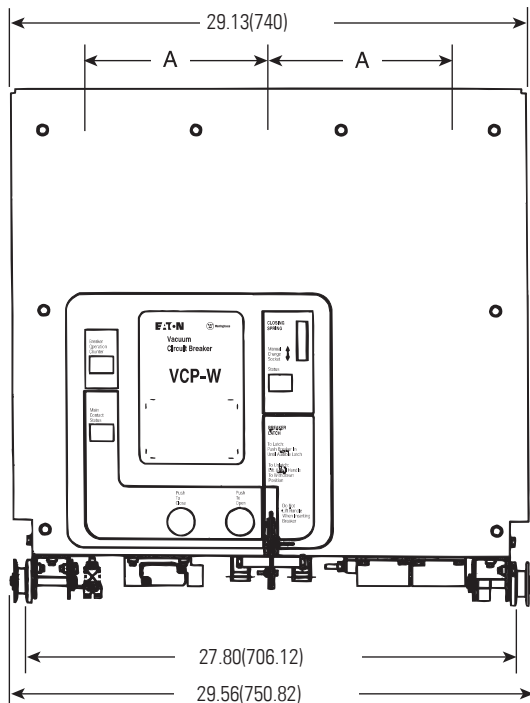
VCP-WC Technical Specification (ANSI Standard)

Breaker Type	Rated Voltage(kV)	Insulation level		Current		Short-Circuit Breaking Current (kA)	DC Components %	3s Withstand Current (kA)	Short-Circuit Breaking Current (kA)
		Power Frequency (kV)	Impulse Withstand (kV)	Rated Current 60Hz (A)					
150VCP-W40C	17.5	42	95	1200/2000/3000		40	75	40	139
150VCP-W50C	17.5	42	95	1200/2000/3000		50	57/57/52	50	139
270VCP-W40C	27	60	125	1200/1600		40	50	40	104

Breakers Weight

Breakers	Rated Current (A)		
	1200	2000	3000
	Weight/Lb (kg)		
75 VCP-W500	375(170)	410(186)	525(238)
150 VCP-W500	350(159)	410(186)	525(238)
150 VCP-W750	350(159)	410(186)	525(238)
150 VCP-W1000	460(210)	490(225)	525(238)
270 VCP-W1250	480(218)	500(227)	—

Dimensions Units: Inch (mm)



Breakers	A	B	C	D	E
270 VCP-W & 270 VCP-WC	10.00(254.00)	14.00(355.60)	16.25(412.75)	34.80(883.92)	35.22(894.59)
Sizes of all 3000A VCP-W, VCP-WG&VCP-WC, except the following types—	10.00(254.00)	12.00(304.80)	13.63(346.20)	29.94(760.48)	31.22(792.99)
— All other VCP-W sizes (eg.150/75C) 1200A	10.00(254.00)	12.00(304.80)	13.63(346.20)	29.81(757.17)	29.44(747.78)

A unique type of VCB-- VCP-WG Generator Vacuum Circuit Breakers



Generator circuits have unique characteristics that require specially designed and tested circuit breakers. The IEEE developed the special industry standards to address these characteristics. Eaton Corporation has dedicated years of research, design, enhancement and testing to create Eaton's VCP-WG generator breakers which meet, and even exceed, the service requirements defined by IEEE.

Eaton's exclusive VCP-WG VCB completely comply with GB/T 14824 «Common technical requirements for generator circuit-breaker» and ANSI C37.013 «Standard For AC High-Voltage Generator Circuit

Breakers Rated on a Symmetrical Current Basis». Eaton's VCP-WG generator circuit breakers meet and even exceed service duty requirements set forth by IEEE for generator circuit applications, including:

- Generator circuit configuration
- High continuous current levels
- Unique fault current conditions
- Transformer-source short-circuit faults
- Generator-source short-circuit faults
- Unique voltage conditions
- Very fast RRRV
- Out-of-phase switching

Unique Fault Current Conditions

Unique Fault Current Conditions System-source faults (see Figure 1, fault location "a") can be extremely high. When short-circuit fault took place in location "a", the full energy of the power system feeds the short-circuit current which results in generator circuit breaking switching, and the low impedance of the fault current path does very little to limit the fault current. As proven by IEEE standard tests, Eaton's VCPWG Generator Circuit Breakers are ideal for breaking such high fault currents because they have demonstrated high interruption ratings up to 75 kA, with high DC fault content up to 75%, Generator-source faults (see Figure 1, fault location "b") can cause a severe condition called "Delayed Current Zero" (see Figure 2). When short-circuit fault took place in location "b", short-circuit current is fed directly by the generator. The high ratio of inductive reactance to resistance (X/R ratio) of the system can cause the DC component of the fault current to exceed 100%. The short-circuit current completely deviates from the zero line (see Figure 2). The natural current zero is delayed for several cycles since fault begins. In this case, the asymmetrical short-circuit fault current peak value is extremely high with slow attenuation. The circuit breaker experiences longer arcing time and more electrical, thermal and mechanical stress during the interruption. According to IEEE's requirement, Eaton's VCP-WG Generator Circuit Breakers have passed the test of this condition to interrupt three-phase asymmetrical fault current levels up to 135% DC content.

Generator Circuit Configuration

The transformer and generator can be in close proximity to the circuit breaker (see Figure 1). Applications with high continuous current levels require connections with large conductors of very low impedance. This construction causes unique fault current and voltage conditions. Eaton VCP-WG Vacuum Circuit Breakers can operate reliably under these conditions.

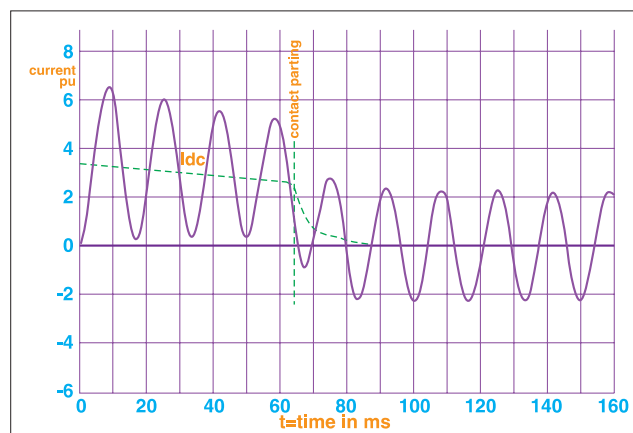
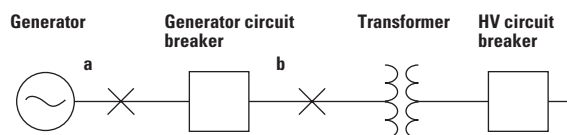


Figure 2: Generator-source faults can cause a severe condition called "Delayed Current Zero". The high ratio of inductive reactance to resistance (X/R ratio) of the system can cause the DC component of the fault current to exceed 100%

High Continuous Current Levels

Generator circuit breakers must be able to operate at high continuous current levels. Eaton's VCP-WG vacuum circuit breakers are designed to reliably operate up to 4000A for drawout breakers with natural air convection cooling, and up to 6000A for fixed circuit breakers. With suitable enclosure fan cooling in overload conditions, drawout circuit breakers are designed to reliably operate up to 5000A and fixed circuit breakers up to 7000A

Unique Voltage Conditions

Generator circuits typically produce very fast rates of rise of recovery voltage (RRRV) due to the high natural frequency and low impedance and very low stray capacitance. Eaton's VCP-WG Generator Circuit Breakers are designed to interrupt fault current levels with very fast RRRV in accordance with IEEE standard.

Vacuum Circuit Breaker VCP-W for Export Generator

Key features

Fault Current Breaking capacity

Eaton's VCP-WG Generator Circuit Breakers have a distinct feature to perform under out-of-phase conditions when the generator and power system voltages are not in sync. The voltages across the open contacts can be as high as twice the rated line-to-ground voltage of the system. The VCP-WG complies with IEEE standard requirement and passes the test that the generator circuit breaker can switch under specified out-of-phase conditions.

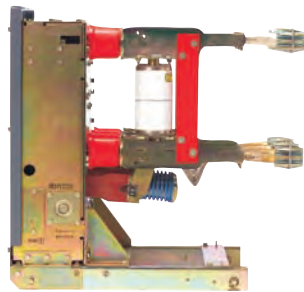
Versatility in Application

Eaton's Generator Vacuum Circuit Breakers are available in drawout (VCP-WG) or fixed (VCP-WRG) configurations to provide superior performance and versatility. Many industrial and commercial power systems now include small generators as a local source of power. New applications are arising as a result of the de-regulation of the utility industry, and the construction of smaller packaged power plants. Typical applications include:

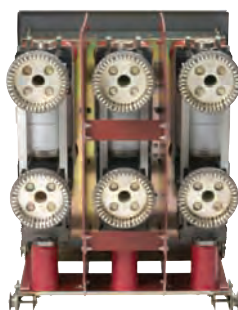
- Small and mid-sized hydro power generator
- Electrical generators
- Power plant
- Combined cycle/combustion turbines
- Paper, Chemical and manufacture companies with backup power plant



29-Inch Frame VCP-WG



31-Inch Frame VCP-WG



Choose a unique breaker for unique generator circuit. Please contact local Eaton sales engineers or visit www.eatonelectrical.com.cn to know more about VCP-WG Vacuum Circuit Breakers.

Drawout Breakers

	Ratings				
	Voltage	insulation level		voltage	
	Voltage rating	Dielectric Strength Impulse withstand	Lighting withstand	Operating current (60Hz)	Short-circuit current Symmetry breaking current
	kV rms	kV rms	kV rms	A rms	kA rms Total
150 VCP-WG 50	15	42	95	1200 2000 3000	50
150 VCP-WG 63	15	42	95	1200 2000 3000	63
150 VCP-WG 75	15	42	95	1200 2000 3000 4000 5000FC	75

Fixed Breakers

	Ratings				
	Voltage	insulation level		voltage	
	Voltage rating	Dielectric Strength Impulse withstand	Lighting withstand	Operating current (60Hz)	Short-circuit current Symmetry breaking current
	kV rms	kV rms	kV rms	A rms	kA rms Total
150 VCP-WRG 50	15	42	95	1200 2000 3000	50
150 VCP-WRG 63	15	42	95	1200 2000 3000	63
150 VCP-WRG 75	15	42	95	1200 2000 3000 4000 5000 6000 7000FC	75

Note:

- 1) Please refer to Figure 1 for specified ratings.
- 2) Fixed breaker types are VCP-WRG.
- 3) Drawout breakers can operate at 4000A with 75kA breaking capacity, 5000A with force air cooling. Drawout breakers can operate at 6000A with 75kA breaking capacity, 7000A with force air cooling.

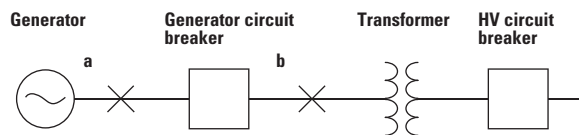
Vacuum Circuit Breaker VCP-W for Export Generator

Technical data

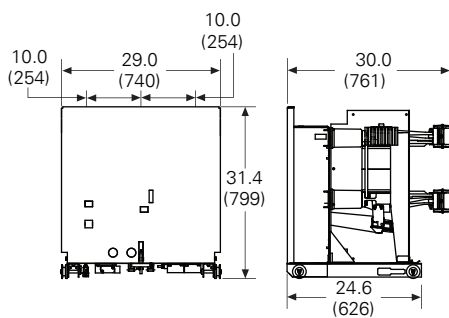
VCP-WG Technical Specifications

	150VCP-W(R)G 50(29 inch)		150VCP-W(R)G 63(29 inch)			150VCP-W(R)G 75(31 inch)		
Maximum Voltage	15kV		15kV			15kV		
Power factor	1.0		1.0			1.0		
Power frequency	50/60Hz		50/60Hz			50/60Hz		
Lighting withstand (voltage peak)	95kV		95kV			95kV		
1min PFMV	42kV		42kV			42kV		
Operation Sequence	CO - 30min - CO		CO - 30min - CO			CO - 30min - CO		
Fault position	"a"	"b"	"a"	"b"	"b"	"a"	"b"	"b"
Short-Circuit current	50 kA	25 kA	63 kA	31.5 kA	40 kA	75 kA	40 kA	50 kA
Breaking time	50 ms	50 ms	50 ms	50 ms	50 ms	83 ms	83 ms	83 ms
Minimum opening time	32 ms	32 ms	30 ms	30 ms	30 ms	54 ms	54 ms	54 ms
Zero point over-voltage delay	N/A	27 ms	N/A	22 ms	22 ms	N/A	22 ms	22 ms
Asymmetrical factor	1.46	2.16	1.47	2.16	1.85	0.63	2.09	1.85
	73 kA rms	54 kA rms	92.5 kA rms	67.9 kA rms	74.0 kA rms	100.0 kA rms	83.7 kA rms	92.5 kA rms
Transit recovery voltage	"a"		"a"			"a"		
Peak E2	27 kV		29 kV			27.6 kV		
Time to peak T2	8.8 μs		8.9 μs			9.3 μs		
Making current(peak)	137 kA		176 kA			206 kA		
Breaking current time	50 kA		63 kA			75 kA		
Short-circuit withstand	3 s		3 s			1 s		
Out-of-phase interrupting								
Voltage	21.2 kV		21.6 kV			21.6 kV		
Breaking current	25 kA		31.5 kA			37.5 kA		
Max. making current(peak)	69 kA		86 kA			110 kA		
Transient recovery voltage								
Transit recovery voltage Peak E2	45 kV		45 kV			45 kV		
Time to peak T2	15 μs		14.9 μs			13.4 μs		
Mechanical endurance	10000		10000			10000		
Load Switching Endurance	10000		10000			10000		

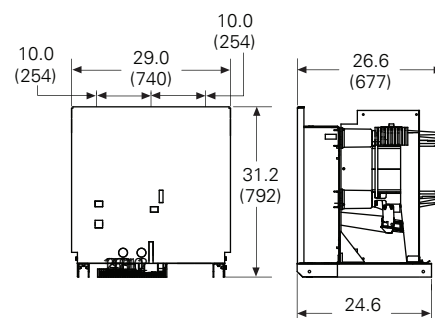
Generator circuit has unique specifications. VCP-WG can operate safely when system short-circuit (a) and generator short-circuit (b) happens



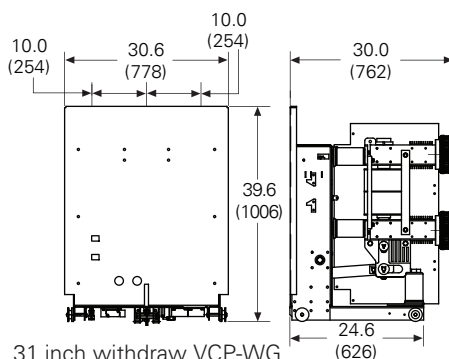
Dimension (Unit: Inch(mm))



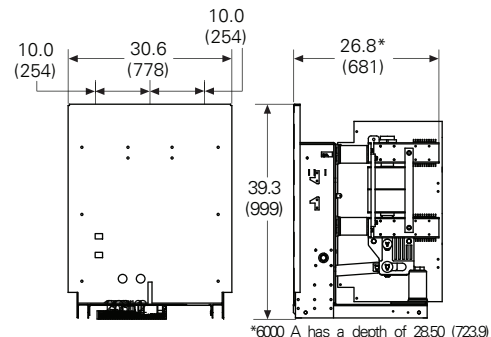
29 Inch frame withdraw VCP-WG



29 inch frame fixed VCP-WRG



31 inch withdraw VCP-WG

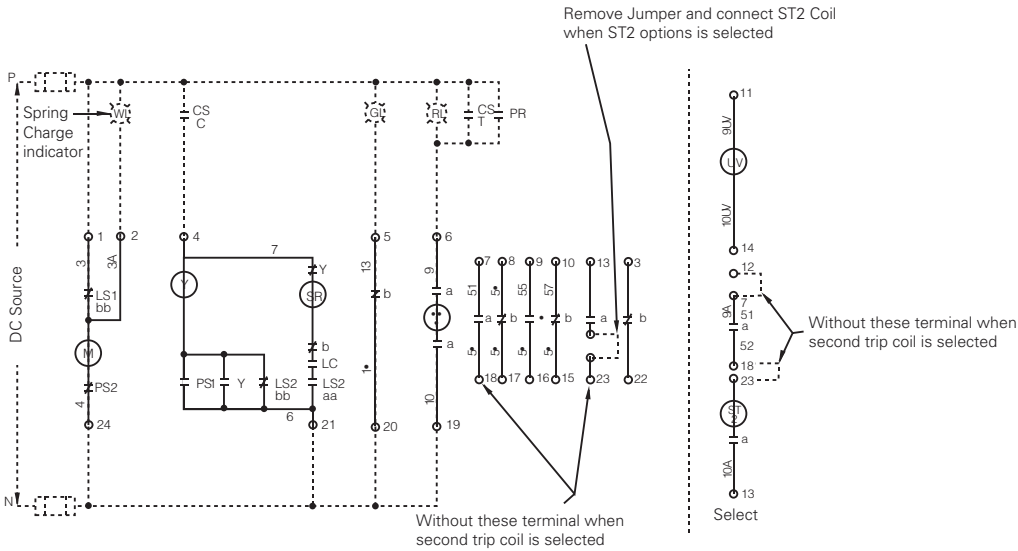


31 inch frame fixed VCP-WRG

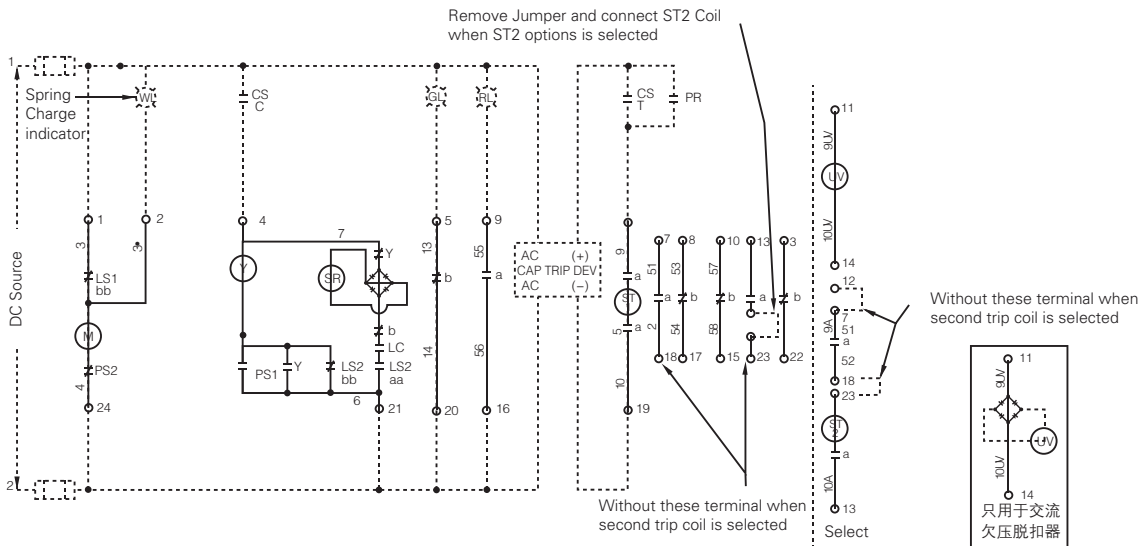
Vacuum Circuit Breaker VCP-W for Export Generator

Principle chart

DC Control Principle Chart of VCP-W/WG Vacuum Circuit Breakers



AC Control Principle Chart of VCP-W/WG Vacuum Circuit Breakers



Legend

CS C	-	Breaker Switch - Closing	LS1 bb	Closed until Spring charged
CS T	-	Breaker Switch -Tripping	LS2 aa	Open until Spring charged
Y	-	Anti-Pumping Relay	LS2 bb	Closed until Spring charged
SR	-	Spring release coil (Closing Coil)	LC	Open until mechanism reset
M	-	Spring charge motor	PS 1	Open (except for test and connect position)
ST	-	Shunt-Tip Coil	PS 2	Open (except for test and connect position)
PR	-	Protection relay		
O	-	Terminal block/bar		
PS 1	-	Position Switch 1		
PS 2	-	Position Switch 2		

Breaker Terminal

'C' and 'NO'	Brown Switch
'C' and 'NC'	Black Switch
'C' and 'NO'	
'C' and 'NC'	Black Switch
'C' and 'NO'	Brown Switch

* Option of 5NO,5NC contact is available, please contact Eaton



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Powering Business Worldwide

The power of fusion.



There's a certain energy at Eaton. It's the power of uniting some of the world's most respected names to build a brand you can trust to meet your every power management need.

EAT•N

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Eaton is dedicated to ensuring that reliable, efficient and safe power is available when it's needed most. Building on over 100 years of experience in electrical power management, the experts at Eaton deliver customized, integrated solutions to solve your most critical challenges. To learn more visit www.eaton.com/electrical.

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Eaton is dedicated to ensuring that reliable, efficient and safe power is available when it's needed most. With unparalleled knowledge of electrical power management across industries, experts at Eaton deliver customized, integrated solutions to solve our customers' most critical challenges.

Our focus is on delivering the right solution for the application. But, decision makers demand more than just innovative products. They turn to Eaton for an unwavering commitment to personal support that makes customer success a top priority. For more information, **visit www.eaton.com/electrical**.

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