



VK12

INDOOR MEDIUM VOLTAGE VACUUM CIRCUIT BREAKER

PRODUCT INTRODUCTION



www.veikai.cn

VEIKAI 维凯电气
VEIKAI ELECTRIC



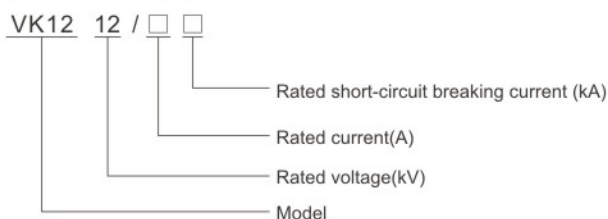
VK12 Indoor medium voltage vacuum circuit breaker

- This switchgear should be only installed indoors where is suitable for electrical equipment.
- The installation, operation and maintenance should be done by the professionals.
- Must guarantee the connection reliability of on-site electrical equipment as well as the applicability and safety of operation rules.
- All operations to switchgear should conform to relevant regulations in this manual.
- ⚠ Danger!
Please pay special attention to the precautions with this mark.
- Don't use loads that beyond the specified technical parameters under normal operating conditions.
- The manual should be put in visible place where the operator and maintenance personnel can get it easily.
- The operator should be responsible for all safety operations, and should use the switchgear properly.
- Feel free to contact us if any question, we are pleasure to provide further information.

VK12 Indoor medium voltage vacuum circuit breaker



Model description



Overview

VK12 indoor high-voltage vacuum circuit breaker (hereinafter referred to as circuit breaker) is an indoor switching device for power systems of 12KV, used as protection and control unit for power grid equipment and electrical equipment in industrial and mining enterprises. Due to its special advantages, it is quite suitable for locations where need frequent operation at rated working current, or need frequent short-circuit current breaking operation. The circuit breaker adopts integrated design of operating mechanism and body of circuit breaker, it not only can be used as a fixed installation unit, but also can be equipped with a special propelling mechanism to constitute a handcart unit for operation. The fixed type circuit breaker also can be equipped with corresponding interlocks to meet the needs of XGN2, GG1A and other fixed type switchgears.



Normative references

The circuit breaker complies with the standards GB1984-89 Alternating current high-voltage circuit-breakers, JB3855-1996 Indoor high-voltage alternating-current vacuum circuit breaker of 3.6~40.5kV, DL/T403-2000 HV vacuum circuit-breaker for rated voltage 12kV to 40.5kV, also is in conformity with relevant requirements of IEC56 (87 edition).

Service conditions

- Ambient temperature
Maximum: +40℃
Minimum: -15℃
- Ambient humidity
Daily mean relative humidity: ≤95%
Monthly mean relative humidity: ≤90%
Daily mean vapor pressure: ≤2.2×10⁻³ MPa
Monthly mean vapor pressure: ≤1.8×10⁻³ MPa
- Altitude: not exceed 1000m;
- Seismic intensity: not exceed Ms8;
- Locations free of water drop, far away from flammable or explosive danger, no chemical or corrosive gas or severe vibration.



VK12 Indoor medium voltage vacuum circuit breaker

Main specifications and technical parameters

See table 1 for main specifications and technical parameters

No.		Unit	Data						
1	Rated voltage	kV	12						
2	Rated short-time power frequency withstand voltage (1min)		42						
3	Rated lightning impulse withstand voltage (peak)		75						
4	Rated frequency	Hz	50						
5	Rated current	A	630 1250	630 1250	630 1250 1600 2000 2500 3150	1250 1600 2000 2500 3150 4000*	1600 2000 2500 3150 4000*		
6	Rated short-circuit breaking current	kA	20	25	31.5	40	50		
7	Rated short-time withstand current		20	25	31.5	40	50		
8	Rated short-circuit duration	s	4						
9	Rated peak withstand current	kA	50	63	80	100	125		
10	Rated short-circuit making current		50	63	80	100	125		
11	Power frequency withstand voltage of secondary circuit (1min)	V	200						
12	Rated breaking current of single / back-to-back capacitor bank	A	630/400(that of 40kA is 800/400)						
13	Rated capacitor bank inrush making current	kA	12.5(frequency not more than 1000Hz)						
14	Opening time (rated voltage)	ms	20~50						
15	Closing time (rated voltage)		35~70						
16	Mechanical life	次 / Times	20000(that of 50kA is 10000 times)						
17	Rated current breaking times (electrical life)		20000(that of 50kA is 10000 times)						
18	Rated short-circuit current breaking times		50(that of 40kA is 30, 50kA is 20)						
19	Permissible wear thickness of moving and static contacts	mm	3						
20	Rated closing operating voltage	V	AC110/220 DC110/220						
21	Rated opening operating voltage		AC110/220 DC110/220						
22	Rated voltage of energy-storage motor	V	AC110/220 DC110/220						
23	Rated power of energy-storage motor	W	80						
24	Energy-storage time	s	≤15						
25	Clearance between open contacts	mm	11±1						
26	Overtravel		3.5±0.5						
27	Contact closing bounce time	ms	≤2(40kA≤3)						
28	Three-phase opening and closing asynchrony		≤2						
29	Average opening speed (contact opening~6mm)	m/s	0.9~1.2						
30	Average closing speed (6mm-contact closing)		0.5~0.8						
31	Contact opening rebound value	mm	≤3						
32	Resistance of main conductive circuit	μΩ	≤55(630A) ≤50(1250A) ≤35(1600~2000A) ≤25(2500A以上)						
33	Contacting pressure of contact closing	N	2400±200(20kA、25kA) 3100±200(31.5kA) 4250±250(40kA) 7000+250(50kA)						
34	Rated operation sequence		O-0.3s-CO-180s-CO O-180s-CO-180s-CO (50kA)						

Note: that of 4000A needs forced air cooling system

VK12 Indoor medium voltage vacuum circuit breaker

Product structure and working principle



Structure of main body

Main body of circuit breaker is set in an insulating cylinder that is made of epoxy resin by means of APG casting, which protects the vacuum arc-extinguish chamber from impact of external forces, polluted environment, or other external factors. The main body of breaker is installed at the back of framework, forms into one-piece with the operating mechanism.

Current path of main loop of circuit breaker in closing position: (see Fig.2)

From upper outlet 27, pass the upper support 26 that is fixed on the arc-extinguish chamber, flow through the static contact inside the vacuum arc-extinguish chamber, to lower support 30 by moving contact and conductive clamp and flexible coupling that are connected with the moving contact, reach the lower outlet 31.

When leaving the factory, circuit breakers of each current class are equipped with dustproof insulating cylinder cover, which can be remained when the breakers of rated current up to and including 1250A is put into operation, but must be removed for that of rated current of 1600A and above.



Operating mechanism (see Fig.1 and 2)

It adopts spring energy-storage operating mechanism, with closing unit, opening unit that is composed of one or multi tripping electromagnets, auxiliary switch, indicator and other components inside the framework of circuit breaker; there are ON/OFF button, manual storing operating hole, spring storing status indicator, ON/OFF indicator and so on in the front.

VK12 Indoor medium voltage vacuum circuit breaker

Energy storage

Energy required by closing of circuit breaker is provided by energy storing of closing spring. The energy storage can be finished either by external power supply by means of motor driving, or by energy-storage handle by manual.

Energy storing: it can be done by energy-storage motor 16 that is fixed on the framework, or by inserting the energy-storage handle into manual storing hole and rotating CCW. When adopting motor storage, the motor output shaft 15 drives sprocket driving system (14, 23, 18); or the worm wheel and worm (11, 13) drive the sprocket driving system if adopted manual storage. When the sprocket wheel 13 rotates, pin 2 pushes the sliding block 4 on the wheel 6 and let the energy-storage shaft 7 rotate along with the wheel, and the crank arms 5 and 21 elongate the closing spring to store energy. When reaching the designated position, the gag lever post 3 on the framework presses down the sliding block 4 to separate the energy-storage shaft from the sprocket driving system, meanwhile, energy-storage retaining detent 9 presses against the idler wheel 8 and retains the storing position, connecting plate 24 on the energy-storage shaft drives the energy-storage indicator to turn to display the mark of energy stored, meanwhile, change over the auxiliary switch to cut off the power supply of energy-storage motor, now the circuit breaker is in ready state of closing.

Closing

Energy required by closing of circuit breaker is provided by energy storing of closing spring. The energy storage can be finished either by external power supply by means of motor driving, or by energy-storage handle by manual.

In closing operation, the energy-storage retaining shaft 19 can be rotated either by pressing the Closing Button or by closing electromagnet by remote operation to separate the detent 9 from idler wheel 8, at the same time of compression of closing spring, to drive the energy-storage shaft 7 and the cam 22 on it by means of crank arms 5 and 21, the cam drives the link mechanism (34, 36, 37, 38, 39) to bring the insulating pull rod 33 and moving contact into closing position and compress the contact spring 32 to keep a necessary contacting pressure for contacts. After the closing operation, the closing detent 38 and haft-shaft 41 retain the closing position. Meanwhile, the energy-storage indicator and energy storing auxiliary switch restore, power supply circuit of motor is put through, it would enter into energy-storage state again if the external power supply is switched on once more. The connecting rod 44 pulls the ON/OFF indicator to display "ON", and the driving rod actuates the main and auxiliary switches to switch over.

VK12 Indoor medium voltage vacuum circuit breaker

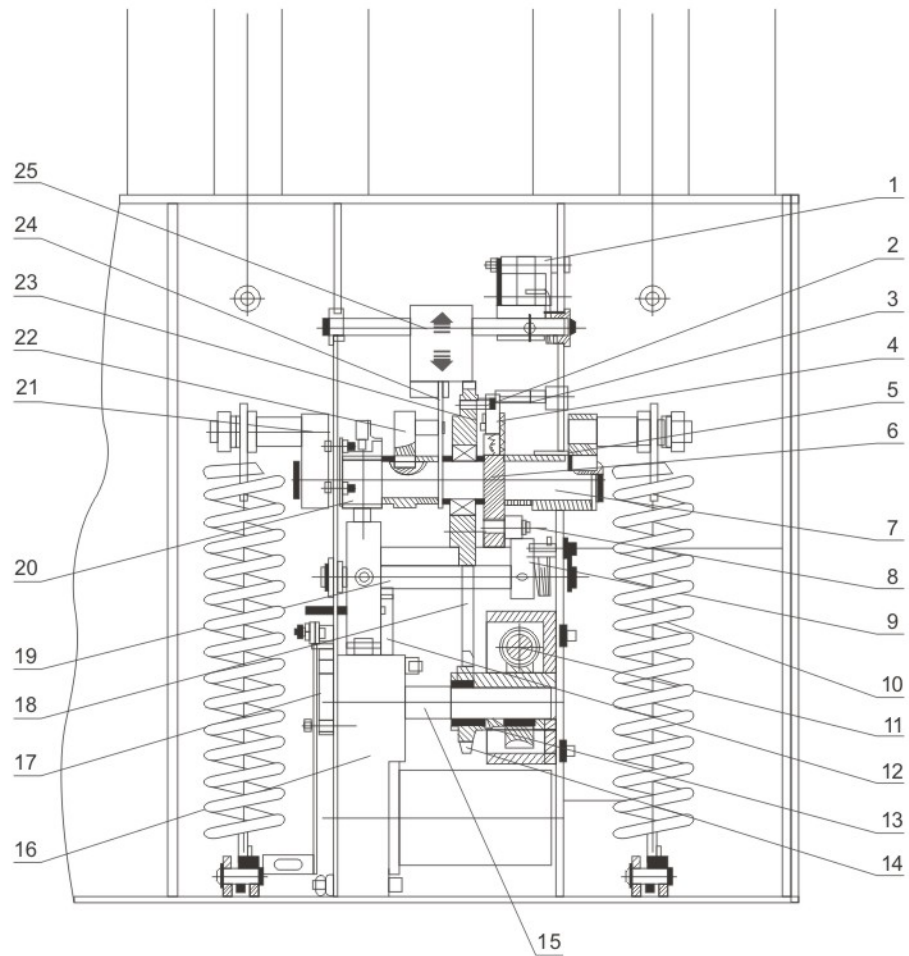


Fig.1

- | | |
|---|--|
| 1. Sensitive switch for changeover at energy fully stored | 13. Manual energy-storage driving worm wheel |
| 2. Pin | 14. Motor driving sprocket |
| 3. Gag lever post | 15. Motor output shaft |
| 4. Sliding block | 16. Energy-storage motor |
| 5. Crank arm | 17. Interlocking driving bending plate |
| 6. Energy-storage driving wheel | 18. Driving chain |
| 7. Energy-storage shaft | 19. Energy-storage retaining shaft |
| 8. Idler wheel | 20. Latching electromagnet |
| 9. Energy-storage retaining detent | 21. Crank arm |
| 10. Closing spring | 22. Cam |
| 11. Manual energy-storage worm | 23. Energy-storage driving sprocket |
| 12. Closing electromagnet | 24. Connecting plate |
| | 25. Energy-storage indicator |

VK12 Indoor medium voltage vacuum circuit breaker

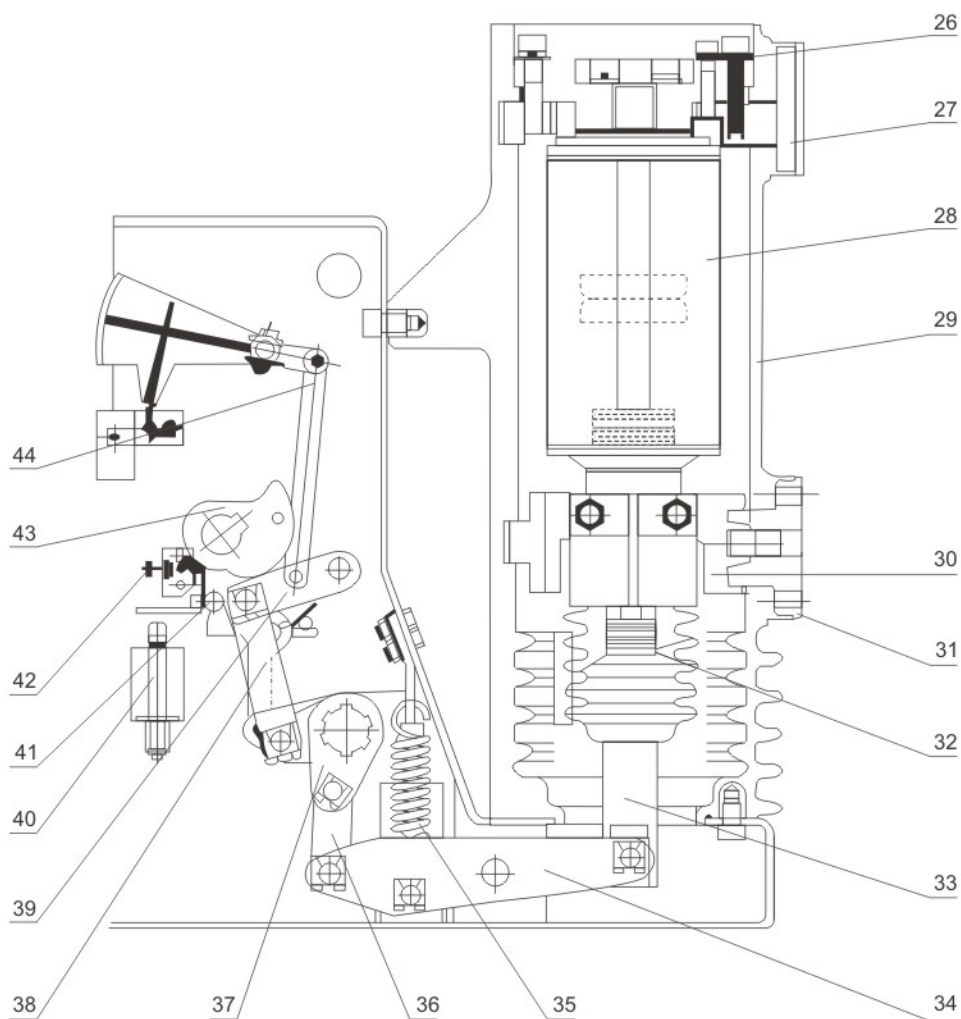


Fig.2

- | | |
|-----------------------------------|--|
| 26. Upper support | 35. Opening spring |
| 27. Upper outlet | 36. Driving connecting plate |
| 28. Vacuum arc-extinguish chamber | 37. Driving crank arm of main shaft |
| 29. Insulating cylinder | 38. Closing retaining detent |
| 30. Lower support | 39. Connecting plate |
| 31. Lower outlet | 40. Opening electromagnet |
| 32. Belleville spring | 41. Haft-shaft |
| 33. Insulating pull rod | 42. Manual opening pin |
| 34. Driving crank arm | 43. Cam |
| | 44. Connecting plate of ON/OFF indicator |

VK12 Indoor medium voltage vacuum circuit breaker

Note: It is unable to conduct closing operation when the circuit breaker is in closing state, or when using the locking device while the locking device has not been unlocked, or during the propelling/withdrawing process of handcart type circuit breaker.

c.Opening

Opening operation can be realized by pressing the Opening Button simply, or by putting through the external power supply and driving the opening tripping electromagnet or over-current tripping electromagnet to release the closing retaining detent 38 from half-shaft 41. The energy stored by contact spring and opening spring 35 enables the moving and static contacts of arc-extinguish chamber 28 to separate from each other. During the last stage of opening process, the hydraulic buffer would absorb the residual energy in opening, and restrict the opening position. The connecting rod 44 pulls the ON/OFF indicator to display "OFF", meanwhile, it drives the counter to count, and the driving rod actuates the main and auxiliary switches to switch over.



VK12 Indoor medium voltage vacuum circuit breaker

Anti-misoperation interlocking

Main body of circuit breaker is set in an insulating cylinder that is made of epoxy resin by means of APG casting, which protects the vacuum arc-extinguish chamber from impact of external forces, polluted environment, or other external factors. The main body of breaker is installed at the back of framework, forms into one-piece with the operating mechanism.

Circuit breaker provides perfect anti-misoperation function. (See Fig.3 and 4)

- After the circuit breaker finishes the closing operation, the closing interlocking bending plate 1 moves downwards and catches the closing bending plate 2 on the closing retaining shaft, and it will not conduct closing again before the circuit breaker get into opening.
- When the closing operation is finished, the anti-trip control circuit inside the circuit breaker would cut off the closing circuit to prevent reclosing if the closing signal has not been removed in time. (Optional)
- When the handcart type circuit breaker has not reached the test or work position, the interlocking bending plate 3 would catch the pin 4 on the closing bending plate 2, meanwhile cut off the closing circuit, in order to prevent the circuit breaker entering into load area in closing state.
- When the handcart type circuit breaker gets closing in work or test position, the idler wheel 5 will press the lock plate 6 of propelling mechanism, and the handcart could not move any more, in order to prevent pushing in or drawing out from the load area in closing state. (Fig.4)
- When selecting electric closing locking, don't conduct closing operation when the locking device has not been unlocked.

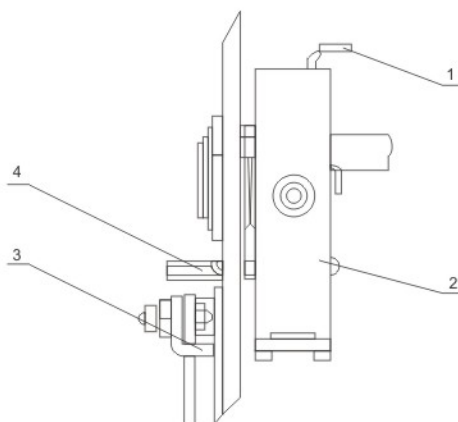


Fig.3

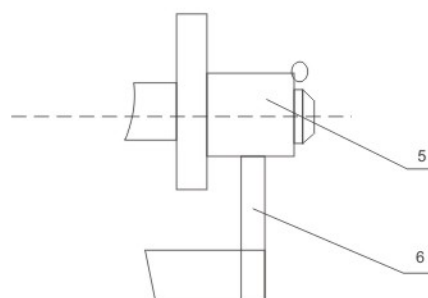
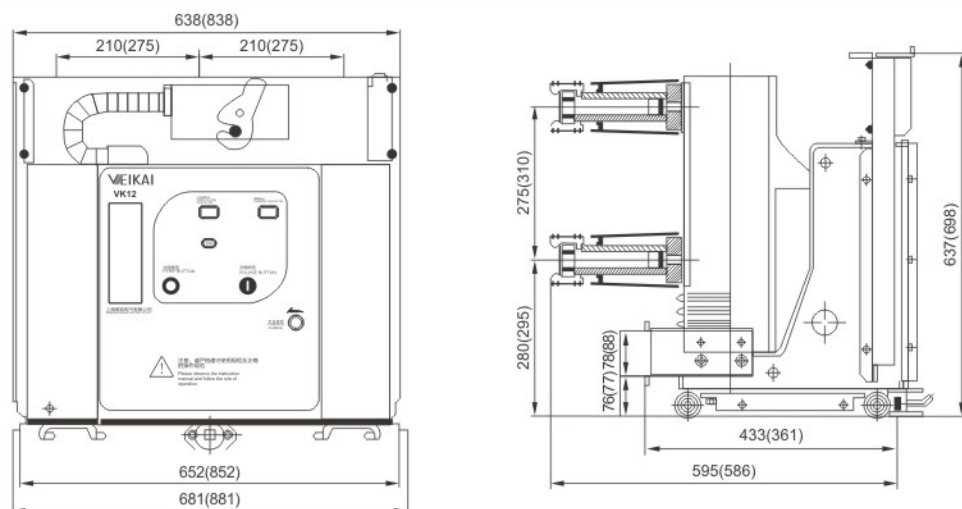


Fig.4

Note: power of closing locking device is 2.7W, operating voltage range is 0.65~1.1 times of rated voltage.

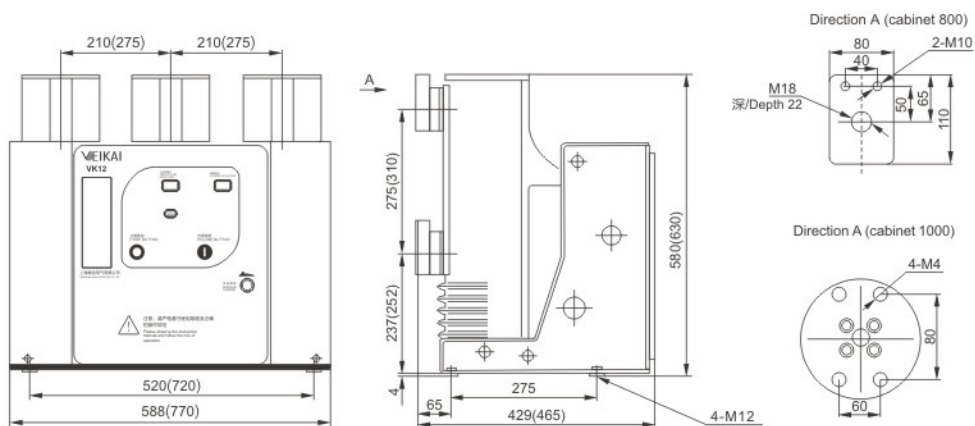
VK12 Indoor medium voltage vacuum circuit breaker

Outline dimension and installation [data in () is dimension of heavy current]



Handcart type

Rated current (A)	630	1250	1600	2000	2500、 3150、4000
Rated short-circuit breaking current (kA)	20、25、31.5	20、25、 31.5、40	25、31.5、40	25、31.5、40	25、31.5、40
Dim. of the static contact matched (mm)	Φ35	Φ49	Φ55	Φ79	Φ109



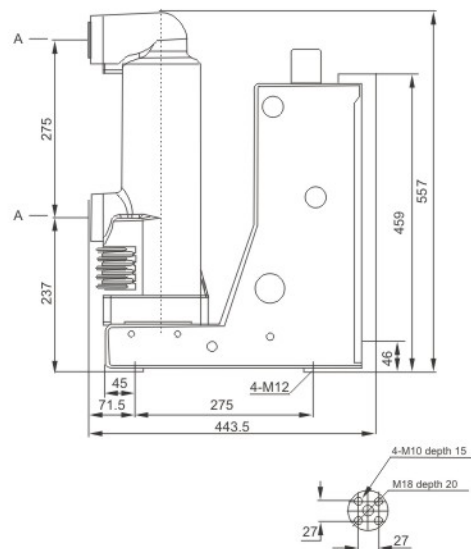
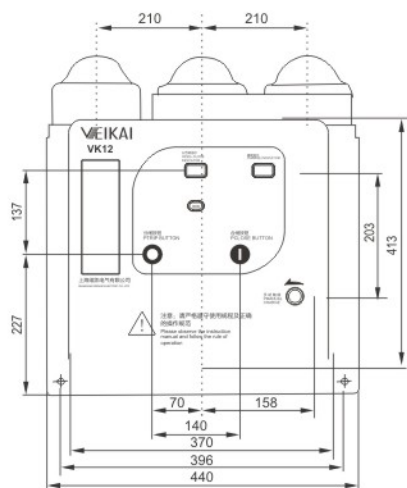
Fixed type

Rated current (A)	630	1250	1600	2000	2500、 3150、4000
Rated short-circuit breaking current (kA)	20、25、31.5	20、25、 31.5、40	25、31.5、40	25、31.5、40	25、31.5、40

VK12 Indoor medium voltage vacuum circuit breaker

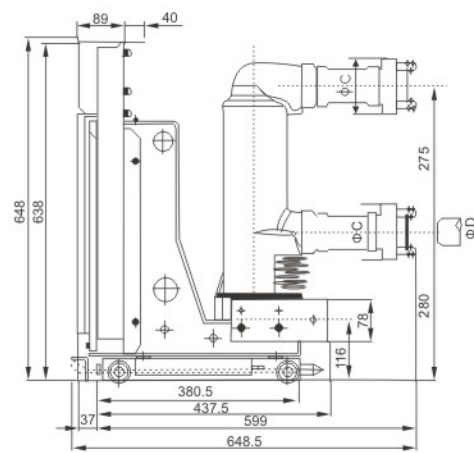
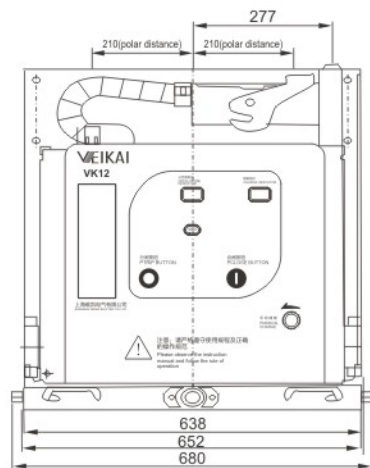
Outline of circuit breaker

Outline and installation dimensions of the VK12 fixed type (polar distance 210mm)



Rated current (A)	630	1250	1600
Rated short-circuit breaking current (kA)	20,25	25,31.5	25,31.5

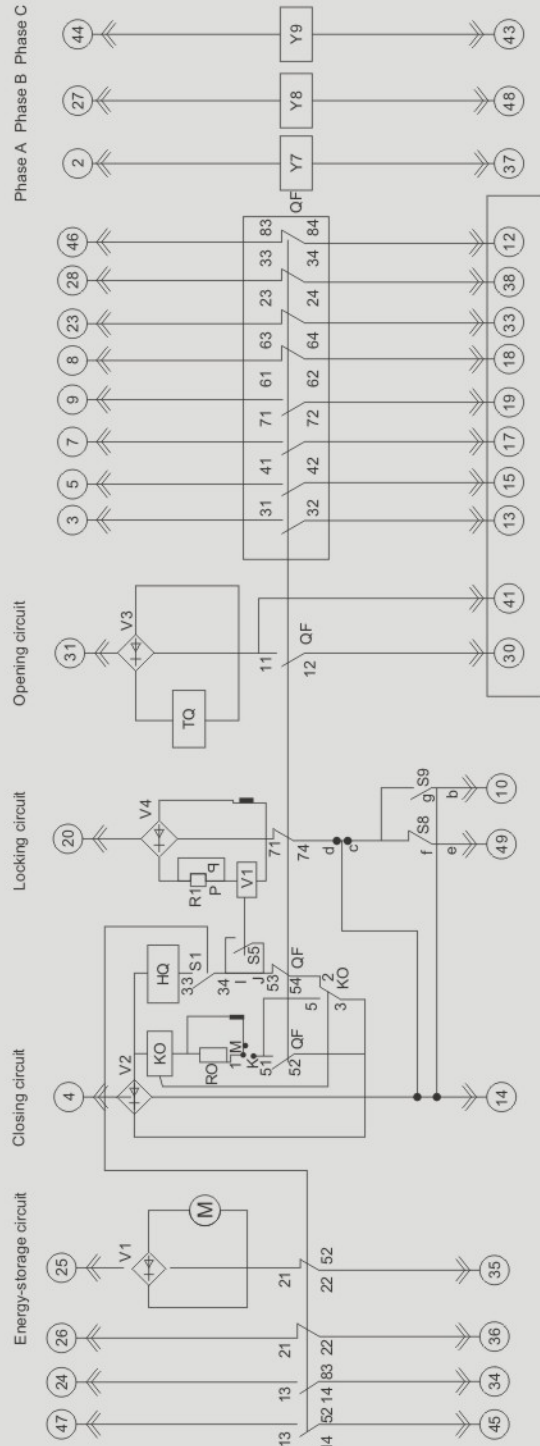
Outline and installation dimensions of the VK12 handcart type (polar distance 210mm)



Rated current (A)	630	1250	1600
Rated short-circuit breaking current (kA)	20,25	20,31.5	31.5,40
O.D. of tulip contact sheath C(mm)	86	98	104
Dim. of the static contact matched D(mm)	35	49	55

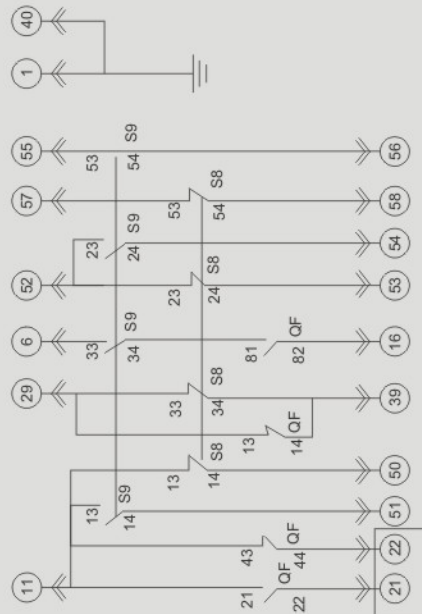
VK12 Indoor medium voltage vacuum circuit breaker

Internal electric circuit diagram of circuit breaker (handcart type)



Function configuration	Jumper wire description
With anti-trip	Short-circuit connect k and 1
Without anti-trip	Not short-circuit connect k and 1
With locking	Short-circuit connect a and b, c and d, e and f, g and h
Without locking	Short-circuit connect a and f, a and g, b and c, i and j
AC/DC 220	Not short-circuit connect m and 1, p and q
AC/DC 110	Short-circuit connect m and 1, p and q

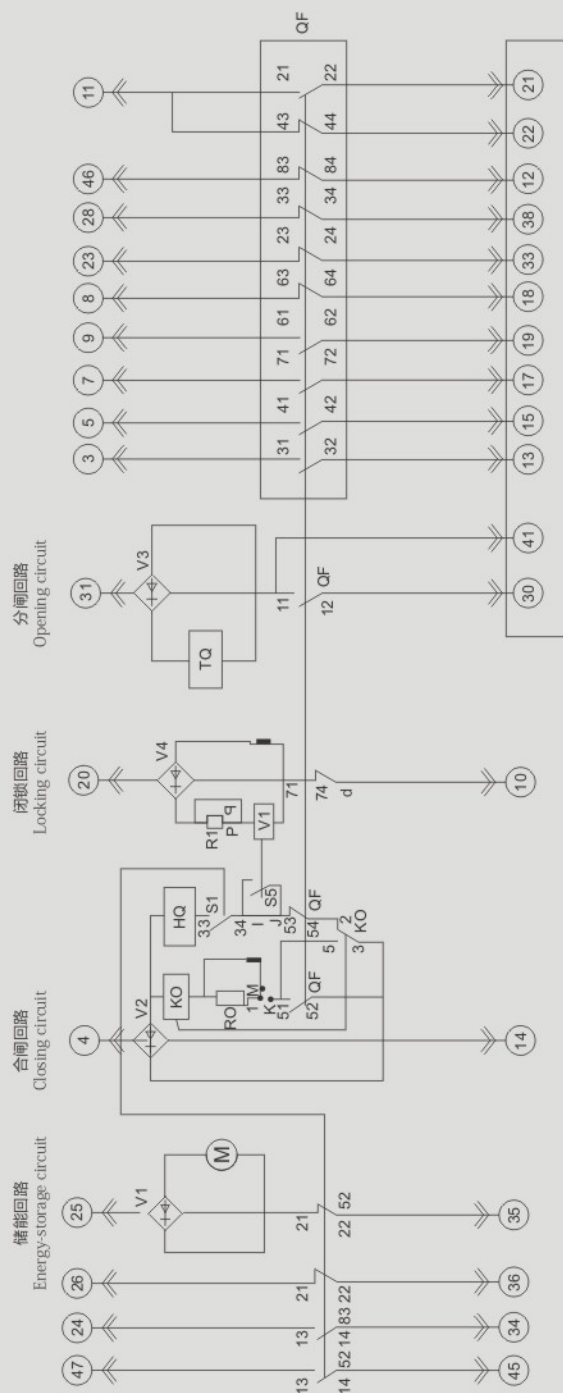
HQ: closing coil
TQ: opening coil
M: energy-storage motor
S1, S2, S3: sensitive switch (switching after energy storing)
QF: auxiliary switch (switching at opening and closing operations)
Y7, Y8, Y9: indirect overcurrent release coil (optional)
Y1: latching electromagnet (optional)
K0: anti-bounce relay (optional)
S8: auxiliary switch of test position
S9: auxiliary switch of work position
S5: auxiliary switch of latching electromagnet
R0, R1: resistor
V1, V2, V3, V4: bridge rectifier



Note:
1. VK12 as shown in the diagram is in test position in opening state without energy stored.
2. When the operating power is DC, the polarity in the broken line frame should be according.

VK12 Indoor medium voltage vacuum circuit breaker

Internal electric circuit diagram of circuit breaker (fixed type)



Note:

1. VK12 as shown in the diagram is in test position in opening state without energy stored;
2. When the operating power is DC, the polarity in the broken line frame should be according.

Function configuration	Jumper wire description
With anti-trip	Short-circuit connect k and 1
Without anti-trip	Not short-circuit connect k and 1
With locking	Not short-circuit connect l and j
Without locking	Short-circuit connect l and j
AC/DC 220	Not short-circuit connect m and 1, p and q
AC/DC 110	Short-circuit connect m and 1, p and q

HQ: closing coil

TQ: opening coil

M: energy-storage motor

S1, S2, S3: sensitive switch (switching after energy storing)

QF: auxiliary switch (switching at opening and closing operations)

Y7, Y8, Y9: indirect overcurrent release coil (optional)

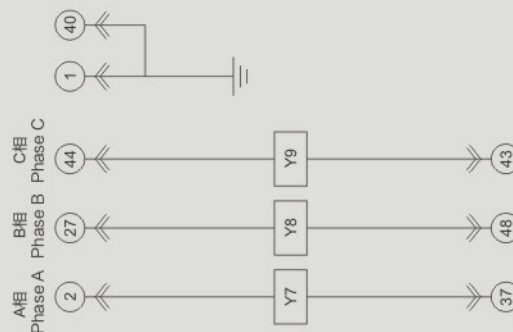
Y1: latching electromagnet (optional)

K0: anti-bounce relay (optional)

S5: auxiliary switch of latching electromagnet

RO, R1: resistor

V1, V2, V3, V4: bridge rectifier





FOR MORE INFORMATION, PLEASE
VISIT THE OFFICIAL WEBSITE

SHANGHAI VEIKAI ELECTRIC CO., LTD. Add: Building 4, No.8 Hengyong Road, Jiading District, Shanghai



Tel: 0086-21-59588829



Fax: 0086-21-69588207



[Http://www.veikai.cn](http://www.veikai.cn)



E-mail: veikai@veikai.cn