VS1-12 Series Indoor High Voltage Vacuum Circuit Breaker

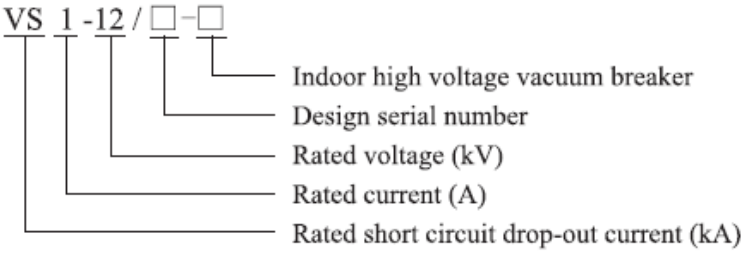
Installation and Operation Manual

1.General description

ZN63 (VS1) -12 indoor high voltage vacuum circuit breaker is a three-phase AC 50Hz, rated voltage of 12kV indoor switchgear, control and protection for industrial and mining enterprises, power plants and substations, electrical facilities, and for frequent operation place. Adopting VET operating mechanism and circuit breaker integrated , design can be used as a fixed installation unit can also be equipped with special advance mechanism, the composition of handcart unit used. Some of the main circuit can use the whole solid seal post, in order to achieve smaller circuit breakers, high reliability, maintenance-free, can be equipped with KYN28A-12 (GZS) and other handcart switch cabinet in the home can also be used with fixed XGN switchgear.

2.Product model and the meaning

1.Enterprise mode



3.Product standard

Standards the breaker complies with are as follows:

GB1984 AC high voltage breaker

GB/T11022 Common technical requirements of high voltage switching equipment and control equipment standard

JB3855 3.6~40.5kV Indoor AC high voltage vacuum breaker

DL/T402 Technical conditions for AC high voltage breaker ordering

IEC56 AC high voltage breaker

4.The use of environmental conditions:

a.Ambient temperature: not higher than +40 ℃, not less than -15℃

b. Altitude: not exceed 1000m.

c. Relative humidity: daily average of not more than 95%, month average of not more than 90%.

d. Earthquake intensity: not more than ten.

e. No fire, explosion hazard, serious filthy, chemical corrosion, as well as places of intense vibration.

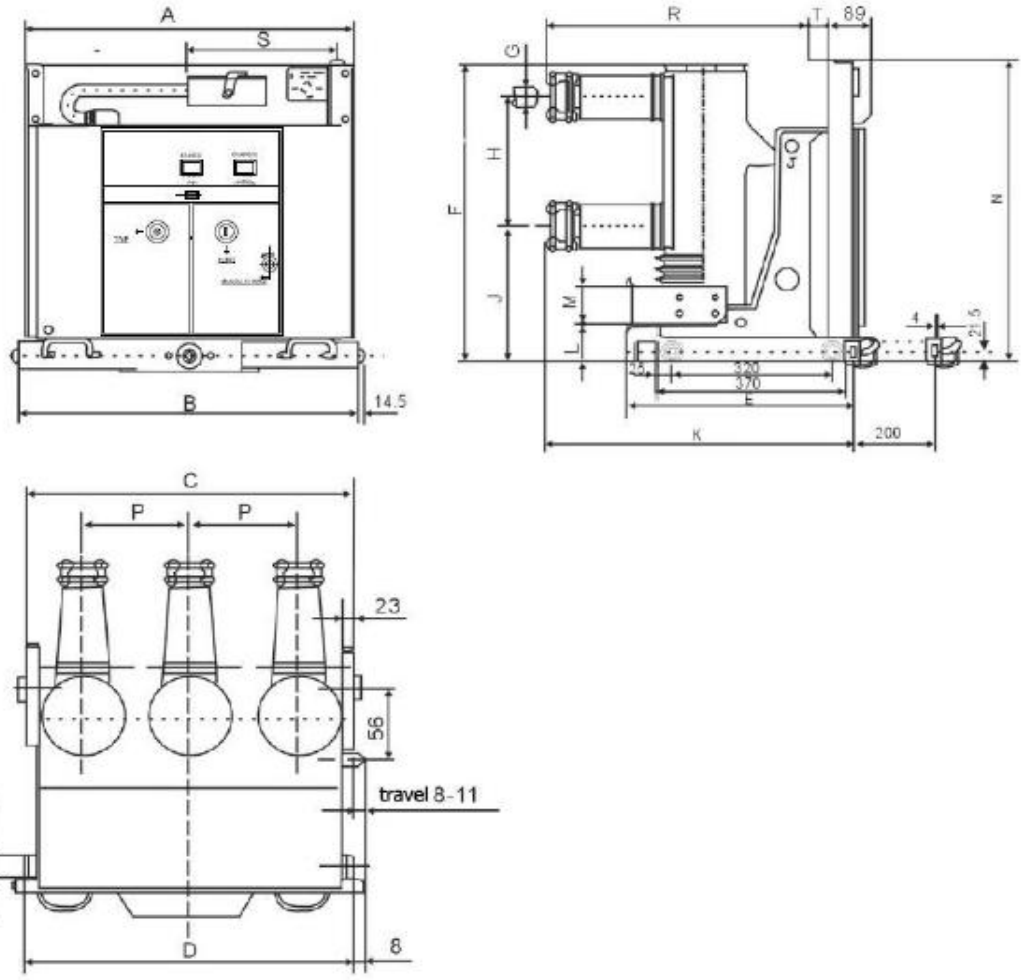
5.Rated parameters

Serial No.	Name		Unit	Parameter
1	Rated voltage		kV	12
2	Rated insulation level	1min industrial frequency voltage withstand		42
		Rated lightning impact tolerance voltage		75
3	Rated Frequence		HZ	50
4	Rated current		KA	630、1250、1600、2000、2500、3150、4000
5	Rated short circuit breaking current		KA	20、25、31.5、40
6	Rated short time withstand current			20、25、31.5、40
7	Rated short circuit continuance time		S	4
8	Rated peak value withstand current		KA	50、63、80、100
9	Rated short circuit closing & opening current			50、63、80、100
10	Secondary circuit industrial frequency withstand voltage (1min)		V	2000
11	Rated a single/back-to-back capacitor group breaking current		A	630/400(40KA 800/400)
12	Rated capacitor group closing current		A	12.5
13	Open time		Ms	20-50
14	Close time		Ms	35-70
15	Mechanical life		Times	20000(50KA 10000Times)
16	Rated current breaking number		Times	20000(50KA 10000Times)
17	Rated short time current breaking number		Times	50(40KA30Times, 50KA 20Times)
18	Action static contact cumulative wear thickness allows		mm	3
19	Rated closing& opening operation voltage		V	AC110/220 DC110/220
20	Rated voltage energy storage motor		V	AC110/220 DC110/220
21	Rated power energy storage motor		W	70 (40KA.50KA 80)
22	Energy storage time		S	≤10
23	Contact distance		mm	11±1
24	Over travel		mm	3.5±0.5
25	Contact closing bounce time		ms	≤2
26	Three phase opening &closing synchronism		ms	≤2 (40KA 50KA≤3)
27	Average opening speed		ms	0.9-12.
28	Average closing speed		υΩ	0.5-0.8
29	Leading electrical circuit resistance		N	≤60 （630A） ≤50(1250A) ≤35(1600-2000A) ≤25(+2500A)
30	Closing contact pressure		ms	2000±200(20KA) 2400±200(25KA) 3100 ±200(31.5KA) 4250±250(40KA) 6500±500(50KA)
31	Rated operating sequence			o-0.3s-co-180s-co o-180s-co-180s-co(50KA)

Note:4000A. 5000A need forced air cooling!

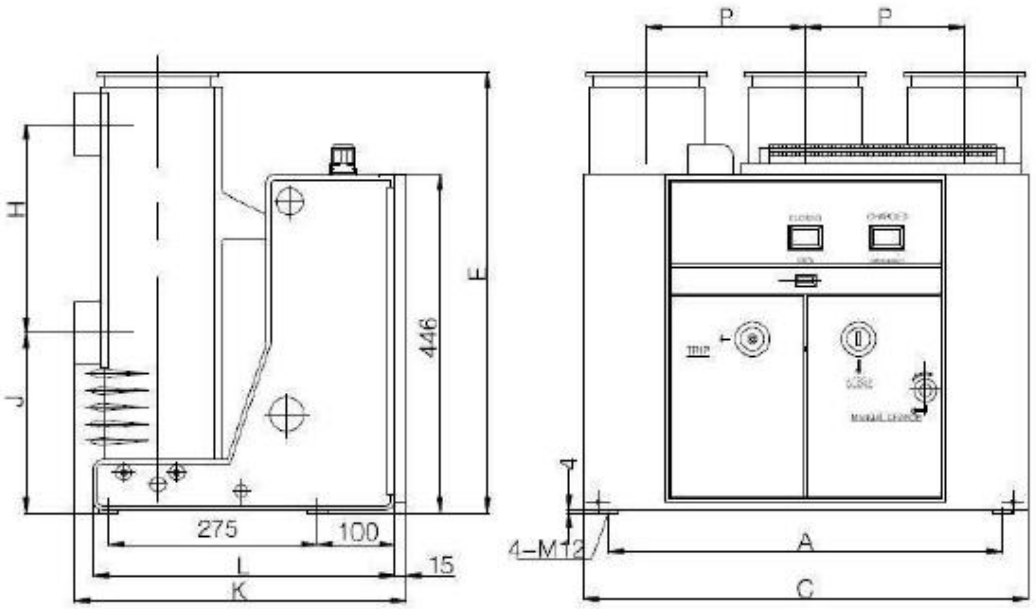
6.Draw out Type VS1 general structure drawing and installation size:

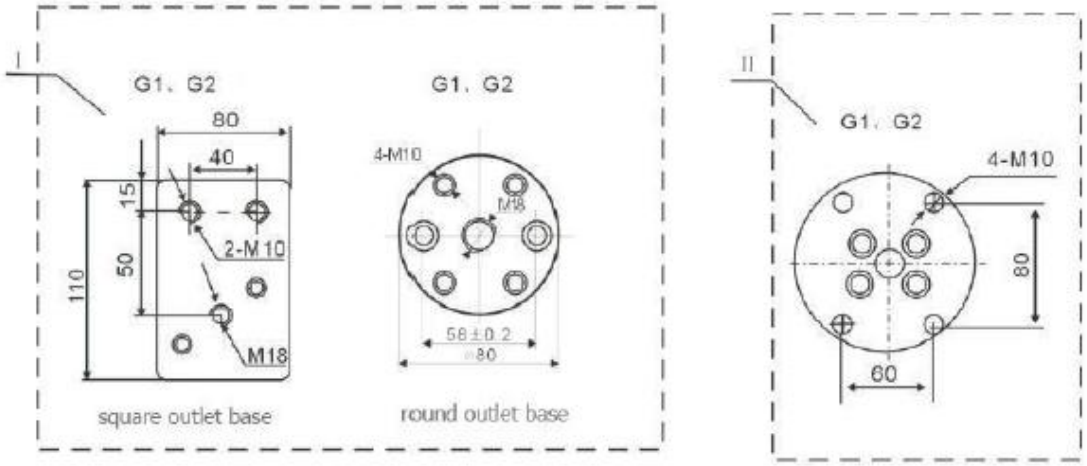
Unit: mm



Width of cabinet	Rated Current (A)	Rated short circuit breaking current (KA)	P	H	A	B	C	D	E	F	G	J	K	L	M	N	R	S	T
650	630	20~31.5	150	275	490	502	492	500	433	626	Φ35	280	598	76	78	637	508	202	40
650	1250	20~31.5	150	275	490	502	492	500	433	626	Φ49	280	598	76	78	637	508	202	40
800	630	20~31.5	210	275	638	652	640	650	433	626	Φ35	280	598	76	78	637	508	277	40
800	1250	20~40	210	275	638	652	640	650	433	626	Φ49	280	598	76	78	637	508	277	40
800	1600	31.5~40	210	275	638	652	640	650	433	626	Φ55	280	598	76	78	637	508	277	40
1000	630	20~31.5	275	275	838	852	838	850	433	626	Φ35	280	598	76	78	637	508	377	40
1000	1250	20~40	275	275	838	852	838	850	433	626	Φ49	280	598	76	78	637	508	377	40
1000	1600	31.5~40	275	275	838	852	838	850	433	626	Φ55	280	598	76	78	637	508	377	40
1000	1600~2000	31.5~40	275	310	838	852	838	850	361	680	Φ79	295	586	77	88	698	536	377	0
1000	2500~5000	31.5~50	275	310	838	852	838	850	361	680	Φ109	295	586	77	88	698	536	377	0

7.Fixed Type VS1 general structure drawing and installation size:
Unit: mm

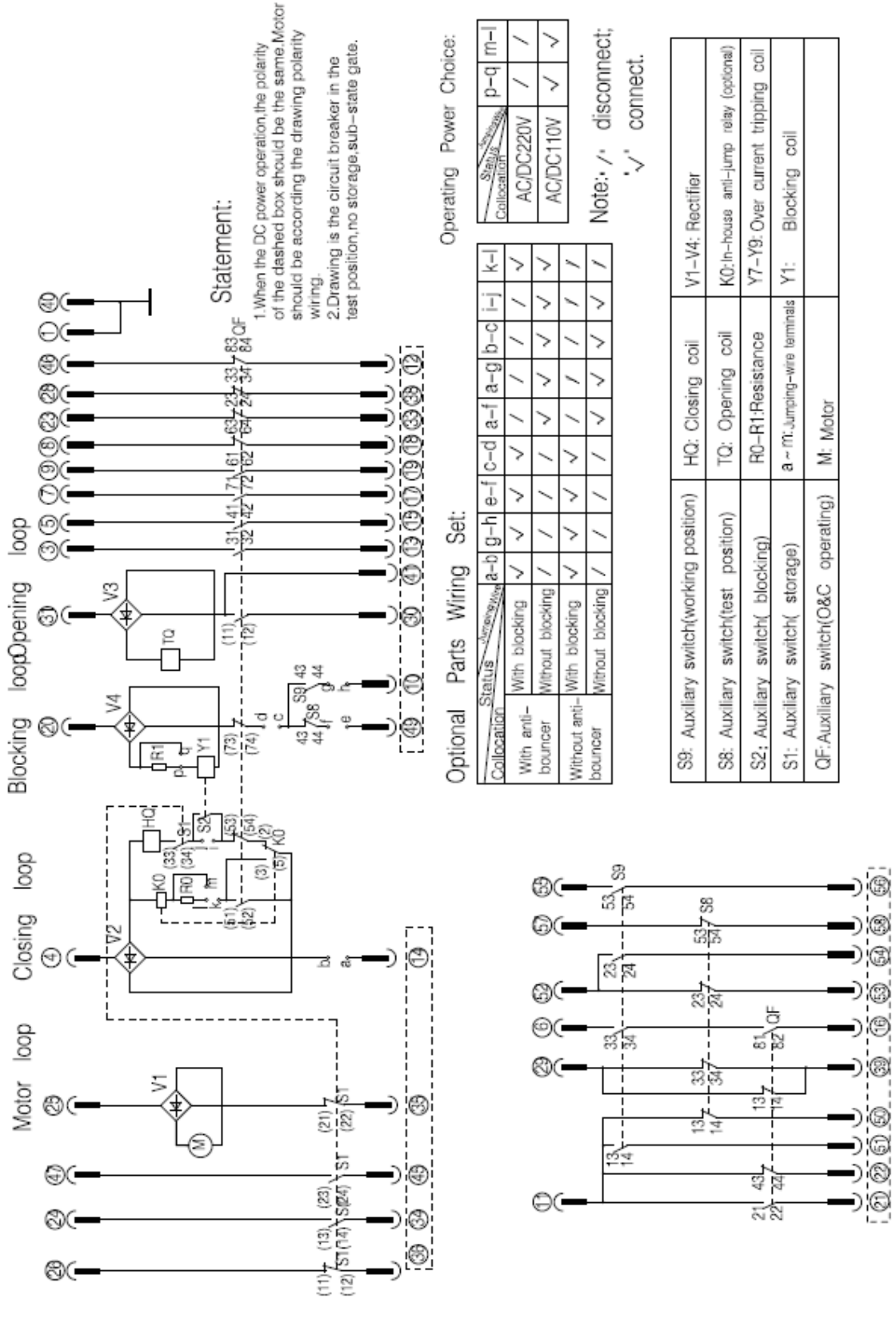




Note: Normal I match round outlet base.

Cabinet width	Rated current	P	H	A	B	C	E	F	G1 G2	J	K	L
800	630-1600	210	257	520	520	588	580	65	I	237	455	410
1000	630-1600	275	257	720	720	770	580	65	I	237	455	410
1000	1600-5000	275	310	720	720	770	632	78	II	252	465	440

8.Draw Out Type Circuit breaker internal circuit diagram:



Optional Parts Wiring Set:

Collocation \ Status		a–b	g–h	e–f	c–d	a–f	a–g	b–c	i–j	k–l
With anti-bouncer	With blocking	√	√	√	√	/	/	/	/	√
	Without blocking	/	/	/	/	√	√	√	√	√
Without anti-bouncer	With blocking	√	√	√	√	/	/	/	/	/
	Without blocking	/	/	/	/	√	√	√	√	/

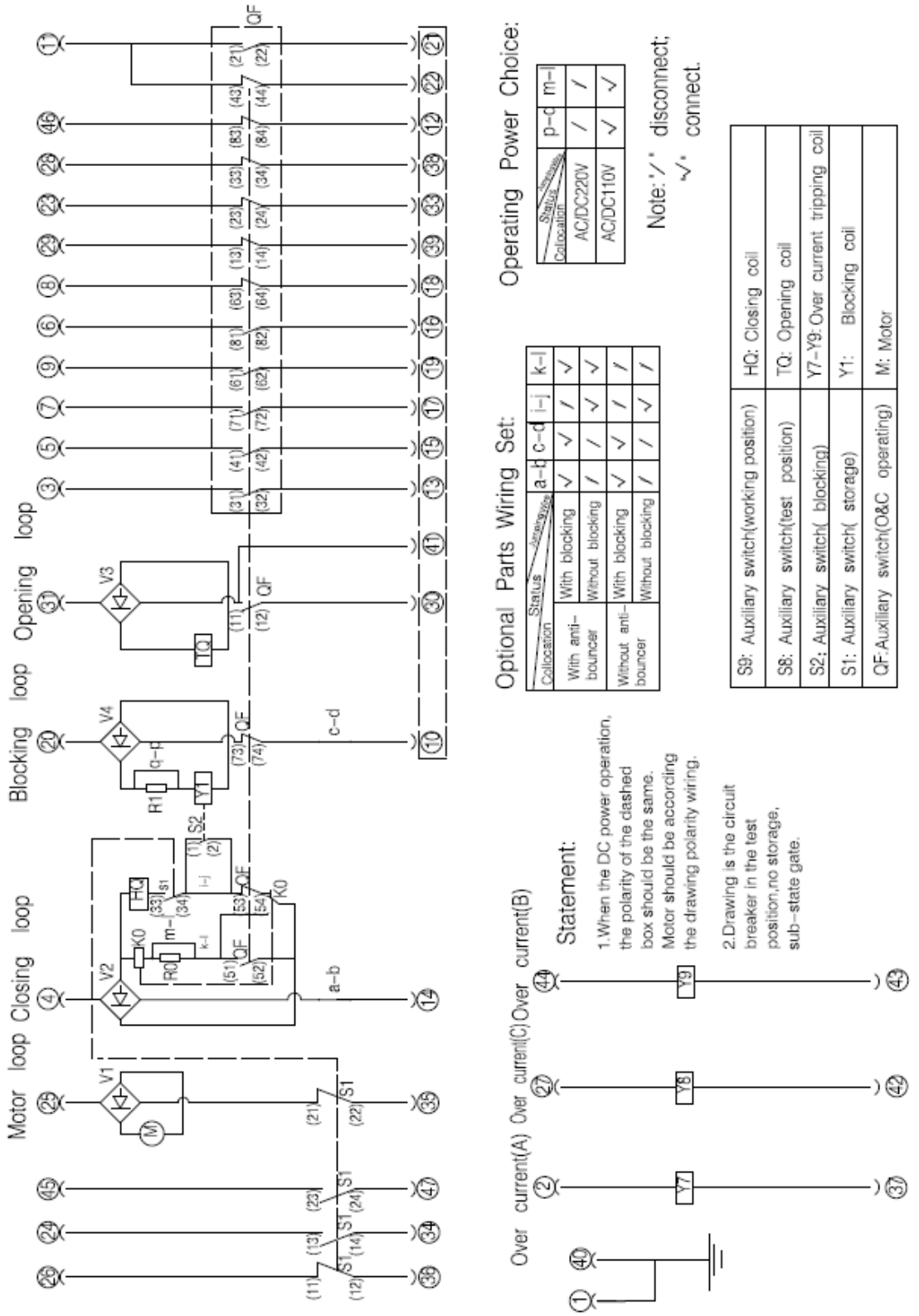
Operating Power Choice:

Collocation \ Status	p–q	m–l
AC/DC220V	/	/
AC/DC110W	√	√

Note: "/" disconnect;
"√" connect.

S9: Auxiliary switch(working position)	HQ: Closing coil	V1–V4: Rectifier
S8: Auxiliary switch(test position)	TQ: Opening coil	K0: In-house anti-jump relay (optional)
S2: Auxiliary switch(blocking)	R0–R1:Resistance	Y7–Y9: Over current tripping coil
S1: Auxiliary switch(storage)	a ~ m: Jumping-wire terminals	Y1: Blocking coil
QF:Auxiliary switch(O&C operating)	M: Motor	

9.Fixed Type Circuit breaker internal circuit diagram:



Optional Parts Wiring Set:

Collocation \ Status	Arrangement	a–b	c–d	i–j	k–l
With anti-bouncer	With blocking	√	√	/	√
	Without blocking	/	/	√	√
Without anti-bouncer	With blocking	√	√	/	/
	Without blocking	/	/	√	/

Operating Power Choice:

Collocation \ Status	Arrangement	p–q	m–l
AC/DC220V		/	/
AC/DC110V		√	√

Note: '/' disconnect;
'√' connect.

S9: Auxiliary switch(working position)	HQ: Closing coil
S8: Auxiliary switch(test position)	TQ: Opening coil
S2: Auxiliary switch(blocking)	Y7–Y9: Over current tripping coil
S1: Auxiliary switch(storage)	Y1: Blocking coil
QF:Auxiliary switch(O&C operating)	M: Motor

10: Installation and test run :

1: Examination before installation

a)Examine if the specification of the breaker complies with the contract

b)Examine if the documents and the accessories provided with the breaker are complete

c)Examine if there is any injury on the surface of the breaker and if the isolated drum is damaged

d)Examine the vacuity of the vacuum arc-chute with industrial frequency voltage withstand method, s witch tripping and apply industrial frequency voltage 42kV for 1min at the fracture and there should be no flash-over or breakdown.

When the product is damaged or there are other doubts, it is suggested to take pictures of the damages on site and notice the supplier in time.

2 Installation

When hand-cart breaker is cooperated with the cabinet, the contacting depth of the dynamic and static contacts should be between 15mm and 25mm

When installing fixed type breaker, the installation surface should be smooth and if the four installation points are not on a plane, washers should be used for adjustment to avoid deformation of the overall structure of the breaker because of force bearing.

a)When connecting the fixed type breaker with the bus row, the outlet end of the breaker must not bear permanent forces of pulling, pressing and torque.

b)When the installation is completed, examination should be conducted for the breaker to see if there are any foreign matters in the breaker and cleaning should be conducted.

c)Examine the dust-proof cover on the isolated drum of the breaker. When the rated current of the switch is less than 1250A, the dustproof cover can be installed and when the rated current of the switch is greater than or equal to 1250A, the dust-proof cover should be removed.

d)When there are angle steels for lifting on the frame of the breaker, before application, the angle steels on the two sides of the frame for lifting should be removed.

3 Test run

3.1 Push-in and pull-out of the hand-cart

Insert the pushing handle into the push-hole and rocking clockwise is to push in while rocking counter clockwise is to withdraw. The total travel of push-in is 200mm. Please rock the handle smoothly and when a sound of "da" is heard, the hand-cart reaches the position. Do not rock with too great force to prevent the pushing mechanism from damage. When in tripping state, the hand-cart should be able to get into the test position or operation position successfully and the corresponding position indicating switch (S8 or S9) loop is electrified.

3. 2 Accumulation energy operation

Insert the handle into the accumulation energy shaft of the motor and rock it clockwise till the accumulation energy is completed. When electric accumulation energy is conducted, after the accumulation energy process is completed, the power supply for accumulation energy should be able to cut off automatically. All the above operations should be normal.

3.3 Closing and tripping operation

Closing and tripping operations are conducted in manual and electric modes respectively and the operations should be accurate and with no mistake.

3. 4 Mal-operation prevention and interlock tests

The tests should be conducted in turn based on the sequence in clause 5.9 and the operation should be reliable.

4. Difficult problems

During the process of test run and operation, if there are nay difficult problems, please first try to solve those problems as indicated in Table 5.

Table 5 Difficult problems and the counter-measures

Problem	Cause	Counter-measure
The hand-cart breaker is unable to be closed manually and electrically at the test position and operation position. If connecting the closing power supply for a long period of time, the closing coil will be burnt.	Though the position indicating light on the cabinet is on, the mechanical interlock of the breaker has not reached the position and the breaker is still in an interlocked state.	When rocking the hand-cart in or out, the handle of the test position and the operation position should be rocked to the end and a sound of "ta" can be heard at the moment, indicating the mechanical part has reached the position
Manual or electric closing is unable to conduct。	1. The lock loop has not been turned on yet and the breaker is in a locked state. 2. The voltage of the lock power supply is not within the scope; therefore, the lock coil is unable to act reliably.	1. Turn on the lock circuit power supply to release the lock. 2.Examine the voltage of the lock power supply and make it meet the requirement.
The electric closing is nor reliable.	Anti-bounce loops are configured repeatedly for the breaker and the cabinet and they interference with each other.	Cancel one of the anti-bounce loops
The over-current trip does not act.	The power supply of the over-current trip board has not been turned on.	Turn on the power supply of the over-current trip board
Electric accumulation energy, electric close and electric tripping are unable to conduct	1. The secondary power supply has not been turned on. 2. The voltage of the secondary power supply is not within the scope. 3. The airborne plug connected with the cabinet has not been firmly plugged in. 4. Loose push and pull items on the secondary part in the breaker.	1. Turn on the secondary power supply. 2. Examine the voltage of the secondary power supply and make it meet the requirement. 3. Firmly insert the airborne plug. 4. Remove the panel of the breaker and examine the push and pull items and plug them firmly.

11. Maintenance

During normal operation, though the breaker is designed as maintenance free, and special bearings, special surface treatment technology and enduring effect lubricating grease are adopted, the breaker is maintenance free for the whole service life theoretically, as the operation environments are different and the configurations are different (for example, vacuum arc-chutes made by different manufacturers) in order to ensure safety and reliability, it is still required to conduct necessary examination and maintenance.

11. 1 Surface

Examination should be conducted every two years for the filthy, wetted and corroded situation of the surfaces of the breaker based on the operation environment. Dusts on the surfaces of the insulators should be removed with dry cloth and then silk cloth with household mild base cleaning agent or safe cleaning agent should be used to remove various filths. Attention should be paid to if the cleaning agents used are suitable to plastic and synthetic rubbers. Solvents such as catbon tetrachloride or trichloroethylene must not be used.

11. 2 Structure

The structural components should be examined periodically based on tripping and close frequencies to see if there are deformation, caused by mal-operation and if there is any, replacement should be conducted in time

11. 3 Fastener

It is suggested that after 6000 times operation for the breakers below 31.5kA and 2000 times for 40kA breakers, the panel should be opened and the fasteners should be examined to see if there are any loose items and if there are any deformation and come-of of the clamps and retaining rings according to the actual situation. If there are any, the problem fasteners should be resumed to the normal state in time.

11. 4 Hindrance

When the breaker is stored for a long period of time or seldom operated, hindrance may occur in the moving parts; therefore, at least 5 times of accumulation energy, closing and tripping operation should be conducted every year for the breaker

11. 5 Insulation

At least one time insulation test should be conducted for the breaker every year to judge if there is any gas leakage in the vacuum arc-chute and if the insulation strength of the other insulators has reduced. The test can be conducted via industrial frequency voltage withstand method.

11. 6 Service life

For frequently operated applications, attention should be paid to the operation times and the breaker must not be used when the allowable drop-out times of the vacuum arc=chute and the mechanical service life are exceeded.

Precautions :

a)When maintenance is conducted, the breaker should be in non-accumulation-energy and tripping state. All the power supplies should be cut off. As the accumulation energy and the closing state springs are all accumulated with energy, when maintenance is conducted, even slight carelessness may make the mechanism operate, casing injury to personnel. ;

b)Maintenance should only be conducted by professionals. ;

c)After maintenance, especially component replacement and re-adjustment, the mechanical performance of the switch should be tested to make it meet the stipulation of the technical conditions 。

12. Optional accessories

12. 1 Anti-bouncer

After the close operation of the breaker is completed, if the close signal is not canceled in time, the anti-bounce control loop inside of the breaker will cut off the close loop to avoid multiple re-close. If overall PC protector or anti-bounce loop is adopted, it should be confirmed that if it is necessary to install the anti-bounce device 。

12. 2 Locking device

In order to prevent close in condition that the secondary control power supply has not been turned on or it is lower than what the technical conditions require, a locking device is equipped, which can also be used to achieve other cooperative interlock functions the client asks for 。

12. 3 Over-current tripping device

The device is an electronic and intelligent device. Compared with conventional tripping coil circuit, it has the advantages such as accurate control and sensitive action, etc. However, when the device operates, it requires outside power supply; therefore, it is called active program. Please refer to Table 6 for the HP consumption parameters of the device。

Table 6 HP consumption parameters of over-current tripping devic

Operation voltage (V)	Rated current (m A)	
	Static	Dynamic
AC85V~265V	10	≤100
DC80V~300V		

The device obtains A, B and C 3-phase current signals from the secondary side of the current inductor and compares the signals with the setting values. When they are greater than the setting values, the device sends out signal of action, turns on the tripping loop of the breaker, makes the breaker trip and completes the over-current protection function. When the client has no special requirement, the rated current setting is 5A 。

13. Notice for ordering

When ordering, please indicate：

a) Model, name and quantity of the breaker;

b) The rated voltage, rated current and rated short circuit drop-out current of the breaker;

c) Rated operation voltage;

d) Secondary wiring program (Optional) ;

e) Name and quantity of spare parts ;

f) Other special requirements of the user。